Publication 75A

Guide to weed control FIELD CROPS 2020

Ministry of Agriculture,
Food and Rural Affairs

Ontario

Discard old editions of this publication. Each year a committee comprised of representatives from provincial government, industry, academia and grower organizations review the pesticides listed in the publication.

To the best knowledge of the committee, at the time of printing, the pesticide products listed in this publication were:

- federally registered
- classified by the Ontario Ministry of the Environment, Conservation and Parks (MECP)

The information in this publication is general information only. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

This publication lists a number of brand names of pesticides. It is neither an endorsement of the product nor a suggestion that similar products are ineffective.

THE PESTICIDE LABEL

Consult each product label before you use a pesticide. The label provides specific information on how to use the product safely, hazards, restrictions on use, compatibility with other products, the effect of environmental conditions, etc.

The pesticide product label is a legal document. Follow all label directions.

REGISTRATION OF PESTICIDE PRODUCTS

The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticide products for use in Canada following an evaluation of scientific data to ensure that the product has value, and the human health and environmental risks associated with its proposed use are acceptable.

1. Full Registration

Pesticide registrations are normally granted for a period of 5 years, subject to renewal.

2. Emergency Registration

An emergency registration is a temporary, time-limited registration of no more than 1 year, approved to deal with serious pest outbreaks. An emergency is generally deemed to exist when both of the following criteria are met:

A. An unexpected and unmanageable pest outbreak or pest situation occurs that can cause significant health, environmental or economic problems; and

B. Registered pesticides and cultural control methods or practices are insufficient to address the pest outbreak.

MAXIMUM RESIDUE LIMITS

The PMRA has established maximum residue limits (MRLs) for pesticides. An MRL is the maximum amount of pesticide residue that may remain on food after a pesticide is applied as per label directions and which can safely be consumed. Processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to-date records on pesticide use in each crop.

SUPPLEMENTAL/AMENDED LABELS

Supplemental/amended labels provide label directions for new approved uses for a registered pesticide that do not appear on the current label. These label directions MUST be followed when using the pesticide for these purposes.

Examples of when you must use a supplemental/amended label include:

- **Emergency Use Registration**
- **Minor Use Label Expansion**

You can obtain a copy of a supplemental amended label from the pesticide manufacturer or pesticide vendor, the grower association that sponsored the emergency registration or minor use, from OMAFRA or PMRA's Pest Management Information Service.

For more information on the federal registration status, check the PMRA website at www.healthcanada.gc.ca/pmra or call 1-800-267-6315.

REGULATION OF PESTICIDES IN ONTARIO

The MECP is responsible for regulating pesticide sale, use, transportation, storage and disposal in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09.

All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling the ServiceOntario Publications Toll-Free number: 1-800-668-9938 or 416-326-5300.

CLASSIFICATION OF PESTICIDES

The Ontario pesticide classification system provides the basis for regulating the distribution, availability and use of pesticide products in Ontario. Classified products are posted on the MECP website: ontario.ca/pesticides.

CERTIFICATION AND LICENSING

Growers and Their Assistants

For information about certification for growers and training for assistants, check the Ontario Pesticide Education Program website: www.opep.ca or call 1-800-652-8573.

Commercial Applicators (Exterminators) and Their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician or call 1-800-265-5656 or e-mail pic@hort- trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca.

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The information contained in this publication is printed following the review by the Ontario Weed Committee on November 6th, 2019.

Members of the Ontario Weed Committee wish to recognize the following members:

Dr. Clarence Swanton - Retired from the University of Guelph, Department of Plant Agriculture in 2019, Dr. Swanton has made many great contributions to Ontario Agriculture and the Ontario Weed Committee. We wish Dr. Swanton all the best in his future endeavors.

Dr. Peter Sikkema - Professor in the Department of Plant Agriculture, University of Guelph, Dr. Sikkema was recently inducted into the Kent Agricultural Hall of Fame for his public service in exploring weed management solutions for Ontario farmers.

Cover photos provided by:
Jodie Aldred Photography
www.jodiealdredphotography.com
@jodiealdredphotography

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1. MANAGEMENT STRATEGIES FOR PROBLEM WEEDS

Problem perennial and biennial weeds are challenging to control because they typically have extensive root systems that can propagate new shoots. Although difficult to eradicate it is possible to minimize the impact perennial weeds have by eliminating top growth and providing competition from desired vegetation to exhaust the root system. An integrated approach that uses tillage, cover crops and effective herbicides has proven to be the most effective way to reduce populations of problem weeds. This chapter provides a summary of over three decades of public research that has investigated management strategies for some of the most challenging weed species.

Crop Rotation

A number of long term studies have demonstrated that the density of perennial weeds increases under monoculture cropping system compared to cropping rotations consisting of three or more crops.

Cover Crops

The inclusion of cover crops such as rye, red clover, buckwheat and oilseed radish or overwintering crops like winter wheat or forages in the cropping system will suppress perennial weed growth and reduce seed production of annual and perennial weeds. Fast growing crops or crops exhibiting allelopathic properties will also suppress weed growth. It is best to kill off a lush cover crop prior to winter so that the above ground biomass can decompose prior to planting in the spring.

Tillage Systems

The type of tillage implement used and the depth at which the ground is tilled has been shown to influence the density of perennial and biennial weeds. No-till systems are more likely to increase perennial weed populations due to a lack of underground root disruption. Deep tillage (greater than 15 cm) with a moldboard plough has been shown to decrease populations of Canada thistle and perennial sow-thistle. The choice of tillage system used on any particular field should be based primarily on the soil type and slope of the land so as to minimize erosion. Its benefits to weed control should only be taken advantage of when it has the sustainability of the top soil as the priority.

Herbicide Selection

In general, the use of postemergence herbicides results in more successful top growth control of perennial and biennial weeds compared to preemergence herbicides. The strategy with in-crop postemergence herbicides is to kill off top growth so that the perennial plant must use its root reserves to generate new top growth. Every opportunity should be made to apply a systemic herbicide (e.g., glyphosate) in the fall months. The combination of shorter day lengths and cooler temperatures triggers many perennial weeds to begin allocating carbohydrates to the roots for over-wintering, which allows for translocation of a systemic herbicide down to the roots resulting in density reductions the next spring. Below are the most successful herbicide strategies for corn, soybean and cereal production on 16 different species based on University of Guelph comparative research trials conducted over more than 20 years. Always refer to each product's label for specific details about the weed species which are controlled. Refer to the precautionary statements provided for each product in the appropriate crop chapter in this guide as well as the product label.

Alfalfa, Volunteer (Retired Stand)

BEST STRATEGY

Autumn is the best time to terminate an old stand of alfalfa so that a suitable seedbed exists in the spring and volunteer plants are minimized. A moldboard plough is the most effective tillage implement. If in a minimum or no-till cropping system, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) tank-mixed with either 2,4-D Ester 700 at 1.3 L/ha (520 mL/acre) or ENGENIA at 1 L/ha (400 mL/acre) or XTENDIMAX/FEXAPAN at 1.7 L/ha (680 mL/acre) provides the most effective chemical control (>95%). If trying to terminate an old stand of glyphosate tolerant alfalfa, these tank-mixes will be equally effective.

Corn – Conventional

In comparative trials postemergence applications of dicamba (e.g., ENGENIA) at 1L/ha (0.4 L/acre) dicamba/atrazine (e.g., MARKSMAN) at 3.75 L/ha (1.5 L/acre) and DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) have provided suppression of volunteer alfalfa. When either dicamba, dicamba/atrazine or DISTINCT is tank-mixed with ACCENT, OPTION or ULTIM, control of volunteer alfalfa is improved.

Expectation for control: 70%–75%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, glyphosate can be tank-mixed with either dicamba (e.g., ENGENIA) or dicamba/atrazine products (e.g., MARKSMAN).

Expectation for control: 70%–80%

Soybeans – Conventional

If fall herbicide applications have not been made in reduced tilled soybeans, then the tank-mix of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre) + 2,4-D Ester 700 at 800 mL/ha (320 mL/acre) applied 7 days preplant provides the best control of alfalfa.

Expectation for control: 75%–85%

Once soybeans have emerged, volunteer alfalfa is virtually impossible to control. REFLEX or BLAZER will burn the leaf tissue of volunteer alfalfa but the plants will grow out of the injury in 2–3 weeks. Volunteer alfalfa is tolerant to all other postemergence soybean herbicides.

Expectation for control: 40%–50%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, control of volunteer alfalfa is listed on the ROUNDUP WEATHERMAX (540 g/L) label when applied at a rate of 4.67 L/ha (1.87 L/acre).

Expectation for control: 70%–80%

In Roundup Ready 2 Xtend soybean varieties, control of volunteer alfalfa is listed RU Xtend label when applied at 2 L/acre. Expectation for control: 80%–90%.

Cereals

In limited comparative trial work, cereal herbicides containing 2,4-D Ester 700, dichlorprop/2,4-D (e.g., ESTAPROP XT, TURBOPROP) and the PIXXARO co-pack have provided the best suppression of volunteer alfalfa.

Expectation for control: 60%–70%

Bindweed, Field

Corn – Conventional

In limited comparative trials, postemergence applications of dicamba (e.g., ENGENIA) at 1 L/ha (0.4 L/acre) or DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) have provided the most consistent control of emerged field bindweed.

Expectation for control: 75%–85%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, sequential applications of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre) applied at the 2–3 leaf stage of corn and then again at the 7–8 leaf stage of corn to emerged field bindweed provided the most consistent level of control. Alternatively, a single application of glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) provided comparable control to the sequential applications.

Expectation for control: 75%–85%

In glufosinate tolerant ("Liberty Link") corn, suppression of top growth can be achieved when LIBERTY is applied twice, to emerged field bindweed. The first application typically being at the 3 leaf stage of corn and at a rate of 2.5 L/ha (1 L/acre) followed by a second application at the 7–8 leaf stage of corn at a rate of 2 L/ha (0.8 L/acre). Alternatively you could tank-mix LIBERTY with dicamba /atrazine (e.g., MARKSMAN) and apply once to emerged field bindweed between the 2–6 leaf stage of corn.

Soybeans – Conventional

Postemergence applications of BLAZER at 2.5 L/ha (1 L/acre) or BASAGRAN FORTE at 2.25 L/ha (0.9 L/acre) can burn back the foliage of field bindweed when applied during periods of high heat, high humidity and adequate soil moisture. However, field bindweed will grow back.

Expectation for control: 40%–50%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, sequential applications of glyphosate (360 g/L) at 2.5 L/ha (1 L/acre) applied at the 1st trifoliate stage of soybean and then again at the 4th trifoliate stage of soybean to emerged field bindweed provided the most consistent level of control. Alternatively, a single application of glyphosate (360 g/L) at 5 L/ha (2 L/acre) provided comparable control to the sequential applications.

Expectation for control: 75%–85%

Cereals

The challenge with field bindweed control in cereal crops is that the weed often emerges after the appropriate crop stage for herbicide applications. In winter wheat some farmers have had success in applying bromoxynil/MCPA in the fall to suppress field bindweed growth the following spring. The single most important management practice that a grower can implement to reduce field bindweed is with either a pre-harvest glyphosate (360 g/L) application at 2.5 L/ha (1 L/acre) or with an application of glyphosate (360 g/L) at 3.75 L/ha (1.5 L/acre) after cereal harvest, typically in mid to late September, after field bindweed has re-grown. Following cereal harvest, some farmers have had better success when tank-mixing 2,4-D Ester 700 at 0.67 L/acre with glyphosate (540 g/L) at 1 L/acre than using high rates of glyphosate. Both application timings will decrease the level of field bindweed to manage in the following spring. A pre-harvest application is preferred if field bindweed is at a population density that is problematic for harvesting.

Black Medick

Refer to management strategies for ALFALFA, as they apply equally to Black medick.

Bur Cucumber

Corn – Conventional

Sequential applications provide the most consistent level of control. Either CONVERGE XT or PRIMEXTRA II MAGNUM should be applied preemergence followed by a postemergence application of bromoxynil (e.g., PARDNER + AATREX 480) or CALLISTO + AATREX 480. Bromoxynil + AATREX 480 is best applied when bur cucumber is at the 4–6 leaf stage of growth.

Expectation for control: 85%–90%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, the most consistent bur cucumber control has been achieved when glyphosate (540 g/L) is applied twice to emerged bur cucumber, with the first application occurring at the 2–3 leaf stage of corn and the second at the 7–8 leaf stage of corn. Bur cucumber at the 4–6 leaf stage requires a glyphosate (540 g/L) rate of 3.33 L/ha (1.34 L/acre) to provide adequate control.

Expectation for control: 85%–90%

Soybeans – Conventional

Sequential applications provide the most consistent level of control. In comparative trials the best control of bur cucumber was achieved when SENCOR 75DF was applied preemergence at 0.6 kg/ac (1.5 kg/ha) followed by an application of either CLASSIC/CHAPERONE at 35 g/ha (14 g/acre) with a non-ionic surfactant at 0.2% v/v or PINNACLE SG at 12 g/ha (4.8 g/acre) with a non-ionic surfactant at 0.1% v/v to bur cucumber at the 4–6 leaf stage of growth.

Expectation for control: 75%–80%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, sequential applications of glyphosate (360 g/L) applied at the 1st trifoliate stage of soybean and then again at the 4th trifoliate stage of soybean provided the most consistent level of control. Bur cucumber at the 4–6 leaf stage requires a glyphosate (360 g/L) rate of 5 L/ha (2 L/acre) to provide adequate control.

Expectation for control: 85%–90%

Cereals

Typically not found in winter cereals as the crop produces enough ground cover to inhibit the germination of this summer annual weed. Cereal herbicides have not been evaluated. However in field corn, the active ingredient bromoxynil has shown to have reasonable activity on bur cucumber, therefore cereal herbicides that contain bromoxynil (e.g., BUCTRIL M, INFINITY) should provide some control of this species in cereals.

Canada Fleabane – Glyphosate Resistant

Corn

Control of glyphosate resistant Canada fleabane has been most consistent with postemergence herbicide applications but good control can be achieved with preemergence herbicides. Of the preemergence herbicides, ACURON, INTEGRITY, MARKSMAN, CALLISTO + AATREX 480 and ENGENIA, FEXAPAN or XTENDIMAX are all good options. Postemergence applications of MARKSMAN, ENGENIA , PARDNER + AATREX 480 and DISTINCT are also effective on glyphosate resistant Canada fleabane. Aggressive primary tillage prior to planting to small fleabane rosettes can also be very effective.

Soybean

Glyphosate resistant Canada fleabane is most difficult to control in soybean because few options exist to control it once the soybean crop has emerged. Therefore it must be controlled prior to planting. When research trials were initially done, the pre-plant tank-mix of glyphosate + ERAGON LQ + MERGE was the most effective option. However, as that treatment was evaluated over several seasons and locations, about one third of the time, glyphosate + ERAGON LQ + MERGE failed to provide commercially acceptable control of glyphosate resistant Canada fleabane. To address this inconsistency, different tank-mix options were evaluated and the addition of SENCOR 75 DF (metribuzin) at 538 g/ha (215 g/acre) to glyphosate + ERAGON LQ + MERGE improved control of glyphosate resistant Canada fleabane. This improved control has also been observed when other herbicides containing metribuzin are used (e.g., BIFECTA, BOUNDARY LQD, CANOPY PRO, CONQUEST LQ, TIEDOWN, TRIACTOR etc.). The pre-plant herbicide BLACKHAWK has proven to be ineffective when applied alone but control exceeds 90% when tank-mixed with BIFECTA.

Soybeans – Herbicide Tolerant

In glyphosate and dicamba tolerant ("Roundup Ready 2 Xtend") soybean, the highest labelled rate of ENGENIA, FEXAPAN or XTENDIMAX provide good control of emerged Canada fleabane provided the weed is <15 cm tall at time of application.

Cereals

INFINITY, PIXXARO and LONTREL XC are the most effective at controlling Canada fleabane in winter wheat, spring wheat and spring barley.

Post Cereal Harvest

Once the cereal crop is harvested, a greater amount of sunlight will hit the soil surface and will either stimulate new weed germination or growth of Canada fleabane that was suppressed by the cereal canopy. To minimize Canada fleabane seed being produced and returned to the soil, an aggressive cover crop (e.g., oats, rye, cover, oilseed radish) should be planted. Alternatively, fall tillage should be done no later than 4–6 weeks after harvest or before weed seed reaches maturity. In research conducted by the University of Guelph (Guelph campus), fall tillage folowed by planting cereal rye at 56 kg/ha (50 lbs/acre) has been very effective at lowering populations of glyphosate resistant Canada fleabane and have improved the control achieved with spring applied herbicides.

Canada Thistle

Corn – Conventional

In comparative trials postemergence applications of DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) has provided excellent control of Canada thistle. Other herbicides like dicamba (e.g., ENGENIA) or dicamba/atrazine (e.g., MARKSMAN) also have good activity on Canada thistle. CALLISTO + AATREX 480 will provide suppression. LONTREL XC applied at 0.25 L/ha (0.1 L/acre) provides season long control of Canada thistle.

Expectation for control (with DISTINCT): 90% top growth control

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, target actively growing Canada thistle at the rosette stage and no larger then 50 cm in height with an application of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre). It is not advisable to tank-mix DISTINCT + glyphosate because of increased risk of crop injury.

Expectation for control: 90% top growth control

Soybeans – Conventional

Consistent control of Canada thistle is difficult to obtain in non-GMO (conventional) soybeans. In comparative trials CLEANSWEEP, BLAZER, PURSUIT or REFLEX + TURBOCHARGE were all capable of providing acceptable levels of top growth control when low populations of Canada thistle were present. However, all 4 products are inconsistent in their ability to deliver acceptable control with the most consistent product being CLEANSWEEP.

Expectation for control: 55%–90% top growth control

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, target actively growing Canada thistle at the rosette stage and no larger then 50 cm in height with an application of glyphosate (540 g/L) at 1.67L/ha (0.67 L/acre).

Expectation for control: 90% top growth control

Cereals

The challenge with Canada thistle control in cereal crops is that the weed often emerges after the appropriate crop stage for herbicide applications. If emerged prior to the flag leaf stage of cereals, dichlorprop/2,4-D, TROPHY and MCPA Ester have provided the best top growth control. The single most important management practice that a grower can implement to reduce Canada thistle is with either a pre-harvest glyphosate (360 g/L) application at 2.5 L/ha (1 L/acre) or with an application of glyphosate (360 g/L) at 3.75 L/ha (1.5 L/acre) after cereal harvest, typically in mid to late September, after Canada thistle has re-grown to 20–25 cm. Both application timings will decrease the level of Canada thistle to manage in the following spring. A pre-harvest application is preferred if Canada thistle is at a population density that is problematic for harvesting.

Chamomile, Scentless

IMPORTANT CONSIDERATION: Scentless chamomile is extremely difficult to control once in its second year of growth. Successful management of this species relies on removing newly germinated plants. Since this species germinates and emerges in both the fall and spring, effective management must be initiated during both those emergence periods. Trying to control fall germinated scentless chamomile with selective herbicides in the spring often results in poor performance. Established plants are best controlled in the fall with either glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) or tillage with a moldboard plough.

Corn

Ontario research has demonstrated that (540 g/L) at 3.33 L/ha (1.34 L/acre) is the most effective herbicide at controlling top growth of scentless chamomile in glyphosate tolerant corn. A split application is more effective than a single application. In conventional corn, no herbicide evaluated provided over 50% control.

Soybeans – Conventional

In Ontario trial work, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) provided the best control of scentless chamomile when applied prior to planting. Certified Crop Advisors in the Niagara region have had success with the higher rate of glyphosate also, but two applications are required to provide season long control as one application tends to result in re-growth. Classic can also provide decent activity on scentless chamomile but has been inconsistent

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) provides the best control of scentless chamomile

Cereals

In winter wheat a "two application" system works best whereby the first herbicide is applied in the fall to emerged winter wheat and the second application is made in the spring during the tillering to first node stage of winter wheat. In comparative trials, REFINE SG, REFINE M or BOOST M and bromoxynil/MCPA have all provided good control of scentless chamomile, provided it is no bigger than the 6 leaf stage of growth. Therefore, one strategy to achieve optimum control of fall germinated scentless chamomile would be to apply bromoxynil/MCPA in the fall and then REFINE SG in the spring if spring germinated seedlings are present.

Clover, Red

IMPORTANT: A lush stand of red clover, either as a cover or forage crop must be controlled in the fall if the intention is to plant a field crop in the spring. If one waits until the spring to control a stand of red clover, the level of control will not be as good and it will take that thick biomass at least 3–4 weeks to decompose enough to make a suitable seedbed. A fall moldboard plough is the only type of tillage that effectively buries a red clover stand. For minimum till cropping systems, a fall application of glyphsoate (540 g/L) at 2.5 L/ha (1 L/acre) + either dicamba (e.g., ENGENIA) at 0.5 L/ha (0.2 L/acre) or DISTINCT at 285 g/ha (115 g/acre) is the most effective way to remove a red clover stand.

Corn – Conventional

If glyphsoate + dicamba was not applied in the fall, then it should be applied in the spring 2 weeks prior to corn planting.

If red clover plants have escaped tillage treatments, such volunteer plants can be controlled with postemergence applications of either dicamba (e.g ENGENIA) at 0.5 L/ha (0.2 L/acre), or DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre). When these broadleaf herbicides are tank-mixed with either ACCENT, OPTION or ULTIM, control of volunteer red clover is improved. CALLISTO + AATREX 480 when applied postemergence can also provide good control of volunteer red clover.

Expectation for control: 95%

Corn – Herbicide Tolerant

If glyphsoate + dicamba was not applied in the fall, then it should be applied in the spring 2 weeks prior to corn planting.

In glyphosate tolerant ("Roundup Ready") corn, glyphosate could be used at a lower use rate and tank-mixed with either dicamba or dicamba/atrazine products.

Expectation for control: 95%

Soybeans – Conventional

In reduced tilled soybeans without any fall control of red clover, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) provides the best level of control.

Expectation for control: 85%

Once soybeans have emerged, red clover is virtually impossible to control. REFLEX or BLAZER will burn the leaf tissue of red clover but the plants will grow out of the injury in 2–3 weeks. Red clover is tolerant to all other postemergence soybean herbicides.

Expectation for control: 40%–50%

Soybeans – Herbicide Tolerant

In reduced tilled soybeans without any fall control of red clover, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) provides the best level of control in Roundup Ready soybeans. In "Roundup Ready 2 Xtend" soybean, ROUNDUP XTEND or ENGENIA, FEXAPAN or XTENDIMAX + glyphosate will control emerged red clover.

Expectation for control: 85%

If red clover escapes the preplant treatment above and is present in emerged glyphosate tolerant ("Roundup Ready") soybeans, glyphosate (360 g/L) at 3.75 L/ha (1.5 L/acre) should provide adequate control.

Expectation for control: 80%–85%

Cereals

The under-seeding of red clover in cereals has numerous benefits and is desired. Therefore if controlling weeds in a winter wheat crop under-seeded to red clover, herbicides which minimize clover injury should be used. Bromoxynil/MCPA, MCPA sodium and MCPA/MCPB products are all registered for use on winter wheat under-seeded to red clover.

Dandelion

Corn – Conventional

A tank-mix of OPTION 2.25 OD at 1.56 L/ha (0.63 L/acre) or ULTIM at 33 g/ha (13 g/acre) + DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) has provided the best control of dandelion in comparative trials. DISTINCT applied alone provides less visual control than when tank-mixed with OPTION or ULTIM.

Expectation for control: 75%–85%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, glyphosate (540 g/L) applied at 3.33 L/ha (1.34 L/acre) provides suppression of dandelion. The practice of tank-mixing a herbicide like dicamba, dicamba/atrazine or CALLISTO + AATREX 480 with glyphosate has not improved the level of dandelion control in limited comparative trials.

Expectation for control: 65%–70%

Soybeans – Conventional or Herbicide Tolerant

GUARDIAN MAX (a co-pack of POLARIS MAX + CLASSIC) applied preplant has provided the best control of dandelion in comparative trials.

Cereals

Comparative trials have shown that INFINITY and dichlorprop/2,4-D products have provided the best control of larger dandelions. However, results can be inconsistent especially under dryer soil conditions (visual control range of 50%–95%). Smaller dandelions can be suppressed with REFINE M and 2,4-D (visual control range of 40%–75%). The optimal time to control dandelions is post cereal harvest with glyphosate (360 g/L) applied typically in mid September to early October at a rate of 2.5 L/ha (1 L/acre) if dandelions are 15 cm in diameter or less or at a rate of 5 L/ha (2 L/acre) if dandelions are larger than 15 cm in diameter.

Horsetail, Field

Corn – Conventional

Either OPTION 2.25 OD at 1.56 L/ha (0.63 L/acre), ULTIM at 33 g/ha (13 g/acre) + non-ionic surfactant at 0.2% v/v, ACCENT at 33 g/ha (13 g/acre) + non-ionic surfactant at 0.2% v/v or BROADSTRIKE RC have activity on field horsetail but effectiveness varies greatly by population.

Expectation for control: 40%–70%

The most effective herbicide treatment for field horsetail in recent University of Guelph research has been the combination of BROADSTIKE RC at 62.5 g/ha (25 g/acre) + MCPA Amine (500 g/L) at 1 L/ha (0.4 L/acre). However, this treatment MUST be applied before the 4 leaf stage of corn to minimize crop injury and yield loss. When this combination has been applied to corn past the 4 leaf stage, significant crop injury occurs and has resulted in yield losses as great as 1.9 MT/ha (30 bu/acre), which was more than any yield loss associated with field horsetail competition.

Expectation for control: 80%

Corn – Herbicide Tolerant

Field horsetail is fairly tolerant to glyphosate. In glyphosate tolerant ("Roundup Ready") corn the combination of glyphosate + BROADSTIKE RC at 62.5 g/ha (25 g/acre) + MCPA Amine (500 g/L) at 1 L/ha (0.4 L/acre). However, this treatment MUST be applied before the 4 leaf stage of corn to minimize crop injury and yield loss. When this combination has been applied to corn past the 4 leaf stage, significant crop injury occurs and has resulted in yield losses as great as 1.9 MT/ha (30 bu/acre), which was more than any yield loss associated with field horsetail competition.

Expectation for control: 80%

Soybeans – Conventional or Herbicide Tolerant

Glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre) + BROADSTRIKE RC at 87.5 g/ha (35 g/acre) applied preplant to soybeans has provided the best control of field horsetail. However, susceptibility of field horsetail to this treatment varies significantly by population.

Expectation for control: 45%–99%

Cereals

Comparative trials have shown that any cereal herbicide that contains the active ingredient MCPA will provide very effective top growth control of field horsetail.

Horse Nettle

Corn – Conventional

Postemergence applications of ULTIM at 33 g/ha (13 g/acre) + non-ionic surfactant at 0.2% v/v tank-mixed with either DISTINCT, dicamba (e.g., ENGENIA), dicamba/atrazine (e.g., MARKSMAN) or PEAK has provided the best control in comparative trials.

Expectation for control: 75%–95% top growth control

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, two 2.5 L/ha (1 L/acre) applications of glyphosate (360 g/L), the first at the 2–3 leaf stage of corn and the second at the 7–8 leaf stage of corn provide the most consistent level of control. A single application of glyphosate (360 g/L) applied at a rate of 5 L/ha (2 L/acre) also provides control but not as consistent as the two application strategy.

Expectation for control: 90%–95%

Soybeans – Conventional

FIRSTRATE at 20.8 g/ha (8.5 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 2.5% v/v and REFLEX applied postemergence are the only herbicide sto provide suppression of horse nettle in non-GMO (conventional) soybeans.

Expectation for control: 70%–85% top growth control

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, two 2.5 L/ha (1 L/acre) applications of glyphosate (360 g/L), the first at the 1st trifoliate stage of soybean and the second at the 3rd trifoliate stage of soybean provide the most consistent level of control. A single application of glyphosate (360 g/L) at a rate of 5 L/ha (2 L/acre) also provides control but not as consistent as the two application strategy.

Expectation for control: 90%–95%

Cereals

There has been no public research done on horse nettle susceptibility to cereal herbicides. However, limited field experience would suggest that dichlorprop/2,4-D products (e.g., ESTAPROP XT, TURBOPROP, DICHLORPROP D) have some activity on horse nettle. The single most important management practice that a grower can implement to reduce horse nettle is with either a pre-harvest glyphosate (360 g/L) application at 2.5 L/ha (1 L/acre) or with an application of glyphosate (360 g/L) at 5 L/ha (2 L/acre) after cereal harvest, typically in mid to late September, after horse nettle has re-grown. Both application timings will decrease the level of horse nettle to manage in the following spring. A pre-harvest application is preferred if horse nettle is at a population density that is problematic for harvesting.

Medick, Black

Refer to management strategies for ALFALFA, as they apply equally to Black medick.

Nutsedge, Yellow (Nut Grass)

Corn – Conventional

Preplant incorporated (PPI) applications of either DUAL II MAGNUM at 1.75 L/ha (0.7 L/acre) or FRONTIER MAX at 1.4 L/ha (0.56 L/acre) will suppress nutsedge growth. If either product is not applied PPI, nutsedge control will be reduced. A postemergence application of PERMIT at 70–90 g/ha (28–38 g/acre) + non-ionic surfactant at 0.25% v/v) provides the best control of yellow nutsedge.

Expectation for control: 60%–80%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, nutsedge control with glyphosate is greatly affected by rate. A single application of glyphosate (360 g/L) applied at a rate of 5 L/ha (2 L/acre) will provide around 80% visual control of nutsedge whereas the 2.5 L/ha (1 L/acre) rate will typically provide less than 60% visual control A tank-mix of PERMIT at 47–90 g/ha (19–38 g/acre) + glyphosate (360 g/L) at 1 L/acre (2.5 L/ha) non-ionic surfactant at 0.25% v/v) provides the best control of yellow nutsedge.

Expectation for control: 70%–80%

Soybeans – Conventional

CLASSIC/CHAPERONE at 36 g/ha (14 g/acre) + non-ionic surfactant at 0.2% v/v applied postemergence has provided the best control of nutsedge in comparative trials. In fields with tremendous nutsedge pressure, some producers have opted to preplant incorporate either DUAL II MAGNUM or FRONTIER MAX at their highest labelled rate and then apply CLASSIC/CHAPERONE postemergence in soybeans.

Expectation for control (with CLASSIC/CHAPERONE): 90%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, GUARDIAN MAX (a co-pack of POLARIS MAX + CLASSIC) applied postemergence to nutsedge has continually provided the best visual control.

A single application of glyphosate (540 g/L) applied at 3.33 L/ha (1.34 L/acre) will also provide control of nutsedge but consistently at 10%–20% less than GUARDIAN MAX.

Expectation for control: 95%

Cereals

Typically not a huge problem in winter cereals since cereal growth will provide a level of competition that keeps nutsedge suppressed during the season. The majority of cereal herbicides provide little activity on nutsedge.

Sow-Thistle, Perennial

Corn – Conventional

In comparative trials postemergence applications of dicamba/atrazine (e.g., MARKSMAN) at 2.5 L/ha (1 L/acre), dicamba (e.g., ENGENIA) at 1 L/ha (0.4 L/acre) or DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) and PEAK at 13.3 g/ha (5.3 g/acre) + non-ionic surfactant at 0.2% v/v. have all provided good control of perennial sow-thistle. LONTREL XC applied at 0.25L/ha (0.1 L/acre) provides season long control of perennial sow-thistle

Expectation for control 80%–90% top growth control

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, glyphosate (540 g/L) applied postemergence at 3.33 L/ha (1.34 L/acre) will provide good top growth control of perennial sow-thistle. It is not uncommon for perennial sow-thistle to re-grow after an application of glyphosate, therefore requiring follow-up applications. Tank-mixing glyphosate with dicamba/atrazine, dicamba, PEAK or LONTREL XC can deter perennial sow-thistle re-growth.

Expectation for control 85%–95% top growth control

Soybeans – Conventional

In comparative trials all postemergence soybean herbicides can periodically provide some level of perennial sow-thistle control however none do consistently. CLEANSWEEP, BLAZER at 2.5 L/ha (1 L/acre), BASAGRAN FORTE at 2.25 L/ha (0.9 L/acre) and CLASSIC + non-ionic surfactant at 0.2% v/v provide top growth control, but typically sow-thistle will re-grow and be present at harvest. Pre-harvest glyphosate applications will have more impact on reducing perennial sow-thistle populations than any in-crop herbicide.

Expectation for control: 50%–70% top growth control

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, glyphosate (540 g/L) applied postemergence at 3.33 L/ha (1.34 L/acre) will provide good top growth control of perennial sow-thistle. It is not uncommon for perennial sow-thistle to re-grow after an application of glyphosate, therefore requiring follow-up applications.

In "Roundup Ready 2 Xtend" soybean, ENGENIA, FEXAPAN or XTENDIMAX + glyphosate or ROUNDUP XTEND will provide good top growth control of perennial sow-thistle and can also suppress the emergence of new vegetative shoots.

Expectation for control 85%–95% top growth control

Cereals

The challenge with perennial sow-thistle control in cereal crops is that the weed often emerges after the appropriate crop stage for herbicide applications. If emerged during the tillering to nodal stage of cereals, dichlorprop/2,4-D, TROPHY and MCPA Ester have provided good top growth control. The single most important management practice that a grower can implement to reduce perennial sow-thistle is to use either a pre-harvest glyphosate (540 g/L) application at 1.67 L/ha (0.67 L/acre) or with an application of glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) after cereal harvest, typically in mid to late September, after perennial sow-thistle has re-grown. Both application timings will decrease the level of thistles to manage in the following spring. A pre-harvest application is preferred if perennial sow-thistle is at a population density that is problematic for harvesting.

Quackgrass

Corn – Conventional

Either OPTION 2.25 OD at 1.56 L/ha (0.63 L/acre), ULTIM at 33 g/ha (13 g/acre) + non-ionic surfactant at 0.2% v/v or ACCENT at 33 g/ha (13 g/acre) + non-ionic surfactant at 0.2% v/v applied postemergence to quackgrass will provide excellent control.

Expectation for control 90%–95% top growth control

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, target actively growing quackgrass that is 10–20 cm in height with an application of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre).

Expectation for control: 90%–95%

Soybeans – Conventional

If quackgrass has emerged before planting, a preplant burndown with glyphosate (540 g/L)at 3.33 L/ha (1.34 L/acre) should be made.

For quackgrass that has emerged in the soybean crop, postemergence applications of ASSURE II at 0.75 L/ha (0.3 L/acre) + SURE MIX at 0.5% v/v, VENTURE at 2 L/ha (0.8 L/acre) or POAST ULTRA at 1.1 L/ha (0.45 L/acre) + MERGE at 2 L/ha (0.8 L/acre) will provide suppression/control of quackgrass. ASSURE II has been the most consistent of the three in limited comparative trials.

Expectation for control 70%–85%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, target actively growing quackgrass that is 10–20 cm in height with an application of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre).

Expectation for control: 90%–95%

Cereals

There are no products available in cereals that will control quackgrass. The single most important management practice that a grower can implement to reduce quackgrass is to use either a pre-harvest glyphosate (540 g/L) application at 3.33 Lha (1.34 L/acre) or an application of glyphosate after cereal harvest, typically in mid to late September, after quackgrass has re-grown. Both application timings will decrease the level of quackgrass to manage in the following spring. A pre-harvest application is preferred if quackgrass is at a population density that is problematic for harvesting.

Vetch, Tufted

Corn – Conventional

In comparative trials either dicamba (i.e. ENGENIA) at 0.5 L/ha (0.2 L/acre), DISTINCT at 285 g/ha (115 g/acre) + non-ionic surfactant at 0.25% v/v + 28% UAN at 5 L/ha (2 L/acre) or CALLISTO at 210 mL/ha (85 mL/acre) + AATREX 480 at 580 mL/ha (235 mL/acre) + non-ionic surfactant at 0.2% v/v have all provided good top growth control of tufted vetch.

Expectation for control: 80%–90%

Corn – Herbicide Tolerant

The maximum rate of glyphosate listed for use in glyphosate tolerant ("Roundup Ready") corn has only provided 70% visual control of vetch in University of Guelph dose response trials. Tank-mixes of either CALLISTO + AATREX, dicamba/atrazine (e.g., MARKSMAN), dicamba (e.g., ENGENIA) or LONTREL XC with glyphosate have provided the best level of vetch control in comparative trials.

Expectation for control: 85%–95%

Soybeans – Conventional

It is extremely difficult to control a perennial legume weed in an annual legume crop. Of all the herbicide programs tested over the past 10 years, a "two-pass" strategy of applying DUAL II MAGNUM + SENCOR premergence followed by REFLEX postemergence has provided the best suppression of vetch. If vetch has emerged prior to planting, University of Guelph research has shown that the addition of 2,4-D Ester 700 at 320 mL/acre (800 mL/ha) tank-mixed with glyphosate and applied 7 days prior to planting can provide good early season control of vetch.

Expectation for control: 50%–70%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, the rate listed on the ROUNDUP WEATHERMAX (540 g/L) label of 4.67 L/ha (1.87 L/acre) for the control of volunteer alfalfa offers the best potential for vetch suppression/control. If vetch has emerged prior to planting, University of Guelph research has shown that the addition of 2,4-D Ester 700 at 800 mL/ha (320 mL/acre) tank-mixed with glyphosate and applied 7 days prior to planting can provide good early season control of vetch.

Expectation for control: 70%–80%

In "Roundup Ready 2 Xtend" soybean the high rate of Engenia/Xtendimax or RU Xtend will provide good control.

Expectation for control: 80%

Cereals

The challenge with vetch control in cereal crops is that the weed often emerges after the appropriate crop stage for herbicide applications. If emerged during the tillering to nodal stage of cereals, PIXXARO, TROPHY, 2,4-D Ester, MCPA Ester and dichlorprop/2,4-D have all provided some level of top growth control. Post harvest herbicide applications made before the first frost (vetch is sensitive to cold air temperatures and is one of the first species to die off in the fall) are advantageous in decreasing the level of vetch to manage in the following spring. In limited comparative trial work, glyphosate (540 g/L) at 3.33 L/ha (1.34 L/acre) tank-mixed with either DISTINCT at 285 g/ha (115 g/acre) or dicamba (e.g. ENGENIA) at 1 L/ha (0.4 L/acre) significantly reduced the amount of vetch that emerged the following spring and into the summer.

Waterhemp – Glyphosate Resistant

Corn

Control of glyphosate resistant waterhemp is best achieved with a two-pass herbicide program where one of ACURON, LUMAX EZ, INTEGRITY, CONVERGE XT or CALLISTO + AATREX is applied preemergence. If a second flush of waterhemp emerges after the crop has emerged, then one of CALLISTO + AATREX, MARKSMAN, ENGENIA, FEXAPAN or XTENDIMAX, SHEILDEX + AATREX, ARMEZON + AATREX or 2,4-D can be applied. It is advisable not to apply the same active ingredient postemergence if you have applied it preemergence as this can result in carryover issues for next year's crop (e.g. applying ACURON preemergence followed by CALLISTO + AATREX postemergence results in the active ingredient "mesotrione" being applied twice).

Soybeans

Control of glyphosate resistant waterhemp is best achieved with a two-pass herbicide program where one of FIERCE, AUTHORITY SUPREME, BOUNDARY LQD, TIEDOWN or TRIACTOR is applied preemergence. If a second flush of waterhemp emerges once the crop has emerged, then one of REFLEX or BLAZER can be applied.

If growing "Roundup Ready 2 Xtend" soybean, varieties, a preemergence herbicide is still critical, but there is more flexibility in postemergence options as ENGENIA, FEXAPAN or XTENDIMAX provide good control of emerged waterhemp.

Cereals

In University of Guelph research trials, LONTREL XC, PIXXARO, INFINITY and 2,4-D ESTER have provided over 90% visual control of waterhemp.

Wire-Stemmed Muhly

Corn – Conventional

OPTION 2.25 OD at 1.56 L/ha (0.63 L/acre) provides the best control.

Expectation for control 80%–95%

Corn – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") corn, target actively growing wire-stemmed muhly that is 10–20 cm in height with an application of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre).

Expectation for control: 80%–95%

Soybeans – Conventional

If wire-stemmed muhly has emerged before planting, a preplant burndown with glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre) should be made. For wire-stemmed muhly that has emerged in the soybean crop, VENTURE at 2 L/ha (0.8 L/acre) will provide the best suppression/control of wire-stemmed muhly.

Expectation for control: 75%–95%

Soybeans – Herbicide Tolerant

In glyphosate tolerant ("Roundup Ready") soybean, target actively growing wire-stemmed muhly that is 10–20 cm in height with an application of glyphosate (540 g/L) at 1.67 L/ha (0.67 L/acre).

Expectation for control: 80%–95%

Cereals

There are no products available in cereals that will control wire-stemmed muhly. The single most important management practice that a grower can implement to reduce this weed is to use either a pre-harvest glyphosate (540 g/L) application at 3.33 L/ha (1.34 L/acre) or an application of glyphosate after cereal harvest, typically in mid to late September, after wire-stemmed muhly has re-grown. Both application timings will decrease the level of wire-stemmed muhly to manage in the following spring. A pre-harvest application is preferred if wire-stemmed muhly is at a population density that is problematic for harvesting.

2. APPLICATION TECHNOLOGY

Introduction

Herbicide application should be a precision operation. Recent advances in equipment and control systems can make the job relatively simple and precise.

Pesticides applied incorrectly may result in wasted pesticide, poor or no control, damage to crops (possibly the neighbour's) or environmental contamination. Every effort must be made to apply chemicals properly.

Developments in New Equipment

In building sprayers that accurately apply herbicides, equipment manufacturers work closely with the crop-protection industry. Innovations, such as closed-injection systems with herbicide concentrate carried separately from the water carrier, are now in use. Electronic rate controllers provide more accurate spray application by utilizing speed sensors, flow controllers and microprocessors to maintain the desired application rate. This technology has also included radar to accurately sense true ground speed of the sprayer. Rate controllers are commonly used by professional applicators. GPS guidance control systems with possible auto steer allow sprayers to cover the field with minimal overlap swath to swath. This allows for complete field spray coverage while not double applying product in certain areas.

The industry is currently working towards the closed-injection system. Work continues in the area of drift reduction using air assist and electrostatic spray methods.

Air-induction nozzles significantly reduce spray drift and are available in a range of sizes from a number of suppliers. Operating these nozzles within their working pressure range is crucial to ensure designed spray angle development, proper air induction into the nozzle and necessary droplet size for the job at hand. Before buying air induction spray tips, make sure your sprayer pump can produce sufficient pressure to operate these tips under all conditions. Check with the nozzle manufacturers for operating pressures required. Most nozzle manufactures a variety of air induction nozzles including both low-pressure and high pressure designs.

Field Sprayers

The most common type of sprayer used in herbicide application is the boom sprayer. This sprayer applies a uniform amount of spray solution across the width of the boom.

The main requirements for field spraying are:

- uniform pressure across the whole boom
- all nozzles have the same output and a good spray pattern
- a constant forward speed in actual field conditions
- ability to adjust boom height so that the required nozzle – to – target height can be achieved
- a stable boom height to ensure proper overlap of the nozzle-tip patterns

Most commercially built sprayers can be adapted and used safely to apply liquid fertilizers. Extra agitation may be required. Ensure that the sprayer components being used will resist the corrosive nature of some fertilizer formulations and follow the manufacturer's recommendations.

Air-Blast or Mist Sprayers

These machines should never be used to apply herbicides, especially hormone-type herbicides such as 2,4-D. The danger of causing off-target crop injury at a great distance from the treated area is very high.

Wiper Applicators for Selective Weed Control

Wiper applicators (rope-wick, roller applicator or similar devices) containing glyphosate can be used when the target weeds are taller than the crop so as to avoid contact with a crop sensitive to that herbicide. Other products may exist that can be wick applied. Refer to intended product labels for use of this application technique. The main criteria for using wiper applicators are:

- contact enough of the target plant to get herbicidal effectiveness
- keep the wick application above the crop to avoid crop injury

Travel speeds should be 4–10 km/h for wick application. Two passes in opposite directions may be beneficial, especially in heavy weed infestations and where higher vehicle speed is contemplated. Care must be taken not to contact sucker growth in orchards, vineyards and shelterbelts. This may result in crop injury.

Care and Use of Equipment

Spraying Speeds

Since herbicides must be uniformly applied, the forward speed of a sprayer must be constant whenever the nozzles are delivering liquid. If the driving wheels of a tractor slip on the soil surface, the tractor's speedometer does not indicate a change in forward speed. To be certain that the forward speed is constant in spite of wheel slippage on hills, or loose soil, use an independent speedometer powered by a non-driven wheel or use newer radar or GPS speed sensors. Spray monitors and other electronic rate controllers also may be installed. Only rate controllers will automatically adjust for variation in tractor speed to maintain a constant rate of application.

Water

Use only clean water that contains no debris, soil or organic matter. On your farm water supply, use a frost-free water hydrant located outside a building. An anti-backflow or anti-siphon valve should always be installed on any hydrant or water supply. Never allow the suction screen to rest on the bottom of a farm pond while filling a sprayer. The intake line near the screen must, by law, be equipped with a spring-loaded check valve or anti-backflow device to prevent contamination of the pond or stream when the pump is shut off. Tank-refilling nozzles, volume-booster nozzle or injection pumps should not be used to refill the sprayer tank from farm ponds or streams. These tank-refilling aids may cause pond or stream contamination.

Agitation

When chemical formulations in solution are used (e.g., 2,4-D and water) at least 2–14 L of spray solution should be returned to the tank each minute to provide adequate agitation. Higher rates will apply with wettable powders. To be effective, the agitation line from the pump should pass through a control valve and deliver the liquid to the bottom (not the top) of the tank. Agitation propellers, agitation nozzles or a sparge tube should always be used to ensure sufficient liquid circulation in the tank.

When wettable powder herbicides are used, the return to the tank should be 14–27 L/min for each 450 L of tank capacity. A dedicated line from the pressure side of the pump (not the pressure regulator) to the tank must be used to supply the liquid necessary for hydraulic agitation in the tank. Always use a venturi jet or sparge tube. This flow can be reduced if the sprayer has a mechanical agitator. Sparge tube agitation requires more water than venturi nozzles to give the same agitation.

Avoid excessive agitation of the mixture, as it may turn into an invert immulsion, a grease-like mass that will settle to the bottom of the tank and cannot be pumped. Excessive agitation may also cause foaming resulting in pumping problems. To prevent a build-up of oil in the sprayer, the tank should be emptied completely before refilling. After any break in the spraying operation, agitate thoroughly before resuming operation. Immediately after use, clean the tank and sprayer with a detergent or solvent and flush with clean water.

Pumps

The pump is the most important part of the sprayer and should have adequate capacity to maintain the desired pressure, volume and agitation. Piston, diaphragm and centrifugal pumps are best for pumping wettable-powder suspensions. For liquid herbicide applications, roller pumps may be used in addition to the above types. When used for wettable powders or flowable formulations, choose a pump with an abrasion resistant housing. Carefully follow the manufacturer's care and storage instructions for the best pump performance.

CAUTION: Running a spray pump without water may cause damage or premature wear.

Nozzle Tips

Numerous companies make spray nozzles. Nozzles from different suppliers may be similar in design but may differ in setup requirements. Always follow manufacturer's recommendations for nozzle spacing and nozzle-to-target distances. These distances may vary according to the spray angle of the nozzle. Proper spacing and orientation of nozzles is essential to ensure adequate overlap of adjacent nozzle spray plumes.

Care should be taken to maintain a stable boom height to ensure uniform overlap of the nozzle spray patterns.

The success of the spray application is dependent in part on the condition of the nozzle tips and the uniformity of application across the whole spray boom. The spray pattern of all nozzles should be examined prior to their use. In addition, every nozzle should be checked when calibrating the sprayer.

Materials used for nozzle tips range from brass, stainless steel, hardened stainless steel, as well as plastics/polymers and ceramics. All product formulations and carriers cause wear of the nozzle orifice. Wettable powders cause abrasive wear, more than other formulations.

Sprayers should be calibrated regularly. (See *Care and Use of Equipment,* "Sprayer Calibration").

Nozzle tips should be replaced when they deliver 10% more than manufacturer's rated output specifications or when their distribution pattern becomes unacceptable.

Flat fan nozzles are widely used on boom sprayers to apply herbicides. Spray operating pressures should be within limits specified by the nozzle manufacturer. Nozzles with a 110 degree spray angle have more overlap than 80 degree nozzles. This allows less chance of spray skips as the boom moves closer to the ground. Always follow manufacturer's recommendations for spacing minimum nozzle to target distance and spray operating pressures.

Air induction or venturi nozzles are now available from at least a dozen different suppliers. These nozzles were specifically designed to reduce the amount of fine droplets produced in the smaller nozzle sizes. The nozzle manufacturers offer air induction or venturi nozzles in a wide range of sizes.

These nozzles draw air into the nozzle as the spray liquid passes through the nozzle venturi. The result is a coarser spray with very few fine spray droplets that are prone to drift. These coarse droplets contain air bubbles that cause the droplets to rupture upon impact with plant surfaces.

Air induction nozzles are made in two pressure ranges, low pressure and high pressure. If a sprayer cannot exceed 345 kPa, only consider a low pressure design. All venturi nozzles should be operated in the middle of their working range. For the low pressure designs this is approximately 275 kPa and in the high pressure designs, about 550 kPa. All venturi nozzle designs are extremely sensitive to low working pressure. The spray patterns will collapse to less than their designed spray angle if the nozzle pressure is too low. In addition, the induction of air into the spray liquid will not occur if the pressure goes below the operating range of the nozzle.

Many producers have quickly adopted this new nozzle technology. The significant reduction in spray drift, compared to conventional flat fan nozzles, is a welcome feature. See Figure 2–1. *Conventional vs. Air Induction Nozzles,* on this page. Some producers are using these nozzles for all their herbicide spraying.

Some product performance problems have occurred when air induction or venturi nozzles have been used. Poor timing of spray, reduced water volumes, spray pressures that are too low and difficult-to-wet weeds may all contribute to poor control.

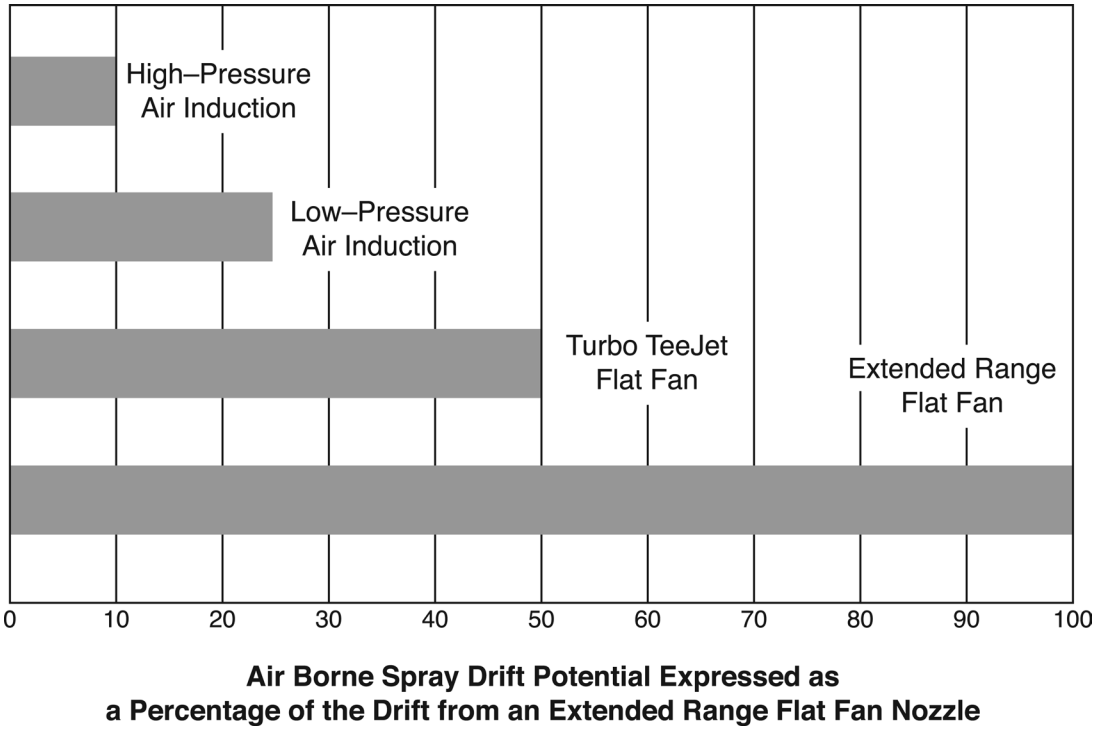

FIGURE 2–1. Conventional vs. Air Induction Nozzles.

Special "even flat fan" spray nozzles are available for band spraying of herbicides. These even flat fan nozzles deliver a uniform amount of spray over their sprayed area. A variety of sizes, spray angles and nozzle materials are available. The nozzle-to-target height, and spray angle of the nozzles as well as their orientation to the direction of travel, determines the width of the sprayed band. Carefully follow the manufacturer's literature and directions.

Flooding nozzle tips are used at low pressures and, because of their wide spray angle, can be used closer to the ground surface, thus reducing the potential for drift. New flooding nozzle tip designs have improved the spray distribution patterns to the point that it is as good as with the flat fan tips. Flooding nozzle tips are available in brass, plastic/polymers and stainless steel. Half as many of these nozzle tips are required to cover the same width as would be required with flat fan nozzles.

Full or hollow cone nozzle tips may be used for applying herbicides to the soil surface when the herbicide is mixed into the soil with a disk harrow, cultivator or similar tillage implement.

NOTE: When using any nozzle for spraying wettable powders or micro-nutrients, it is essential to calibrate the sprayer frequently because, as a nozzle wears, the quantity of spray material delivered increases and distribution is uneven. Worn nozzles usually result in a poor spray pattern.

Nozzle manufacturer's catalogues will list screens required for various nozzle types and sizes. Diaphragm check valve nozzle bodies will ensure dripless operation when the boom is turned off. To clean nozzle screens, remove them from the nozzle bodies and wash thoroughly with soap and water, using a nozzle tip brush. Simply flushing water through the boom and nozzles will not remove pesticide residue that has built up on the outside of the nozzle screens.

Tank-mixing

When it comes to reliable information on tank mixing, there are many resources available. The label is, of course, your first point of reference. You can also consult a trusted point-of-sale or agrichemical representative: they know their products best and want to see you succeed. If you are considering a new tank mix, it's best not to exceed three tank partners. The more you put in, the more likely active ingredients and formulated adjuvants will be incompatible.

"Compatibility" in this case means that mixing products will not cause a chemical problem (e.g., affect product efficacy) or a physical problem (e.g., products gel or fall out of suspension). In Canada, users of commercial class pest control products for crop protection or vegetation management are permitted to apply unlabeled tank mixes of registered pest control products as long as:

- Each partner is registered for use on the crop.
- The tank mix only includes an adjuvant when specifically required by one of the mix partners.
- The application timing of each partner is compatible with crop and pest staging.
- Each partner is used according to the product label.
- No partner is specifically excluded on any other partner label.

Cleaning the Sprayer

Before cleaning the sprayer, dispose of surplus tank mix. As suggested in the Grower Pesticide Safety Course, one method of disposal is to dilute the remaining spray solution at least 10:1 with water. This diluted solution can be applied to the previously treated area as long as the maximum labelled product rate is not exceeded.

Clean out the sprayer immediately after finishing the day's work or when changing chemicals. At the end of each spray day, thoroughly flush out the boom with plenty of water to rinse lines, diaphragm check valves and nozzles. Delaying cleanout, even overnight, can allow the formation of hard-to-remove deposits. The sprayer tank is much more difficult to clean out, if it is allowed to dry. Don't forget to also clean out the measuring containers.

Steps

1. Read the product label to determine the recommended cleaning procedure. Have all the materials required for the cleanup ready, including appropriate personal safety equipment.
2. Drain the spray tank.
3. Fill the tank with water and add detergent, ammonia or other tank cleaner product and agitate for 10–20 minutes (clean the whole tank not just the bottom half). Flush boom and hoses with solution, allow to stand for several hours (or overnight if possible) and then flush boom and nozzles again and drain the tank. When flushing the boom, open the boom ends to get particles out of the boom.
4. Inspect the inside of the tank for visual residues. Rinse the inside of the tank if necessary. Repeat step 2.
5. Wash the outside of the sprayer with soap or mild detergent and water.
6. Remove nozzles, screens, and wash separately in a bucket containing cleaning solution. Wash out measuring containers with the cleaning solution.
7. Remove all boom end plugs or caps. Product residues collected in the ends of the various boom pipe sections could cause crop injury. Thoroughly clean out the plugs or caps and pipe ends with cleaning solution. Carefully replace all the boom end plugs or caps.

Thoroughly rinse the tank, hoses, booms, nozzles and screens with clean water for a minimum of 10 minutes. Repeat immediately before the next use.

Use household detergent at rate of 250 mL/100 L or 1 kg/150 L of water. Use ammonia (3%) at 1 L/100 L of water. Use other cleaning agents according to label directions. Never mix ammonia with chlorine bleach. Chlorine gas is produced which may cause severe eye, nose, throat, or lung irritation.

NOTE: Contact the manufacturer of pesticides being used to determine the best methods and product(s) to clean residue from tanks and associated equipment. Read the label, since many products provide specific tank-cleaning information on their label.

When surfactants or fertilizer solutions (e.g., AGRAL 90, 28% UAN) are used in a labelled mix with herbicides, there may be some inadvertent cleaning of previous residues from the tank/equipment that could affect the crop. Proper cleanout when changing products is essential to prevent crop injury.

The wash water contains herbicide. Never allow wash water to run into a well, lake, pond, river or other water source.

Do not leave puddles of herbicide solution, tank cleaning or rinse water that may be accessible to children, pets, farm animals or wildlife.

Sprayer Calibration

Field Boom-Type Sprayer Calibration

(Determining application rates in L/ha).

There are many ways of determining the rate of spray material that is being applied to 1 ha of land.

Instructions

1. Measure the time.
   - Place 2 stakes 50 m apart in the field.
   - Select the gear and throttle setting (rpm) at which you plan to spray. Half-fill the sprayer with water.
   - Drive the distance between the stakes three times, timing each pass. Each time, make sure the tractor is at the desired speed as you pass the first stake. Continue driving at this speed until you pass the second stake.
   - Note the average time of the 3 passes.
2. Measure the average nozzle output.
   - Park the sprayer with the PTO engaged and the throttle adjusted to reach the PTO speed set in the test run.
   - Adjust the pressure regulator to the desired working pressure with full flow to the boom.
   - Collect the output from each nozzle for the average length of time needed to travel the 50 m in the test run.
   - Enter the nozzle outputs into the equation below.
   - If any nozzle is more than 10% above or below the average output, it should be cleaned, re-tested and if still 10% off, be replaced.
3. Measure the nozzle spacing in metres.
4. Use the following formula to determine the sprayer output:

$$\text{Sprayer Output (Litres/hectare)} = \frac{\text{Average Nozzle Output (mL)}}{\text{Nozzle spacing (metres)}} \times 0.2$$

5. Calculate the area sprayed per full tank of spray solution. Re-check the sprayer calibration after each tank of spray is applied by dividing the volume sprayed by the area sprayed. The nature of some products may slightly alter the calibration from that of clean water.
6. Growers who are more comfortable with litres/acre or gallons/acre can use the following conversion guide.

   Litres/hectare × 0.4 = L/acre
   Litres/hectare × 0.09 = Imp. gal/acre
   Litres/hectare × 0.11 = U.S. gal/acre

Sample Calculation

Average time to travel 50 m (164 ft) = 24.5 sec
Average amount of liquid collected per nozzle for 24.5 sec = 525 mL
Nozzle spacing on the boom = 0.5 m (» 20 in.)

$$\text{Application rate} = \frac{525 \text{ mL}}{0.5 \text{ m}} \times 0.2 = 210 \text{ L/ha}$$

210 L/ha × 0.4 = 84 L/acre
210 L/ha × 0.09 = 18.9 Imp. gal/acre
210 L/ha × 0.11 = 23 U.S. gal/acre

Band Spraying: The same formula can be used to calibrate when banding. Instead of using nozzle spacing in metres, use width of area sprayer per nozzle in metres.

NOTE 1: Sprayer-calibration bottles or kits are available from a number of suppliers. For further information contact your local office of the Ontario Ministry of Agriculture, Food and Rural Affairs or manufacturers of sprayers, sprayer parts or herbicides.

NOTE 2: For banded-spray applications, measure the width of the spray band (at the soil surface or surface of the crop canopy) and enter this value into the formula instead of the "nozzle spacing". Note that in band spraying the acreage sprayed is **not** the same as the crop acreage. (When broadcast spraying a row crop with 1 m rows, the whole field is treated. A band spray may only treat 30 cm over each row. Therefore, only about 1/3 of the field is actually treated.) The herbicide rates referred to in most herbicide publications and labels refer to the actual area sprayed unless otherwise stated.

Hand-Held/Backpack Sprayer Calibration

Many people use small hand-held or backpack sprayers for treating problem areas or spraying areas that were missed. Calibration of these sprayers is as important as calibrating your field sprayer.

Method I

1. Measure an area that is 100 m^2.
   e.g., 10 m × 10 m, or 25 m × 4 m
2. Fill the spray tank with water. Mark the level on a measuring stick. Pump to the pressure that will be used during the pesticide application.
3. Spray the water over the 100 m^2 area. Walk at a steady pace, taking care to apply it as evenly as possible, just as you would when applying pesticide.
4. Measure the amount of water needed to refill the spray tank to the mark on the measuring stick. This amount will be the sprayer output per 100 m^2.

Method II

1. Set 2 stakes 50 m (164 ft) apart in the field.
2. Half-fill the sprayer with water.
3. Walk the 50 m three times at a steady pace. Calculate your average time to travel the 50 m.
4. Measure the width of the band sprayed by the nozzle (in metres) at your walking pace.
5. Pump the sprayer for the same amount of time as calculated in step #3, collecting the liquid from the nozzle in a measuring device.
6. Application rate (L/ha)=

$$\frac{\text{mL liquid per nozzle}}{\text{Band width (metres)}} \times 0.2$$

Method III

1. Partially fill sprayer. Pump to the pressure you will use during the pesticide application.
2. Spray to determine width of swath (in metres).
3. Walk at a steady pace for 15 seconds. Measure the distance (in metres).
4. Multiply spray width times distance travelled to provide the area (in square metres) sprayed in 15 seconds.
5. Spray into a measuring device for 15 seconds – gives amount of solution sprayed in 15 seconds.
6. Application rate (L/ha) =

$$\frac{\text{amount sprayed}}{\text{area (length} \times \text{width)}} - \frac{\text{L} \times 10{,}000}{\text{sq. metres}}$$

To convert the application rate of any pesticide to the amount required for a small area, follow this guide:

- 1 kg/ha = 10 grams/100 m^2
- for liquid measure, 100 L/ha = 1 L/100 m^2

(Source: Ontario Pesticide Education Program Manual 1995).

Determining Amount of Herbicides Needed

Determining Amount of Product per Hectare

Most rates suggested in this publication are given in terms of both active ingredients (common name) per hectare and product (TRADE NAME) per hectare. However, where the amount of active ingredient in the formulations varies considerably (for example, glyphosate is available in concentrations of 360 g/L, 480 g/L, 500 g/L and 540 g/L) The rate may be given in terms of active ingredient only.

NOTE: Throughout this publication, the common name of each herbicide (its active ingredient) is printed in italicized lowercase letters (e.g., atrazine, dicamba), whereas the product trade name (the name of the liquid or powder etc., inside the container as supplied by the manufacturer) is printed in capital letters (e.g., AATREX, BANVEL II), and its formulation is listed within brackets following the trade name.

Determining Amount of Product Required per Tankful

After determining how much commercial product is needed per hectare, calibrate the sprayer and determine the number of hectares each tank will cover. Determine the quantity of herbicide needed to add to the spray tank using the following formula:

Area covered per tankful =
sprayer tank size (Litres)/Application Rate (L/ha) =
hectares

Product required/tank =
hectares covered by tank × product rate/ha

Sample Calculations

(a) product/tank = 4.1 ha × 2.2 kg/ha
= 9.02 kg LOROX/tank

(b) product/tank = 4.1 ha × 2.1 L/ha
= 8.61 L AATREX/tank

Follow manufacturer's recommendations on mixing order and procedures.

Materials, Mixing and Mixtures

Dry herbicide formulations include granules, soluble powders and wettable powders. Granules do not require prior mixing into a slurry. They are ready to be mixed in water. Soluble powders can be dissolved in water. Wettable powders will not dissolve but will form a suspension that requires constant agitation.

Liquid herbicide formulations either mix in water to form a solution or may be oil-based and form an emulsion that will require agitation.

Pesticide labels usually provide mixing directions for registered tank-mixes, often describing the order of mixing. Whenever a label provides mixing directions, they should be followed. Consult the package labels for information on the compatibility of different herbicide products as certain formulations may react when mixed together, resulting in materials with different properties and activities than the original ones. If the pH or hardness of the water requires adjustment, adjustments should be made prior to the addition of spray material to the tank.

When the label does not provide mixing instructions for a registered tank-mix, pesticides should generally be mixed using the following procedure:

- Fill the spray tank with water to ½ of the total spray volume required and start agitation. Add the different formulation types in the order listed below, allowing time for complete mixing and dispersion after adding each product.

  1. dissolvable packs
  2. wettable powders
  3. water dispersible granules and dry flowables

- Maintain agitation and fill spray tank to ¾ of total spray volume. Then add:

  4. water-based solutions
  5. emulsifiable concentrates
  6. spray adjuvants

- Finish filling the spray tank to the required volume, Maintain continuous agitation during mixing and final filling, and throughout application.

Mixtures of different herbicides or mixtures of herbicides with pesticides or foliar fertilizers should not be applied in a single application unless registered for use in this way.

Unless specifically mentioned in this publication, or on a herbicide label, the addition of a surfactant or a detergent to a spray solution is not recommended.

Where water is known to have an excessive salt content, compatibility of the water and the chemical at field strength should be tested first on a small scale. See note on *Agitation* in the *Care and Use of Equipment* section, page 12.

Application Indicators

Colourants/Foam Markers for Pesticides Application

Colourants added to the pesticide solution help show where pesticides have been applied. Foam marking systems help minimize overlap. Adding a colourant to the basal sprays of herbicides on cut stumps of woody plants helps assure thorough coverage without respraying. Examples of colourants are listed below.

- Blazon: blue, water soluble
- Bas-oil Red : red, oil soluble
- Red Dye Foam

Colourants are available from agricultural chemical dealers.

Additional Information

Video

- *How to Manage Spray Drift*
- *Spray Drift Reduction Through Air Induction*
- *Field Sprayer Calibration*

Available from:

Ontario Pesticide Education Program
Phone 1-800-652-8573
www.opep.ca

OMAFRA Factsheets

- *Six Elements of Effective Spraying in Orchards and Vineyards*
- *How Weather Conditions Affect Spray Applications* (web only)
- *Ways to Avoid Pesticide Spills*
- *Calibrating Airblast Sprayers*
- *Adjusting, Maintaining and Cleaning Airblast Sprayers*
- *Pesticide Contamination of Farm Water Sources*
- *Pesticide Drift from Ground Applications*
- *Farm Pesticide Storage Facility*

Pesticide Drift

Do you know what pesticide drift looks like or what you can do about it? OMAFRA and CropLife Canada have created two short videos with innovative visual demonstrations using dyes and night-spraying to show what drift actually looks like. See how spray particles behave and discover what changes can be made to your spray program to greatly reduce the risk of pesticide drift. Learn more at ontario.ca/spraydrift.

3. USING PESTICIDES IN ONTARIO

The information in this chapter is up to date as of October 31, 2019. At that point in time, amendments were being proposed on the Environmental Registry of Ontario to the Pesticides Act and O.Reg. 63/09 to reduce the complexity and modernize pesticide management in Ontario while ensuring protection of human health and the environment. Please visit the Environmental Registry for further information related to the proposal, or the Ministry of Environment, Conservation and Parks' Pesticides webpage at ontario.ca/pesticides for the most up to date information on pesticide management in Ontario, including licences, permits, training and certification requirements.

For the most up to date version of this chapter, visit ontario.ca/using pesticides. Some of the information in this generic chapter may not apply to all crops.

Read the label before use.
Product labels may change.

Review the Grower Pesticide Safety Course Manual.
www.opep.ca/certification/

Keep detailed spray records.

Federal Registration of Pesticides

Before a pesticide (pest control product) can be sold or used in Ontario, it must be registered under the federal Pest Control Products Act (PCP Act) and be classified under the provincial Pesticides Act. The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticides for use in Canada following an evaluation of scientific data to ensure that any human health and environmental risks associated with its proposed uses are acceptable, and that the products have value.

The PMRA re-evaluates registered pesticides to determine whether today's health and environmental protection standards are still met when the pesticide is used according to the label. The PMRA also assesses whether the pesticide still has value. Re-evaluations are initiated every 15 years. Outcomes of a re-evaluation can be:

- no change to the registration
- amendments to the label (e.g., changes to personal protective equipment requirements, restricted entry intervals, buffer zones)
- modifications to existing Maximum Residue Limits (MRLs)
- elimination or phasing-out of certain uses or formulations
- discontinuation of the registration

A special review of a registered pesticide can be initiated at any time by the PMRA if the PMRA has reason to believe its use may pose unacceptable risk to human health or the environment or the pesticide no longer has value. Special reviews focus on a specific concern (e.g., pollinator health).

The pesticide label is a legal document. Follow all label directions. Labels for all registered pesticides are under "Search Pesticide Labels" on the PMRA website at www.healthcanada.gc.ca/pmra. Ensure you have the most current label and are aware of any re-evaluation decisions. Emergency registrations are temporary registrations (1 year or less) for pesticides needed by growers to manage a new invasive pest or pest outbreak. Know the expiration date for pesticides you are using under an emergency registration.

Regulation of Pesticides in Ontario

The Ontario Ministry of the Environment, Conservation and Parks (MECP) is responsible for regulating the sale, use, transportation, storage and disposal of pesticides in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09. All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling ServiceOntario at 1-800-668-9938 or 416-326-5300.

Classification of Pesticides

Before a federally registered pesticide can be sold or used in Ontario, it must be classified under the provincial Pesticides Act. The Ontario pesticide classification system consists of 12 classes. Ontario's Pesticides Advisory Committee (OPAC) is responsible for assessing new pesticide products and recommending to the MECP the classification of these products. Pesticide products are classified on the basis of their toxicity, environmental and health hazard, persistence of the active ingredient or its metabolites, concentration, usage, federal class designation (e.g., domestic, commercial, restricted) and registration status. The provincial classification system provides the basis for regulating the distribution, availability and use of pesticide products in Ontario. Once approved by the MECP, classified products are posted on the MECP website at ontario.ca/pesticides.

Certification and Licensing

Certified Farmers and their Assistants

Growers must be certified through the Grower Pesticide Safety Course in order to buy and use Class 2 and 3 pesticides on their farms. They do not require this certification to buy and use Class 4, 5, 6 or 7 pesticides, however, a grower needs to provide his/her Farm Business Registration Number or a signed "Farmer Self Declaration to Enable Purchase of a Class 4 Pesticide" form to the vendor when buying Class 4 pesticides. For information about certification for growers and training for assistants to growers, visit the Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

Class 12 Requirements for Growers

There are regulatory requirements in place for growers who plan to purchase or plant neonicotinoid-treated corn (silage or grain) or soybean seed in Ontario. For more information on the training and reporting requirements for growers, visit the MECP website at ontario.ca/pesticides, then click on "Neonicotinoid regulations."

Commercial Applicators (Exterminators) and their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician or call 1-800-265-5656 or e-mail pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

Exception Uses Under the Cosmetic Pesticide Ban

Pesticides listed in this publication are meant for Exception Uses (e.g., agriculture) under the Cosmetic Pesticide Ban unless the active ingredient is listed under Class 11 pesticides in Ontario Regulation 63/09.

For information about requirements under the *Pesticides Act* and Regulation 63/09, for golf courses and other excepted uses for turfgrass, including mandatory golf course IPM accreditation, go to ontario.ca and search for:

- Pesticides and Golf Courses
- Specialty Turf and Specified Sports Fields

For more information about requirements in the *Pesticides Act* and Regulation 63/09 for the exception regarding the use of pesticides to maintain the health of trees, go to ontario.ca and search for:

- Tree Care Specialists

For more information about pesticide regulations, certification and licensing, see:

- Inside front cover of this publication
- Pest Management Regulatory Agency (PMRA) website: www.healthcanada.gc.ca/pmra
- PMRA Pest Management Information Service: 1-800-267-6315 or TTY 1-800-465-7735
- (from within Canada) or 1-613-736-3799 (from outside Canada)
- Ontario Ministry of the Environment, Conservation and Parks (MECP) website: ontario.ca/pesticides
- Regional MECP Pesticides Specialists Directory infogo.gov.on.ca/infogo/home.html#orgProfile/-270/en
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) website: www.opep.ca
- Ontario Pesticide Training & Certification website: www.ontariopesticide.com
- Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician
- IPM Council of Canada website: www.ontarioipm.com or www.ipmcouncilcanada.org
- Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

Pesticide Application Information

When you decide to use a pesticide, choose the most appropriate formulation and application method for your situation. Use only properly calibrated sprayer equipment. Choose less toxic and less volatile alternatives when possible. Take all possible precautions to prevent the exposure of people and non-target organisms to the pesticide. Read the most current pesticide label thoroughly before application. The label provides important information, such as:

- directions for use (e.g., rates of application, crops/sites it can be used on, target pests, crop rotation restrictions, total number of applications, droplet size/nozzle type, application equipment, timing, appropriate weather conditions)
- required personal protective equipment (PPE)
- hazard symbols and warnings
- restricted entry intervals
- pre-harvest intervals
- buffer zones
- precautionary statements
- steps to be taken in case of an accident
- disposal

For more information on hazards, consult the Safety Data Sheet (SDS) or contact the manufacturer.

For more information on pesticide application, see:

- Sprayers 101 at www.sprayers101.com
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos at www.opep.ca/resources/
- OMAFRA Agriculture and Agri-Food Canada booklet Best Management Practices — *Pesticide Storage, Handling and Application*, Order No. BMP13
- OMAFRA Factsheet Pesticide *Contamination of Farm Water Supplies*

Restricted Entry Intervals

Restricted Entry Interval (REI) is the period of time after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done.

An REI can range from 0 hours to several days. A pesticide label may state different REIs that are specific to a crop and post-application task (e.g., scouting, harvesting). If the REI is not stated on a label for agricultural crops, use a 12-hr REI. For golf courses and residential turf applications, the spray solution must be dry before re-entry can occur.

Hand labour tasks involve substantial worker contact with treated surfaces such as plants, plant parts or soil. Examples of these activities include planting, harvesting, pruning, detasseling, thinning, weeding, scouting, topping, sucker removal, mowing, roguing and packing produce into containers in the field or greenhouse. You can only do these tasks after the REI has passed. Hand labour generally does not include operating, moving or repairing irrigation or water equipment, except for hand-set irrigation.

A Certified Farmer or Licensed Commercial Applicator (i.e., a holder of the appropriate Exterminator License, such as an Agriculture Exterminator Licence or a Greenhouse/Interior Plant Exterminator Licence) may need to enter a treated area early to do short-term tasks before the end of the REI. In these cases, the Certified Farmer or Licensed Commercial Applicator may enter between 4–12 hr after the application wearing a NIOSH-approved respirator and any other protective clothing (PC) and the personal protective equipment stated on the label for mixing and loading. This Certified Farmer or Licensed Commercial Applicator (exterminator) must not be in the treated area during the REI for more than a total of 1 hr in any 24-hr period.

See Figure 3–1 for an example of a 24-hr REI on a pesticide label.

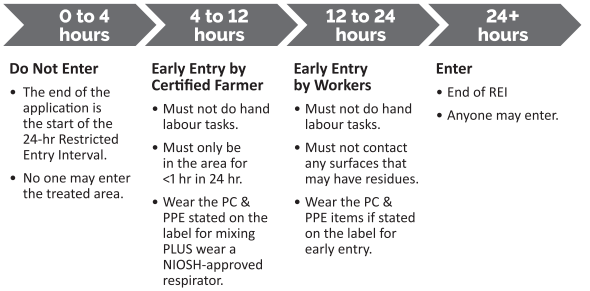

Figure 3–1. Example of a 24-hr REI on a pesticide label.

Certified Farmers and Licensed Commercial Applicators should plan pesticide applications around work tasks so that no one needs to enter treated areas before the restricted entry interval has passed.

Days to Harvest Intervals for Food Crops (Pre-harvest, Pre-grazing and Feeding Intervals)

These intervals state the minimum time that must pass between the last pesticide application and the harvesting of the crop or the grazing and cutting of the crop for livestock feed. If you harvest a crop before the pre-harvest interval (PHI) has ended, there may be pesticide residues in excess of the maximum residue limits (MRLs) set by PMRA.

"Up to the day of harvest" means the same as 0 days PHI; however, the REI may be more restrictive (e.g., a 12-hr restricted entry interval) and must be observed for harvesting that occurs on the day of pesticide application.

To avoid exceeding the maximum residue limits, always follow the directions on the label.

Spray Buffer Zones

Spray buffer zones are no-spray areas required at the time of application between the area being treated and the closest downwind edge of a sensitive aquatic or terrestrial habitat. Spray buffer zones reduce the amount of spray drift that enters non-target areas.

Sensitive terrestrial habitats include hedgerows, grasslands, shelterbelts, windbreaks, forested areas and woodlots.

Sensitive freshwater habitats include lakes, rivers, streams, creeks, reservoirs, marshes, wetlands and ponds.

The pesticide label indicates the size of the spray buffer zone, which depends on the product used, the method of application, and the crop being sprayed.

Unless forbidden by the pesticide label, Health Canada's online Buffer Zone Calculator may allow applicators to reduce the spray buffer zones based on weather conditions, the category of the spray equipment and the droplet size. For more information, search for "Buffer Zone Calculator" at www.canada.ca.

For soil fumigation, a buffer zone is an area established around the perimeter of each application block.

Vegetative Filter Strips

A vegetative filter strip is:

- a permanently vegetated strip of land.
- sits between an agricultural field and downslope surface waters.
- must be at least 10 m wide from edge of field to the surface water body.
- must be composed of grasses, but may also contain other vegetation (shrubs, trees, etc.).

Vegetative filter strips reduce the amount of pesticide entering surface waters from runoff by slowing runoff water and filtering out pesticides carried with the runoff. Certain pesticide labels will require a vegetative filter strip; and, other labels will recommend a vegetative filter strip as a best management practice.

Protect the Environment

Protect Water sources

According to the British Crop Protection Council (BCPC), 40%–70% of surface water pesticide contamination comes from mixing and filling areas.

Where possible, load or mix pesticides on impermeable surfaces located safely away from watercourses or environmentally sensitive areas. Collect drainage and run-off and dispose of it safely (*Your Guide to Using Pesticides*, BCPC 2007).

Clean your spray equipment away from wells, ponds, streams and ditches. Apply the diluted rinse water (usually at a ratio of 10:1) to the treatment area (crop), but do not exceed the pesticide rate recommended on the label.

Do not make a direct connection between any water supply (e.g., public supply, wells, watercourse or pond) and a spray tank. Use an anti-backflow device or intermediate system to prevent back-siphoning that could contaminate the water supply.

Immediately contain and clean up any spills to prevent contamination to water sources.

Check the pesticide label for specific instructions on protection of water sources.

For more information on protecting water sources, see ontario.ca/crops:

- OMAFRA Factsheet Pesticide Contamination of Farm Water Supplies
- OMAFRA Factsheet Groundwater — *An Important Rural Resource: Protecting the Quality of Groundwater Supplies*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13

Bee Poisoning

Honeybees, native bee species (e.g., bumble bees, squash bees) and other pollinating insects are important pollinators for many Ontario crops. Insecticides, some of which may negatively affect bees, require careful management to achieve both pollination and insect control. Growers and licensed commercial applicators can protect bees by following these suggestions:

- Time insecticide applications to minimize bee exposure (e.g., apply post bloom). Daytime treatments, when bees are foraging, are most hazardous. Insecticide applications in the evening are the safest, unless there is evidence of a strong temperature inversion or high humidity. Under normal circumstances, spraying after 8 p.m. allows the spray to dry before the bees are exposed to it the next day. Spraying during early morning is the next best time, when fewer bees are foraging, but pesticide residues may still be present. Spraying should be completed well before 7 a.m. While honeybees and most other pollinating insects do not usually forage at temperatures below 13°C, bumblebees do. If you plan to spray in the morning, contact beekeepers who have bees within 5 km of your crop and spray site. The beekeepers may then have the option of taking any possible protective action.
- Do not apply insecticides while fruit trees are in bloom. The Bees Act makes it an offence to do so in Ontario. Do not spray any flowering crop on which bees are foraging.
- To prevent drift toward nearby hives, do not apply insecticides on windy days or when there is evidence of a strong temperature inversion.
- Bees and other pollinators may be poisoned by visiting flowering weeds, trees and cover crops that have come into contact with an insecticide via spray drift or drift of insecticide-contaminated dust during planting. Avoid spray drift to flowering weeds that are adjacent to or within the target field. Where possible, mow down flowering cover crops or flowering weeds in and bordering target fields prior to spraying to help safeguard the bees. Control dandelions and other flowering weeds within fields before spraying or planting seeds treated with an insecticide. Take measures to reduce movement of dust from insecticide seed treatments to flowering trees, weeds and water sources that are in or adjacent to the target field. For more information on reducing dust movement, search for "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" at www.canada.ca.
- Systemic insecticides may also pose a high risk to bees and other insect pollinators. Bees can be exposed to insecticide residues in or on flowers, leaves, pollen, nectar and/or surface water. Do not apply insecticide or allow it to drift onto blooming crops or off-site habitat if bees are foraging in or adjacent to the treatment area.
- In crop settings where pesticide use is highly likely, beekeepers should remove honeybee colonies as soon as pollination and bloom are complete in the crop and before any insecticides are applied post bloom. In emergency situations, if the colonies cannot be removed in time, beekeepers can place burlap or cloth soaked in water at the entrance of the hive to disrupt the flight of the bees for up to 12 hr and provide more time for spray to dry. To help prevent overheating of the hive during this time, keep an opening of 2.5 cm on each side of the hive entrance so bees can still get out and ventilate the hive. Also, the water on the burlap or cloth will help cool the colony.
- Not all pesticides are equally toxic to bees. If there is a risk of honeybee poisoning, try to choose an insecticide that is not highly toxic to bees. When there is a choice, choose a product formulation that is less hazardous to bees.
- Always read the most current pesticide label for guidance. Some pesticides cannot be used when bees are active in the crop.

For more information on ways to reduce bee poisoning, see:

- *Practices to Reduce Bee Poisoning* from Agricultural Pesticides in Canada, available at honeycouncil.ca. Select "Bee Health Roundtable".

Manage drift

Pesticide drift is the aerial movement and unintentional deposit of pesticide outside the target area. Drift results in wasted product and may compromise crop protection and also may adversely affect nearby sensitive environmental areas, crops and wildlife. The following strategies can help reduce the risk of pesticide drift:

- Do not spray when wind direction is changeable, or wind speeds are high or gusty. These conditions increase the potential for off-target drift. While most pesticide labels indicate allowable wind speeds, some do not.
- Regularly monitor wind conditions during spraying, preferably in the field with a handheld wind meter at nozzle height. Record the wind speed and direction. As conditions change, make adjustments to manage drift potential. Adjustments may include a coarser droplet size, minimizing nozzle-to-target distance, slowing travel speed, changing nozzle technology, using a drift reducing spray additive or discontinuing spraying until conditions improve.
- Do not spray during periods of dead calm. Periods of dead calm may occur between late evening and early morning and can result in the vapor or fine spray droplets remaining aloft, like fog. Spray-filled air can move unpredictably over great distances several hours after the spray event is completed.

Temperature inversions create problems for spray applicators because pesticide spray can:

- remain suspended and active in the air above the target for long periods of time
- move with light breezes in changeable and unpredictable directions
- move down slopes and concentrate in low-lying regions

Field air temperatures are often very different from local or regional forecasts, so the most reliable method of detecting inversion conditions is to measure temperatures at, and several metres above, the ground. Commercial hand-held inversion detectors are now available. Spray applicators can also recognize a temperature inversion from environmental cues, such as when:

- there is a big drop from daytime to nighttime temperature
- wind dies down by early evening and night
- far away sounds can be heard clearly
- odours seem more intense
- daytime cumulus clouds collapse toward evening
- overnight cloud cover is 25% or less
- smoke or dust hangs in the air and/or moves laterally in a sheet

Temperature inversions start to form about 3 hr prior to sunset, become stronger as the sun sets and continue until sunrise when the surface warms and air mixing begins. **If you suspect there's an inversion, don't spray. Often, warnings for the risk of inversions are stated right on the product label.**

- Use the sprayer output specified on the pesticide label.
- Use a nozzle that will produce the droplet size specified on the pesticide label or delivers droplets appropriate for the job.
- Where practical, use air induction nozzles, which significantly reduce drift compared to conventional nozzles.
- Minimize the distance between nozzle and target as much as possible while still maintaining spray uniformity.
- Establish buffer zones for the protection of adjacent sensitive areas. Some pesticide labels will state buffer zone setbacks; follow these carefully.
- Use drift reduction technology, such as hoods, shrouds, screens or air curtains.
- If appropriate, use drift-reducing adjuvants in the spray tank. The intense agitation in airblast sprayers has been shown to reduce the effectiveness of drift-reducing adjuvants. Certain combinations of drift-reducing adjuvants and air- induction nozzles have been shown to increase the incidence of fine droplets.
- When possible, use non-volatile pesticide formulations or products.

For more information about spray drift, see:

- Sprayers 101: www.sprayers101.com
- OMAFRA website: ontario.ca/spraydrift
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) Drift of Pesticides video series, available at www.opep.ca/resources (click the YouTube icon)

Waste Management (Container Disposal)

Empty Pesticide and Fertilizer containers up to 23 L

Never re-use empty pesticide containers.

The Ontario Empty Pesticide and Fertilizer Container Recycling Program, an industry-led program, is available free of charge to growers and commercial applicators. Through this program, you can return triple-rinsed or pressure-rinsed plastic pesticide and fertilizer containers up to 23 L to container collection depots located throughout the province. Remove the cap and booklet from the pesticide container and metal handle from the fertilizer pail before recycling. To locate the closest container collection depot, visit www.cleanfarms.ca, call your local dealer or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Pesticide Containers Greater than 23 L (Totes and Drums)

Growers and commercial applicators should return pesticide containers that are greater than 23 L in size to the point of sale or local collection site for disposal. Contact your local dealer for details on disposal of these containers, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Seed And Pesticide Bags

Growers can return their empty seed and pesticide bags to select retail locations. Contact your local dealer for details on disposal of these empty seed and pesticide bags, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Surplus Spray Mix

The best approach is to plan the spray job accurately to avoid creating a surplus.

When this is unavoidable, dispose of excess spray mix by spraying it on other crops that require an application of this pesticide. Before spraying, check the label to make sure the pesticide is registered for use on that other crop.

If you cannot find another allowable crop to spray, then dilute the remaining spray mix by adding 10 parts of water for each 1 part of spray mix.

The diluted solution can be safely applied to the original treated area as long as you do not exceed the pesticide rate recommended on the label. Be sure to check the label for any restrictions about crop rotation, days to harvest or disposal of surplus spray mix.

Never re-spray the treated field with undiluted spray mix. Spraying an area twice at the same pesticide rate will double the labeled pesticide rate. This may cause illegal pesticide residues in the harvested crop or harmful residues in the soil that can cause crop damage.

Surplus Pesticide Disposal

Be sure to safely dispose of pesticides that you do not need or cannot use. Options for proper disposal include:

- Contact the supplier. It is sometimes possible to return unused pesticide if it is still in its original, unopened container.
- Hire a licensed waste hauler who is licensed under Part V of the *Environmental Protection Act* to carry hazardous wastes.
- Cleanfarms operates a free Obsolete Pesticide and Animal Health Product Collection Program throughout the province every 3 years. To locate the closest collection point and date, visit the Cleanfarms website (www.cleanfarms.ca), contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca or contact your local dealer for program details.
- Contact your municipality to see if any hazardous waste collection days are scheduled and verify whether quantities of agricultural pesticides will be accepted.

Storing Pesticides

Ontario's *Pesticides Act* and Regulation 63/09 provide details on storage requirements for pesticide storage facilities. As shown in Table 1–1, the storage requirements that must be followed are dependent on which classes of pesticides you store.

Table 3–1. Requirements for Pesticide Storage Facilities

	Pesticide Classes		
Storage requirements	**Class 2**	**Class 3**	**Class 4, 5, 6 & 7**
No contact with food or drink	**YES**	**YES**	**YES**
Not an impairment to health and safety	**YES**	**YES**	**YES**
Clean and orderly	**YES**	**YES**	**YES**
Warning sign G posted*	**YES**	**YES**	**YES**
Emergency telephone numbers posted**	**YES**	**YES**	**YES**
Vented to outside	**YES**	**YES**	NO
Limited access (locked)	**YES**	**YES**	NO
No floor drain	**YES**	**YES**	NO
Respiratory protection and protective clothing kept readily available	**YES**	**YES**	NO
Area used primarily for pesticides	**YES**	NO	NO

Note: Sufficient precautions are needed in your storage area to prevent the pesticide from entering the natural environment. Ensure your floor drain does not enter the natural environment.

* See ontario.ca for requirements for warning sign G (Search for sample warning signs for pesticide use). These signs can be purchased from your pesticide dealer/vendor.

** Emergency contact numbers must include telephone numbers for the local fire department, hospital and poison control centre. The number for the MECP Spills Action Centre (1-800-268-6060) should also be readily available.

For more information about storing pesticides, see:

- OMAFRA Factsheet *Farm Pesticide Storage Facility*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learning."

Pesticide Spills

If a pesticide spill causes, or is likely to cause, an adverse effect that is greater than that which would result from the proper use of the pesticide, you must notify the Ontario Ministry of the Environment, Conservation and Parks Spills Action Centre at 1-800-268-6060 (24 hr a day, 7 days a week) and your municipality.

A spill is defined as a discharge of pollutant that is abnormal in quality or quantity, from or out of a structure, vehicle or other container into the environment. An incident such as an overturned pesticide sprayer that results in the loss of the spray solution to the environment is an example of a spill. A pesticide container that ruptures and leaks its contents is another example of a spill. The discharge or spraying of a pesticide in an unapproved area is also considered a spill.

Before you begin to clean up a spill of any nature, remember to protect yourself against pesticide exposure. Wear the proper protective clothing and personal protective equipment. If the spill occurs inside an enclosed area (e.g., a pesticide storage area or a vehicle during transport), ventilate the area first. Once you have protected yourself and removed other persons or animals from the spill site, take additional measures to stop the spill at the source and prevent it from spreading and/or contaminating watercourses. Specific precautions, emergency contact information and first aid procedures may be found on the label.

For minor spills, it may be possible to rectify the problem:

- For a liquid spill — Cover the spill with a thick layer of absorbent material such as kitty litter, vermiculite or dry soil. Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.
- For a dust, granular or powder spill — Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.

For major spills, it is essential to stop the spill from spreading.

The clean-up guidelines above may not be appropriate for all spill situations. Once you have contained the spill, follow directions from the manufacturer and regulatory authorities on cleaning the contaminated area.

Some of the information contained in this chapter is not authoritative. It is derived from the *Pesticides Act*, Ontario Regulation 63/09, and the federal *Pest Control Products Act*, *Fisheries Act* and *Species at Risk Act* and is for informational purposes only. Efforts have been made to make it as accurate as possible, but in the event of a conflict, inconsistency or error, the requirements set out in the referenced legislation take precedence. For specific legal details, please visit ontario.ca/laws (for Ontario legislation) and www.laws.justice.gc.ca (for federal legislation) and consult your lawyer if you have questions about your legal obligations.

For information on preventing spills, see:

- OMAFRA Factsheet *Ways to Avoid Pesticide Spills*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learning."

For pesticide poisonings and pesticide injuries, call:

Ontario Poison Centre: 1-800-268-9017
(TTY) 1-877-750-2233

For more information, see Emergency and First Aid Procedures for Pesticide Poisoning on inside back cover.

4. HERBICIDES USED IN ONTARIO

TABLE 4–1. Herbicides Used in Ontario

Mention of a brand or trade name in this table does not constitute a guarantee or warranty of the product. Always refer to the product label before using.

LEGEND: DC = dispersible concentrate; DF = dry flowable; DG = dry granules; DS = dry soluble; EC = emulsifiable concentrate; EM = emulsion; F = flowable; Gi = gel; Gr = granular; Li = liquid; ME = microencapsulated suspension; OD = oil dispersible; PE = pellets; PS = pressurized spray; SC = soluble concentrate; SG = soluble granules; Sn = solution; SP = soluble powder; Su = suspension (flowable); WDG = wettable dry granules; WG = wettable granules; WP = wettable powder; – = not specified on label

common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
2,4-D Amine	2,4-D AMINE 600	Sn	564 g/L	4	5931	4	B	12 hrs	2 hrs	Loveland Products
2,4-D Amine	2,4-D AMINE 600, IPCO	Sn	564 g/L	4	17511	4	B	12 hrs	2 hrs	Interprovincial Co-op
2,4-D Amine	2,4-D AMINE 600, NUFARM	Sn	564 g/L	4	14726	4	B	12 hrs	2 hrs	Nufarm
2,4-D AMINE 600	2,4-D	Sn	564 g/L	4	5931	4	B	12 hrs	2 hrs	Loveland Products
2,4-D AMINE 600, IPCO	2,4-D	Sn	564 g/L	4	17511	4	B	12 hrs	2 hrs	Interprovincial Co-op
2,4-D AMINE 600, NUFARM	2,4-D	Sn	564 g/L	4	14726	4	B	12 hrs	2 hrs	Nufarm
2,4-D Ester	2,4-D ESTER 700, ADAMA	EC	660 g/L	4	31698	3	A	12 hrs	2 hrs	Adama Canada
2,4-D Ester	2,4-D ESTER 700, IPCO	EC	660 g/L	4	20310	3	A	12 hrs	2 hrs	Interprovincial Co-op
2,4-D Ester	2,4-D ESTER 700, NUFARM	EC	660 g/L	4	27820	3	A	12 hrs	2 hrs	Nufarm
2,4-D Ester	2,4-D ESTER 700, SALVO	EC	660 g/L	4	27818	3	A	12 hrs	2 hrs	Loveland Products
2,4-D ESTER 700, ADAMA	2,4-D	EC	660 g/L	4	31689	3	A	12 hrs	2 hrs	Adama Canada
2,4-D ESTER 700, IPCO	2,4-D	EC	660 g/L	4	20310	3	A	12 hrs	2 hrs	Interprovincial Co-op
2,4-D ESTER 700, NUFARM	2,4-D	EC	660 g/L	4	27820	3	A	12 hrs	2 hrs	Nufarm
2,4-D ESTER 700, SALVO	2,4-D	EC	660 g/L	4	27818	3	A	12 hrs	2 hrs	Loveland Products
2,4-D choline/ glyphosate	ENLIST DUO	Sn	194 g/L 204 g/L	4 9	30958	3	A	48 hrs	2 hrs	Corteva
2,4-DB	CALIBER 625	EC	625 g/L	4	27910	3	A	12 hrs	2 hrs	Loveland Products
2,4-DB	COBUTOX 625	EC	625 g/L	4	28346	3	A	12 hrs	2 hrs	Interprovincial Co-op
2,4-DB	EMBUTOX	EC	625 g/L	4	19217	3	A	12 hrs	2 hrs	Nufarm

[1] The amount of active ingredient in the unit of formulated herbicide and expressed as grams active ingredient per litre of product or the percentage of active ingredient per mass of product.

[2] Indicates the numeric grouping of herbicides by their site of action and by the Weed Science Society of America (WSSA). Herbicide resistant weeds have historically been selected when herbicides with the same site of action are used repeatedly. Refer to Table 4-6. *Weed Populations Confirmed Resistant to Herbicide Groups in Ontario Counties,* for a listing of herbicide resistant weeds in Ontario by WSSA group and corresponding site of action.

[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

[4] Refers to the numeric classification of pesticides under Regulation 63/09 of the Pesticides Act. Refer to Table 4–2. *Description for Ontario Classification of Pesticide Products*, for a description of each Ontario classification.

[5] A = Does not need to be stored in a heated building, but its preferred; B = Cannot be stored at temperatures at or below 0°C; C = Store above 5°C to keep product from freezing and D = Store above 7°C, DO NOT FREEZE.

[6] REI = Restricted Entry Intreval, and is the period of time (in hours) after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks (e.g. scouting) in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done. If an REI is not stated on the label, use a 12 hour REI.

[7] Rainfast = Is the duration (in hours) needed after application before a rain event occurs so as to ensure that the herbicide wiil be adequately taken up by the target weed so as to maximize control.

[8] Indicates herbicides sold as a co-pack under this trade name.

TABLE 4–1. Herbicides Used in Ontario (cont'd)

Mention of a brand or trade name in this table does not constitute a guarantee or warranty of the product. Always refer to the product label before using.

LEGEND: DC = dispersible concentrate; DF = dry flowable; DG = dry granules; DS = dry soluble; EC = emulsifiable concentrate; EM = emulsion; F = flowable; Gi = gel; Gr = granular; Li = liquid; ME = microencapsulated suspension; OD = oil dispersible; PE = pellets; PS = pressurized spray; SC = soluble concentrate; SG = soluble granules; Sn = solution; SP = soluble powder; Su = suspension (flowable); WDG = wettable dry granules; WG = wettable granules; WP = wettable powder; – = not specified on label

common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
AATREX LIQUID 480	atrazine	Li	480 g/L	5	18450	3	A	12 hrs	2 hrs	Syngenta
ACCENT 75 DF	nicosulfuron	DF	75%	2	25116	3	A	12 hrs	2 hrs	Corteva
acifluorfen	ULTRA BLAZER	Sn	240 g/L	14	32330	3	B	12 hrs	6 hrs	UPL AgroSolutions
ACURON	bicylopyrone mesotrione s-metolachlor atrazine	Su	7.1 g/L 28.5 g/L 257 g/L 120 g/L	27 27 15 5	31846	4	B	12 hrs	–	Syngenta
AIM EC	carfentrazone-ethyl	EC	240 g/L	14	28573	3	A	12 hrs	2 hrs	Nufarm
aminopyralid	MILESTONE	Sn	240 g/L	4	28517	3	A	12 hrs	2 hrs	Corteva
aminopyralid/ metsulfuron-methyl	CLEARVIEW	WG	52.5% 9.45%	4, 2	29752	3	A	24 hrs	2 hrs	Corteva
ANTLER 240 EC	clethodim	EC	120 g/L	1	32880	3	A	12 hrs	1 hr	Winfield Canada
ARMEZON	topramezone	Su	336 g/L	27	30131	3	C	12 hrs	2 hrs	BASF
ARMEZON PRO	dimethenamid-P topramezone	EC	630 g/L 12.5 g/L	15 27	32148	3	A	24 hrs	2 hrs	BASF
ARMORY	diquat	EC	240 g/L	22	32726	3	B	24 hrs	15 min	Adama Canada
ARROW ALL-IN	clethodim	EC	120 g/L	1	33225	3	A	12 hrs	1 hr	Adama Canada
ASSIGNMENT[8] (PURSUIT + ROUNDUP WEATHERMAX)	imazethapyr + glyphosate	Su Li	240 g/L 540 g/L	2 9	21537 27487	2 4	B	12 hrs	2 hrs	BASF
ASSURE II	quizalofop-p-butyl	EC	96 g/L	1	25462	3	C	12 hrs	1 hr	Amvac
atrazine	AATREX LIQUID 480	Li	480 g/L	5	18450	3	A	12 hrs	2 hrs	Syngenta
atrazine	CONVERGE 480	Li	480 g/L	5	26277	3	A	12 hrs	2 hrs	Bayer CropScience

[1] The amount of active ingredient in the unit of formulated herbicide and expressed as grams active ingredient per litre of product or the percentage of active ingredient per mass of product.

[2] Indicates the numeric grouping of herbicides by their site of action and by the Weed Science Society of America (WSSA). Herbicide resistant weeds have historically been selected when herbicides with the same site of action are used repeatedly. Refer to Table 4-6. *Weed Populations Confirmed Resistant to Herbicide Groups in Ontario Counties,* for a listing of herbicide resistant weeds in Ontario by WSSA group and corresponding site of action.

[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

[4] Refers to the numeric classification of pesticides under Regulation 63/09 of the Pesticides Act. Refer to Table 4–2. *Description for Ontario Classification of Pesticide Products*, for a description of each Ontario classification.

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[6] REI = Restricted Entry Intreval, and is the period of time (in hours) after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks (e.g. scouting) in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done. If an REI is not stated on the label, use a 12 hour REI.

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TABLE 4–1. Herbicides Used in Ontario (cont'd)

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
AUTHORITY 480	sulfentrazone	Su	480 g/L	14	29012	2	C	12 hrs	–	FMC
AUTHORITY SUPREME	pyroxasulfone/ sulfentrazone	Su	250 g/L 250 g/L	15 14	32562	2	C	12 hrs	–	FMC
AXIAL BIA	pinoxaden	EC	50 g/L	1	30431	3	B	12 hrs	1 hr	Syngenta
BADGE II	bromoxynil/ MCPA	EC	225 g/L 225 g/L	6 4	30370	3	A	24 hrs	2 hrs	Adama Canada
BARRICADE M[8] (BARRICADE SG + PERIMETER II + MCPA ESTER 600, NUFARM)	thifensulfuron methyl tribenuron methyl fluroxypyr MCPA	SG SG EC EC	25% 25% 333 g/L 600 g/L	2 2 4 4	29544 29544 30094 27803	3 3 3 3	A	12 hrs	1 hr	FMC
BASAGRAN FORTÉ	bentazon	Li	480 g/L	6	22006	4	C	12 hrs	6 hrs	BASF
BENGAL WB	fenoxaprop-p-ethyl	EC	120 g/L	1	30843	3	B	12 hrs	1 hr	Adama Canada
bentazon	BASAGRAN FORTÉ	Li	480 g/L	6	22006	4	C	12 hrs	6 hrs	BASF
bentazon	BROADLOOM	Li	480 g/L	6	32661	4	C	12 hrs	6 hrs	UPL AgroSolutions
bentazon/ acifluorfen	HURRICANE	Li	320 g/L 160 g/L	6/14	32662	2	C	48 hrs	4 hrs	UPL AgroSolutions
bicylopyrone mesotrione s-metolachlor atrazine	ACURON	Su	7.1 g/L 28.5 g/L 257 g/L 120 g/L	27 27 15 5	31846	4	B	12 hrs	–	Syngenta
BIFECTA[8] (TRICOR 75 DF + VALTERA)	metribuzin flumioxazin	DF WDG	75% 51.1%	5 14	30661 29320	3 4	A	12 hrs	–	Nufarm
BISON	tralkoxydim	Su	400 g/L	1	29256	3	C	12 hrs	1 hr	Adama

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
BLACKHAWK	pyraflufen-ethyl 2,4-D Ester	EC	6.1 g/L 473 g/L	14 4	32111	3	A	12 hrs	2 hrs	Nufarm
BOLSTER	diquat	Sn	240 g/L	22	32540	3	B	24 hrs	15 min	Interprovincial Co-op
BONANZA 480	trifluralin	EC	480 g/L	3	28289	4	C	12 hrs		Loveland Products
BOOST M[8] (NUFARM BOOST + MCPA ESTER 600)	thifensulfuron methyl tribenuron methyl MCPA Ester	SG EC	50% 25% 600 g/L	2 2 4	30377 27803	3 3	A	12 hrs	2 hrs	Nufarm
BOUNDARY LQD	s-metloachlor metribuzin	EC	628 g/L 149 g/L	15 5	30812	3	A	12 hrs	–	Syngenta
BROADLOOM	bentazon	Li	480 g/L	6	32661	4	C	12 hrs	6 hrs	UPL AgroSolutions
BROADSTRIKE RC	flumetsulam	WG	80%	2	27004	3	A	12 hrs	1 hr	Corteva
BROMAX	bromoxynil	Li	480 g/L	6	31431	3	D	12 hrs	1 hr	Interprovincial Co-op
BROMOTRIL 240 EC	bromoxynil	EC	240 g/L	6	28276	3	D	12 hrs	1 hr	Adama Canada
bromoxynil	BROMAX	Li	480 g/L	6	31431	3	D	24 hrs	1 hr	Interprovincial Co-op
bromoxynil	BROMOTRIL 240 EC	EC	240 g/L	6	28276	3	D	24 hrs	1 hr	Adama Canada
bromoxynil	BROTEX 240	Li	240 g/L	6	28519	3	D	24 hrs	1 hr	Interprovincial Co-op
bromoxynil	BROTEX 480	Li	480 g/L	6	31348	3	D	24 hrs	1 hr	Interprovincial Co-op
bromoxynil	KORIL	EC	235 g/L	6	25341	3	D	24 hrs	1 hr	Nufarm
bromoxynil	PARDNER	EC	280 g/L	6	18001	3	D	24 hrs	1 hr	Bayer CropScience
bromoxynil MCPA	BADGE II	EC	225 g/L 225 g/L	4 6	30370	3	A	24 hrs	2 hrs	Adama Canada

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TABLE 4–1. Herbicides Used in Ontario (cont'd)

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
bromoxynil MCPA	BUCTRIL M	EC	280 g/L 280 g/L	4 6	18022	3	A	24 hrs	2 hrs	Bayer CropScience
bromoxynil MCPA	LOGIC M, IPCO	EC	225 g/L 225 g/L	4 6	28109	3	A	24 hrs	2 hrs	Interprovincial Co-op
bromoxynil MCPA	MEXTROL 450	EC	225 g/L 225 g/L	4,6	26999	3	A	24 hrs	2 hrs	Nufarm
BROTEX 240	bromoxynil	LI	240 g/L	6	28519	3	D	24 hrs	1 hr	Interprovincial Co-op
BROTEX 480	bromoxynil	LI	480 g/L	6	31348	3	D	24 hrs	1 hr	Interprovincial Co-op
BUCTRIL M	bromoxynil/ MCPA	EC	280 g/L 280 g/L	4 6	18022	3	A	24 hrs	2 hrs	Bayer CropScience
CALIBER 625	2,4-DB	EC	625 g/L	4	27910	4	A	12 hrs	2 hrs	Loveland Products
CALLISTO	mesotrione	Su	480 g/L	27	27833	3	A	12 hrs	3 hrs	Syngenta
CALLISTO GT	mesotrione glyphosate	Su	45.5 g/L 455 g/L	27 9	31711	3	A	12 hrs	3 hrs	Syngenta
CANOPY PRO[8] (CLASSIC + TRICOR 75DF)	chlorimuron-ethyl + metribuzin	WG DF	25% 75%	2 5	29416 30661	3 3	A	12 hrs	6 hrs	Corteva
carfentrazone-ethyl	AIM EC	EC	240 g/L	14	28573	3	A	12 hrs	2 hrs	Nufarm
CHAPERONE	chlorimuron-ethyl	WG	25%	2	30475	3	A	12 hrs	4 hrs	Nufarm
chlorimuron-ethyl	CLASSIC	WG	25%	2	29416	3	A	12 hrs	4 hrs	Corteva
chlorimuron-ethyl	CHAPERONE	WG	25%	2	30475	3	A	12 hrs	4 hrs	Nufarm
chlorimuron-ethyl/ flumioxazin	DILIGENT	WG	5.14% 40.59%	2 14	31494	3 4	A	12 hrs	4 hrs	Corteva

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chlorimuron-ethyl + glyphosate	GUARDIAN MAX[8] (CLASSIC + POLARIS MAX)	WG Sn	25% 540 g/L	2 9	25433 32504	3 4	A	12 hrs	4 hrs	Corteva
chlorimuron-ethyl + imazethapyr	FREESTYLE[7] (CLASSIC + DUPONT IMAZETHAPYR 240 SL)	WG Sn	25% 240 g/L	2 2	29416 31157	3 4	A	12 hrs	4 hrs	Corteva
chlorimuron-ethyl metribuzin	CANOPY PRO[8] (CLASSIC + TRICOR 75DF)	WG DF	25% 75%	2 5	29416 30661	3 4	A	12 hrs	6 hrs	Corteva
CLASSIC	chlorimuron-ethyl	WG	25%	2	29416	3	A	12 hrs	4 hrs	Corteva
CLEANSWEEP[8] (PURSUIT + BASAGRAN FORTÉ)	imazethapyr + bentazon	Sn Li	240 g/L 480 g/L	2 6	21537 22006	2 4	B	12 hrs	6 hrs	BASF
CLEARVIEW	aminopyralid/ metsulfuron-methyl	WG	52.5% 9.45%	4, 2	29752	3	A	24 hrs	2 hrs	Corteva
clethodim	ANTLER 240 EC	EC	240 g/L	1	32880	3	A	12 hrs	1 hr	Winfield Canada
clethodim	ARROW ALL-IN	EC	120 g/L	1	33225	3	A	12 hrs	1 hr	Adama Canada
clethodim	SELECT	EC	240 g/L	1	22625	3	A	12 hrs	1 hr	BASF
clethodim	STATUE	EC	240 g/L	1	32885	3	A	12 hrs	1 hr	NuFarm
clomazone	COMMAND 360 ME	ME	360 g/L	13	27827	3	C	12 hrs	–	FMC
clopyralid	LONTREL XC	Sn	600 g/L	4	32795	3	B	12 hrs	2 hrs	Corteva
cloransulam-methyl	FIRSTRATE	WG	84%	2	26697	3		24 hrs	2 hrs	Corteva
CLOVITOX PLUS	MCPB/MCPA	Li	375 g/L + 25 g/L	4,4	22003	3	A	12 hrs	4 hrs	Interprovincial Co-op
COBUTOX 625	2,4-DB	EC	625 g/L	4	22404	4	A	12 hrs	2 hrs	Interprovincial Co-op
COMMAND 360 ME	clomazone	ME	360 g/L	13	27827	3	C	12 hrs	–	FMC
CONQUEST LQ[8] (PURSUIT + SENCOR)	imazethapyr + metribuzin	Sn Li	240 g/L 480 g/L	2 5	21537 29346	2 3	B	12 hrs	6 hrs	BASF

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COMMENZA[8] (BROADSTRIKE RC + TRICOR 75 DF + S-METLOACHLOR 960)	flumetsulam + metribuzin + s-metolachlor	WG DF EC	80% 75% 960 g/L	2 5 15	27004 30661 32847	3	B	12 hrs	–	Corteva
CONTENDER	quizalofop-p-butyl	EC	96 g/L	1	32091	3	C	12 hrs	1 hr	Interprovincial Co-op
CONVERGE XT[8] (CONVERGE FLEXX + CONVERGE 480)	isoxaflutole + atrazine	Sn Li	240 g/L 480 g/L	27 5	29071 26277	2 3	B	12 hrs	–	Bayer CropScience
CREDIT 45	glyphosate	Sn	450 g/L	9	29124	4	A	12 hrs	1 hr	Nufarm
CREDIT XTREME	glyphosate	Sn	540 g/L	9	29888	4	A	12 hrs	1 hr	Nufarm
CRUSH'R PLUS	glyphosate	Sn	360 g/L	9	29995	4	A	12 hrs	1 hr	Agwest Inc.
DESTRA IS	rimsulfuron/ mesotrione	WG	5.45% 36.36%	2 27	31348 32626	3	A	12 hrs	3 hrs	Corteva
dicamba	ENGENIA	Sn	600 g/L	4	32220	3	B	12 hrs	4 hrs	BASF
dicamba	FEXAPAN	Sn	350 g/L	4	32188	3	B	12 hrs	4 hrs	Corteva
dicamba	XTENDIMAX	Sn	350 g/L	4	31896	3	B	12 hrs	4 hrs	Bayer CropScience
dicamba/ atrazine	MARKSMAN	Su	132 g/L 261 g/L	4 5	19349	3	A	12 hrs	4 hrs	BASF
dicamba/ s-metolachlor	TAVIUM	CS	134 g/L 271 g/L	4 15	33268	3	A	12 hrs	4 hrs	Syngenta
dichlorprop/ 2,4-D	DICHLORPROP DX	EC	210 g/L 400 g/L	4 4	29664	3	A	12 hrs	2 hrs	Interprovincial Co-op
dichlorprop/ 2,4-D	DICHLORPOP D	EC	300 g/L 282 g/L	4 4	27966	3	A	12 hrs	2 hrs	Interprovincial Co-op

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dichlorprop/ 2,4-D	ESTAPROP XT	EC	210 g/L 400 g/L	4 4	29660	3	A	12 hrs	2 hrs	NUfarm
dichlorprop/ 2,4-D	TURBOPROP	EC	300 g/L 282 g/L	4 4	27967	3	A	12 hrs	2 hrs	Loveland Products
DICHLORPROP DX	dichlorprop/ 2,4-D	EC	210 g/L 400 g/L	4 4	29664	3	A	12 hrs	2 hrs	Interprovincial Co-op
DICHLORPROP D	dichlorprop/ 2,4-D	EC	300 g/L 282 g/L	4 4	27966	3	A	12 hrs	2 hrs	Interprovincial Co-op
diflufenzopyr/dicamba	DISTINCT	WDG	70%	4,19	26406	3	A	12 hrs	4 hrs	BASF
DILIGENT	chlorimuron-ethyl/ flumioxazin	WG	5.14% 40.59%	2 14	31494	3 4	A	12 hrs	4 hrs	Corteva
dimethenamid-P	FRONTIER MAX	EC	720 g/L	15	29194	3	A	24 hrs	–	BASF
dimethenamid-P topramezone	ARMEZON PRO	EC	630 g/L 12.5 g/L	15 27	32148	3	A	24 hrs	2 hrs	BASF
DISTINCT	diflufenzopyr/dicamba	WDG	70%	4,19	26406	3	A	12 hrs	4 hrs	BASF
diquat	ARMORY	EC	240 g/L	22	32726	3	B	24 hrs	15 min	Adama Canada
diquat	BOLSTER DESICCANT	Sn	240 g/L	22	32540	3	B	24 hrs	15 min	Interprovincial Co-op
diquat	REGLONE DESSICANT	Sn	240 g/L	22	26396	3	B	24 hrs	15 min	Syngenta
ELEVORE	halauxifen	SC	68.5 g/L	4	32948	3	A	12 hrs	1 hr	Corteva
EMBUTOX	2,4-DB	EC	625 g/L	4	27912	3	A	12 hrs	2 hrs	Nufarm
ENFORCER M	fluroxypyr/ bromoxynil/ MCPA	EC	80 g/L 200 g/L 200 g/L	4 4 4	30691	3	A	24 hrs	2 hrs	Nufarm

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[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
ENGARDE	rimsulfuron/ meostrione	WG	4.31% 41.38%	2 27	31595	3	A	12 hrs	3 hrs	Corteva
ENGENIA	dicamba	Sn	600 g/L	4	32220	3	B	12 hrs	4 hrs	BASF
ENLIST DUO	2,4-D choline/ glyphosate	Sn	194 g/L 204 g/L	2 9	30958	4	A	12 hrs	2 hrs	Corteva
EPTAM	EPTC	EC	800 g/L	8	11284	5	A	24 hrs	–	Gowan
EPTC	EPTAM	EC	800 g/L	8	11284	5	A	24 hrs	–	Gowan
ethametsulfuron-methyl	MUSTER TOSS-N-GO	DF	75%	2	23569	3	A	12 hrs	4 hrs	FMC
ERAGON LQ	saflufenacil	Su	342g/L	14	31469	3	C	12 hrs	1 hr	BASF
ESTAPROP XT	dichlorprop/ 2,4-D	EC	210 g/L 400 g/L	4 4	29660	3	A	12 hrs	2 hrs	Nufarm
EXPRESS SG	tribenuron-methyl	SC	50%	2	28262	3	A	12 hrs	4 hrs	FMC
FACTOR 540	glyphosate	Sn	540 g/L	9	27988	4	A	12 hrs	1 hr	Interprovincial Co-op
FEXAPAN	dicamba	EC	350 g/L	4	32188	3	A	12 hrs	4 hrs	Corteva
fenoxaprop-p-ethyl/safener	BENGAL	EC	120 g/L	1	29268	3	B	12 hrs	1 hr	Adama Canada
fenoxaprop-p-ethyl/safener	VIGIL	EC	120 g/L	1	29273	3	B	12 hrs	1 hr	Interprovincial Co-op
fenoxaprop-p-ethyl/safener	PUMA ADVANCE	EC	90 g/L	1	29615	3	B	12 hrs	1 hr	Bayer CropScience
FIERCE	flumioxazin/ pyroxasulfone	WG	33.5% 42.5%	14 15	31117	2	A	12 hrs	–	Valent
FIRSTRATE	cloransulam-methyl	WDG	84%	2	26697	3	B	24 hrs	2 hrs	Corteva
FLEXSTAR GT	fomesafen/ glyphosate	Sn	67 g/L 271 g/L	14 9	30412	3	B	12 hrs	4 hrs	Syngenta

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
fluazifop-p-butyl	VENTURE L	EC	125 g/L	1	21209	2	A	12 hrs	1 hr	Syngenta
flumetsulam	BROADSTRIKE RC	WG	80%	2	27004	3	A	12 hrs	2 hrs	Corteva
flumetsulam + metribuzin + s-metolachlor	COMMENZA[8] (BROADSTRIKE RC + TRICOR 75 DF + S-METLOACHLOR 960)	WG DF EC	80% 75% 960 g/L	2 5 15	27004 30661 32847	3	B	12 hrs	–	Corteva
flumioxazin	VALTERA	WDG	51.1%	14	29230	4	A	12 hrs	–	Valent
flumioxazin	VALTERA EZ	SC	480 g/L	14	33523	4	A	12 hrs	–	Valent
flumioxazin + metribuzin + imazethapyr	TRIACTOR[8] (VALTERA + TRICOR 75 DF + NU-IMAGE)	WDG	51.1% 75% 240 g/L	14 5 2	29230 30661 30420	4	B	12 hrs	–	Nufarm
flumioxazin/ pyroxasulfone	FIERCE	WDG	33.5% 42.5%	14 15	31117	4	A	12 hrs	–	Valent
fluroxypyr	TROPHY A	EC	180 g/L	4	27246	3	B	12 hrs	1 hr	Nufarm
fluroxypyr/ bromoxynil/ MCPA	ENFORCER M	EC	80 g/L 200 g/L 200 g/L	4 4 4	30691	3	A	24 hrs	2 hrs	Nufarm
FOCUS	pyroxasufone/ carfentrazone-ethyl	Su	447 g/L 53 g/L	15 14	32292	2	C	12 hrs	–	FMC
fomesafen	REFLEX	Sn	240 g/L	14	24779	3	A	12 hrs	4 hrs	Syngenta
fomesafen/ glyphosate	FLEXSTAR GT	Sn	67 g/L 271 g/L	14 9	30412	3	B	12 hrs	4 hrs	Syngenta
foramsulfuron	OPTION 2.25 OD	OD	22.5 g/L	2	27424	4	A	12 hrs	2 hrs	Bayer CropScience

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FREESTYLE[8] (CLASSIC + DUPONT IMAZETHAPYR)	chlorimuron-ethyl + imazethapyr	WG Su	25% 240 g/L	2 2	29416 31156	3 2	A	12 hrs	4 hrs	Corteva
FRONTIER MAX	dimethenamid-p	EC	720 g/L	15	29194	3	A	12 hrs	–	BASF
GLYFOS	glyphosate	Su	360 g/L	9	28924	4	A	12 hrs	1 hr	FMC
glufosinate ammonium	IGNITE	Sn	150 g/L	10	28532	4	B	12 hrs	4 hrs	BASF
glufosinate ammonium	LIBERTY 200SN	Sn	200 g/L	10	25337	4	B	24 hrs	4 hrs	BASF
glyphosate	CREDIT XTREME	Sn	540 g/L	9	29888	4	A	12 hrs	1 hr	Nufarm
glyphosate	CRUSH'R PLUS	Sn	360 g/L	9	29995	4	A	12 hrs	1 hr	Agwest Inc.
glyphosate	FACTOR 540	Sn	540 g/L	9	27988	4	A	12 hrs	1 hr	Interprovincial Co-op
glyphosate	GLYFOS	SC	360 g/L	9	28924	4	A	12 hrs	1 hr	FMC
glyphosate	MATRIX	Sn	480 g/L	9	29775	4	A	12 hrs	1 hr	Interprovincial Co-op
glyphosate	POLARIS MAX	Sn	540 g/L	9	32504	4	A	12 hrs	1 hr	Corteva
glyphosate	ROUNDUP TRANSORB HC	Sn	540 g/L	9	28198	4	A	12 hrs	1 hr	Bayer CropScience
glyphosate	ROUNDUP WEATHERMAX	Sn	540 g/L	9	27487	4	A	12 hrs	1 hr	Bayer CropScience
glyphosate	STONEWALL	Sn	540 g/L	9	31655	4	A	12 hrs	1 hr	Winfield Canada
glyphosate/ dicamba	ROUNDUP XTEND	Sn	240 g/L 120 g/L	9/ 4	32274	3	A	12 hrs	4 hrs	Bayer CropScience
glyphosate/ s-metolachlor/benoxacor/ mesotrione	HALEX GT	Sn	250 g/L 250 g/L 25 g/L	9 15 27	29341	4	A	12 hrs	3 hrs	Syngenta
halauxifen/fluroxypyr	PIXXARO A	EC	16.25 + 250 g/L	4	31303	3		12 hrs	1 hr	DOW

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HALEX GT	glyphosate/ s-metolachlor/benoxacor/ mesotrione	Sn	250 g/L 250 g/L 25 g/L	9 15 27	29341	4	A	12 hrs	3 hrs	Syngenta
halosulfuron	PERMIT	WG	72.6%	2	31210	3	A	12 hrs	2 hrs	Gowan
HURRICANE	bentazon/ acifluorfen	Li	320 g/L 160 g/L	6/14	32662	2	C	48 hrs	4 hrs	UPL AgroSolutions
IGNITE	glufosinate ammonium	Sn	150 g/L	10	28532	4	B	12 hrs	4 hrs	BASF
imazethapyr	NU-IMAGE	Sn	240 g/L	2	30420	2	B	12 hrs	2 hrs	Nufarm
imazethapyr	PHANTOM	Sn	240 g/L	2	30017	2	B	12 hrs	2 hrs	Adama Canada
imazethapyr	PURSUIT	Sn	240 g/L	2	26287	2	B	12 hrs	2 hrs	BASF
imazethapyr	DUPONT IMAZETHAPYR 240	Sn	240 g/L	2	31156	2	B	12 hrs	2 hrs	Corteva
imazethapyr + bentazon	CLEANSWEEP[8] (PURSUIT + BASAGRAN FORTÉ)	Sn Li	240 g/L 480 g/L	2 6	26287 22006	2 4	B	12 hrs	6 hrs	BASF
imazethapyr + metribuzin	CONQUEST LQ[8] (PURSUIT + SENCOR)	Sn Li	240 g/L 480 g/L	2 5	26287 29346	2+3	B	12 hrs	6 hrs	BASF
IMPACT	topramezone	Su	336 g/L	27	28141	3	C	12 hrs	2 hrs	Amvac
INFINITY	pyrasulfotole/ bromoxynil	EC	37.5 g/L 210 g/L	27 6	28738	3	A	12 hrs	1 hr	Bayer CropScience
INFINITY FX	pyrasulfotole/ bromoxynil/ fluroxypyr	EC	31.5 g/L 174.3 g/L 72 g/L	27 6 4	33248	3	A	24 hrs	1 hr	Bayer CropScience
INTEGRITY	saflufenacil/ dimethenamid-P	EC	68 g/L 600 g/L	14 15	29371	3	A	12 hrs	1 hr	BASF

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isoxaflutole	CONVERGE FLEXX	SC	240 g/L	27	29071	2	B	12 hrs	–	Bayer CropScience
isoxaflutole + atrazine	CONVERGE XT[8] (CONVERGE FLEXX + CONVERGE 480)	SC Li	240 g/L 480 g/L	27 5	29071 26277	2 3	B	12 hrs	–	Bayer CropScience
KOMODO (UPI S-MET)	s-metolachlor	EC	960 g/L	15	32847	3	A	12 hrs	–	UPL AgroSolutions
KORIL 235	bromoxynil	EC	235 g/L	6	25341	3	D	12 hrs	2 hrs	NuFarm
LIBERTY 200 SN	glufosinate ammonium	Li	200 g/L	10	25337	4	B	24 hrs	4 hrs	BASF
linuron	LOROX L	Li	480 g/L	7	16279	4	B	12 hrs	8 hrs	Tessenderlo Kerley
LOGIC M	bromoxynil/ MCPA	EC	225 g/L 225 g/L	6 4	28109	3	A	24 hrs	2 hrs	Interprovincial Co-op
LONTREL XC	clopyralid	Sn	600 g/L	4	32795	3	B	12 hrs	4 hrs	Corteva
LOROX L	linuron	Li	480 g/L	7	16279	4	B	12 hrs	8 hrs	Tessenderlo Kerley
MARKSMAN	dicamba/ atrazine	Su	132 g/L 261 g/L	4 5	19349	3	A	12 hrs	4 hrs	BASF
MCPA amine	MCPA AMINE 500	Sn	500 g/L	4	9516	4	B	12 hrs	4 hrs	Loveland Products
MCPA amine	MCPA AMINE 500, IPCO	Li	500 g/L	4	20308	4	B	12 hrs	4 hrs	Interprovincial Co-op
MCPA amine	MCPA AMINE 500, NUFARM	Li	500 g/L	4	14730	4	B	12 hrs	4 hrs	Nufarm
MCPA amine	MCPA AMINE 600	Li	600 g/L	4	31432	3	B	12 hrs	4 hrs	Loveland Products
MCPA amine	MCPA AMINE 600, IPCO	Li	600 g/L	4	28384	3	B	12 hrs	4 hrs	Interprovincial Co-op
MCPA amine	MCPA AMINE 600, NUFARM	Li	600 g/L	4	31327	3	B	12 hrs	4 hrs	Nufarm
MCPA AMINE 500	MCPA amine	Li	500 g/L	4	9516	4	B	12 hrs	4 hrs	Loveland Products
MCPA AMINE 500, IPCO	MCPA amine	Li	500 g/L	4	20308	4	B	12 hrs	4 hrs	Interprovincial Co-op
MCPA AMINE 500, NUFARM	MCPA amine	Li	500 g/L	4	14730	4	B	12 hrs	4 hrs	Nufarm

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
MCPA AMINE 600	MCPA amine	Li	600 g/L	4	31432	3	B	12 hrs	4 hrs	Loveland Products
MCPA AMINE 600, IPCO	MCPA amine	Li	600 g/L	4	28384	3	B	12 hrs	4 hrs	Interprovincial Co-op
MCPA AMINE 600, NUFARM	MCPA amine	Li	600 g/L	4	31327	3	B	12 hrs	4 hrs	Nufarm
MCPA ester	TROPHY B	EC	500 g/L	4	27245	3	B	12 hrs	2 hrs	Nufarm
MCPA ester	MCPA ESTER 600, IPCO	EC	600 g/L	4	27802	3	B	12 hrs	2 hrs	Interprovincial Co-op
MCPA ester	MCPA ESTER 600, NUFARM	EC	600 g/L	4	27803	3	B	12 hrs	2 hrs	Nufarm
MCPA ester	MCPA ESTER 600, CHECKMATE	EC	600 g/L	4	27804	3	B	12 hrs	2 hrs	Loveland Products
MCPA ESTER 600, IPCO	MCPA ester	EC	600 g/L	4	27802	3	B	12 hrs	2 hrs	Interprovincial Co-op
MCPA ESTER 600, NUFARM	MCPA ester	EC	600 g/L	4	27803	3	B	12 hrs	2 hrs	Nufarm
MCPA ESTER 600, CHECKMATE	MCPA ester	EC	600 g/L	4	27804	3	B	12 hrs	2 hrs	Loveland Products
MCPA sodium	MCPA SODIUM 300	Sn	300 g/L	4	9858	4	B	12 hrs	6 hrs	Loveland Products
MCPA sodium	MCPA SODIUM 300, IPCO	Li	300 g/L	4	20306	4	B	12 hrs	6 hrs	Interprovincial Co-op
MCPA sodium	MCPA SODIUM 300, NUFARM	Li	300 g/L	4	14718	4	B	12 hrs	6 hrs	Nufarm
MCPA SODIUM 300	MCPA sodium	Sn	300 g/L	4	9858	4	B	12 hrs	6 hrs	Loveland Products
MCPA SODIUM 300, IPCO	MCPA sodium	Li	300 g/L	4	20306	4	B	12 hrs	6 hrs	Interprovincial Co-op
MCPA SODIUM 300, NUFARM	MCPA sodium	Li	300 g/L	4	14718	4	B	12 hrs	6 hrs	Nufarm
MCPB/MCPA	CLOVITOX PLUS	Li	375 g/L + 25 g/L	4	24336	4	B	12 hrs	4 hrs	Interprovincial Co-op
MCPB/MCPA	TOPSIDE	Li	375 g/L + 25 g/L	4	22003	4	B	12 hrs	4 hrs	Loveland products
MCPB/MCPA	TROPOTOX PLUS	Li	375 g/L + 25 g/L	4	8211	4	B	12 hrs	4 hrs	Nufarm
mesotrione	CALLISTO	SC	480 g/L	27	27833	3	A	12 hrs	3 hrs	Syngenta
mesotrione/ glyphosate	CALLISTO GT	Su	45.5 g/L 455 g/L	27 9	31711	3	A	12 hrs	3 hrs	Syngenta

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[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

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TABLE 4–1. Herbicides Used in Ontario (cont'd)

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
metribuzin	SENCOR 480 F	F	480 g/L	5	27091	3	A	12 hrs	6 hrs	Bayer CropScience
metribuzin	SENCOR 75 DF	DF	75%	5	17242	3	A	12 hrs	6 hrs	Bayer CropScience
metribuzin	SQUADRON 75 DF	DF	75%	5	32081	3	A	12 hrs	6 hrs	Adama Canada
metribuzin	TRICOR 75 DF	DF	75%	5	30661	3	A	12 hrs	6 hrs	UPL AgroSolutions
metribuzin flumioxazin	BIFECTA[7] (TRICOR 75 DF + VALTERA)	DF WDG	75% 51.1%	5 14	30661 29320	3 4	A	12 hrs	6 hrs	Nufarm
MEXTROL 450	bromoxynil/ MCPA	EC	225 g/L 225 g/L	6 4	26999	3	A	24 hrs	1 hr	Nufarm
MILESTONE	aminopyralid	Sn	240 g/L	4	28517	3	A	12 hrs	2 hrs	Corteva
MUSTER TOSS-N-GO	ethametsulfuron-methyl	DF	75%	2	23569	4	A	12 hrs	4 hrs	FMC
nicosulfuron	ACCENT	DF	75%	2	25116	3	A	12 hrs	2 hrs	Corteva
nicosulfuron/ rimsulfuron	ULTIM 75DF	DF	37.5% 37.5%	2	24736	3	A	12 hrs	2 hrs	Corteva
NUFARM TRALKOXYDIM	tralkoxydim	SC	400 g/L	1	32078	4	C	12 hrs	1 hr	Nufarm
NU-IMAGE	imazethapyr	Sn	240 g/L	2	30420	2	B	12 hrs	2 hrs	Nufarm
OPTILL	saflufenacil/ imazethapyr	WDG	17.8% 50.2%	14 2	30756	2	A	12 hrs	2 hrs	BASF
OPTION 2.25 OD	foramsulfuron	Li	22.5 g/L	2	27424	4	A	12 hrs	2 hrs	Bayer CropScience
PARDNER	bromoxynil	EC	280 g/L	6	18001	3	D	24 hrs	1 hr	Bayer CropScience
PEAK 75WG	prosulfuron	WG	75%	2	25310	3	B	12 hrs	4 hrs	Syngenta
pendimethalin	PROWL H2O	ME	455 g/L	3	29542	3	B	12 hrs		BASF
PERMIT	halosulfuron	WG	72.6%	2	31210	3	A	12 hrs	2 hrs	Gowan
PHANTOM 240	imazethapyr	Sn	240 g/L	2	30017	2	B	12 hrs	2 hrs	Adama Canada

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
picloram/2,4-D	TORDON 101	Sn	(1:3.7) 305 g/L	4	9007	3		12 hrs	4 hrs	DWE
PINNACLE SG TOSS-N-GO	thifensulfuron methyl	SG	50%	2	30741	4	A	12 hrs	4 hrs	FMC
pinoxaden	AXIAL	EC	50 g/L	1	30431	4	B	12 hrs	1 hr	Syngenta
PIXXARO[8] (PIXXARO A + MCPA ESTER 600)	halauxifen/ fluroxypyr + MCPA ester	EC + EC	16.25 g/L 250 g/L 600 g/L	4 4 4	31303 27803	3 3	B B	12 hrs	1 hr	Corteva
POAST ULTRA	sethoxydim	EC	450 g/L	1	24835	4	A	12 hrs	1 hr	BASF
PRIMEXTRA II MAGNUM	s-metolachlor/benoxacor/ atrazine	Li	400 g/L 320 g/L	15 5	25370	3	A	12 hrs	–	Syngenta
prosulfuron	PEAK 75WG	WG	75%	2	25310	3	B	12 hrs	hrs	Syngenta
PROWL H2O	pendimethalin	ME	455 g/L	3	29542	3	B	12 hrs	–	BASF
PUMA ADVANCE	fenoxaprop-p-ethyl	EC	90 g/L	1	29615	4	B	12 hrs	1 hr	Bayer CropScience
PURSUIT	imazethapyr	Sn	240 g/L	2	21537	2	B	12 hrs	2 hrs	BASF
pyrasulfotole/ bromoxynil	INFINITY	EC	37.5 g/L 210 g/L	27 6	28738	3	A	12 hrs	1 hr	Bayer CropScience
pyrasulfotole/ bromoxynil/ fluroxypyr	INFINITY FX	EC	31.5 g/L 174.3 g/L 72 g/L	27 6 4	33248	3	A	24 hrs	1 hr	Bayer CropScience
pyroxasulfone	ZIDUA SC	SC	500 g/L	15	32542	2	B	12 hrs	–	BASF
pyroxasulfone/ carfentrazone-ethyl	FOCUS	Su	447 g/L + 53 g/L	15 14	32292	2	C	12 hrs	–	FMC
pyroxasulfone/ sulfentrazone	AUTHORITY SUPREME	SC	250 g/L 250 g/L	15 14	32562	2	C	12 hrs	–	FMC

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common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
pyroxsulam	SIMPLICITY GODRI	WG	21.5%	2	31916	3	A	12 hrs	–	Corteva
quizalofop-p-ethyl	ASSURE II	EC	96 g/L	1	25462	3	C	12 hrs	1 hr	Amvac
quizalofop-p-ethyl	CONTENDER	EC	96 g/L	1	32091	3	C	12 hrs	1 hr	Interprovincial Co-op
quizalofop-p-ethyl	YUMA GL	EC	96 g/L	1	29134	3	C	12 hrs	1 hr	Gowan
REFINE M[8] (REFINE SG + MCPA ESTER 600)	thifensulfuron methyl/ tribenuron methyl + MCPA ester	SG + EC	33.35% 16.65% + 600 g/L	2 2 4	28285 + 27803	3 + 3	B	12 hrs	2 hrs	FMC
REFINE SG	thifensulfuron methyl/ tribenuron methyl	SG	33.35% 16.65%	2 2	28285	3	A	12 hrs	2 hrs	FMC
REFLEX	fomesafen	Li	240 g/L	14	24779	3	A	12 hrs	4 hrs	Syngenta
REGLONE	diquat	Sn	240 g/L	22	26396	3	B	24 hrs	15 min	Syngenta
rimsulfuron/ mesotrione	ENGARDE	WG	4.31% 41.38%	2 27	31595	3	A	12 hrs	2 hrs	Corteva
rimsulfuron/ mesotrione	DESTRA IS	WG	5.45% 36.36%	2 27	32626	3	A	12 hrs	2 hrs	Corteva
rimsulfuron/ nicosulfuron	STEADFAST IS	WG	12.5% 25.2%	2 2	33369	3	A	12 hrs	2 hrs	Corteva
RIVAL EC	trifluralin	EC	500 g/L	3	18612	4	C	12 hrs	–	Nufarm
ROUNDUP TRANSORB HC	glyphosate	Sn	540 g/L	9	28198	4	A	12 hrs	1 hr	Bayer CropScience
ROUNDUP WEATHERMAX	glyphosate	Sn	540 g/L	9	27487	4	A	12 hrs	1 hr	Bayer CropScience
ROUNDUP XTEND	glyphosate/ dicamba	Sn	240 g/L 120 g/L	9/ 4	32274	3	A	12 hrs	4 hrs	Bayer CropScience

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saflufenacil	ERAGON LQ	Su	342g/L	14	31469	3	C	12 hrs	1 hr	BASF
saflufenacil/ dimethenamid-P	INTEGRITY	EC	68 g/L 600 g/L	14 15	29371	3	A	12 hrs	1 hr	BASF
saflufenacil/ imazethapyr	OPTILL	WDG	68%	14,2	30756	3	A	12 hrs	2 hrs	BASF
SELECT	clethodim	EC	240 g/L	1	22625	3	A	12 hrs	1 hr	BASF
SENCOR 480 F	metribuzin	F	480 g/L	5	27091	3	A	12 hrs	6 hrs	Bayer CropScience
SENCOR 75 DF	metribuzin	DF	75%	5	17242	3	A	12 hrs	6 hrs	Bayer CropScience
sethoxydim	POAST ULTRA	EC	450 g/L	1	24835	4	A	12 hrs	1 hr	BASF
SHIELDEX 400 SC	tolpyralate	SC	400 g/L	27	32943	3	A	12 hrs	1 hr	Gowan
simazine	SIMAZINE 480	Su	480 g/L	5	23181	3	A	12 hrs	–	Loveland Products
SIMAZINE 480	simazine	Su	480 g/L	5	23181	3	A	12 hrs	–	Loveland Products
SIMPLICITY GODRI	pyroxsulam	WG	21.5%	2	31916	3	A	12 hrs	–	Corteva
s-metolachlor	KOMODO (UPI S-MET)	EC	960 g/L	15	32847	3	A	12 hrs	–	UPL AgroSolutions
s-metolachlor/benoxacor	DUAL II MAGNUM	EC	915 g/L	15	25729	3	A	12 hrs	–	Syngenta
s-metolachlor/benoxacor/ atrazine	PRIMEXTRA II MAGNUM	SC	400 g/L 320 g/L	15 5	25730	3	A	12 hrs	–	Syngenta
s-metolachlor + metribuzin	TIEDOWN[8] (UPI S-MET + TRICOR 75 DF)	EC DF	960 g/L 75%	15 5	32847 30661	3 3	A	12 hrs	–	United Phosphorus
s-metolachlor/ metribuzin	BOUNDARY LQD	EC	628 g/L 149 g/L	15 5	30812	3	A	12 hrs	–	Syngenta

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STATUE	clethodim	EC	240 g/L	1	22625	3	A	12 hrs	–	Nufarm
STEADFAST IS	rimsulfuron/ nicosulfuron	WG	12.5% 25.2%	2 2	33369	3	A	12 hrs	2 hrs	Corteva
STONEWALL	glyphosate	Sn	540 g/L	9	31655	4	A	12 hrs	1 hr	Winfield Canada
sulfentrazone	AUTHORITY 480	Su	480 g/L	14	29012	3	C	12 hrs	–	FMC
TAVIUM	dicamba/ s-metolachlor	CS	134 g/L 271 g/L	4 15	33268	3	A	12 hrs	–	Syngenta
tembotrione/ thiencarbazone-methyl	VIOS G3	Su	68 g/L 345 g/L	2 27	29643	4	C	12 hrs	–	Bayer CropScience
thifensulfuron-methyl	PINNACLE SG TOSS-N-GO	SG	50%	2	30741	4	A	12 hrs	4 hrs	FMC
thifensulfuron-methyl/ tribenuron-methyl	REFINE SG	SG	33.35% 16.65%	2	28286	3	A	12 hrs	2 hrs	FMC
thifensulfuron methyl tribenuron methyl fluroxypyr MCPA	BARRICADE M[8] (BARRICADE SG + PERIMETER II + MCPA ESTER 600, NUFARM)	SG SG EC EC	25% 25% 333 g/L 600 g/L	2 2 4 4	29544 29544 30094 27803	3 3 3 3	A	12 hrs	1 hr	FMC
thifensulfuron-methyl/ tribenuron-methyl + MCPA	BOOST M[8] (BOOST + MCPA ESTER 600)	SG EC	50% 25% 600 g/L	2 2 4	30377 27803	3 3	A	12 hrs	2 hrs	Nufarm
thifensulfuron-methyl/ tribenuron-methyl + MCPA	REFINE M[8] (REFINE SG + MCPA ESTER 600)	SG EC	33.5% 16.65% + 600 g/L	2 2 4	28286 27803	3 3	B	12 hrs	2 hrs	FMC

[1] The amount of active ingredient in the unit of formulated herbicide and expressed as grams active ingredient per litre of product or the percentage of active ingredient per mass of product.

[2] Indicates the numeric grouping of herbicides by their site of action and by the Weed Science Society of America (WSSA). Herbicide resistant weeds have historically been selected when herbicides with the same site of action are used repeatedly. Refer to Table 4-6. *Weed Populations Confirmed Resistant to Herbicide Groups in Ontario Counties,* for a listing of herbicide resistant weeds in Ontario by WSSA group and corresponding site of action.

[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

[4] Refers to the numeric classification of pesticides under Regulation 63/09 of the Pesticides Act. Refer to Table 4–2. *Description for Ontario Classification of Pesticide Products*, for a description of each Ontario classification.

[5] A = Does not need to be stored in a heated building, but its preferred; B = Cannot be stored at temperatures at or below 0°C; C = Store above 5°C to keep product from freezing and D = Store above 7°C, DO NOT FREEZE.

[6] REI = Restricted Entry Intreval, and is the period of time (in hours) after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks (e.g. scouting) in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done. If an REI is not stated on the label, use a 12 hour REI.

[7] Rainfast = Is the duration (in hours) needed after application before a rain event occurs so as to ensure that the herbicide wiil be adequately taken up by the target weed so as to maximize control.

[8] Indicates herbicides sold as a co-pack under this trade name.

TABLE 4–1. Herbicides Used in Ontario (cont'd)

Mention of a brand or trade name in this table does not constitute a guarantee or warranty of the product. Always refer to the product label before using.

LEGEND: DC = dispersible concentrate; DF = dry flowable; DG = dry granules; DS = dry soluble; EC = emulsifiable concentrate; EM = emulsion; F = flowable; Gi = gel; Gr = granular; Li = liquid; ME = microencapsulated suspension; OD = oil dispersible; PE = pellets; PS = pressurized spray; SC = soluble concentrate; SG = soluble granules; Sn = solution; SP = soluble powder; Su = suspension (flowable); WDG = wettable dry granules; WG = wettable granules; WP = wettable powder; – = not specified on label

common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
TIEDOWN[8]	s-metolachlor +	EC	960 g/L	15	32847	3	A	12 hrs	–	United Phosphorus
(UPI S-MET + TRICOR 75 DF)	metribuzin	DF	75%	5	30661	3				
tolpyralate	SHIELDEX 400 SC	SC	400 g/L	27	32943	3	A	12 hrs	1 hr	Gowan
topramezone	ARMEZON	Su	336 g/L	27	30131	3	C	12 hrs	2 hrs	BASF
topramezone	IMPACT	SC	336 g/L	27	28141	3	C	12 hrs	2 hrs	Loveland Products
tralkoxydim	ACHIEVE LIQUID	EC	400 g/L	1	27011	4	C	12 hrs	1 hr	Corteva
tralkoxydim	BISON 400 L	SC	400 g/L	1	29256	4	C	12 hrs	1 hr	Adama Canada
tralkoxydim	NUFARM TRALKOXYDIM	SC	400 g/L	1	32078	4	C	12 hrs	1 hr	Nufarm
TRIACTOR[8]	flumioxazin +	WDG	51.1%	14	29230	4	B	12 hrs	–	Nufarm
(VALTERA + TRICOR 75 DF +	metribuzin +	DF	75%	5	30661	3				
NU-IMAGE)	imazethapyr	Sn	240 g/L	2	30420	2				
TREFLAN LIQUID EC	trifluralin	EC	480 g/L	3	23933	4	C	12 hrs	–	Gowan
tribenuron-methyl	EXPRESS SG	SC	50%	2	28262	3	A	12 hrs	4 hrs	FMC
TRICOR 75 DF	metribuzin	DF	75%	5	30661	3	A	12 hrs	6 hrs	UPL AgroSolutions
TRIFLUREX 40 EC	trifluralin	EC	412 g/L	3	17233	4	C	12 hrs	–	Adama Canada
trifluralin	BONANZA 480	Li	480 g/L	3	28289	4	C	12 hrs	–	Loveland Products
trifluralin	RIVAL EC	EC	500 g/L	3	18612	4	C	12 hrs	–	Nufarm
trifluralin	TRIFLUREX 40 EC	EC	12 g/L	3	17233	4	C	12 hrs	–	Adama Canada
trifluralin	TREFLAN LIQUID EC	EC	480 g/L	3	23933	4	C	12 hrs	–	Gowan
TROPHY[8]	fluroxypyr +	EC	180 g/L	4	27246	3	B	12 hrs	2 hrs	Nufarm
(TROPHY A + TROPHY B)	MCPA ester	EC	600 g/L	4	27245	3				
TURBOPROP	dichlorprop/ 2,4-D	EC	300 g/L 282 g/L	4 4	27967	3	A	12 hrs	2 hrs	Loveland Products

[1] The amount of active ingredient in the unit of formulated herbicide and expressed as grams active ingredient per litre of product or the percentage of active ingredient per mass of product.

[2] Indicates the numeric grouping of herbicides by their site of action and by the Weed Science Society of America (WSSA). Herbicide resistant weeds have historically been selected when herbicides with the same site of action are used repeatedly. Refer to Table 4-6. *Weed Populations Confirmed Resistant to Herbicide Groups in Ontario Counties,* for a listing of herbicide resistant weeds in Ontario by WSSA group and corresponding site of action.

[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

[4] Refers to the numeric classification of pesticides under Regulation 63/09 of the Pesticides Act. Refer to Table 4–2. *Description for Ontario Classification of Pesticide Products*, for a description of each Ontario classification.

[5] A = Does not need to be stored in a heated building, but its preferred; B = Cannot be stored at temperatures at or below 0°C; C = Store above 5°C to keep product from freezing and D = Store above 7°C, DO NOT FREEZE.

[6] REI = Restricted Entry Intreval, and is the period of time (in hours) after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks (e.g. scouting) in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done. If an REI is not stated on the label, use a 12 hour REI.

[7] Rainfast = Is the duration (in hours) needed after application before a rain event occurs so as to ensure that the herbicide wiil be adequately taken up by the target weed so as to maximize control.

[8] Indicates herbicides sold as a co-pack under this trade name.

TABLE 4–1. Herbicides Used in Ontario (cont'd)

Mention of a brand or trade name in this table does not constitute a guarantee or warranty of the product. Always refer to the product label before using.

LEGEND: DC = dispersible concentrate; DF = dry flowable; DG = dry granules; DS = dry soluble; EC = emulsifiable concentrate; EM = emulsion; F = flowable; Gi = gel; Gr = granular; Li = liquid; ME = microencapsulated suspension; OD = oil dispersible; PE = pellets; PS = pressurized spray; SC = soluble concentrate; SG = soluble granules; Sn = solution; SP = soluble powder; Su = suspension (flowable); WDG = wettable dry granules; WG = wettable granules; WP = wettable powder; – = not specified on label

common name or TRADE NAME	TRADE NAME or common name	Formulation	Concentration[1]	WSSA[2] Groups	PCP Number[3]	Class.[4]	Winter Storage[5]	REI[6]	Rain fast[7]	Manufacturer
ULTRA BLAZER	acifluorfen	Sn	240 g/L	14	32330	3	B	12 hrs	6 hrs	UPL AgroSolutions
VALTERA	flumioxazin	WDG	51.1%	14	29230	4	A	12 hrs	–	Valent
VALTERA EZ	flumioxazin	SC	480 g/L	14	33523	4	A	12 hrs	–	Valent

[1] The amount of active ingredient in the unit of formulated herbicide and expressed as grams active ingredient per litre of product or the percentage of active ingredient per mass of product.

[2] Indicates the numeric grouping of herbicides by their site of action and by the Weed Science Society of America (WSSA). Herbicide resistant weeds have historically been selected when herbicides with the same site of action are used repeatedly. Refer to Table 4-6. *Weed Populations Confirmed Resistant to Herbicide Groups in Ontario Counties,* for a listing of herbicide resistant weeds in Ontario by WSSA group and corresponding site of action.

[3] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label in possession should always be used for the most accurate and current PCP number.

[4] Refers to the numeric classification of pesticides under Regulation 63/09 of the Pesticides Act. Refer to Table 4–2. *Description for Ontario Classification of Pesticide Products*, for a description of each Ontario classification.

[5] A = Does not need to be stored in a heated building, but its preferred; B = Cannot be stored at temperatures at or below 0°C; C = Store above 5°C to keep product from freezing and D = Store above 7°C, DO NOT FREEZE.

[6] REI = Restricted Entry Intreval, and is the period of time (in hours) after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks (e.g. scouting) in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done. If an REI is not stated on the label, use a 12 hour REI.

[7] Rainfast = Is the duration (in hours) needed after application before a rain event occurs so as to ensure that the herbicide wiil be adequately taken up by the target weed so as to maximize control.

[8] Indicates herbicides sold as a co-pack under this trade name.

TABLE 4–2. Description for Ontario Classification of Pesticide Products

Ontario Classification	Summary*
1	Designated under the *Pesticide Control Product Act* (PCPA) as pesticides of the Manufacturing Class for use only in the manufacture of a pest control product or a product regulated under the *Fertilizers Act*.
2,3,4	Designated under the PCPA as pesticides of the Commercial Class for use in commercial activities that are specified on the label or Restricted Class when the label specifies essential conditions respecting the display, distribution or limitations on the use of, or qualifications of persons who may use the product.
5,6,7	Designated under the PCPA as pesticides of the Domestic Class to be distributed primarily to the general public for personal use in or around their homes.
8	Banned for sale in Ontario.
9	Banned for use in, on or over land unless their use is excepted.
10	Are allowed for use under the promotion of public health or safety exception.
11	Require a "green" notice sign be posted for the purposes of providing public notice when products containing these ingredients are used by any person on non-residential area land and by a licensed exterminator on residential area land in performing land exterminations.

* Detailed descriptions of each classification can be found at: ontario.ca/page/pesticide-licences-and-permits.

Notes on Herbicides

Read these notes together with the information provided in other chapters throughout this publication. Additional information on use, toxicity and safety precautions is given here. Herbicides are listed by their common (chemical) name rather than their trade (product) name. See Table 4–1. *Herbicides Used in Ontario* to determine the corresponding common name for a particular trade name. For example, Table 4–1 indicates that the trade name AATREX has a common name of atrazine; notes on AATREX are listed under atrazine in this section. See Chapter 5, Notes on Adjuvants for information on adjuvants.

Complete information on each herbicide is available on the product label located on the herbicide container. The federal Pest Management Regulatory Agency also lists pesticide labels on their website bit.ly/herbicidelabels. Many herbicide manufacturers also list product labels and/or Material Safety Data Sheets (MSDS) on their websites.

2,4-D

Trade Names: 2,4-D AMINE 600, 2,4-D ESTER 700.
Chemical Family: Phenoxy.
Crop and/or Non-Crop Registrations: Cereals, turf, pastures, non-cropland, asparagus, field corn, soybeans (preplant only), high bush blueberries, cranberries, raspberries, strawberries, bearing fruit trees including apple, pear, peach, plum, apricot and cherries, potato (preharvest) and brush.
Sensitive Weeds: annual sow-thistle, bluebur, cocklebur, daisy fleabane, false flax, flixweed, goat's beard, kochia, lamb's-quarters, mustards, plantain, prickly lettuce, ragweeds, redroot pigweed, Russian pigweed, Russian thistle, shepherd's purse, stinging nettle, stinkweed, sweet clover, wild radish and wild sunflower.
A number of other broadleaf and woody species are listed as less susceptible or for top growth cont rol only.
Uptake and Translocation: Readily absorbed through leaves or roots. Translocated primarily in phloem with the sugars but can also move with water in the xylem. Accumulation is primarily in the young, rapidly growing meristematic regions of roots or shoots.
Basis of Selectivity: Differences in interception, penetration, translocation, metabolism and sensitivity of active sites lead to greater activity on broadleaf weeds compared to grasses.
Application Methods: Postemergence (broadleaf weeds), stem-foliage or stem-basal (brush).
Residual Activity: Half-life in soil is usually not longer than 1 or 2 weeks during the growing season due to rapid decomposition by soil micro-organisms.
Unique Characteristics: All weeds are more easily killed when growing rapidly in moist soil. Unfortunately, some broadleaf crops, garden and ornamental plants are as sensitive to 2,4-D as many weeds and only a trace of the chemical as spray drift, vapour drift or contaminant in soil or water may cause serious damage. Even crops that can be sprayed safely can be sensitive at some stages of growth or at excessive application rates; thus follow label precautions carefully. Amines and esters are the most common formulations of 2,4-D. The esters are the most active and can be used at the lower rates and for brush control. Since vapour drift is a potential problem with the ester formulations, use only amines on lawns, or near gardens or susceptible crop areas. Low volatile esters can be used by agriculturists or licenced applicators in areas where risk of damage to sensitive non-target vegetation is low.

2,4-D CHOLINE/GLYPHOSATE

Trade Names: ENLIST DUO.
Chemical Family: Phenoxy/amino acid.
Crop and/or Non-Crop Registrations: Enlist field corn, Enlist soybeans, prior to seeding or after seeding (but before crop emergence) in spring wheat, winter wheat, barley, rye and field corn.
Sensitive Weeds: 2.9 L/ha rate: volunteer barley; lamb's-quarters; bluebur; mustards (except dog and green tansy); burdock (before 4 leaf); pigweed (Russian); canola (volunteer); pigweed (redroot); chickweed (common); plantain; common cocklebur; common ragweed; false flax; giant ragweed; Canada fleabane; Russian thistle; daisy fleabane; shepherd's purse; flixweed; stinkweed; foxtail (giant, green); sunflower; goatsbeard; sweet clover; hempnettle; vetch; hoary cress; volunteer wheat; horsetail (field); wild radish; kochia; wild oats
4.3 L/ha rate: barnyard grass; mustard (dog); hedge bindweed; narrow-leaved hawk's beard; nightflowering catchfly; buckwheat (tartary); nightshade, (Eastern black); buckwheat (wild); oak leaf goosefoot; corn spurry; pigweed (smooth); cleavers, common; pineappleweed; cow cockle; proso millet; crabgrass (smooth); purslane, common; crabgrass (large); quackgrass; dandelion; chickweed (common); smartweed (green); smartweed (Pennsylvania); fall panicum; sow-thistle (annual); field peppergrass; hairy galinsoga; tansy (common); knotweed (before 4 leaf); velvetleaf; lady's thumb; waterhemp (common); wild tomato
Top Growth only (4.3 L/ha): leafy spurge; biennial wormwood; blue lettuce; burdock; chickweed (mouse-eared)
Two applications at 4.3 L/ha: milkweed (common); bindweed (field); nutsedge (yellow); Canada thistle; round-leaved mallow; sow-thistle (perennial); palmer amaranth
Uptake and Translocation: Enlist Duo Herbicide is a systemic herbicide and is intended for control of emerged annual and perennial weeds.
Basis of Selectivity: Enlist Duo Herbicide is specific to Enlist field corn and Enlist soybean. Enlist field corn contains an AAD-1 expressing event plus a glyphosate tolerance trait. These are patented genes that provide tolerance to Enlist Duo Herbicide. For non-Enlist field corn or any other crops not containing an AAD-1 expressing event plus glyphosate tolerance traits, foliar application of Enlist Duo Herbicide will cause serious crop

damage and yield loss. Enlist soybeans contain an AAD-12 expressing event plus a glyphosate tolerance trait. These are patented genes that provide tolerance to Enlist Duo Herbicide. For non-Enlist soybeans (i.e., soybeans that do not contain an AAD-12 expressing event plus glyphosate tolerance traits), foliar application of Enlist Duo Herbicide will cause serious crop damage and yield loss.

Application Methods: Postemergence to Enlist corn and soybean. Prior to the emergence of cereals and field corn.

Residual Activity: Half-life in soil is usually not longer than 1 or 2 weeks during the growing season due to rapid decomposition by soil micro-organisms.

Unique Characteristics: All weeds are more easily killed when growing rapidly in moist soil. Unfortunately, some broadleaf crops, garden and ornamental plants are as sensitive to 2,4-D as many weeds and only a trace of the chemical as spray drift, vapour drift or contaminant in soil or water may cause serious damage. Even crops that can be sprayed safely can be sensitive at some stages of growth or at excessive application rates; thus follow label precautions carefully. Enlist Duo Herbicide contains drift control technology. If desired, use only a Dow AgroSciences-approved drift control additive. When a drift control additive is used, read and carefully observe the precautionary statements and all other information appearing on the additive label.

2,4-DB

Trade Names: COBUTOX 625, EMBUTOX, CALIBER 625.

Chemical Family: Phenoxy.

Crop and/or Non-Crop Registrations: Seedling alfalfa, bird's-foot trefoil, clovers (except sweet) direct seeded or underseeded in spring wheat, barley or oats and corn.

Sensitive Weeds: Many small broadleaf weeds such as stinkweed, ragweed, lamb's-quarters, wild buckwheat and mustards. Top-growth control of Canada thistle, field bindweed and perennial sow-thistle.

Uptake and Translocation: Absorbed through the foliage and readily translocated to the growing points.

Basis of Selectivity: Sensitive weeds rapidly convert 2,4-DB into 2,4-D; tolerant species do not make this conversion under normal conditions.

Application Method: Postemergence.

Residual Activity: None.

Unique Characteristics: Mustards are not usually controlled by 2,4-DB alone if sprayed beyond the 4 leaf stage; a tank-mixture with MCPA will improve control of these larger mustards. Injury to alfalfa increases under drought stress or when alfalfa seedlings have more than 4 trifoliate leaves.

ACIFLUORFEN

Trade Name: ULTRA BLAZER.

Chemical Family: Diphenyl ether.

Crop and/or Non-Crop Registrations: Soybeans.

Sensitive Weeds: Annual broadleaf weeds including: cocklebur, jimsonweed, lady's-thumb, lamb's-quarters, wild mustard, redroot pigweed, common ragweed and eastern black nightshade. Suppression of perennial weeds including: Canada thistle, hedge bindweed, field bindweed and common milkweed.

Uptake and Translocation: Taken up through the foliage. Not readily translocated.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Postemergence when weeds are small and actively growing. Apply in 200–400 L/ha of water with a pressure of 275–400 kPa. Soybeans are tolerant after the first trifoliate-leaf stage. Thorough coverage is necessary. Do not add adjuvants to acifluorfen applied at the full rate.

Residual Activity: None.

Unique Characteristics: Acifluorfen is not volatile. Significant crop injury can be expected if acifluorfen is applied during hot, humid weather or if the crop is stressed due to previous herbicide injury, flooding, drought or cold conditions prior to the application. Cool weather or drought may delay control. Rainfall within 6 hours after application may reduce effectiveness.

ADJUVANT

See Chapter 5, *Notes on Adjuvants.*

AMINOPYRALID

Trade Name: MILESTONE HERBICIDE.

Chemical Family: Pyridine.

Crop and/or Non-Crop Registrations: Rangeland, grass pastures.

Sensitive Weeds: Milestone used alone controls: Canada thistle, spotted knapweed, Canada goldenrod, scentless chamomile, absinth wormwood, common tansy. MILESTONE can be tank mixed with 2,4-D amine for control of western snowberry, dandelion, annual sow-thistle, bluebur, bull thistle, burdock, buttercup, cocklebur, common plantain, curled dock, flixweed, goat's beard, hawkweed, hoary cress, peppergrass, perennial sow-thistle, prickly lettuce, stinging nettle, sweet clover and wild carrot.

Uptake and Translocation: Herbicide taken up primarily through the foliage, but also has soil residual activity on roots, seedlings and seeds. Strong translocation.

Basis of Selectivity: Metabolized by tolerant species.

Application Methods: Postemergence when weeds are small and actively growing. Apply with ground equipment in minimum of 100 L/ha or aerial equipment in a minimum of 19 L/ha spray volumes. Good coverage is necessary.

Residual Activity: Short term soil residual activity that will control most species for two years.

Unique Characteristics: MILESTONE has no grazing restriction on livestock or lactating dairy animals grazing in treated areas. Allow 3 days of grazing on untreated pasture or untreated hay before transferring livestock to areas were sensitive broadleaf crops may be grown. Do not move manure compost containing MILESTONE onto sensitive crops, flowers, gardens, etc. Use only on well established forage grasses (secondary root development). MILESTONE Herbicide will kill legume plants including alfalfa and clover in tame pastures. Use adequate buffer

zones from sensitive crops and do not allow product spray to drift off site onto sensitive crops. Do not plant legumes crops on treated land for 48 months after application. Clean spray equipment throughly after use, before using spray equipment for other applications to sensitive crops. MILESTONE Herbicide cannot be applied on domestic or commercial turf grass. Rainfast period is 2 hours.

AMINOPYRALID/METSULURON-METHYL

Trade Name: CLEARVIEW HERBICIDE.
Chemical Family: Pyridine and sulfonylurea.
Crop and/or Non-Crop Registrations: Rangeland, permanent pastures.
Sensitive Weeds (135 g/ha): Ball mustard, bluebur, Canada fleabane, Canada thistle, chickweed, clover, common groundsel, common ragweed, common tansy, corn spurry, cow cockle, dandelion, field scabious, flixweed, green smartweed, hempnettle, horsenettle, kochia, lady's thumb, musk or nodding thistle, narrow-leaved hawksbeard, ox-eye daisy, perennial sow-thistle, plumeless thistle, prostrate pigweed, Russian thistle, scentless chamomile, shephard's purse, spotted knapweed, stinkweed, stork's bill, sweet clover, tall buttercup, tartary buckwheat, volunteer canola, western snowberry, wild mustard, yellow starthistle.
Uptake and Translocation: Herbicide taken up primarily through the foliage, but also has soil residual activity on roots, seedlings and seeds. Strong -translocation.
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: Postemergence when weeds are actively growing. Apply with ground equipment in minimum of 110 L/ha or aerial equipment in a minimum of 30 L/ha spray volumes. Good coverage is necessary.
Residual Activity: Short term soil residual activity that will control most species for two years.
Unique Characteristics: There is no restriction on livestock or lactating dairy animals grazing in treated areas. Allow 3 days of grazing on untreated pasture or untreated hay before transferring livestock to areas where sensitive broadleaf crops may be grown. Do not move manure compost containing CLEARVIEW onto sensitive crops, flowers, gardens, etc. Use only on well established forage grasses (secondary root development). CLEARVIEW Herbicide will kill legume plants including alfalfa and clover in tame pastures. Use adequate buffer zones from sensitive crops and do not allow product spray to drift off site onto sensitive crops. Do not plant legumes crops on treated land for 48 months after application. Clean spray equipment throughly after use, before using spray equipment for other applications to sensitive crops. CLEARVIEW Herbicide cannot be applied on domestic or commercial turf grass. Rainfast period is 2 hours.

ATRAZINE

Trade Names: AATREX LIQUID 480, CONVERGE 480.
Chemical Family: S-triazine.
Crop and/or Non-Crop Registrations: Corn (ensilage, field, seed and sweet), sorghum.
Sensitive Weeds: Will control a wide range of broadleaf weeds such as mustards, purslane, ragweed, smartweed, lady's-thumb, wild buckwheat, lamb's-quarters, pigweed, wild oats and volunteer clover. Populations of lamb's-quarters, pigweed, wild oats and ragweed have been found that are resistant to atrazine and are therefore not controlled.
Uptake and Translocation: Actively absorbed by roots and foliage, although foliar absorption is usually small. It is translocated to the top of the plant and accumulates in the leaf margins and the growing points.
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: For corn, preplant incorporated, preemergence, or postemergence (with or without oil) usually before the annual weeds are more than 4 cm high; under dry weather conditions a shallow incorporation may enhance activity; oil or oil/surfactant blends will increase the postemergence activity.
Residual Activity: Can persist in the soil for varying lengths of time depending on rate, weather and soil conditions (longer under dry, cool weather conditions and in sandy soils). Postemergence treatments tend to persist longer than preemergence treatments. Refer to Tables 4–4 and 4–5. *Herbicide Crop Rotation and Soil pH Restrictions* for information on rotational crop restrictions.

BENTAZON

Trade Names: BASAGRAN FORTÉ, BROADLOOM.
Chemical Family: Benzothiadiazine.
Crop and/or Non-Crop Registrations: Alfalfa (seed production), clover (seed production), Corn (field, seed and sweet), dry beans (refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings*), faba beans, flax, millet, peas, sorghum and soybeans.
Sensitive Weeds: Annual broadleaf weeds including hairy nightshade, lamb's-quarters, redroot pigweed, low cudweed, purslane, common ragweed, wild radish, Russian thistle, hairy galinsoga, corn spurry, bird rape, flower-of-an-hour, buttercups, common groundsel, jimsonweed, giant ragweed, velvetleaf, lady's-thumb, wild mustard, cocklebur, stinkweed, shepherd's-purse and common chickweed. Triazine-tolerant biotypes of lamb's-quarters, redroot pigweed, common ragweed and common groundsel are also controlled. Top growth of Canada thistle and nutsedge are controlled. Field bindweed may be suppressed by 2 applications applied 10 days apart.
Uptake and Translocation: Taken up through the foliage. Not translocated.
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: Postemergence when weeds are small and actively growing. Apply in 100–400 L water/ha. Crop must be in a tolerant growth stage (see specific recommendations on label). Thorough spray coverage is necessary. Liquid ammonium sulphate or 28% urea ammonium nitrate may be added for improved and more consistent control of velvetleaf and lamb's-quarters in soybeans only.
Residual Activity: None.

Unique Characteristics: Corn and turf are tolerant at all stages of growth. Bentazon is not volatile. Temporary crop injury can be expected if bentazon is applied during hot, humid weather or if crop is stressed (flooding, drought, cold). Cool weather or drought may delay control. Rainfall within 6–8 hours after application may reduce effectiveness. Since there is no residual activity, a new flush of weeds may emerge after the first flush has been controlled.

BENTAZON/ACIFLUORFEN

Trade Names: HURRICANE.
Chemical Family: Benzothiadiazine, diphenyl ether.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Annual broadleaf weeds including: lamb's-quarters[1], pigweed species, common ragweed, velvetleaf[2], and common waterhemp. [1] = suppression or partial control and [2] = use ammonium sulphate (AMS) or urea ammonium nitrate (UAN) as the additive when velvetleaf is a target weed.
Uptake and Translocation: Taken up through the foliage. Not translocated.
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: Postemergence when weeds are small and actively growing. Apply in 100–200 L/ha of water with a minimum pressure of 275 kPa. Soybeans are tolerant after the first trifoliate-leaf stage. Thorough coverage is necessary. To achieve consistent weed control, one of the following additives is recommended: ammonium sulfate, crop oil concentrate, or urea ammonium nitrate.
Residual Activity: None.
Unique Characteristics: Bentazon/acifluorfen is not volatile. Significant crop injury can be expected if acifluorfen/bentazon is applied during hot, humid weather or if the crop is stressed due to previous herbicide injury, flooding, drought or cold conditions prior to the application. Cool weather or drought may delay control. Rainfall within 4 hours after application may reduce effectiveness. Since there is no residual activity, a new flush of weeds may emerge after the first flush has been controlled.

BICYCLOPYRONE/MESOTRIONE/S-METOLACHLOR/ATRAZINE

Trade Name: ACURON HERBICIDE
Chemical Family: Triketone/Triketone/Chloracetamide/Triazine.
Crop and/or Non-Crop Registrations: Corn (field, seed and sweet)
Sensitive Weeds: Broadleaf weeds controlled (including triazine and group 2 tolerant biotypes): American nightshade; Eastern black nightshade; common ragweed; lady's thumb; lambsquarters; redroot pigweed; velvetleaf; wild buck wheat; wild mustard; Canada fleabane and waterhemp. Grass weeds controlled: barnyard grass; crab grass (smooth, hairy); fall panicum; foxtail (green, yellow, giant) and witchgrass. Grass weeds suppressed: proso millet.
Uptake and Translocation: ACURON Herbicide provides selective control of annual grass and broadleaf weeds in corn. ACURON Herbicide will not provide control of emerged grass weeds that are past the 2 leaf stage.
Application Method: Postemergence only to field corn, preemergence to field, seed and sweet corn.
Residual Activity: Activity will normally be maintained for 10–14 weeks. Late germinating fall panicum will not be controlled. Degradation is primarily by soil microbial action.
Unique Characteristics: ACURON Herbicide contains benoxacor that has been shown to enhance S-metolachlor metabolism in corn.

BROMOXYNIL

Trade Name: BROMOTRIL, BROMAX 480, BROTEX 240, BROTEX 480, KORIL, PARDNER.
Chemical Family: Hydroxybenzonitrile.
Crop and/or Non-Crop Registrations: Alfalfa (seedling, established-seed), barley, canary grass (seed), corn, fall rye, flax, oats, millet, sorghum, triticale, and wheat (Durum, spring, winter).
Sensitive Weeds: Smartweed, nightshade, velvetleaf, pigweed, common ragweed, cocklebur, stinkweed, and wild mustard are killed if the chemical thoroughly contacts these plants before they have more than 4 true leaves: wild buckwheat and lamb's-quarters control to 8 leaf. Most established perennial broadleaf weeds, chickweed and grasses tolerate typical field rates of this herbicide.
Uptake and Translocation: Absorbed by plant foliage and moves very little within the plant.
Basis of Selectivity: Differential spray retention, uptake, translocation and degradation.
Application Method: Postemergence.
Residual Activity: Essentially no soil residual activity.
Unique Characteristics: Crop injury symptoms (leaf scorch) may develop if the plant is under stress within 2 or 3 days before or after spraying; this stress could be caused by high temperatures or high humidity or, in the case of corn, application following a period of cool, wet weather; such injury usually does not affect yields. Although bromoxynil is not an effective soil-applied herbicide, broadleaf crops such as turnips, peas and beans should not be seeded for a week after spray application.

BROMOXYNIL/MCPA

Trade Names: BADGE, BUCTRIL M, LOGIC M, MEXTROL.
Chemical Family: Hydroxybenzonitrile/phenoxy.
Crop and/or Non-Crop Registrations: Spring and winter wheat, barley, oats, flax, fall rye, corn, timothy hay and canary grass.
Unique Characteristics: Combination of bromoxynil with MCPA provides better control of mustards than bromoxynil alone. Also see notes on BROMOXYNIL and MCPA.

CARFENTRAZONE-ETHYL

Trade Name: AIM EC.
Chemical Family: Aryl triazolinone.
Crop and/or Non-Crop Registrations: Preplant burndown (all crops– refer to product label for specific crop registrations); harvest aid treatment for potatoes, dry beans, soybeans and cereals.
Sensitive Weeds: 36.5 mL/ha rate – redroot pigweed, velvetleaf. 58 mL/ha rate – lamb's-quarters, mallow, hairy nightshade, field pennycress, pigweed (prostrate, smooth and tumble), purslane, smartweed, tall waterhemp, tansy mustard. 73 mL/ha rate – carpetweed, cocklebur, eastern black nightshade, jimsonweed, kochia, volunteer canola. 117 mL/ha rate – burclover, prickly lettuce and corn spurry.
Uptake and Translocation: Carfentrazone-ethyl is taken up through the foliage and not readily translocated.
Basis of Selectivity: Metabolism.
Application Methods: Coverage of the weeds is essential for good control. For dessication, apply when the crop is mature and the grain has begun to dry down.
Residual Activity: None.
Unique Characteristics: AIM EC is a non-residual product and will not injure subsequent crops.

CHLORIMURON-ETHYL

Trade Name: CLASSIC, CHAPERONE.
Chemical Family: Sulfonylurea.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Common ragweed, dandelion, prickly lettuce, redroot pigweed, velvetleaf and yellow nutsedge.
Uptake and Translocation: Following foliar application, chlorimuron is rapidly absorbed through the leaves and translocated in both xylem and phloem.
Basis of Selectivity: Inhibition of acetolactate synthase (ALS) enzyme in susceptible plants leads to a rapid cessation of cell division and growth. Tolerant species rapidly convert chlorimuron to non-phytotoxic metabolites.
Application Methods: Postemergence. Preplant or post plant for control of dandelion.
Residual Activity: Chlorimuron-ethyl will provide some residual activity after application.
Unique Characteristics: A non-ionic surfactant must be added at 0.2% v/v. 28% Urea ammonium nitrate (U.A.N.) at 2 L/ha will improve the control of velvetleaf. Typical symptoms of plant death (chlorosis, necrosis) may occur from 1–3 weeks after application, depending on growing conditions. Favourable growing conditions will speed the activity while cool or dry conditions will delay it.

CHLORIMURON-ETHYL + FLUMIOXAZIN

Trade Name: DILIGENT.
Chemical Family: Sulfonylurea, Dicarboxamide.
Crop and/or Non-Crop Registrations: Preplant to soybeans.
For All Other Information: Refer to chlorimuron-ethyl, and flumioxazin alone.

CHLORIMURON-ETHYL + GLYPHOSATE

Trade Name: GUARDIAN MAX (co-pack of CLASSIC and POLARIS MAX).
Chemical Family: Sulfonylurea, Dicarboxamide, Amino acid.
Crop and/or Non-Crop Registrations: Preplant to Soybeans. Postemergence only to glyphosate tolerant ("Roundup Ready") soybean varieties.
Sensitive Weeds: Season long control of dandelion (preplant). Season long control of annual sow-thistle, dandelion and yellow nutsedge (post).
For All Other Information: Refer to chlorimuron-ethyl and glyphosate alone.

CHLORIMURON-ETHYL + IMAZETHAPYR

Trade Name: FREESTYLE (co-pack of CLASSIC and DUPONT IMAZETHAPYR).
Chemical Family: Sulfonylurea, imidazolinone.
Crop and Non-Crop Registrations: Soybeans. Preplant or pre-emergence.
For All Other Information: refer to chlorimuron-ethyl and imazethapyr alone.

CHLORIMURON-ETHYL + METRIBUZIN

Trade Name: CANOPY PRO (co-pack of CLASSIC and TRICOR 75 DF).
Chemical Family: Sulfonylurea, imidazolinone.
Crop and Non-Crop Registrations: Soybeans. Preplant or pre-emergence.
For All Other Information: Refer to chlorimuron-ethyl and metribuzin alone.

CLETHODIM

Trade Name: ARROW ALL-IN, ANTLER, SELECT, STATUE.
Chemical Family: Cyclohexanedione.
Crop and/or Non-Crop Registrations: canola, chickpeas (Desi and Kabuli), field peas, flax, a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings,* for specific crop registrations, lentils, safflower, soybeans and sunflowers.
Sensitive Weeds: Annual grasses (wild oats, green and yellow foxtail, volunteer cereals, volunteer corn and barnyard grass).
Uptake and Translocation: Uptake through the foliage and translocated through both the phloem and xylem throughout the plant accumulating in the meristemic regions both above and below the ground.
Basis of Selectivity: Tolerant plants rapidly metabolize clethodim to several conjugated metabolites.
Application Method: Postemergent to actively growing grasses in the 2–6 true-leaf stage.
Residual Activity: Rapid degradation in both soil and water with no soil activity.
Unique Characteristics: ARROW ALL-IN includes a "built in" adjuvant whereas SELECT and STATUE are sold with an adjuvant that you must add.

CLOMAZONE

Trade Names: COMMAND 360 ME.
Chemical Family: Isoxazolidinone.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Velvetleaf, lamb's-quarters, lady's thumb, eastern black nightshade, barnyardgrass, green foxtail, yellow foxtail.
Uptake and Translocation: Primarily absorbed through the roots and is translocated through the xylem in the plant.
Basis of Selectivity: Clomazone is metalized in soybeans.
Application Methods: Preemergence.
Residual Activity: When applied at labelled rates, Command 360 ME will provide season long weed control. It is relatively immobile in soil and microbial decomposition is the principle path of dissipation. Some rotational restrictions apply, refer to Tables 4–4 and 4–5. *Herbicide Crop Rotation and Soil pH Restrictions* for more information. Soil texture impacts residual and product efficacy, see product label for appropriate rates.
Unique Characteristics: Sensitive plants in the application zone will turn white (bleached) as carotenoid biosynthesis is inhibited .

CLOPYRALID

Trade Names: LONTREL XC.
Chemical Family: Pyridine.
Crop and/or Non-Crop Registrations: canola, spring barley, spring wheat, winter wheat and field corn.
Sensitive Weeds: The 0.25 L/ha rate controls: Canada thistle (top growth), vetch (Vicia spp.), alsike clover. The 0.34 L/ha rate controls: Canada thistle, scentless chamomile, wild buckwheat, perennial sow-thistle (top growth), common groundsel, volunteer alfalfa, common ragweed, sheep sorrel (suppression), ox-eye daisy (suppression), kudzu (for short term suppression of top growth). The 0.5 L/ha rate controls: Canada thistle (season-long control of top growth with a reduction in population in the following year), kudzu (for up to season long suppression of top growth).
Uptake and Translocation: Rapidly absorbed by foliage and translocated readily throughout the plant via both xylem and phloem systems. Clopyralid is distributed throughout the plant to the meristem.
Basis of Selectivity: Effects on nucleic acid metabolism and growth are not observed in grasses and other tolerant species.
Application Methods: Postemergence as a broadcast or selective foliar.
Residual Activity: Half-life in soil is less than 30 days under conditions that are favourable for microbial degradation. Little to no residual activity.
Unique Characteristics: Clopyralid has little to no activity on woody vegetation, except woody species of the legume family.

CLORANSULAM-METHYL

Trade Name: FIRSTRATE.
Chemical Family: Triazolopyrimidine sulfonanilide.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Common ragweed, cocklebur, velvetleaf, and lamb's-quarters (Pre). Cocklebur, common ragweed, giant ragweed, jimsonweed and velvetleaf (Post).
Uptake and Translocation: Absorption by roots, shoots and foliage. Translocation via the xylem and phloem and accumulation in the growing points.
Basis of Selectivity: Metabolism by soybeans. Inhibition of the acetolactase synthase (ALS) enzyme in susceptible plants followed by a rapid cessation of cell division and plant growth.
Application Methods: Preemergence in both conventional and conservation tillage systems or postemergence prior to the flowering stage of soybeans.
Residual Activity: Decomposition in soils is attributed primarily to microbial degradation. Some rotational cropping restrictions apply. Refer to Tables 4–4 and 4–5, *Herbicide Crop Rotation and Soil pH Restrictions* for additional information.
Unique Characteristics: Do not apply to peat or muck soils. Preemergence or postemergence applications require an activating rainfall that moistens the soil to a depth of at least 5 cm in order to move FIRSTRATE into the weed germination zone. If adequate rainfall is not received within 7–10 days after application, a shallow cultivation or use of a rotary hoe is suggested. Do not apply when air temperature is near freezing or when freezing conditions are expected for several days following time of application. Extended cold, wet conditions or abnormally high soil moisture conditions during emergence and early crop development may cause injury symptoms on soybeans such as temporary yellowing of the leaves and/or crop stunting. Soybeans will quickly outgrow these symptoms once normal growing conditions resume. Postemergence application prior to full emergence of the first trifoliate leaf may cause temporary yellowing of soybeans. This effect is transient and has no effect on soybean yields. Postemergence application requires the addition of a non-ionic surfactant (Agral 90) and a liquid ammonium fertilizer (28-0-0 or 32-0-0). See label for details.

DICAMBA

Trade Names: ENGENIA, FEXAPAN PLUS VAPORGROP TECHNOLOGY, XTENDIMAX WITH VAPORGRIP TECHNOLOGY.
Chemical Family: Benzoic acid.
Crop and/or Non-Crop Registrations: Field corn, spring and winter wheat, spring barley, spring rye, oats, soybeans (Roundup Ready 2 Xtend varieties only), summer fallow and stubble, pastures, red fescue, lowbush blueberries and turf; non-crop areas such as roadsides, utility rights-of-way and railways.
Sensitive Weeds: Annual weeds: buckwheat (tartary, wild), cleavers, corn spurry, cow cockle, Canada fleabane, common ragweed, giant ragweed, lady's thumb, lamb's-quarters, mustard spp., pigweed spp., smartweed and velvetleaf. Perennial weeds: field bindweed, sow-thistle (perennial), Canada thistle. Brush weeds (when tank-mixed with 2,4-D): alder, aspen poplar, cherry, western snowberry, wolf willow, prickly rose and wild rose.

Uptake and Translocation: Readily absorbed by roots, stems or leaves and then translocated to other plant parts.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Preemergence or postemergence in field corn and soybeans (Roundup Ready 2 Xtend varities only). For all other crops and non-crop uses, apply postemergence.

Residual Activity: Half-life in soil is approximately 30 days. Residue carryover into the next season is not a problem when applied at rates labelled for crop situations.

Unique Characteristics: Spray drift is toxic to sensitive plants in the same manner as 2,4-D, thus similar precautions should be followed. Cold weather conditions and/or subsequent high rainfall after dicamba application may lead to temporary corn injury particularly on early-season hybrids in Eastern Ontario. There is also a possibility of dicamba vapour drift from treated plant foliage during high temperatures (in excess of 25°C). At higher rates, dicamba can be toxic to trees and shrubs having roots under the treated areas.

DICAMBA/ATRAZINE

Trade Name: MARKSMAN.

Chemical Family: Benzoic acid/s-triazine.

Crop and/or Non-Crop Registrations: Field corn.

Sensitive Weeds: Buckwheat (wild, tartary), cleavers, cocklebur (emerged only), corn spurry, cow cockle, field bindweed, green smartweed, lady's thumb, lamb's-quarters, mustards, pigweed (redroot, Russian), ragweed (common and giant), sow-thistle (perennial), Canada thistle, velvetleaf, volunteer adzuki beans, waterhemp.

Application Methods: Preemergence and Postemergence until the standing height of the corn is 13 cm (5 leaf stage).

Unique Characteristics: Provides season long broadleaf weed control in corn. Provides excellent control of triazine-resistant broadleaf weeds and is particularly effective in controlling velvetleaf and other later-germinating deep-rooted annuals.

DICAMBA/S-METOLACHLOR

Trade Name: TAVIUM.

Chemical Family: Benzoic acid/s-triazine.

Crop and/or Non-Crop Registrations: Soybean (Xtend varieties), other varieties that are not dicamba tolerant will be killed.

Sensitive Weeds: annual grasses (not emerged): crabgrass (smooth, hairy); barnyard grass; fall panicum; foxtail (green, yellow, giant); old witchgrass. annual broadleaves (not emerged): american nightshade, eastern black nightshade. annual broadleaves (emerged): canada fleabane; cleavers; common ragweed; corn spurry; cow cockle; false ragweed; giant ragweed; green smartweed; hare's-ear mustard; indian mustard; lady's-thumb; lamb's-quarters; redroot pigweed; russian pigweed; tartary buckwheat; tumble mustard; velvetleaf; wild buckwheat; wild mustard; wormseed mustard. perennial weeds (emerged): canada thistle; perennial sow thistle; field bindweed. residual (short term) broadleaf weeds: lamb's-quarters; redroot pigweed; common ragweed; wild buckwheat and velvetleaf (suppression only)

Application Methods: Pre-plant or Preemergence only to Roundup Ready 2 Xtend soybean varieties. This product will cause severe crop injury or destruction if applied to soybeans that are not dicamba tolerant, including soybeans with a trait engineered to confer tolerance to other growth regulator herbicides other than dicamba.

Unique Characteristics: Do not tank mix products containing ammonium salts such as ammonium sulfate (AMS), urea ammonium nitrate, foliar fertilizers or glyphosate present as an ammonium salt. Do not add acidifying buffering agents, acidic pH adjusting agents or adjuvants. Do not use crop oil concentrates (COC) and methylated seed oils (MSO) as adjuvants when this product is applied with glyphosate-based agricultural herbicides.

DICHLORPROP/2,4-D

Trade Names: DICHLORPROP D, DICHLORPROP DX, ESTAPROP XT, TURBOPROP.

Chemical Family: Phenoxy/phenoxy.

Crop and/or Non-Crop Registrations: Spring and fall wheat and barley; perennial weed and brush control on non-cropland.

Sensitive Weeds: 2.75 L/ha – annual sow-thistle, bluebur, burdock, common ragweed, Canada thistle, cocklebur, curled dock, dandelion, dog mustard, flixweed, giant ragweed, kochia, lady's thumb, lamb's-quarters, night-flowering catchfly, oak-leaved goosefoot, perennial sow-thistle, prickly lettuce, mustard spp., pigweed (redroot, Russian), round leaved mallow, Russian thistle, shepherd's-purse, smartweed spp., spreading atriplex, stinkweed, stork's-bill, volunteer canola, volunteer sunflower and wild buckwheat.

Unique Characteristics: Most properties of dichlorprop are very similar to those of 2,4-D. Do not use on oats.

DIFLUFENZOPYR/DICAMBA

Trade Name: DISTINCT.

Chemical Family: Semicarbazone/Benzoic acid.

Crop and/or Non-Crop Registrations: Field corn (silage and grain).

Sensitive Weeds: Redroot pigweed, common ragweed, lamb's-quarters, wild buckwheat, lady's-thumb, Canada thistle, cocklebur (emerged), waterhemp (tall) and , velvetleaf. Controls horsenettle and horsetail when tank-mixed with nicosulfuron/rimsulfuron. Control is best when weeds are actively growing.

Uptake and Translocation: Readily absorbed by roots, stems or leaves and then translocated to other plant parts.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Apply postemergence from the 2 to 6 leaf stage of corn.

Residual Activity: Half-life in soil is approximately 30 days. Residue carryover into the next season is not a problem when applied at registered rates.

Unique Characteristics: This product has a wider application window, a lower use rate and has better activity on perennial weeds than dicamba alone. Spray drift is toxic to sensitive plants in the same manner as 2,4-D, thus similar precautions should be followed. The auxin transport inhibitor, diflufenzopyr, will also be active with other growth hormone herbicides such as 2,4-D and clopyralid and may cause crop injury if tank-mixed. Do not use additives such as oils, ionic surfactants, wetting agents, sticking agents, etc. Do not apply when there is a risk of severe drop in night temperature. Do not spray when temperatures are expected to exceed 27°C. Do not spray in high humidity or fog. Do not apply preemergence on sandy or sandy loam soils. Do not till or cultivate treated area for at least 7 days following application. Adding a non-ionic surfactant at 0.25% v/v plus liquid nitrogen fertilizer 28-0-0 at 1.25% is suggested for postemergence applications.

DIMETHENAMID-P

Trade Name: FRONTIER MAX.
Chemical Family: Chloroacetamide.
Crop and/or Non-Crop Registrations: Corn (field, seed and sweet), dry beans (kidney, otebo and white), peanuts, soybeans.
Sensitive Weeds: Green and yellow foxtail, barnyard grass, fall panicum, witchgrass, large and smooth crabgrass, redroot pigweed, eastern black nightshade, and tall waterhemp. Yellow nutsedge can be controlled with a preplant incorporated application.
Uptake and Translocation: Absorbed through shoots and roots of germinating grass and broadleaf weeds but primarily via plant coleoptile.
Basis of Selectivity: Not established.
Application Method: 1) preplant incorporated – incorporate with vibrating shank cultivator, harrow or other implement capable of giving uniform shallow incorporation into the top 5 cm of the soil within 7 days of planting; 2) preemergence – rainfall is needed within 10 days of application to achieve sufficient herbicide activation; 3) early postemergence (corn only) – apply at the spike to 3 leaf stage of corn and up to the 2 leaf stage of annual grass weeds.
Residual Activity: Provides season-long weed control. Length of residual activity depends upon soil and moisture factors, application rate and timing. Heavy rainfall following an incorporated treatment may reduce weed control.
Unique Characteristics: No recropping restrictions in the fall or spring application in corn or soybeans. Application flexibility; there are many tank-mix and sequential treatment options for broad-spectrum weed control in corn and soybeans in all tillage systems (zero tillage to conventional tillage). Mixes well with bulk liquid and dry fertilizers.

DIMETHENAMID-P/TOPRAMEZONE

Trade Name: ARMEZON PRO
Chemical Family: Chloroacetamide/ Pyrazolone.
Crop and/or Non-Crop Registrations: Corn (field, seed and sweet)
Sensitive Weeds: Green foxtail, yellow foxtail, large crabgrass, barnyard grass, old witchgrass, redroot pigweed, common ragweed, lamb's-quarters, wild mustard, stinkweed
Application Methods: pre- emergence up to and including the 3 leaf stage of field corn.
For All Other Information: Refer to dimethenamid-P and topramazone alone.

DIQUAT

Trade Name: ARMORY, BOLSTER, REGLONE DESICCANT.
Chemical Family: Bipyridylium.
Crop and/or Non-Crop Registrations: Desiccation of canola, flax, dry beans, dry peas, mustard, sunflowers, soybeans, adzuki beans, legume seed crops. Vine killing of potatoes. Control of corn spurry in oats. Stale seedbed and inter-row weeding.
Sensitive Weeds: Any foliage contacted by diquat will be killed.
Uptake and Translocation: Rapidly absorbed by foliage. Limited translocation.
Basis of Selectivity: None.
Application Methods: Postemergence.
Residual Activity: Essentially none due to adsorption of chemical to soil particles.
Unique Characteristics: Must be used with clean (non-turbid) water as the soil particles in muddy water drastically reduce the effectiveness of diquat. Apply in weather conditions that will not promote drift. For aerial application suggested conditions for good application are moderate temperatures (less than 25°C), humidity (greater than 40%) and wind (3.6–10 km/h). Do not apply in dead calm conditions or when temperature inversion is likely (e.g., morning or evening when warm air is rising from crop). To avoid spray drift, use flat fan or hollow cone nozzles and a pressure of 140–210 kPa. For aerial application point the nozzles back 130°–180°. For further information on aerial application see product label.

EPTC

Trade Name: EPTAM.
Chemical Family: Thiocarbamate.
Crop and/or Non-Crop Registrations: Alfalfa, bird's-foot trefoil, flax, potatoes, sunflowers, sugar beets, turnips, and annual flowers. EPTAM is registered for use dry on a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings, page 74* for specific crop registrations.
Sensitive Weeds: Annual grasses such as crabgrass, barnyard grass, fall panicum, wild oats, green foxtail and yellow foxtail, yellow nutsedge, some annual broadleaf weeds such as corn spurry, lamb's-quarters, nightshade, pigweed and chickweed if conditions are favourable for germination and growth.
Uptake and Translocation: Uptake by underground plant parts (roots, hypocotyl and seed). Upward translocation to the growing tip.
Basis of Selectivity: Metabolized by tolerant species at the seed germination stage through enzymatic breakdown of the chemical. Seed food reserves also permit seedling to outgrow chemical effect.

Application Methods: Preplant incorporated or postplant incorporated. May be applied using water or liquid fertilizers as the carrier. Dry fertilizers may also be used as a carrier when impregnated by licenced fertilizer dealers. To prevent chemical loss and reduced weed control, EPTC should be uniformly incorporated in the soil by setting the incorporation equipment (i.e., tandem disks, field cultivator with sweep teeth, or vibrating shank S-tine cultivator) to work the soil approximately 10 cm deep, followed by a levelling device. Irrigation (approximately 0.6 cm) can also be used to incorporate. When application and incorporation are done in separate operations, application should be on a dry soil surface.

Residual Activity: Applied in the spring preplant, EPTC provides season-long weed control with no soil residues the following year to prevent crop rotation.

Unique Characteristics: EPTC does not need rainfall to activate and will not leach significantly under heavy rainfall. Under unfavourable germination conditions, leaf crinkling or leaf sealing may be observed on certain crops but usually without adverse effects on yield. May be tank-mixed with metribuzin for additional broadleaf weed control in potatoes. May be tank-mixed with ethalfluralin or trifluralin for additional broadleaf weed control in beans (white, snap and kidney). See label for other tank-mix combinations and information on less conventional application methods.

ETHAMETSULFURON-METHYL

Trade Name: MUSTER TOSS-N-GO.

Chemical Family: Sulfonyl urea.

Crop and/or Non-Crop Registrations: Spring canola, sunflower.

Sensitive Weeds: Wild mustard, flixweed, green smartweed, hemp-nettle and stinkweed.

Uptake and Translocation: Following foliar application, is rapidly absorbed and translocated in both xylem and phloem.

Basis of Selectivity: Inhibition of acetolactate synthase in susceptible plants leads to a rapid cessation of cell division and growth. Tolerant species rapidly convert etha-metsulfuron-methyl to non-phytotoxic metabolites.

Application Methods: Postemergence.

Residual Activity: Rapid soil microbial degradation.

Unique Characteristics: A non-ionic surfactant must be added. Typical symptoms of plant death (leaf crinkling, curling, chlorosis) occur 5–10 days after application depending on growing conditions.

FENOXAPROP-P-ETHYL/SAFENER

Trade Name: BENGAL, PUMA ADVANCE, VIGIL.

Chemical Family: Aryloxyphenoxypropionate.

Crop and/or Non-Crop Registrations: Spring wheat, spring barley (PUMA ADVANCE only).

Sensitive Weeds: Wild oats, foxtail (green, yellow) and barnyard grass.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Postemergence, apply to wild oats at the 1–6 leaf stage (plus 3 tillers) and prior to flag leaf emergence of spring wheat. For best results, apply when weeds are young and actively growing.

Residual Activity: Essentially none.

Unique Characteristics: PUMA ADVANCE can be tankmixed with BUCTRIL M for broad-spectrum annual broadleaf weed control in spring wheat. Treatment at the 3–4 leaf stage of crops and weeds usually combines maximum crop tolerance and weed susceptibility. Under stressed conditions and/or heavy crop canopy, earlier application will result in improved grassy weed control. PUMA ADVANCE contains a safener which allows spring cereals to metabolize fenoxaprop-p-ethyl.

FLUAZIFOP-P-BUTYL

Trade Names: VENTURE L.

Chemical Family: Aryloxyphenoxypropionate.

Crop and/or Non-Crop Registrations: Flax, canola, soybeans, sugar beets, sunflowers, tobacco, forage legumes (alfalfa, red clover and bird's-foot trefoil), asparagus, cabbage, broccoli, Brussels sprouts, cauliflower, cucumber, ginseng, onions, peanut, potatoes, rutabagas, lupins, tomatoes, lowbush and highbush blueberries, raspberries, strawberries, non-grassy ornamental plants, poplars, shrubs, trees, apples, apricots, cherries, cranberries, grapes, peaches, pears and plums, forest and ornamental nurseries.

Sensitive Weeds: Barnyard grass, crabgrass, fall panicum, foxtail (giant, green, yellow), Johnson grass, volunteer corn, wheat and barley, wild oats, wirestem muhly, witchgrass, and quackgrass.

Uptake and Translocation: Absorbed primarily by leaves. Translocated to roots and rhizomes.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Postemergence. Apply when grasses are actively growing, and annual grasses are in the 2–5 leaf stage and quackgrass is in the 3–5 leaf stage.

Residual Activity: Essentially none.

Unique Characteristics: Preplant tillage to break up rhizomes will improve control of quackgrass. Except as noted on the label, apply broadleaf herbicides separately at least 3 days after fluazifop-p-butyl. Do not cultivate for 5 days after applying fluazifop-p-butyl. When plants are stressed (lack of moisture, excessive humidity, low temperature and/or very low relative humidity), fluazifop-p-butyl is less effective. Regrowth by tillering may occur if application is made under any of the above conditions. Since there is no residual activity, a new flush of weeds may emerge after the first flush has been controlled.

FLUMETSULAM

Trade Name: BROADSTRIKE RC.

Chemical Family: Triazolopyrimidine sulfonanilide.

Crop and/or Non-Crop Registrations: Soybeans.

Sensitive Weeds: Common lamb's-quarters, redroot pigweed, eastern black nightshade, and velvetleaf are controlled. Cocklebur, green foxtail, and lady'sthumb are suppressed.

Uptake and Translocation: Flumetsulam is absorbed by both roots and shoots of germinating broadleaf weeds.
Basis of Selectivity: Selectivity of flumetsulam in soybeans is based on metabolism.
Application Methods: Surface preplant, preplant incorporated or preemergence.
Residual Activity: The most significant means of dissipation of flumetsulam is microbial degradation. Provides season-long residual control of annual broadleaf and grass weeds. Rotational crops are winter wheat, spring wheat, spring barley, soybeans, common beans (dry, snap), lima beans, peas, field corn, seed corn.
Unique Characteristics: Can be applied up to 21 days before planting. Rainfall within 7–10 days is required for maximum activity of a preemergence application. Do not apply to areas where the soil pH is more than 7.8 and organic matter is less than 2%. Do not apply to soils containing more than 5% organic matter. Suspension concentrate formulation separates into 2 phases over time. Shake container well before using.

FLUMETSULAM + METRIBUZIN + S-METOLACHLOR

Trade Name: COMMENZA (co-pack of BROADSTRIKE RC + TRICOR + S-METOLACHLOR 960).
Chemical Family: Triazolopyrimidine sulfonanilide, S-triazine, Acetanilide.
Crop and/or Non-Crop Registrations: Soybeans
Application Methods: Apply pre-plant, pre-plant incoproated or pre-emergence.
For all other information: Refer to flumetsulam, metribuzin and s-metolachlor alone.

FLUMIOXAZIN

Trade Name: VALTERA, VALTERA EZ.
Chemical Family: Dicarboxamide.
Crop and/or Non-Crop Registrations: Celery, dry bulb onion, potato, pome fruit (apple and pear), grape, strawberry, highbush blueberry, stone fruit (peach, cherry, nectarine, plum and apricot), asparagus, field-grown woody ornamentals, peppermint, soybeans, spearmint, tree nuts, edible bean dessicant and non-crop areas.
Sensitive Weeds: Hairy bittercress, liverwort, pigweed spp., common ragweed, lamb's-quarters, hairy nightshade, eastern black nightshade. Suppression of green foxtail, common groundsel and common chickweed.
Uptake and Translocation: Primarily taken up by the roots of treated plants following soil applications. Movement in the phloem is limited because of the rapid foliar desiccation caused by the herbicide.
Application Methods: See label for specific timing in each registered crop. In general, flumioxazin must be applied prior to weed emergence.
Residual Activity: Generally will provide 4–6 weeks of broadleaf weed control, however the length of residual control is dependent on application rate, rainfall and temperature conditions following application.
Unique Characteristics: Flumioxazin is a soil applied herbicide providing residual control of annual broadleaf weeds and suppression of grassy weeds. Moisture is necessary for effective residual weed control. Dry weather following applications of flumioxazin may reduce effectiveness. Flumioxazin will not control emerged weeds and may not control weeds that germinate after application but before an activating rainfall or weeds that germinate through cracks resulting from dry soil. Disturbing soil surfaces may reduce efficacy.

FLUMIOXAZIN + METRIBUZIN + IMAZETHAPYR

Trade Name: TRIACTOR (co-pack of VALTERA, TRICOR and NU-IMAGE).
Chemical Family: Dicarboxamide. S-triazine, Imidazolinone.
Crop and/or Non-Crop Registrations: Soybeans
Application Methods: Apply pre-plant or pre-emergence but no longer than 3 days after planting.
For all other information: Refer to flumioxazin, metribuzin and imazethapyr alone.

FLUMIOXAZIN/PYROXASULFONE

Trade Name: FIERCE.
Chemical Family: Dicarboxamide and Isoxazoline/ Aryl triazolinone.
Crop Registrations: Soybeans.
Sensitive Weeds: lamb's-quarters, Common ragweed, Common Waterhemp, Dandelion, Eastern black nightshade, Green foxtail, Green pigweed, Hairy nightshade, Large crabgrass, Palmer amaranth,Pennsylvania smartweed, Redroot pigweed, Velvetleaf, Wild buckwheat, Wild mustard, Kochia, Canada fleabane
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: Early preplant and preemergence. Rainfall within 10 days is required for maximum activity of the preemergent application.
Residual Activity: Provides season long control of labeled weeds and is dependent on soil type, moisture and rate of application.
Unique Characteristics: The rate of application depends on weed pressure. Lack of moisture or too much moisture can affect activity. Winter cereals may be planted 4 months after application.

FLUROXYPYR

Trade Name: TROPHY A.
Chemical Family: Pyridine.
Crop and/or Non-Crop Registrations: Winter wheat, spring wheat, barley and oats.
Sensitive Weeds: Cleavers, kochia, round-leaved mallow, volunteer flax. Suppression of chickweed, hempnettle, stork's bill and wild buckwheat.
Application Methods: Postemergence from the 3 leaf to flag leaf stage of winter wheat.
Residual Activity: Half life ranges from 11–38 days. Fluroxypyr provides very little residual weed control.
Unique Characteristics: This product was specifically brought to the Ontario marketplace for the control of cleavers in winter wheat. Trophy A is one component of the Trophy co-pack, the second component is Trophy B (MCPA). Field experience has shown that it also provides suppression of tufted vetch, an increasingly problematic species in Ontario.

FLUROXYPYR/BROMOXYNIL/MCPA

Trade Name: ENFORCER M.
Chemical Family: Pyridine, hydroxybenzonitrile/phenoxy.
Crop and/or Non-Crop Registrations: Spring barley, spring and winter wheat.
Sensitive Weeds: Kochia (up to 5 cm tall), wild buckwheat (suppression), lamb's quarters, wild mustard, American nightshade (up to 4-leaf), redroot pigweed (suppression), ball mustard (up to 4-leaf), Russian thistle (up to 4-leaf, < 5 cm tall), bluebur (up to 4-leaf), scentless chamomile (up to 4-leaf), Canada thistle (top growth control only), shepherd's purse (up to 4-leaf), chickweed, stinkweed, cleavers (up to 6 whorls), stork's bill (suppression), cocklebur (up to 4-leaf), tartary buckwheat, common buckwheat, triazine resistant pigweed (up to 4-leaf), common groundsel, velvetleaf (up to 4-leaf), common ragweed, volunteer canola (up to 4-leaf), cow cockle (up to 4-leaf), volunteer flax, flixweed (up to 4-leaf), volunteer rapeseed (up to 4-leaf), green smartweed (up to 4-leaf), volunteer sunflower (up to 4 leaf), hemp-nettle, wild buckwheat, lady's thumb (up to 4-leaf), wormseed mustard, night flowering catchfly (up to 4-leaf), perennial sow thistle (top growth control only), pale smartweed (up to 4-leaf)
Application Methods: Postemergence from the 2 leaf to early flag leaf stage of cereals.
Residual Activity: Half life ranges from 11–38 days. Fluroxypyr provides very little residual weed control.

FOMESAFEN

Trade Name: REFLEX.
Chemical Family: Diphenyl ether.
Crop Registrations: Cucumber, soybeans, and is registered for use on a number of different edible bean market classes, refer to Table 7–1. *Beans Adzuki, Dry, Lima and Snap) Weed Control Ratings,* for specific crop registrations.
Sensitive Weeds: Redroot pigweed, common ragweed, wild mustard, lady's-thumb, eastern black nightshade, cocklebur; suppression of velvetleaf, lamb's-quarters, tall waterhemp.
Uptake and Translocation: Taken up through foliage. Not readily translocated.
Mode of Action: Cell-membrane disrupter.
Method of Selectivity: Beans metabolize fomesafen. Some initial bronzing of crop leaves may occur, but plants normally outgrow this condition without any effect on maturity or yield.
Application Method: Early postemergence to weeds and crop. Apply when beans are 1–2 trifoliate and weeds are at the 2–4 leaf stage. Good coverage is essential for optimum weed control. Apply in 200–350 L of water/ha at a pressure between 245–420 kPa. Always add an adjuvant such as AGRAL 90 (0.25% v/v) or TURBOCHARGE (0.5% v/v). PINNACLE or VENTURE may be tank-mixed for additional weed control.
Residual Activity: Persistence depends on weather and soil conditions (more persistent under dry conditions). Rotation to field corn, dry beans or soybeans the following year. Winter wheat may be planted 90 days after treatment. All other crops require a field bioassay.
Unique Characteristics: Do not apply REFLEX to any field more than once every 2 years.

FOMESAFEN/GLYPHOSATE

Trade Name: FLEXSTAR GT.
Chemical Family: Amino acid/Diphenyl ether.
Crop Registrations: Soybeans.
Sensitive Weeds: All weed species listed on glyphosate labels at comparable use rates in addition to residual control of common ragweed and redroot pigweed.
Uptake and Translocation: Absorbed through the foliage of emerged plants. Glyphosate component is readily translocated throughout the plant while the fomesafen component is not readily translocated. Selected broadleaf residual weed control provided by shoot uptake.
Basis of Selectivity: Metabolized by glyphosate tolerant soybean species when applied postemergence. Some initial bronzing of crop leaves may occur after postemergence application, but plants normally outgrow this condition without any effect of maturity or yield. When applied surface preplant or preemergence, the soybeans safely metabolize the fomesafen component.
Application Methods: Surface preplant (up to 7 days prior to planting) and preemergence across all types of soybeans. Postemergence: from the 1–2 trifoliate stage of only glyphosate tolerant soybeans.
Residual Activity: 3–4 weeks residual activity (control) of redroot pigweed and common ragweed. Winter wheat may be planted 4 months after application.
Unique Characteristics: Do not apply FLEXSTAR GT to any field more than once every 2 years. Add Turbocharge if weeds are stressed (hardened off from drought) or are at the maximum leaf stage specified on the product label

FORAMSULFURON

Trade Name: OPTION 2.25 OD.
Chemical Family: Sulfonylurea.
Crop and/or Non-Crop Registrations: Field Corn, lowbush blueberries.
Sensitive Weeds: Quackgrass, green, yellow and bristly foxtail, fall panicum, proso millet, barnyard grass, witchgrass, large crabgrass, redroot pigweed, common lamb's-quarters, velvetleaf, eastern black nightshade, common chickweed, wild and worm-seed mustard.
Uptake and Translocation: Foramsulfuron is quickly absorbed through leaves and rapidly translocated throughout the plant.
Basis of Selectivity: Inhibition of acetolactate synthase (ALS) enzyme in susceptible plants. Tolerant species rapidly metabolize foramsulfuron.
Application Methods: Postemergent from the 1–8 leaf stage of corn, emerged grassy weeds up to the early tillering stage, emerged broadleaf weeds.
Residual Activity: Essentially none.
Unique Characteristics: Addition of the safener isoxadifen in the formulated product maximizes crop tolerance, enhances crop recovery under severe environmental conditions and allows the use of an ethylated/methylated seed oil based adjuvant system.

GLUFOSINATE AMMONIUM

Trade Name: IGNITE, LIBERTY 200SN.

Chemical Family: Phosphinic acid.

Crop and/or Non-Crop Registrations: IGNITE – Desiccation of dry beans; directed applications in apples, apricots, highbush blueberries, sweet and sour cherries, grapes, nectarines, peaches, pears and plums, raspberries and tree nuts; stale seedbed techniques in asparagus, carrots, lettuce and onions; ground crack application in potatoes. LIBERTY 200SN – Corn hybrids, soybean and canola varieties specially developed to be tolerant to Liberty 200SN herbicide. Glufosinate-ammonium tolerant inbred lines grown for seed corn production.

Sensitive Weeds: Non-selective – affects all actively growing green plants; regrowth of perennial species may occur.

Uptake and Translocation: Absorbed through foliage; minimal translocation – dependent on application rate and species treated.

Basis of Selectivity: IGNITE – All green plant tissue is sensitive; safe on mature (non-green) bark of woody plants. LIBERTY 200SN – All green plant tissue is sensitive except for field corn, seed corn, soybeans and canola plants that have been specially developed to be tolerant.

Application Methods: IGNITE – Postemergence; broadcast or directed spray to avoid contact with leaves or green bark of desirable plants; thorough coverage of the plant tissue to be controlled is essential. LIBERTY 200SN – Postemergence. Can be broadcast in "Liberty Link" corn at the 1–8 leaf stage, apply with drop nozzles to later corn growth stages; cotyledon to flowering stage in "Liberty Link" soybeans and cotyledon to early bolting stage in InVigor canola.

Residual Activity: None; there are no cropping or rotational restrictions after application.

Unique Characteristics: Speed of action is influenced by environmental factors; at cool temperatures, poor moisture and low humidity, speed of action may be reduced. Heavy dew at time of application may reduce control of certain weed species.

GLYPHOSATE

Trade Names: CREDIT XTREME, CRUSH'R 540, FACTOR 540, GLYFOS, MATRIX, POLARIS MAX, ROUND-UP TRANSORB HC, ROUNDUP WEATHERMAX, STONEWALL, VP480.

Chemical Family: Amino acid.

Crop and/or Non-Crop Registrations: Preplant or postharvest with no cropping restrictions. Preharvest in wheat, barley, soybeans, canola, flax, lentils, peas and forages. "Roundup Ready" Crops – refer to Table 4–3. *Glyphosate Products, Registered Uses and Rates Needed to Control Specific Weed Species in Glyphosate Tolerant Crops*

Sensitive Weeds: Annual grasses; perennial weeds (quackgrass, Canada thistle, sow-thistle, field bindweed, milkweed, cattails, nutsedge, poison-ivy etc.); brush (birch, alder, poplar, raspberry, willow and maple).

Uptake and Translocation: Absorbed through foliage and translocated throughout the plant.

Basis of Selectivity: Non-selective for agricultural crops. Conifers are tolerant at some stages but the basis has not been established.

Application Methods: Postemergence, usually at the bud to bloom stage of growth for most perennial weeds. Canada thistle should be at least in early flower bud, milkweed at flower bud and bindweed at full flower. Quackgrass can be treated in the spring or fall when it is actively growing with at least 3–4 new leaves on each emerged shoot; in the fall, remove crop refuse but do not till prior to application; fall or spring tillage prior to spring application may reduce control; wait at least 3–5 days after application before working the area; for maximum control it is advisable to till before the quackgrass turns completely brown. (See Preplant Weed Control and Wick Wiper and Roller Application).

Residual Activity: None – crops can be planted or seeded directly into treated areas following application. Other herbicides are required to control weeds emerging after the application.

Unique Characteristics: Rainfall within 6 hours after application or heavy frost within 24 hours may reduce control for 356 g/L formulations. 360 g/L formulations are rainfast as soon as 4 hours after application. Glyphosate (540 g/L) formulations are rainfast as soon as 1 hour after application.

GLYPHOSATE/DICAMBA

Trade Name: ROUNDUP XTEND

Chemical Family: Amino acid, Benzoic acid.

Crop and Non-Crop Registrations: Soybeans (Roundup Ready 2 Xtend Varities only), corn applied pre-plant, preemergence or postemergence.

For All Other Information: Refer to glyphosate and dicamba alone.

GLYPHOSATE/MESOTRIONE/ S-METOLACHLOR/BENOXACOR

Trade Name: HALEX GT.

Chemical Family: Amino acid, triketone and acetanalide.

Crop and/or Non-Crop Registrations: Glyphosate tolerant ("Roundup Ready") corn only.

Sensitive Weeds: Emerged annual grass and broadleaf weeds controlled by glyphosate and residual control of unemerged annual grass and broadleaf weeds (see residual activity for specific species).

Uptake and Translocation: Refer to glyphosate, meostrione and s-metolachlor/benoxacor.

Basis of Selectivity: Refer to glyphosate, meostrione and s-metolachlor/benoxacor.

Application Methods: Postemergence from the spike to 6 leaf stage of glyphosate tolerant corn.

Residual Activity: HALEX GT will provide residual control of eastern black nightshade, lady's thumb, lamb's-quarters, pigweed spp. mustard (wild), velvetelaf, barnyardgrass, crabgrass (smooth and large), fall panicum, foxtails (green, yellow and giant), witchgrass.

HALAUXIFEN/FLUROXYPYR

Trade Name: Pixxaro A.
Chemical Family: Synthetic auxins (Picolinic and Carboxylic acids).
Crop and/or Non-Crop Registrations: spring barley, spring wheat, winter wheat.
Sensitive Weeds: postemergent control of alfalfa (volunteer), chickweed, cleavers, flixweed, hemp-nettle, kochia, lamb's-quarters, redroot pigweed, ragweed (common), round-leaved mallow, shepherd's-purse and wild buckwheat.
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: Postemergent from 3 leaf to just prior to flag leaf emergence of barley and wheat.
Residual Activity: Does not provide significant residual weed control.
Unique Characteristics: 1 hour rainfast. Sold only in a co-pack called PIXXARO which contains PIXXARO A and MCPA ESTER 600.

HALOSULFURON

Trade Name: Permit.
Chemical Family: Sulfonylurea.
Crop and/or Non-Crop Registrations: Permit- Dry Beans, Field corn (including seed), Sweet Corn, Popcorn, Grain Sorghum.
Sensitive Weeds: Canada fleabane, Chickweed (common), Cocklebur, Common groundsel, Corn spurry, Creeping yellowcress, Flower-of-an-hour, Fringed (Northern) willowherb, Hairy galinsoga, Horsetail, Jimsonweed, Lamb's-quarters, Plantain, broadleaf, Prickly lettuce, Ragweed (common and giant), Redroot pigweed, Round-leaved mallow, Shepherd's-purse, Smartweed (Lady's-thumb, Pennsylvania), Smooth pigweed, Spiny amaranth, Stinking chamomile, Velvetleaf, Wild mustard, Wild radish and Yellow nutsedge. For certain weeds, activity may be greater as a pre or post emergent treatment. Will not control Group 2 resistant weed populations. Refer to label for application timing and use rate for specific weed control recommendations.
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: Soil applications (Preplant incorporated and preemergent) and postemergent foliar application timings in dry beans, poatemergence only in corn. Refer to label for specific crop staging recommendations.
Residual Activity: Generally will provide 4–6 weeks of control. Length of residual control is dependent on soil and moisture factors, application rate and timing. Refer to label for rotation crop guidelines.
Unique Characteristics: Heavy infestations of nutsedge may require sequential applications. An earlier treatment may be required to prevent nutsedge from competing with the crop. Refer to label for other weeds suppressed. Refer to label for specific crop directions for pre-emergent rates. Refer to label for rotation crop guidelines.

IMAZETHAPYR

Trade Name: CONQUEST B (Available only in CONQUEST LQ co-pack), NU-IMAGE, PHANTOM, PURSUIT, DUPONT IMAZETHAPYR.
Chemical Family: Imidazolinone.
Crop and/or Non-Crop Registrations: Soybeans, a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings* for specific crop registrations, processing peas, snow peas and alfalfa for seed production.
Sensitive Weeds: Soil applications – green foxtail, yellow foxtail, witchgrass, barnyard grass, lamb's-quarters, redroot pigweed, smartweed, lady's-thumb, wild mustard, velvetleaf, common ragweed and reduced competition from eastern black nightshade and proso millet. Postemergence application – green foxtail, yellow foxtail, witchgrass, barnyard grass, redroot pigweed, velvetleaf, wild mustard, cocklebur, eastern black nightshade, ragweed and reduced competition from proso millet, large crabgrass, lamb's-quarter's, wild buckwheat and yellow nutsedge. Late postemergence application – green and yellow foxtail (up to 4 leaf stage), barnyard grass (up to 6 leaf stage), redroot pigweed (up to 12 leaf stage) and velvetleaf (up to 8 leaf stage), giant ragweed (up to 6 leaf stage).
Uptake and Translocation: Absorbed by both roots and foliage. Translocation in both xylem and phloem.
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: Early preplant (up to 30 days before planting), preplant incorporated, preemergence and postemergence up to the 2 leaf stage of weeds.
Residual Activity: Persistence depends on weather and soil conditions (more persistent under dry conditions). Some rotational restrictions apply, refer to Tables 4–4 and 4–5. *Herbicide Crop Rotation and Soil pH Restrictions* for more information.
Unique Characteristics: Can be applied up to 30 days prior to planting. Registered for use in reduced and no-till situations. Heavy infestations of ragweed or barnyard grass require a tank-mix with a herbicide that is effective on those species. Postemergence application requires the addition of AGRAL 90, AGSURF or ENHANCE surfactant and liquid fertilizer solution. Temporary soybean discoloration and/or shortening may occur with postemergence applications. A period of 100 days is required between application and planting winter wheat.

IMAZETHAPYR + BENTAZON

Trade Name: CLEANSWEEP (co-pack of PURSUIT + BASAGRAN FORTÉ).
Chemical Family: Imidazolinone+ benzothiadiazine.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Annual grass (barnyard grass, green and yellow foxtail) and broadleaf (cocklebur, flower-of-an-hour, lady's-thumb, lamb's-quarters, pigweed, ragweed, shepherd's-purse, stinkweed, velvetleaf, wild mustard, eastern black nightshade) species including triazine resistant biotypes and reduced competition from yellow nutsedge, Canada thistle and field bindweed.

Uptake and Translocation: Contact and systemic. Absorption occurs through foliage and roots.
Basis of Selectivity: Metabolism by soybeans.
Application Methods: Postemergence.
Unique Characteristics: A liquid ammonium fertilizer solution (such as UAN) must be added at 2 L/ha. Some rotational restrictions apply. See label for details. Refer to notes on imazethapyr and BENTAZON for additional information on each component.

IMAZETHAPYR + METRIBUZIN

Trade Name: CONQUEST LQ (co-pack of CONQUEST A + CONQUEST B).
Chemical Family: Imidazolinone+s-triazine.
Crop and/or Non-Crop Registrations: Soybeans.
Sensitive Weeds: Annual grass and broadleaf species. See label for specific species controlled.
Application Methods: Early preplant incorporated and preemergence.
Unique Characteristics: Some rotational restrictions apply. See label for details. Refer to notes on imazethapyr and metribuzin for additional information on each component.

ISOXAFLUTOLE + ATRAZINE

Trade Name: CONVERGE XT (co-pack CONVERGE FLEXX + CONVERGE 480), or tank-mix of CONVERGE FLEXX + atrazine 480.
Chemical Family: Isoxazole + s-triazine.
Crop and/or Non-Crop Registrations: Corn, field and seed.
Sensitive Weeds: Annual grasses and broadleaf weeds including triazine and ALS inhibitor tolerant biotypes: green, yellow and giant foxtail, barnyard grass, witchgrass, large and smooth crabgrass, lamb's-quarters, pigweed, common ragweed, eastern black nightshade, velvetleaf, wild mustard, wormseed mustard, wild buckwheat, lady's-thumb, sow-thistle (annual and spiny annual) seedling dandelion and seedling plantain.
Uptake and Translocation: Absorbed by roots and shoots of germinating weeds.
Basis of Selectivity: Metabolized by tolerant species. Preemergence and early postemergence up to the 3 leaf stage of corn. Provides season long weed control. Winter wheat can be grown 4 months after application, corn, soybeans, spring cereals, alfalfa, spring canola and processing peas can be grown the following year. Weed seedlings that emerge prior to activation of herbicide by rainfall can be controlled if less than 5 cm in height. NOT for use on sandy loam or finer textured soils with a minimum of 2% organic matter.

LINURON

Trade Name: LOROX L.
Chemical Family: Substituted urea.
Crop and/or Non-Crop Registrations: Corn, soybeans, carrots, celery, dill, parsnips, potatoes, asparagus, caraway, coriander, sweet white lupins, wheat, oats, barley, gladioli, fruit trees.
Sensitive Weeds: Annual weeds such as barnyard grass, common chickweed, corn spurry, crabgrass, velvetleaf, fall panicum, foxtail, goosefoot, goose grass, groundsel, knotweed, lamb's-quarters, redroot pigweed, purslane, common ragweed, shepherd's-purse, smartweed, stinkweed, wild buckwheat, witchgrass, wormseed mustard, triazine-resistant weeds; seedlings only of dandelion, plantain and sow-thistle.
Uptake and Translocation: Readily absorbed through roots, less so through foliage; translocation primarily upwards in xylem.
Basis of Selectivity: Differential metabolism often coupled with differential uptake and translocation.
Application Methods: Preemergence, postemergence, directed postemergence, pre plus postemergence.
Residual Activity: Does not pose a problem for subsequent crops since phytotoxic residues from applications at agricultural rates disappear within 4 months.
Unique Characteristics: Do not use on sandy or coarse-textured soils having less than 2% organic matter. If unusually heavy rains follow application, severe injury may occur to corn, soybeans, carrots and potatoes.

MCPA

Trade Names: MCPA ESTER 600, MCPA ESTER 500, MCPA SODIUM 300, MCPA AMINE 500, MCPA AMINE 600, TROPHY B.
Chemical Family: Phenoxy.
Crop and/or Non-Crop Registrations: Cereal crops, turf, non-crop sites.
Sensitive Weeds: Many broadleaf weeds, especially buttercup, hemp-nettle, field horsetail (top growth only), seedling dock.
Uptake and Translocation: Absorbed through leaves or roots. Translocates to, and accumulates at, growing points of shoots and roots.
Basis of Selectivity: Differences in interception, penetration, translocation, metabolism and sensitivity of active sites leads to greater activity in broadleaf weeds than grasses.
Application Methods: Postemergence.
Residual Activity: Some soil residues can be detected for up to 1 month under moist conditions and 6 months in drier climates.
Unique Characteristics: MCPA is available in amine ester or sodium salt formulations. It is safer than 2,4-D for use on oats, flax and peas. As with 2,4-D, there is a potential drift hazard to nearby susceptible crops such as grapes, turnips, tobacco and cabbage.

MCPB/MCPA

Trade Name: CLOVITOX PLUS, TOPSIDE, TROPOTOX PLUS.
Chemical Family: Phenoxy/phenoxy.
Crop and/or Non-Crop Registrations: Seedling white, ladino, alsike or red clovers direct seeded or underseeded in wheat, oats, barley, rye, pastures, field corn, peas, grapes (not TOPSIDE).
Sensitive Weeds: Small emerged mustards, stinkweed, ragweed, lamb's-quarters, redroot pigweed, shepherd's-purse, volunteer rapeseed, wild radish, hemp-nettle, annual sow-thistle; top-growth control of bull thistle, Canada thistle, curled dock, plantain, perennial sow-thistle, field bindweed, horsetail, buttercup.

Uptake and Translocation: Absorbed through the foliage and readily translocated, especially to the growing points.

Basis of Selectivity: MCPB is not directly toxic to plants. Susceptible weeds convert MCPB to MCPA.

Application Methods: Postemergence. In cereals, clovers and peas, apply as an overall spray. In corn, apply with drop pipes after the corn reaches 45 cm before the beginning of tasselling. Apply to pastures after grazing or cutting.

MESOTRIONE

Trade Name: CALLISTO.

Chemical Family: Triketone.

Crop and/or Non-Crop Registrations: Asparagus, corn (field, seed and sweet), highbush blueberries, cranberries and sod production.

Sensitive Weeds (when tank-mixed with atrazine): Cocklebur (emerged), common ragweed, giant ragweed (emerged), lamb's-quarters, redroot pigweed, tall waterhemp, velvetleaf , volunteer adzuki bean (emerged).

Uptake and Translocation: Readily absorbed by, shoots, roots, stems and leaves and then translocated to other plant parts.

Basis of Selectivity: Inhibits the HPPD enzyme found in photosynthetic cells of susceptible species. Symptoms on susceptible plants are bleaching followed by necrosis. Tolerant species rapidly metabolize mesotrione.

Application Methods: Preemergence and postemergence up to the 8 leaf stage of field, seed and sweet corn. Postemergence applications to corn require the addition of a non-ionic surfactant. Apply to blueberries and cranberry beds preemergence and postemergence to weeds.

Residual Activity: Degradation primarily by soil microbial action. Mesotrione will provide residual control of annual broadleaf weeds.

Unique Characteristics: When mesotrione is tank-mixed with atrazine there is a synergistic effect and improved control of broadleaf weed species. Mesotrione can be tank-mixed with either a soil applied or postemergence grass herbicide for one-pass weed control. Mesotrione has low volatility and poses a reduced risk to nearby sensitive crops.

MESOTRIONE/GLYPHOSATE

Trade Name: CALLISTO GT.

Chemical Family: Triketone, Amino acid.

Crop and/or Non-Crop Registrations: Corn (glyphosate tolerant hyrbids only)

Application Methods: Preemergence and postemergence up to the 8 leaf stage of corn.

Unique characteristics: In addition to broad-spectrum burn-down of emerged weeds, CALLISTO GT will provide residual control of Eastern Black Nightshade, redroot pigweed, velvetleaf and suppression of common ragweed.

For all other information: Refer to mesotrione and glyphosate alone.

METOLACHLOR, see S-METOLACHLOR

METOLACHLOR/ATRAZINE, see S-METOLACHLOR/ATRAZINE.

METRIBUZIN

Trade Names: CONQUEST A (Available only in CONQUEST LQ co-pack), SENCOR 480 F, SENCOR 75 DF, SQUADRON, TRICOR 75DF.

Chemical Family: S-triazine.

Crop and/or Non-Crop Registrations: corn (field), faba beans, soybeans.

Sensitive Weeds: Lamb's-quarters, wild mustard, redroot pigweed, common ragweed, shepherd's-purse, lady's-thumb, velvetleaf, jimsonweed, prostrate pigweed, Russian thistle, yellow wood-sorrel, prickly mallow, chickweed, cocklebur, carpetweed, dandelion seedlings, barnyard grass, crabgrass, foxtail, fall panicum, witchgrass, Johnson grass seedlings and cheat grass.

Uptake and Translocation: Some uptake through the foliage but the major route is via the roots. Translocation upwards in the xylem.

Basis of Selectivity: Degradation by tolerant species.

Application Methods: Preplant incorporated, surface pre-plant, burdnown or preemergence soybeans.

Residual Activity: Varies with the climate. At normal-use rates the half-life is 1–2 months.

Unique Characteristics: Heavy rainfall following application may cause crop damage. Some varieties of potato, soybean and tomato are less tolerant than others. Triazine-resistant weeds are not controlled. Do not use on muck soils.

METRIBUZIN + FLUMIOXAZIN

Trade Name: BIFECTA (co-pack of VALTERA and TRICOR).

Chemical Family: Dicarboxamide. S-triazine.

Crop and/or Non-Crop Registrations: Soybeans

Application Methods: Apply pre-plant or pre-emergence but no longer than 3 days after planting.

For all other information: Refer to flumioxazin and metribuzin alone.

NICOSULFURON

Trade Name: ACCENT.

Chemical Family: Sulfonylurea.

Crop and/or Non-Crop Registrations: Field corn, certain varieties of sweet corn (refer to product label), and seed corn (contact seed source for details on specific inbreds).

Sensitive Weeds: Quackgrass, proso millet, green and yellow foxtail, fall panicum, barnyard grass, witchgrass. Control of yellow foxtail is only achieved with either the addition of MERGE or the addition of 28% UAN at a rate of 5 L/ha along with a labelled non-ionic surfactant.

Uptake and Translocation: Following foliar absorption, nicosulfuron is rapidly absorbed through the leaves and translocated in both xylem and phloem.

Basis of Selectivity: Inhibition of acetolactate synthase (ALS) enzyme in susceptible plants leads to a rapid cessation of cell division and regrowth. Tolerant species rapidly convert nicosulfuron to non-phytotoxic metabolites.

Application Method: Postemergent within the 1–8 leaf stage of corn.

Residual Activity: No soil residual activity.

Unique Characteristics: Emerged grasses will be controlled by nicosulfuron but subsequent germinating grasses will not be controlled. A non-ionic surfactant must be added at 0.2% v/v. Typical symptoms of plant death (chlorosis, necrosis) occur 5–10 days after application, depending on growing conditions. Do not apply to corn that has been treated with an organophosphorus soil insecticide.

NICOSULFURON/RIMSULFURON

Trade Name: ULTIM, STEADFAST IS.

Chemical Family: Sulfonylurea/Sulfonylurea.

Crop and/or Non-Crop Registrations: Field corn. Not for use on sweet or seed corn.

Sensitive Weeds: Quackgrass, proso millet, green and yellow foxtail, fall panicum, barnyard grass, witchgrass, redroot pigweed (incl. triazine-resistant).

Uptake and Translocation: Following foliar application, nicosulfuron/rimsulfuron rapidly absorbed through the leaves and translocated in both xylem and phloem.

Basis of Selectivity: Inhibition of acetolactate synthase (ALS) enzyme in susceptible plants leads to a rapid cessation of cell division and growth. Tolerant species rapidly convert nicosulfuron/rimsulfuron to non-phytotoxic metabolites.

Application Method: Postemergence, within the 1–6 leaf stage of corn.

Residual Activity: Rapid soil microbial degradation of nicosulfuron. Refer to notes on rimsulfuron for information on its soil residual activity.

Unique Characteristics: Emerged grasses will be controlled by nicosulfuron/rimsulfuron, but subsequent germinating grass weeds will not be controlled. A non-ionic surfactant must be added at 0.2% v/v. Typical symptoms of plant death (chlorosis, necrosis) occur 5–10 days after application, depending on growing conditions. Do not use on corn hybrids with a crop heat unit (CHU) rating of 2,500 or less, or in geographic regions with 2,500 or less average seasonal CHU.

PENDIMETHALIN

Trade Name: PROWL H2O.

Chemical Family: Dinitroaniline.

Crop and/or Non-crop Registrations:edible beans (snap, lima and adzuki), field corn, and soybean.

Sensitive Weeds: Green foxtail, crabgrass, barnyard grass, fall panicum, lamb's-quarters and pigweed (suppression).

Uptake and Translocation: Weeds are controlled as they germinate. Translocation is not significant and emerged weeds are not controlled.

Basis of Selectivity: No significant uptake or translocation by the crop.

Application Methods: Field corn: preemergence and early postemergence. For preemergence application, pendimethalin may be applied in water or liquid fertilizer. Conduct a fertilizer compatibility test using pendimethalin and any of its registered tank-mix partners. Early postemergence application may only use water as a carrier.-

Residual Activity: Persistence depends on weather conditions (more persistent under dry conditions). Only registered crops may be planted in the year of application. Soybeans and corn may be planted the year following application in corn. Days to harvest restriction: 100 days.

Unique Characteristics: Strongly adsorbed to soil particles. Most effective when rain is received within 7 days of application. For onions, apply at both growth stages for season-long control. Tank-mixes in corn or sequential application of other herbicides in onions and corn are required for broad-spectrum weed control. Registered for dry bulb onions grown on muck and mineral soils . Do not graze treated fields or feed treated foliage to livestock prior to 100 days after PROWL application.

PINOXADEN

Trade Name: AXIAL BIA.

Chemical Family: Phenylpyrazolin.

Crop and/or Non-Crop Registrations: Spring wheat, winter wheat, spring barley.

Sensitive Weeds: Wild oats, green foxtail, yellow foxtail, barnyard grass, volunteer oats, volunteer cananary seed, proso millet

Uptake and Translocation: Absorbed through foliage and translocates to the site of action in the meristematic growing tissue.

Application Methods: Postemergence from the 1 leaf to flag leaf stage of cereals.

Residual Activity: Essentially none.

PROSULFURON

Trade Name: PEAK 75WG.

Chemical Family: Sulfonyl urea.

Crop and/or Non-Crop Registrations: Corn (field and seed), sorghum, millet and wheat (winter).

Sensitive Weeds: Lamb's-quarters (including triazine tolerant), redroot pigweed, cocklebur, lady's thumb, wild buckwheat, wild mustard, velvetleaf, common ragweed.

Uptake and Translocation: Following foliar application and uptake, prosulfuron is translocated through phloem to meristematic tissues. Growth of susceptible species ceases rapidly, followed by discolouration of leaves; death takes 1–3 weeks to occur.

Basis of Selectivity: Inhibition of the enzyme acetolactate synthase. Tolerant species rapidly metabolize prosulfuron.

Application Methods: Postemergent, corn (2–7 leaf stage), sorghum and millet (3–5 leaf stage) and winter wheat (up to stem elongation).

Residual Activity: Degradation primarily by soil microbial action. Prosulfuron will provide a sufficient degree of control of later germinating broadleaf weeds. Approved rotational crops are soybeans, dry beans, peas, cereals, and corn. See the label and Tables 4–4 and 4–5. *Herbicide Crop Rotation and Soil pH Restrictions* for information on rotational crop restrictions.

Unique Characteristics: Prosulfuron must be applied in a tank-mix combination with a reduced rate of dicamba in corn (field and sweet), millet and sorghum. Prosulfuron must be tank-mixed with bromoxynil in winter wheat. Refer to each crop section for more information on applicable rates and adjuvants.

PYRASULFOTOLE/BROMOXYNIL

Trade Name: INFINITY.
Chemical Family: Benzoylpyrazole and hydroxybenzonitrile.
Crop and/or Non-Crop Registrations: Wheat (spring, durum winter), barley, triticale and timothy (seed production only).
Sensitive Weeds: Annual broadleaf weeds including ALS (Group 2) resistant biotypes: annual sow-thistle, chickweed, cleavers, common ragweed, flixweed, hemp-nettle, kochia, lamb's-quarters, pale smartweed, redroot pigweed, suppression of round-leaf mallow giant ragweed and spreading atriplex, Russian thistle, shepherd's purse, stinkweed, volunteer canola (conventional and herbicide tolerant), wild buckwheat and wild mustard. Suppression of perennial weeds including: Canada thistle, dandelion, perennial sow-thistle.
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: Postemergence – Apply to emerged, young, actively growing weeds. Under cool and/or dry conditions activity may be reduced or delayed. Weed control may also be reduced if application is made when weeds are dust covered or in the presence of heavy dew, fog, or mist/rain. Apply in a minimum of 46.8 L of water/ha at a pressure of 275 kPa. Crops may be treated from the 1 leaf stage of growth until the flag leaf is just visible but still rolled.
Residual Activity: Essentially none.
Unique Characteristics: Application beyond emergence of the flag leaf may result in crop injury. Do not apply to a crop that is stressed by severe weather conditions, frost, low fertility, drought, water-saturated soil, disease or insect damage, as crop injury may result. Do not apply to crops under-seeded with legume species. Do not store below -20°C.

PYRASULFOTOLE/BROMOXYNIL/ FLUROXYPYR

Trade Name: INFINITY FX.
Chemical Family: Benzoylpyrazole, hydroxybenzonitrile, pyridine.
Crop and/or Non-Crop Registrations: Wheat (spring, durum, winter), barley, triticale and timothy (seed production only).
Sensitive Weeds: annual sow-thistle, chickweed, cleavers, canada fleabane, canada thistle (suppression), common ragweed, dandelion (suppression), flixweed, giant ragweed, hemp-nettle, kochia, lamb's-quarters, narrow-leaved hawk's-beard, pale smartweed, perennial sow-thistle (suppression), redroot pigweed, round-leaved mallow, russian thistle, shepherd's purse, spreading atriplex (suppression), stinkweed, stork's-bill, volunteer canola, volunteer flax, volunteer soybean, wild buckwheat and wild mustard
Basis of Selectivity: Metabolism by tolerant species.
Application Methods: Postemergence – Apply to emerged, young, actively growing weeds. Under cool and/or dry conditions activity may be reduced or delayed. Weed control may also be reduced if application is made when weeds are dust covered or in the presence of heavy dew, fog, or mist/rain. Apply in a minimum of 46.8 L of water/ha at a pressure of 275 kPa. Crops may be treated from the 1 leaf stage of growth until the flag leaf is just visible but still rolled.
Residual Activity: Essentially none.
Unique Characteristics: Application beyond emergence of the flag leaf may result in crop injury. Do not apply to a crop that is stressed by severe weather conditions, frost, low fertility, drought, water-saturated soil, disease or insect damage, as crop injury may result. Do not apply to crops under-seeded with legume species. Do not store below -20°C.

PYROXASULFONE

Trade Name: ZIDUA SC.
Chemical Family: Isoxazoline.
Crop Registrations: Field corn and soybeans.
Sensitive Weeds: barnyard grass, common waterhemp, crabgrass (large), redroot pigweed, foxtail (green, yellow, giant), ryegrass (Italian).
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: : Early preplant, preplant shallow incorporated and preemergence. Rainfall within 10 days is required for maximum activity of the preemergent application.
Residual Activity: Provides season long control of labeled weeds and is dependent on soil type, moisture and rate of application.
Unique Characteristics: The rate of application depends on weed pressure . Lack of moisture or too much moisture can affect activity. Winter cereals may be planted 4 months after application. Good tank mix partner with other herbicides.

PYROXASULFONE/CARFENTRAZONE-ETHYL

Trade Name: FOCUS.
Chemical Family: Isoxazoline/ Aryl triazolinone.
Crop Registrations: Spring wheat, winter wheat, field corn and soybeans.
Sensitive Weeds: Control of: green foxtail, yellow foxtail, barnyardgrass, downy brome, Japanese brome, Italian ryegrass, large crabgrass, redroot pigweed, green pigweed, cleavers, common waterhemp, velvet leaf, wormseed mustard. Suppression of: wild oats, giant foxtail, foxtail barley, kochia, stinkweed, lamb's quarters, wild buckwheat, wild mustard.
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: Preplant or preemergence. Rainfall within 10 days is required for maximum activity of the preemergent application.
Residual Activity: Provides season long control of labeled weeds and is dependent on soil type, moisture and rate of application.

Unique Characteristics: The rate of application depends on weed pressure. Lack of moisture or too much moisture can affect activity. Winter cereals may be planted 4 months after application. Good tank mix partner with other herbicides.

PYROXASULFONE/SULFENTRAZONE

Trade Name: AUTHORITY SUPREME.
Chemical Family: Isoxazoline/ Dicarboxamide.
Crop Registrations: Soybeans, field pea and chickpea.
Sensitive Weeds: Controls: barnyardgrass, brome (Downy, Japanense), crabgrass (large, smooth), foxtail (green, yellow, giant), witchgrass, cleavers, cowcockle, wild mustard, groundsel, common, kochia, lamb's quarters, nightshade (Eastern black), pigweed (green, redroot, powell), Purslane, common, stinkweed, waterhemp (common), wild buckwheat and yellow woodsorrel. Suppression of: wild oats, common ragweed.
Basis of Selectivity: Metabolized by tolerant species.
Application Methods: : Preplant and preemergence. Rainfall within 10 days is required for maximum activity of the preemergent application.
Residual Activity: Provides season long control of labeled weeds and is dependent on soil type, moisture and rate of application.

PYROXSULAM

Trade Name: SIMPLICITY GODRI.
Chemical Family: Triazolopyrimidine
Crop Registrations: Spring wheat, winter wheat.
Sensitive Weeds: Controls: barnyard grass (1–5 leaf), Japanese brome (1–6 leaf), canola (volunteer) (1–6 leaf), chickweed (common - up to 10 cm), cleavers (up to 6 whorl), corn spurry (up to 2 whorl stage, <10 cm in height), cow cockle (up to 8 leaf), flixweed (up to 10 cm), foxtail, yellow (1–5 leaf), hemp nettle (1–8 leaf), oats (wild – up to 4 leaf or 2 tiller), pigweed, (redroot- 1–8 leaf), round-leaved mallow (up to 6 leaf stage, <10 cm in size), smartweed (lady's-thumb, 1–5 leaf), shepherd's purse (up to 30 cm tall), stinkweed (up to 30 cm tall). Suppresses: downy brome (2–6 leaf, 4 tillers), dandelion (seedlings and over-wintered rosettes less than or equal to 20 cm), green foxtail (1–5 leaf), white cockle (up to the first flower stage, less than 20 cm in height), wild buckwheat (1–4 leaf), Canada thistle (up to 30 cm tall, prebud), Russian thistle (up to 10 cm tall), Persian darnel (1 leaf to 4 leaf, 2 tiller)
Application Methods: : Postemergence to spring wheat in the spring and to winter wheat in the fall or spring.
Residual Activity: Provides little to no residual weed control.

QUIZALOFOP-P-ETHYL

Trade Name: ASSURE II, CONTENDER, YUMA.
Chemical Family: Aryloxyphenoxypropionate.
Crop and/or Non-Crop Registrations: canola, clover (red and alsike), flax, a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings,* for specific crop registrations, faba beans, mustard, peas, industrial fibre hemp, seed alfalfa, soybeans and sunflower.
Sensitive Weeds: Green foxtail, barnyard grass, fall panicum, foxtail barley, witchgrass, proso millet, wild oats, volunteer cereals and volunteer corn.
Uptake And Translocation: Rapidly absorbed and readily translocated in both the xylem and phloem from the treated foliage to the root system and growing points of the plant.
Basis of Selectivity: Disruption of fatty acid biosynthesis leading to increased permeability and cellular disruption in sensitive plants. Rapid metabolism of the active herbicide in tolerant species.
Application Methods: Postemergence.
Residual Activity: Rapid microbial degradation and essentially no soil activity.
Unique Characteristics: Apply with SURE-MIX at 5 L/1,000 L of spray solution.

RIMSULFURON/MESOTRIONE

Trade Name: ENGARDE
Chemical Family: Sulfonylurea + Triketone.
Crop Registrations: Corn.
Sensitive Weeds: Barnyard grass, crabgrass (large), foxtail (green, yellow), common ragweed, lamb's-quarters, wild mustard, velvetleaf and redroot pigweed.
Application Methods: Preemergence and postemergence up to the 2 leaf stage of corn.
Residual Activity: Degradation primarily by soil microbial action. Mesotrione will provide residual control of annual broadleaf weeds.
Unique Characteristics: Some corn hybrids with corn-heat-unit (CHU) ratings of 2500 or less have shown some sensitivity to postemergent applications of Engarde™ Herbicide. DO NOT APPLY Engarde™ Herbicide as an Early postemergent application on corn hybrids with chu ratings of 2500 or less or in geographic regions having 2500 or less average seasonal corn heat units.

RIMSULFURON/MESOTRIONE/SAFENER

Trade Name: DESTRA IS
Chemical Family: Sulfonylurea + Triketone.
Crop Registrations: Corn.
Sensitive Weeds: Fall panicum, green foxtail, old witch grass, quackgrass, common ragweed, lamb's-quarters, eastern black nightshade, volunteer canola, velvetleaf, green and redroot pigweed.
Application Methods: Postemergence up to the 8 leaf stage of corn.
Residual Activity: Degradation primarily by soil microbial action. Mesotrione will provide residual control of annual broadleaf weeds.
Unique Characteristics: Contains a crop safener that allows DESTRA IS to be applied up to the 8 leaf stage of corn and without the hybrid restrictions that exist with ENGARDE.

SAFLUFENACIL

Trade Names: ERAGON LQ.

Chemical Family: Pyriminedione.

Crop and/or Non-Crop Registrations: Barley, corn (field and sweet), soybean and wheat. Dessicant in edible beans and soybean.

Sensitive Weeds: Canada fleabane, common ragweed, lamb's-quarters, redroot pigweed, stinkweed, velvetleaf, wild buckwheat, wild mustard and dandelion (suppression).

Uptake and Translocation: Emerged plants will take product up primarily by the foliage but sensitive non-emerged species will take up product through the roots and shoots. ERAGON LQ is translocated mainly in the xylem and has limited mobility in the phloem.

Basis of Selectivity: Metabolized by tolerant species.

Application Methods: Preplant (soybean), preplant and preemergence (barley, wheat, corn and sweet corn), preharvest dessicant in edible beans and soybean.

Residual Activity: Dependent on rate, the 36–71 g/ha rate provides limited residual activity while the 107–143 g/ha rate provides much longer residual activity.

Unique Characteristics: Sensitive weed species will begin to show injury symptoms within hours and will typically die within 3 days, depending on environmental conditions. Any crop can be safely grown the year following applications of ERAGON LQ at the 36 g/ha rate. A number of crops can be grown the year following applications of ERAGON LQ at the high rate, refer to Tables 4–4 and 4–5, *Herbicide Crop Rotation and Soil pH Restrictions* and the product label for more specific direction.

SAFLUFENACIL/DIMETHENAMID-P

Trade Names: INTEGRITY.

Chemical Family: Pyriminedione and chloroacetamide.

Crop and/or Non-Crop Registrations: Corn (field and sweet) and soybean.

Sensitive Weeds: Barnyard grass, crabgrass (smooth, large), eastern black nightshade, fall panicum, foxtails (green, yellow and giant), witchgrass, common ragweed, lamb's-quarters, redroot pigweed, velvetleaf, wild buckwheat, wild mustard and yellow nutsedge (PPI only). Refer to saflufenacil for other sensitive species.

Uptake and Translocation: Absorbed through shoots and roots of germinating grass and broadleaf weeds.

Basis of Selectivity: Unknown for dimethenamid-P, saflufenacil is metabolized by tolerant species.

Application Methods: Preplant incorporated and preemergence.

Residual Activity: Provides season-long weed control. Length of residual activity depends upon soil and moisture factors, application rate and timing. Heavy rainfall following an incorporated treatment may reduce weed control.

Unique Characteristics: A number of crops can be grown the year following applications of INTEGRITY, refer to Tables 4–4 and 4–5, *Herbicide Crop Rotation and Soil pH Restrictions* and the product label for more specific direction.

SAFLUFENACIL/IMAZETHAPYR

Trade Names: OPTILL.

Chemical Family: Pyriminedione and imidazolinone.

Crop and/or Non-Crop Registrations: Soybean.

Sensitive Weeds: Barnyard grass, broadleaf plantain, Canada fleabane, common chickweed, common ragweed, crabgrass (large), dandelion (suppression), foxtail (green, yellow), lamb's-quarters, prickly lettuce, redroot pigweed, shepherd's-purse, stinkweed, velvetleaf, wild buckwheat and wild mustard.

For More Information: Refer to SAFLUFENACIL and IMAZETHPYR.

S-METOLACHLOR

Trade Names: DUAL II MAGNUM, KOMODO/ UPI S-MET.

Chemical Family: Acetanilide.

Crop and/or Non-Crop Registrations: Corn, soybeans, a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings* for specific crop registrations, edamame.

Sensitive Weeds: Large and smooth crabgrass, witchgrass, barnyard grass, fall panicum, foxtails (green, yellow and giant), yellow nutsedge, American nightshade, eastern black nightshade and tall waterhemp.

Uptake and Translocation: Absorbed by germinating grasses mainly through the shoot just above seed. Absorbed by germinating broadleaf weeds through roots and shoots.

Basis of Selectivity: Metabolized by tolerant species.

Application Methods: Early preplant, preplant incorporated and preemergence. Early postemergence on corn (spike to 2 leaf stage of corn). Incorporation equipment should be set to work the soil 10 cm deep with a disc operating at 6–10 km/h or a vibrating shank cultivator at 10–13 km/h; 1 incorporation is sufficient and need not be immediate. Rainfall within 10 days is required for maximum activity of the preemergence application.

Residual Activity: Activity will normally be maintained for 10–14 weeks.

Unique Characteristics: The rate required depends on weed pressure (higher rate for heavier weed pressure). Yellow nutsedge control requires a preplant incorporated application. Winter cereals may be planted 4–5 months after metolachlor application. Many tank-mix combinations are registered on various crops. Do not use on muck soils or coarse-textured soils low in organic matter. DUAL II MAGNUM contains benoxacor, a chemical that enhances the corn plant's ability to metabolize s-metolachlor, thereby preventing corn injury even under adverse environmental conditions.

S-METOLACHLOR/ATRAZINE

Trade Name: PRIMEXTRA II MAGNUM.

Chemical Family: Acetanilide/s-triazine.

Crop and/or Non-Crop Registrations: Corn (ensilage, field, seed and sweet).

Sensitive Weeds: Germinating annual broadleaf weeds and annual grasses such as American nightshade, eastern black nightshade, lady's-thumb, lamb's-quarters, wild mustard, purslane, prostrate pigweed, redroot pigweed, wild buckwheat, smartweed, ragweed, crabgrass, barnyard grass, green foxtail, yellow foxtail, giant foxtail, witchgrass and fall panicum. Yellow nutsedge can be controlled with a preplant incorporated application.

Uptake and Translocation: Absorbed by germinating grasses mainly through shoot just above seed. Absorbed by germinating broadleaf weeds through roots and shoot.

Basis of Selectivity: Metabolized by tolerant species.

Application Methods: Early preplant, preplant incorporated, and preemergence. Early postemergence on corn (spike to 2 leaf stage of corn). Incorporation equipment should be set to work the soil 10 cm deep with a disc operating at 6–10 km/h or a vibrating shank cultivator at 10–13 km/h. One incorporation is sufficient and need not be immediate. Rainfall within 10 days is required for maximum activity of the preemergence application. S-metolachlor/atrazine may be applied in nitrogen solutions or liquid fertilizers for preplant incorporated or preemergence weed control. Dry bulk granular fertilizers may be impregnated with metolachlor/atrazine for preplant incorporation.

Residual Activity: Activity will normally be maintained for 10–14 weeks; late-germinating fall panicum will not be controlled. Soybeans, white beans, oats or barley may be planted the following spring.

Unique Characteristics: The rate required depends on weed pressure (higher rate for heavier weed pressure). Yellow nutsedge control requires a preplant incorporated application. Will not control triazine-resistant weed species. Contains atrazine in low amounts, which may carry over in a dry year. Is effective over a wide range of soil types and has a good margin of crop safety. Perennial weeds are not controlled. Primextra II MAGNUM contains benoxacor, a chemical that enhances the corn plant's ability to metabolize s-metolachlor, thereby preventing corn injury even under adverse environmental conditions.

S-METOLACHLOR/BENOXACOR+ METRIBUZIN

Trade Name: TIEDOWN (co-pack of KOMODO/ UPI S-MET and TRICOR 75 DF).

Chemical Family: Acetanilide/S-triazine.

Crop Registrations: Soybeans.

For All Other Information: Refer to s-metolachlor and metribuzin.

S-METOLACHLOR/BENOXACOR/ METRIBUZIN

Trade Name: BOUNDARY LQD.

Chemical Family: Acetanilide/S-triazine.

Crop Registrations: Soybeans, tomato and potato.

Sensitive Weeds: Large and smooth crabgrass, witchgrass, barnyardgrass, fall panicum, giant, green and yellow foxtail, yellow nutsedge, American nightshade, Eastern black nightshade, redroot pigweed and tall waterhemp.

Uptake and Translocation: Absorbed by germinating grasses mainly through the shoot just above the seed. Broadleaf weed uptake is mainly through the roots but can also be through the shoots.

Basis of Selectivity: Metabolized by tolerant species.

Application Methods: Surface preplant, preplant incorporated and preemergence in soybeans; preplant incorporated in tomato and preemergence in potato. Rainfall within 10 days is required for maximum activity of the preemergence application.

Residual Activity: Activity will normally be maintained for 10–14 weeks depending upon use rate.

Unique Characteristics: The rate required depends on weed pressure (higher rate for heavier weed pressure). Yellow nutsedge control requires a preplant incorporated application. Do not use on muck soils or coarse textured soils low in organic matter. Do not use on potato varieties Belleisle, Tobique or Superior.

SETHOXYDIM

Trade Name: POAST ULTRA.

Chemical Family: Cyclohexanedione.

Crop and/or Non-Crop Registrations: Canola, flax, soybeans, a number of different edible bean market classes, refer to Table 7–1. *Beans (Adzuki, Dry, Lima and Snap) Weed Control Ratings, page 74* for specific crop registrations peas, onions, tomatoes, potatoes, sweet potato, pumpkin, squash, cucumbers, alfalfa, buckwheat, creeping red fescue, garlic, broccoli, brussels sprouts, cabbage, cauliflower, chicory, peppermint, spearmint, snow peas, apples, apricots, cherries, peaches, pears, plums, highbush blueberries, cranberries, strawberries and sethoxydim-resistant corn.

Sensitive Weeds: Wild oats, foxtails, barnyard grass, large crabgrass, proso millet, fall panicum, witchgrass, volunteer corn and cereals and quackgrass.

Uptake and Translocation: Absorbed by foliage. Translocated upwards and downwards in plant.

Basis of Selectivity: Degraded by tolerant species (broadleaf plants).

Application Methods: Postemergence to actively growing annual grasses in the 1–6 leaf stage and quackgrass in the 1–3 leaf stage. Use flat fan nozzles and add MERGE adjuvant to the spray mix. Alternatively, ASSIST OIL CONCENTRATE or Ammonium sulphate plus ASSIST OIL CONCENTRATE may be used. Other postemergence herbicides not recommended as tank-mix combinations on the label must be applied at least 4 days before or after sethoxydim application. Aerial application is also registered.

Residual Activity: Essentially none. A second application and/or cultivation may be necessary to control grasses that emerge after treatment.

Unique Characteristics: Susceptible grasses, when sprayed, stop growing immediately and then gradually turn yellow to purple to brown over a period of 7–21 days, depending on growing conditions and crop competition. Rainfall within 1 hour after application may reduce effectiveness. If treated grasses are stressed (drought, flooding, prolonged cool temperatures) control will be delayed or reduced.

SIMAZINE

Trade Names: SIMAZINE 480.

Chemical Family: S-triazine.

Crop and/or Non-Crop Registrations: Corn, bird's-foot trefoil, alfalfa.

Sensitive Weeds: Annual broadleaf weeds such as pigweed, lady's-thumb, lamb's-quarters, purslane, ragweed, volunteer clover, wild buckwheat, smartweed, plantain and groundsel; annual grasses such as barnyard grass, crabgrass, wild oats and yellow foxtail (triazine-resistant biotypes of foxtail, lamb's-quarters, pigweed and groundsel will not be controlled); most perennial species starting freshly from seed.

Uptake and Translocation: Absorbed by roots; little or no foliar absorption; translocated upwards in xylem, accumulating in apical meristem and leaves with napropamide on new plantings of apples, apricot, cherries, plums, peaches and pears.

Basis of Selectivity: Some species, such as corn, metabolize simazine. In most crops, selectivity is based on the roots of the crop plants being deeper than the depth to which simazine leaches.

Application Methods: Preplant incorporated (to a depth of 2.5 cm) or preemergence in corn; preemergence in other crops. Broadcast or band application. In fruit crops, apply a 1 m wide band under the plants; cultivate or sod the area between the rows. For aquatic weed control, apply as a draw-down treatment or water-volume application in drainage ditches and ponds with no water flow-through.

Residual Activity: Soil residues may persist for more than 1 season. After spraying with simazine, do not plant any crop in the treated area in the same year except corn. Where rates in excess of 2 kg/ha have been applied, do not plant rotational crops in the following year; soils should be tested if there is any question of excessive residues remaining.

Unique Characteristics: Needs sufficient moisture to be activated. Should be applied only once per season. To avoid build-up of resistant weeds, simazine should be rotated with other non-triazine residual herbicides. Simazine is more persistent than atrazine. Where rainfall is sufficient to cause erosion, soil containing simazine may wash to lower areas of land and injure existing or subsequent crops.

SULFENTRAZONE

Trade Name: AUTHORITY 480.

Chemical Family: Dicarboxamide.

Crop and/or Non-Crop Registrations: Chickpeas, field peas, flax, sunflower and soybean.

Sensitive Weeds: Controls kochia, redroot pigweed, lamb's-quarters, wild buckwheat, eastern black nightshade, common waterhemp, smooth crabgrass, large crabgrass, yellow woodsorrel, common groundsel, powell pigweed and common purslane. Suppression of cleavers.

Uptake and Translocation: Primarily taken up by the roots of treated plants following soil applications. Movement in the phloem is limited because of the rapid foliar desiccation caused by the herbicide.

Application Methods: Pre-plant or preemergence up to 3 days after planting.

Residual Activity: Provides about 4–6 weeks of residual weed control for sensitive species.

Unique characteristics: Will not control emerged weed species.

SURFACTANT

See Chapter 5, *Notes on Adjuvants*.

TEMBOTRIONE/THIENCARBAZONE-METHYL

Trade Names: VIOS G3.

Chemical Family: Triketone/sulfonylaminocarbonyltriazolinones.

Crop and/or Non-Crop Registrations: Glyphosate tolerant ("Roundup Ready") or Glufosinate-ammonium tolerant ("Liberty Link") corn only.

Sensitive Weeds: Emerged annual grass and broadleaf weeds controlled by glyphosate or Liberty herbicide and residual control of weeds specified in Table 9–6. *Glyphosate Tolerant ("Roundup Ready") Corn Herbicide Weed Control Ratings.*

Uptake and Translocation: Tembotrione – foliar uptake, Thiencarbazone-methyl – foliar and soil uptake.

Basis of Selectivity: Metabolism by tolerant species.

Application Methods: Postemergence from the 1–6 leaf stage of "Roundup Ready" or "Liberty Link" field corn.

Residual Activity: VIOS G3 will provide residual control of lamb's-quarters, redroot pigweed, wild buckwheat, lady's thumb, wild mustard, common hempnettle, common chickweed, spiny annual sowthistle, common ragweed, velvetleaf, eastern black nightshade, green foxtail, yellow foxtail, barnyard grass, witchgrass and large crabgrass.

Unique Characteristics: VIOS G3 has a very low use rate and convenient packaging. It must always be tank-mixed with either glyphosate or LIBERTY 200SN.

THIFENSULFURON-METHYL

Trade Name: PINNACLE SG TOSS-N-GO.

Chemical Family: Sulfonyl urea.

Crop and/or Non-Crop Registrations: Soybeans, tomatoes.

Sensitive Weeds: Redroot pigweed, lamb's-quarters, velvetleaf, lady's-thumb and wild mustard.

Uptake and Translocation: Following foliar application, the herbicide is rapidly absorbed and translocated in both the xylem and phloem to growing points of sensitive weeds.

Basis of Selectivity: Inhibition of acetolactase synthase (ALS) enzyme in susceptible plants that leads to a rapid cessation of cell division and plant growth. Tolerant species rapidly metabolize the herbicide into non-phytotoxic metabolites.

Application Method: Postemergence.

Residual Activity: Rapid soil microbial degradation. Half-life of 5 days at 25°C soil temperatures.

Unique Characteristics: Labelled species can be controlled up to 10 cm in height. Redroot pigweed is very sensitive. Typical symptoms of plant death (leaf crinkling, curling, chlorosis) occur 5–10 days after application depending on the growing conditions. Inclusion of either a non-ionic surfactant at 0.1% v/v or a crop oil concentrate at 0.5% v/v is required for weed control. Velvetleaf control is greatly enhanced by the inclusion of an ammonium containing fertilizer (such as a UAN solution).

THIFENSULFURON-METHYL/ TRIBENURON-METHYL

Trade Name: REFINE SG. REFINE M (co-pack of REFINE SG + MCPA) BOOST M (co-pack of BOOST + MCPA Ester).

Chemical Family: Sulfonyl urea.

Crop and/or Non-Crop Registrations: Wheat (spring, winter, Durum), barley, oats not underseeded to legumes or grasses. Refine SG can be applied to winter wheat in the fall or the spring.

Sensitive Weeds: Lamb's-quarters, annual smartweed (green smartweed, lady's-thumb), chickweed, hemp-nettle, wild buckwheat, cow cockle, stinkweed, Canada thistle, sow-thistle, round-leaved mallow.

Uptake and Translocation: Following foliar application, is rapidly absorbed and translocated in both xylem and phloem.

Basis of Selectivity: Inhibition of acetolactate synthase in susceptible plants leads to a rapid cessation of cell division and growth. Tolerant species rapidly convert to non-phytotoxic metabolites.

Application Method: Postemergence.

Residual Activity: Rapid soil microbial degradation.

Unique Characteristics: A non-ionic surfactant must be added. Typical symptoms of plant death (leaf crinkling, curling, chlorosis) occur 5–10 days after application depending on growing conditions. Tank-mixes with MCPA and 2,4-D for control of ragweed and mustards.

TOLPYRALATE

Trade Name: SHIELDEX 400 SC.

Chemical Family: Pyrazolone.

Crop and/or Non-Crop Registrations: Corn (field, seed, popcorn and sweet).

Sensitive Weeds: amaranth (palmer), amaranth (powell), cocklebur (common), lamb's quarters (common), pigweed (redroot), pigweed (smooth), purslane (common), ragweed (common), ragweed (giant), shepherd's purse, smartweed (pennsylvania), waterhemp (common), waterhemp (tall), barnyardgrass, crabgrass (large), foxtail (giant, green and yellow).

Basis of Selectivity: Inhibits the HPPD enzyme found in photosynthetic cells of susceptible species. Symptoms on susceptible plants are bleaching followed by necrosis. Tolerant species rapidly metabolize topramezone.

Application Methods: Postemergence to corn until the the V6 (6 leaf collar) stage and to emerged weeds prior to 10 cm in height.

Residual Activity: Degradation primarily by soil microbial action. Topramezone provides soil residual activity against broadleaf weeds.

Unique Characteristics: The activity of tolpyralate is significantly enhanced by atrazine.

TOPRAMEZONE

Trade Name: ARMEZON, IMPACT.

Chemical Family: Pyrazolone.

Crop and/or Non-Crop Registrations: Corn (field, seed and sweet).

Sensitive Weeds: Annual broadleaf and grassy weeds, including triazine and group 2 resistant biotypes.

Basis of Selectivity: Inhibits the HPPD enzyme found in photosynthetic cells of susceptible species. Symptoms on susceptible plants are bleaching followed by necrosis. Tolerant species rapidly metabolize topramezone.

Application Methods: Postemergence in field corn between the 1–8 leaf stage for broadleaf weeds and 1–4 leaf stage of grassy weeds.

Residual Activity: Degradation primarily by soil microbial action. Topramezone provides soil residual activity against broadleaf weeds.

Unique Characteristics: The activity of topramezone is significantly enhanced by atrazine. A tank mix of Topramezone with atrazine and dimethenamid-P provides a one-pass, postemergence weed control program with residual activity against grass and broadleaf weeds.

TRALKOXYDIM

Trade Name: ACHIEVE LIQUID, BISON 400 L, NUFARM TRALKOXYDIM.

Chemical Family: Cyclohexanedione.

Crop and/or Non-Crop Registrations: Wheat (Durum, spring and winter), spring barley, rye (spring and winter), triticale. crested wheatgrass, creeping red fescue, meadow and smooth bromegrass, northern wheatgrass, slender wheatgrass and western wheatgrass.

Sensitive Weeds: Wild oats, volunteer oats, green and yellow foxtail.

Uptake and Translocation: Uptake through the leaves, translocated to growing points of roots, shoots and leaves.

Basis of Selectivity: Metabolized in tolerant species.

Application Methods: Postemergence to actively growing wild oats at 1–5 leaf stage. Rainfast in 1 hour.

Residual Activity: None.

Unique Characteristics: Safe on all varieties of spring wheat and barley. May be applied to cereal crops underseeded to legumes such as clover, alfalfa, sainfoil or bird's-foot trefoil. Do not feed or graze forage in year of treatment.

TRIBENURON-METHYL

Trade Names: EXPRESS SG.

Chemical Family: Sulfonyl urea.

Crop and/or Non-Crop Registrations: Soybeans, spring wheat, winter wheat, spring barley, oats and dry beans.

Sensitive Weeds: none listed

Uptake and Translocation: Following foliar application, is rapidly absorbed and translocated in both xylem and phloem.

Basis of Selectivity: Inhibition of acetolactate synthase in susceptible plants leads to a rapid end to cell division and growth. Tolerant species rapidly convert acetolactate synthase into non-phytotoxic metabolites.

Application Method: Preplant, a minimum of 1 day prior to planting.

Residual Activity: Rapid soil microbial degradation.

TRIFLURALIN

Trade Names: BONANZA 480, RIVAL, TREFLAN EC, TRIFLUREX 40 EC.

Chemical Family: Dinitroaniline.

Crop and/or Non-Crop Registrations: Soybeans, winter wheat, black, kidney, lima, snap and white beans, faba beans, snap beans, lima beans, black beans, canola forage kale, sunflowers, turnips, peas (field and canning), mustard, direct-seeded alfalfa; transplants of tomatoes, peppers, Brussels sprouts, broccoli, cabbage and cauliflower; carrots, crambe, direct-seeded cabbage and cauliflower, annual flowers, woody ornamental plantings and field-grown nursery stock, perennials, established shelterbelts, strawberries.

Sensitive Weeds: Most annual grasses, pigweed and lamb's-quarters, including the triazine-tolerant biotypes.

Uptake and Translocation: No significant absorption or translocation of trifluralin in crops grown in soil treated with trifluralin. Susceptible weeds are controlled as they germinate. Established weeds are not controlled.

Basis of Selectivity: Physiological growth processes associated with seed germination.

Application Methods: Preplant incorporated. Apply in 100–300 L of water/ha. Use lower rate of the chemical on sandy soils and increased rate for loam-to-clay soils. Do not use on highly organic soils (muck, peat or black sands above 15% organic matter). Incorporate twice in cross directions using a tandem disc (7–10 km/h) or tine cultivator (10–13 km/h) set to work 8–10 cm deep. The first incorporation should be done as soon as possible after application, but may be delayed 8–24 hours, depending on label directions. The second incorporation should take place anytime before planting. Activated upon incorporation; rainfall is not required.

Residual Activity: Labelled application rates provide season-long weed control. Succeeding crops, even fall-seeded grain crops planted in soil that received trifluralin the preceding spring, will not be injured under normal conditions.

Unique Characteristics: Strongly adsorbed to soil particles and shows negligible leaching. Organic matter and clay content influence application rate. Does not control ragweed, annual nightshades or mustards; lady's-thumb may escape.

TABLE 4–3. Glyphosate Products, Registered Uses and Rates Needed to Control Specific Weed Species in Glyphosate Tolerant Crops

LEGEND: ✓ **=** registered for use on glyphosate tolerant canola, corn, soybeans and sugarbeets **x** = not indicated for use on this crop

Trade Name	Concentration	GLYPHOSATE TOLERANT CROPS				WEED SPECIFIC GLYPHOSATE PRODUCT RATES (L/acre)[1] IN GLYPHOSATE TOLERANT CORN, SOYBEAN AND SUGARBEETS									
		Canola	Field Corn	Soybean	Sugarbeets	Annual Weeds	Alfalfa (Volunteer)	Dandelions (>15 cm)	Canada Thistle	Field Bindweed	Horse Nettle	Yellow Nutsedge	Perennial Sow-thistle	Wire-stemmed Muhly	Quackgrass (3–4 leaf)
CREDIT XTREME	540 g/L	✓	✓	✓	x	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
CRUSH'R 540	540 g/L	✓	✓	✓	x	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
FACTOR 540	540 g/L	✓	✓	✓	x	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
GLYFOS	356 g/L	✓	x	✓	x	2.5 L/ha 1 L/acre	7 L/ha 2.8 L/acre	5 L/ha 2 L/acre	2.5 L/ha 1 L/acre	5 L/ha 2 L/acre	5 L/ha 2 L/acre	5 L/ha 2 L/acre	2.5 L/ha 1 L/acre	2.5 L/ha 1 L/acre	2.5 L/ha 1 L/acre
MATRIX	480 g/L	✓	✓	✓	x	1.87 L/ha 0.75 L/acre	5.25 L/ha 2.1 L/acre	3.75 L/ha 1.5 L/acre	1.87 L/ha 0.75 L/acre	3.75 L/ha 1.5 L/acre	3.75 L/ha 1.5 L/acre	3.75 L/ha 1.5 L/acre	1.87 L/ha 0.75 L/acre	1.87 L/ha 0.75 L/acre	1.87 L/ha 0.75 L/acre
POLARIS MAX	540 g/L	✓	✓	✓	x	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
ROUNDUP TRANSORB HC	540 g/L	✓	✓	✓	✓	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
ROUNDUP WEATHERMAX	540 g/L	✓	✓	✓	✓	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
STONEWALL	540 g/L	✓	✓	✓	x	1.67 L/ha 0.67 L/acre	4.68 L/ha 1.87 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	3.33 L/ha 1.34 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre	1.67 L/ha 0.67 L/acre
VP 480	480 g/L	✓	✓	✓	x	1.87 L/ha 0.75 L/acre	5.25 L/ha 2.1 L/acre	3.75 L/ha 1.5 L/acre	1.87 L/ha 0.75 L/acre	3.75 L/ha 1.5 L/acre	3.75 L/ha 1.5 L/acre	3.75 L/ha 1.5 L/acre	1.87 L/ha 0.75 L/acre	1.87 L/ha 0.75 L/acre	1.87 L/ha 0.75 L/acre

[1] The maximum rate of glyphosate (540 g/L) that can be used on glyphosate tolerant Canola is 0.5 L/acre. Refer to the glyphosate tolerant Canola section in Chapter 12 for weeds that are sensitive at that rate.

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
2,4-D AMINE 600	8	✓	8	8	8	✓	8	8	8	✓	8	f	8	✓	✓
2,4-D ESTER 700	4	✓	4	4	4	✓	4	4	4	✓	✓	f	4	✓	✓
AATREX 480 < 840 ML/ACRE	10	10	10	22	10	✓	✓	10	10	10	10	22	22	10	10
AATREX 480 > 840 ML/ACRE	22	10	22	22	22	✓	✓	10	22	10	10	22	22	10	22
ACCENT	10*	10*	10*	10*	10*	✓	✓	f	f	f	10*	f	f	f	10*
ACURON	f	f	f	f	f	f	✓	f	f	f	11*	f	f	10*	4.5*
AIM	12*	12*	0*	12*	12*	0*	0*	0*	0*	0*	0*	12*	0*	0*	0*
ARMEZON OR IMPACT	10*	f	10*	10*	f	✓	✓	f	f	f	10*	f	f	10*	4*
ARMEZON PRO	10*	f	10*	10*	f	✓	✓	f	f	f	10*	f	f	10*	4*
ASSIGNMENT	0	10	0	22	22	10*	22	22	22	22	✓	22	22	10	3.3*
ASSURE II, CONTENDER OR YUMA GL	0	< 1	✓	✓	0	< 1	< 1	✓	< 1	< 1	✓	✓	✓	< 1	< 1
AUTHORITY 480	12*	12*	f	12*	f	12*	24	✓	f	f	✓	36*	0	12*	4*
AUTHORITY SUPREME	f	f	f	f	f	12*	f	f	f	f	✓	36*	12*	12*	4*
AXIAL	8*	✓	8*	8*	8*	8*	8*	8*	8*	8*	8*	10*	8*	✓	8*
BARRICADE M	2*	✓	8*	2*	8*	8*	8*	2*	0	8*	8*	10*	8*	✓	✓
BASAGRAN FORTE OR BROADLOAM	✓	< 1	✓	< 1	✓	✓	✓	< 1	< 1	< 1	✓	< 1	< 1	< 1	< 1
BENGAL WB OR VIGIL	N	✓	N	N	N	N	N	N	N	N	N	N	N	✓	N
BIFECTA	11*	11*	9*	22	12*	0	12*	12*	12*	12*	v	f	9*	8	4
BISON 400 L	< 1	✓	< 1	< 1	< 1	1*	1*	< 1	1*	✓	< 1	f	< 1	✓	0
BLACKHAWK	1*	✓	1*	1*	1*	✓	1*	1*	0	✓	✓	1*	1*	✓	✓
BLAZER, ULTRA	8	8	8	8	8	8	8	8	8	8	✓	f	8	8	8

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
BOOST M	2*	✓	8*	2*	8*	8*	8*	2*	✓	8*	8*	10*	8*	✓	✓
BOUNDARY LQD OR TIEDOWN	8	8	8	22	8	0	8	8	8	4	✓	22	8	8	4
BROADSTRIKE RC	10	10*	10*	26	10	✓	10*	f	f	f	✓	f	f	10*	4*
BUCTRIL M	8	✓	8	8	8	✓	8	✓	✓	8	8	f	8	✓	✓
CALLISTO	11*	10	11*	f	22	✓	✓	f	10	4	11*	f	f	10*	3*
CALLISTO GT	11*	10	11*	f	22	✓	✓	f	10	4	11*	f	f	10*	3*
CANOPY PRO	10*	10*	10*	22	8	10*	8	8	8	8	✓	f	8	8	4
CLASSIC (PH <7.4)	10*	10*	10*	f	f	10*	f	f	f	f	✓	f	f	f	3*
CLASSIC (PH > 7.8)	22	22	22	f	f	22	f	f	f	f	✓	f	f	f	4*
CLEANSWEEP	10	10	10	22	22	10	22	22	22	22	✓	22	22	10	22
COMMAND 360 ME	16*	16*	10*	10*	16*	10*	10	16	16	16	✓	16	16	10*	16*
COMMENZA	10	10*	10*	26	10	10	10*	f	f	f	✓	f	f	10*	4*
CONQUEST LQ	22	10	22	22	22	10*	22	22	22	22	✓	22	22	10*	4*
CONVERGE XT	10*	10*	22*	10*	f	✓	10*	f	10*	f	10*	f	f	10*	4*
DESTRA IS	11*	10*	11*	f	22	✓	10*	f	10	4	11*	f	f	10*	4*
DILIGENT	11*	11*	10*	9*	f	10*	12*	12*	12*	12*	✓	f	9*	f	3*
DISTINCT	3*	3*	3*	3*	3*	✓	3*	3*	3*	3*	3*	3*	3*	3*	3*
DUAL II MAGNUM OR KOMODO (UPI S-MET)	4	4	✓	4	4	✓	✓	4	4	4	✓	0	4	4	4
ELEVORE	10*	10*	10*	10*	f	✓	f	10*	10*	f	✓	f	10*	10*	4*
ENFORCER M	10	✓	f	10	10	10	10	10	10	10	f	f	f	✓	✓

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
ENGARDE	11*	10*	11*	f	22	✓	10*	f	10	4	11*	f	f	10*	4*
ENGENIA OR FEXAPAN OR XTENDIMAX	4*	✓	4*	4*	4*	✓	4*	4*	✓	✓	4*	4*	4*	✓	✓
ENLIST DUO	4	0	4	4	4	0	4	4	4	0	< 1	f	4	0	0
EMBUTOX	✓	✓	4	4	✓	✓	✓	4	✓	✓	4	f	4	✓	✓
EPTAM	✓	10	✓	10	10	10	10	✓	10	10	10	f	✓	10	10
ERAGON LQ	f	✓	8*	8*	f	✓	8	8*	✓	8	✓	f	f	✓	✓
ESTAPROP XT OR DICHLORPROP DX	1*	✓	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	✓	✓
FIERCE	f	f	f	f	f	0.25*	f	f	f	f	✓	f	f	0.25*	0.25
FIRSTRATE	9	f	9	26	f	9*	f	f	f	f	✓	f	30	4*	4*
FLEXSTAR GT	f	f	10*	f	f	f	f	f	f	f	✓	f	f	10*	4*
FOCUS	f	f	f	f	f	✓	f	f	f	f	✓	f	12*	✓	✓
FREESTYLE	10*	10*	10*	22	22	10*	22	22	22	22	✓	22	22	10	3.3*
FRONTIER MAX1	f	3.3*	✓	f	f	✓	✓	f	3.3*	3.3*	✓	11*	f	3.3*	3.3*
GYLPHOSATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GUARDIAN MAX	10*	10*	10*	f	f	10*	f	f	f	f	0	f	f	f	3*
HALEX GT	11*	f	11*	f	f	✓	0	f	f	f	11*	f	f	10*	4.5*
HURRICANE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
INFINITY OR INFINITY FX	10*	✓	f	10*	f	10*	f	10*	10*	f	10*	f	10*	✓	✓
INTEGRITY (CORN RATE)	11*	4*	11*	11*	11*	✓	11*	11*	4*	4*	11*	22*	11*	4*	11*
LIBERTY 200 SN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
LONTREL XC	22	✓	22	✓	22	10	22	10*	✓	✓	22	0	22	✓	0
LOROX L	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	✓	4*	4*	4*	4*
MARKSMAN	10	10	10	22	10	✓	4*	10	10	10	10	22	22	10	10
MCPA AMINE 500	N	✓	N	N	N	✓	N	✓	✓	N	N	N	4	✓	✓
MCPA ESTER 600	N	✓	N	N	N	✓	N	✓	✓	N	N	N	4	✓	✓
MCPA SODIUM 300	N	✓	N	N	N	✓	N	✓	✓	N	N	N	4	✓	✓
MCPA/MCPB	12*	✓	12*	12*	12*	✓	12*	✓	✓	12*	12*	12*	12*	✓	✓
MILESTONE	48	10	48	10	48	10	10	10	10	10	48	f	48	10	10
MUSTER TOSS-N-GO	22*	10*	22*	22*	22*	f	f	10*	10*	f	10*	f	f	10*	10
OPTILL	10	10	10	22	22	10	22	22	22	22	✓	f	22	10	3.3*
OPTION 2.25 OD	10*	10*	10*	10*	10*	✓	10*	f	10*	f	10*	10*	f	10*	4*
PARDNER, BROMAX, BROTEX OR KORIL	N	✓	N	0	N	✓	N	✓	✓	✓	N	N	N	✓	✓
PEAK	22*	10*	10*	f	f	✓	f	f	10*	f	10*	f	f	f	f
PERMIT	9*	2*	✓	15*	f	✓	2*	f	f	2*	9*	36*	18*	2*	2*
PINNACLE SG	1	0	1*	1*	1*	1*	1*	1*	1*	1*	✓	1*	1*	0	0
PIXXARO A	10*	✓	10*	10*	f	f	f	10*	f	f	10*	f	10*	✓	✓
POAST ULTRA	1*	0.5*	1*	1*	1*	1*	1*	1*	0.5*	0.5*	1*	1*	1*	0.5*	0.5*
PRIMEXTRA II MAGNUM	10	10*	10*	22	10	✓	✓	10	10*	10	10	f	22	10*	10*
PROWL H2O	f	10*	✓	f	f	✓	f	f	10*	10*	✓	f	f	10*	f

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
PUMA ADVANCE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PURSUIT	✓	10	✓	22	22	10*	22	22	22	22	✓	22	22	10	3.3*
REFINE SG OR BOOST	2*	✓	8*	2*	8*	8*	8*	2*	✓	8*	8*	10*	8*	✓	✓
REFINE M OR BOOST M	2*	✓	8*	2*	8*	8*	8*	2*	✓	8*	8*	10*	8*	✓	✓
REFLEX	f	f	✓	f	f	10*	f	f	f	f	✓	f	f	10*	4*
REGLONE, BOLSTER OR ARMORY	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SELECT, STATUE, ANTLER OR ARROW ALL-IN	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SENCOR, TRICOR OR SQUADRON	8	8	8	22	8	✓	8	8	8	8	✓	22*	8	8	4
SHIELDEX	9*	9*	9*	9*	12*	✓	✓	12*	9*	3*	9*	18*	9*	9*	3*
SIMAZINE 480 (LOW)	f	10	22	22	22	✓	10	22	10	10	22	f	22	10	10
SIMAZINE 480 (HIGH)	f	22	22	22	22	✓	22	22	22	22	22	f	22	22	22
SIMPLICITY	f	11*	11*	11*	f	10*	f	f	11*	f	f	f	10*	✓	✓
STEADFAST IS	f	10*	10*	10*	f	✓	10*	10*	10*	f	10*	f	10*	10*	4*
STEP UP	11*	11*	10*	9*	f	10*	12*	12*	12*	12*	✓	f	9*	f	3*
TAVIUM	4*	4.5*	4*	4*	4*	0*	4*	4*	4.5*	4*	4*[2]	4*	4*	4.5*	4.5*
TREFLAN, BONANZA OR RIVAL	✓	10*	✓	✓	10*	10*	10*	10*	22*	10*	✓	22*	0	10*	0
TRIACTOR	11*	11*	12*	11*	22	10*	22	22	22	22	✓	f	22	10	3.3*
TROPHY	f	✓	f	10*	f	f	f	10*	10*	10*	f	f	f	✓	✓
ULTIM	f	10*	10*	10*	10*	✓	f	f	f	f	10*	f	f	f	4*

TABLE 4–4. Herbicide Crop Rotation and Soil pH Restrictions – Field Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	FIELD CROPS														
HERBICIDE	**alfalfa**	**barley**	**beans, white**	**canola**	**clover, red**	**corn, field**	**corn, seed**	**flax-linseed**	**oats**	**rye, fall**	**soybean**	**sugarbeets**	**sunflowers**	**wheat, spring**	**wheat, winter**
	Number of months between application and planting														
VALTERA (56 G/ACRE)	11*	11*	9*	9*	f	✓	f	f	f	f	✓	f	9*	✓	0.25*
VALTERA (84 G/ACRE)	11*	11*	f	11*	f	✓	f	f	f	f	✓	f	9*	✓	4*
VARRO	10*	10*	10*	10*	f	10*	10	10*	10*	10	10*	f	10*	✓	✓
VENTURE L	✓	12*	✓	✓	✓	12*	12*	✓	12*	3	✓	✓	✓	12*	3
VIOS G3	10*	10*	10*	10*	f	0	f	f	f	f	10*	22*	f	10*	4*
ZIDUA SC	f	f	f	f	f	0	f	f	f	f	0	f	f	f	4

TABLE 4–5. Herbicide Crop Rotation and Soil pH Restrictions – Horticulture Crops

LEGEND: ✓ = Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	HORTICULTURE CROPS																						
HERBICIDE	**asparagus**	**beans, snap**	**beets, red**	**broccoli**	**brussels sprouts**	**cabbage**	**carrot**	**cauliflower**	**celery**	**corn, sweet**	**cucumber**	**garlic**	**muskmelon**	**onions**	**peas**	**peppers**	**potato**	**pumpkins**	**rutabaga**	**spinach**	**squash**	**tomato**	**watermelon**
	Number of months between application and planting																						
ACCENT	f	f	f	f	f	10	f	f	f	f	f	f	f	f	f	f	10	f	f	f	f	10	f
ACURON	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f	f	f	f	f	f
AIM	12*	0	12*	12*	12*	12*	12*	12*	12*	0*	0*	12*	0*	12*	0*	0*	12*	0*	12*	12*	0*	0*	0*
ARMEZON or IMPACT	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f	f	f	f	f	f
ARMEZON PRO	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f	f	f	f	f	f
ASSIGNMENT	22	22	22	22	22	22	22	22	22	22	22	22	22	22	0	22	22	22	22	22	22	22	22
ASSURE II, CONTENDER or YUMA GL	f	f	f	f	f	f	f	f	f	0	f	f	0	f	f	f	f	0	0	f	0	f	0
AUTHORITY 480	36*	36*	36*	0	36*	0	36*	0	36*	24*	36*	36*	36*	36*	0	36*	0	36*	36*	36*	36*	0	36*
AUTHORITY SUPREME	36*	36*	36*	36*	36*	36*	36*	36*	36*	36*	36*	36*	36*	36*	0	36*	36*	36*	36*	36*	36*	36*	36*
AXIAL	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*
BARRICADE M	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
BASAGRAN FORTE or BROADLOAM	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
BENGAL WB or VIGIL	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
BIFECTA	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
BISON 400 L	f	f	f	f	f	f	f	f	f	1	f	f	f	f	f	f	f	f	f	f	f	f	f
BLACKHAWK	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
BLAZER, ULTRA	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
BOOST M	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*
BOUNDARY LQD OR TIEDOWN	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
BROADSTRIKE RC	f	10*	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	f	f	f	f	f	f	f
BUCTRIL M	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f

TABLE 4–5. Herbicide Crop Rotation and Soil pH Restrictions – Horticulture Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	HORTICULTURE CROPS																						
HERBICIDE	**asparagus**	**beans, snap**	**beets, red**	**broccoli**	**brussels sprouts**	**cabbage**	**carrot**	**cauliflower**	**celery**	**corn, sweet**	**cucumber**	**garlic**	**muskmelon**	**onions**	**peas**	**peppers**	**potato**	**pumpkins**	**rutabaga**	**spinach**	**squash**	**tomato**	**watermelon**
	Number of months between application and planting																						
CALLISTO	0	f	f	f	f	f	f	f	f	0	f	f	f	f	22	f	11*	f	f	f	f	11*	f
CALLISTO GT	0	f	f	f	f	f	f	f	f	0	f	f	f	f	22	f	11*	f	f	f	f	11*	f
CANOPY PRO	f	f	f	f	f	11	f	f	f	11	f	f	f	f	11	f	f	f	f	f	f	12	f
CLASSIC (PH <7.4)	f	f	f	f	f	11	f	f	f	11	f	f	f	f	11	f	f	f	f	f	f	12	f
CLASSIC (PH > 7.8)	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	12	f
CLEANSWEEP	22	22	22	22	22	22	22	22	22	22	22	22	22	22	0	22	22	22	22	22	22	22	22
COMMAND 360 ME	16	10*	16	10*	16	16	16	16	16	10*	10*	16	16*	6*	10*	10*	10*	10*	16	16	10*	16	10*
COMMENZA	f	22*	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
CONQUEST LQ	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
CONVERGE XT	f	f	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	10*	f	f	f	f	10*	f
DESTRA IS	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
DISTINCT	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*	3*
DUAL II MAGNUM or KOMODO (UPI S-MET)	f	f	0	f	f	f	0	f	0	f	f	f	f	f	0	0	0	0	0	f	0	f	f
ELEVORE	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
ENFORCER M	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
ENGARDE	f	f	f	f	f	f	f	f	f	0	f	f	f	f	22	f	11*	f	f	f	f	11*	f
ENGENIA or FEXAPAN or XTENDIMAX	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*
ENLIST DUO	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
EMBUTOX	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
EPTAM	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f
ERAGON LQ	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f

TABLE 4–5. Herbicide Crop Rotation and Soil pH Restrictions – Horticulture Crops (cont'd)

LEGEND: ✓ = Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	HORTICULTURE CROPS																						
HERBICIDE	**asparagus**	**beans, snap**	**beets, red**	**broccoli**	**brussels sprouts**	**cabbage**	**carrot**	**cauliflower**	**celery**	**corn, sweet**	**cucumber**	**garlic**	**muskmelon**	**onions**	**peas**	**peppers**	**potato**	**pumpkins**	**rutabaga**	**spinach**	**squash**	**tomato**	**watermelon**
	Number of months between application and planting																						
ESTAPROP XT or DICHLORPROP DX	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
FIERCE	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
FIRSTRATE	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
FLEXSTAR GT	f	0	f	f	f	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f
FOCUS	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
FREESTYLE	22	22	22	22	22	22	22	22	22	22	22	22	22	22	11	22	22	22	22	22	22	22	22
FRONTIER MAX[1]	11*	11*	11*	11*	11*	0	11*	11*	11*	0	11*	11*	11*	0	11*	11*	11*	11*	11*	11*	11*	11*	11*
GYLPHOSATE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GUARDIAN	f	f	f	f	f	11	f	f	f	11	f	f	f	f	11	f	f	f	f	f	f	12	f
GUARDIAN PLUS II	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
HALEX GT	0	f	f	f	f	f	f	f	f	0	f	f	f	f	22	f	11*	f	f	f	f	11*	f
HURRICANE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
INFINITY or INFINITY FX	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	f	f	f	f	f
INTEGRITY (CORN RATE)	11*	11*	11*	11*	11*	11*	11*	11*	11*	11*	11*	11*	11*	22*	11*	22*	11*	11*	11*	11*	11*	11*	11*
LIBERTY 200 SN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LONTREL XC	22	22	22	0	22	0	22	0	22	22	22	22	22	22	22	22	22	22	0	22	22	22	22
LOROX L	4*	4*	4*	4*	4*	4*	0	4*	4*	4*	4*	4*	4*	4*	4*	4*	0	4*	4*	4*	4*	4*	4*
MARKSMAN	22	22	22	22	22	22	22	22	22	0	22	22	22	22	22	22	22	22	22	22	22	22	22
MCPA AMINE 500	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
MCPA ESTER 600	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
MCPA SODIUM 300	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
MCPA/MCPB	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*	12*

TABLE 4–5. Herbicide Crop Rotation and Soil pH Restrictions – Horticulture Crops (cont'd)

LEGEND: ✓= Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	HORTICULTURE CROPS																						
HERBICIDE	**asparagus**	**beans, snap**	**beets, red**	**broccoli**	**brussels sprouts**	**cabbage**	**carrot**	**cauliflower**	**celery**	**corn, sweet**	**cucumber**	**garlic**	**muskmelon**	**onions**	**peas**	**peppers**	**potato**	**pumpkins**	**rutabaga**	**spinach**	**squash**	**tomato**	**watermelon**
	Number of months between application and planting																						
MILESTONE	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	48	f	f	f	f	48	f
MUSTER	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
OPTILL	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
OPTION 2.25 OD	f	f	f	f	f	10*	f	f	f	f	f	f	f	f	10*	f	10*	f	f	f	f	10*	f
PARDNER, BROMAX, BROTEX OR KORIL	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PEAK	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
PERMIT	f	f	f	18*	f	15*	15*	18*	f	f	f	f	9*	18*	9*	10*	9*	9*	f	24*	9*	8*	f
PINNACLE SG	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	0	1*
PIXXARO A	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	f	f	f	f	f
POAST ULTRA	0	0	1*	1*	0	1*	1*	1*	0	1*	0	0	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*	1*
PRIMEXTRA II MAGNUM	22	22	22	22	22	22	22	22	22	0	22	22	22	22	22	22	22	22	22	22	22	22	22
PROWL H2O	f	f	f	f	f	f	0	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f	f
PUMA ADVANCE	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
PURSUIT	22	22	22	22	22	22	22	22	22	22	22	22	22	22	0	22	22	22	22	22	22	22	22
REFINE SG or BOOST	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*
REFLEX	f	0	f	f	f	f	f	f	f	f	f	f	f	f	0	f	f	f	f	f	f	f	f
REGLONE, BOLSTER or ARMORY	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SELECT, STATUE, ANTLER OR ARROW ALL-IN	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
SENCOR, TRICOR OR SQUADRON	0	22*	f	f	f	f	0	f	22*	f	f	f	22*	22*	f	22*	0	22*	f	22*	22*	0	f
SHIELDEX	12*	9*	12*	12*	12*	9*	12*	12*	12*	12*	9*	12*	12*	12*	9*	12*	9*	12*	12*	12*	12*	9*	12*

TABLE 4–5. Herbicide Crop Rotation and Soil pH Restrictions – Horticulture Crops (cont'd)

LEGEND: ✓ = Registered for application on this crop f = Field bioassay; user assumes liability for all crops not indicated on the label.
* = re-crop restriction (in months) is listed on the product label. (Other numbers based on the best available information. Contact the manufacturer of the product for more information.)
N = no cropping restrictions listed on the product label.

	HORTICULTURE CROPS																						
HERBICIDE	**asparagus**	**beans, snap**	**beets, red**	**broccoli**	**brussels sprouts**	**cabbage**	**carrot**	**cauliflower**	**celery**	**corn, sweet**	**cucumber**	**garlic**	**muskmelon**	**onions**	**peas**	**peppers**	**potato**	**pumpkins**	**rutabaga**	**spinach**	**squash**	**tomato**	**watermelon**
	Number of months between application and planting																						
SIMAZINE	0	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
SIMPLICITY	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	f	f	f	f	f
STEADFAST IS	f	f	f	f	f	f	f	f	f	f	f	f	f	f	10*	f	10*	f	f	f	f	f	f
STEP UP	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
TAVIUM	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*	4*
TREFLAN, BONANZA OR RIVAL	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*	10*
TRIACTOR	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
TROPHY	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
ULTIM	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
VALTERA (56 G/ACRE)	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
VALTERA (84 G/ACRE)	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
VARRO	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f
VENTURE L	0	12*	12*	0	0	0	0	0	12*	12*	0	12*	12*	0	0	12*	0	12*	12*	12*	12*	0	12*
VIOS G3	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	22*	f	f	f	f	22*	f
ZIDUA SC	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f	f

TABLE 4–6. Weed Species in Ontario Counties Resistant to Herbicides within a Specific WSSA Herbicide Group

#	Weed Species	WSSA Group	Counties with confirmed populations
1	barnyard grass	5	Waterloo
2	Canada fleabane	2	Brant; Chatham-Kent; Elgin; Essex; Frontenac; Haldimand; Halton; Hamilton; Huron; Lambton; Lennox and Addington; Niagara; Norfolk; Northumberland; Oxford; Peel; Perth; Peterborough; Stormont, Dundas and Glengarry; Waterloo; Wellington and York
		9	Brant; Bruce; Chatham-Kent; Dufferin; Durham; Elgin; Essex; Frontenac; Haldimand; Halton; Hamilton; Hastings; Huron; Lambton; Lennox and Addington; Middlesex; Niagara; Norfolk; Northumberland; Ottawa; Oxford; Peel; Perth; Peterborough; Prince Edward; Simcoe; Stormont, Dundas and Glengarry; Waterloo; Wellington and York
		22	Essex
3	carrot, wild	4	Halton; Wellington
4	cocklebur	2	Lambton
5	crabgrass, large	1	Chatham-Kent; Essex
6	foxtail, green	2	Huron; Kawartha Lakes; Lambton; Oxford; Perth; Wellington; Victoria
7	foxtail, giant	2	Elgin; Essex; Lambton; Oxford
8	foxtail, yellow	5	York
9	goosefoot, late flowering	5	Brant
10	groundsel, common	5	York
11	lamb's-quarters	2	Chatham-Kent: Elgin; Essex; Lambton; Middlesex; Simcoe; Stormont, Dundas and Glengarry
		5	Widespread throughout Ontario
12	mustard, wild	5	Stormont, Dundas and Glengarry
13	nightshade, eastern black	2	Bruce; Carleton; Elgin; Huron; Middlesex; Ottawa; Oxford; Perth; Simcoe; Stormont,Dundas and Glengarry; Wellington
		22	Chatham-Kent
14	peppergrass, field	22	Essex
15	pigweed, green	2	Chatham-Kent; Elgin; Essex; Haldimand; Hamilton; Huron; Lambton; Lennox and Addington; Middlesex; Oxford; Perth; Simcoe; Stormont, Dundas and Glengarry; Wellington
		5	Documented in every county except Hastings and Prince Edward. Populations have not been documented in any of the districts.
		7	Middlesex; Simcoe
16	pigweed, redroot	2	Bruce; Chatham-Kent; Elgin; Essex; Haldimand; Hamilton; Huron; Lambton; Lennox and Addington; Middlesex; Oxford; Perth; Simcoe; Stormont, Dundas and Glengarry; Wellington
		5	Chatham-Kent; Simcoe; Stormont, Dundas and Glengarry; Waterloo
		6	Chatham-Kent
		7	Chatham-Kent; Lambton; Middlesex; Simcoe
17	pigweed, smooth	6	Essex

TABLE 4–6. Weed Species in Ontario Counties Resistant to Herbicides within a Specific WSSA Herbicide Group (cont'd)

#	Weed Species	WSSA Group	Counties with confirmed populations
18	ragweed, common	2	Bruce; Carleton; Chatham-Kent; Elgin; Essex; Haldimand; Huron; Lambton; Middlesex; Niagara; Norfolk; Ottawa; Oxford; Perth; Prexcott-Russell; Simcoe; Stormont, Dundas and Glengarry; Wellington
		5	Brant; Bruce; Essex; Haldimond; Hamilton; Lambton; Lennox and Addington; Niagara; Norfolk; Wellington
		9	Essex
19	ragweed, giant	2	Essex; Chatham-Kent; Lambton;
		9	Essex; Chatham-Kent; Lambton; Lennox; Addington
20	waterhemp	2	Bruce; Chatham-Kent; Elgin; Essex; Haldimand; Lambton; Middlesex; Norfolk; Northumberland
		5	Chatham-Kent; Essex; Haldimand; Lambton; Middlesex
		9	Bruce; Chatham-Kent; Elgin; Essex; Lambton; Middlesex; Norfolk; Northumberland
		14	Essex; Lambton
21	witchgrass	5	Grey; Haldimon; Norfolk; Leeds and Grenville; Prescott-Russell; Wellington

IF YOU SUSPECT THAT YOU HAVE RESISTANT WEEDS, THEY CAN BE TESTED:

1. Collect mature seed at harvest. Make sure to get multiple plants from different locations. Remember that weed seeds typically have dormancy and only a small percentage of seed will germinate after maturity.
2. Place seed in a brown paper bag along with information such as the county and township the seed was taken from, your contact number and herbicides that you want tested.
3. Courier or mail the sample to: Crop Science Building (Building #69), University of Guelph, 50 Stone Road East, Guelph, ON, N1G 2W1. Attention: Peter Smith.
4. If you have questions, contact the lab at 519-824-4120 Ext. 58372.

5. NOTES ON ADJUVANTS

Introduction

An adjuvant is any substance added to a spray solution to modify and enhance the effectiveness of the herbicide.

Adjuvants are an important part of the spray solution and if not used will negatively affect the degree of weed control obtained. Some products have adjuvants formulated into the product while other products require that the user add the adjuvant. The selection of adjuvants is key to obtaining the right balance between maximizing weed control and minimizing crop injury. In some cases the rate of adjuvant varies depending on conditions of weather, crop stage, weed species, water quality, etc. Some herbicide labels recommend particular adjuvant products and some recommend particular types of adjuvants. Always use adjuvants as directed on the product label.

Most adjuvants referred to in this guide are listed as the amount (in litres) added to 1,000 L (L/1,000 L) of spray solution. If you wish to convert to % volume/volume (v/v) use the following conversion:

10 L/1,000 L = 1% v/v

There are 2 broad categories of adjuvants:

- activators and spray modifiers, and
- utility modifiers.

Activators and Spray Modifiers

- **Surfactants** (also known as "surface active agents") are the largest class of adjuvants. Surfactants can be non-ionic, anionic, cationic or amphuteric. Most surfactants are non-ionic (NIS); that is they do not ionize. A NIS is used to enhance herbicide penetration into a waxy cuticle. Wetting agents and detergents are primarily anionic and when ionized in solution, the water soluble portion is negatively charged. Cationic surfactants exhibit a net positive charge in solution. Amphuteric surfactants can be either anionic or cationic. Cationic and amphuteric surfactants are not widely used in agricultural chemicals.

- **Oils** solubilize the waxy cuticle layer on a weed leaf surface to increase spray penetration through the leaf cuticle. Oils are refined mineral oils (petroleum based) or seed oils. Seed oils are categorized as triglycerides, methylated seed oils (MSO) or crop oil concentrates (COC). Crop oil concentrates are a combination of seed oil and surfactants.

Utility Modifiers

- **Compatibility** agents improve mixing, especially when using a liquid fertilizer carrier.

- **Drift control** agents increase the droplet size to reduce drift.

- **Anti-foaming/Defoaming** agents are used to reduce and prevent foaming in the spray tank.

- **Foaming** agents are used with specialized equipment to produce and apply foam.

- **Buffering** agents can be used to enhance solubility or adjust pH.

- **Dyes are used** in some instances to enhance visibility of spray foam solutions.

Note

Complete information on each adjuvant is available on the product label which is located on the product container. The federal Pest Management Regulatory Agency also lists pesticide labels on their website.

Many pesticide manufacturers also list product labels and/or Material Safety Data Sheets (MSDS) on their websites.

TABLE 5–1. Adjuvants Used in Ontario

LEGEND: N/A = not applicable. These types of products are not required to be classified under the *Pesticide Control Product Act* (PCPA).

Trade Names[1]	Registration (PCP) Number[2]	Chemical Composition	Concentration	Ontario Class[3]	Manufacturer
Non-Ionic Surfactants					
AGRAL 90	11809	nonylphenoxy polyethyoxyethanol	90%	3	Syngenta Canada Inc.
AGRAL 90	24725	nonylphenoxy polyethyoxyethanol	90%	3	Norac Concepts Inc.
CITOWETT PLUS	12766	ocylphenoxy-polyethoxy ethanol	50%	4	BASF Canada Inc.
CONTACT	28326	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	4	Norac Concepts Inc.
COMPANION	15882	ocylphenoxy-polyethoxy-(9) ethanol	70%	4	Corteva
DYNAMAX ADJUVANT	31814	triglyceride ethoxylate; siloxylated polyether	56% + 24%	3	Norac Concepts Inc.
ENHANCE	29270	triglyceride ethoxylate	80%	4	Norac Concepts Inc.
HIACTIVATE	31817	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	-	Windifeld Solutions
ICON	28342	nonylphenoxy polyethyoxyethanol	90%	4	Norac Concepts Inc.
INDEX	28181	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	4	Norac Concepts Inc.
IPCO AG-SURF	15881	nonylphenoxy polyethyoxyethanol	92%	3	Interprovincial Coop
LI700	23026	phosphatidylcholine, methylacetic acid, alky polyoxyethylene ether	80%	4	Loveland Products
LIBERATE	29491	lecithin, methyl esters of fatty acids and alcohol ethoxylate	100 g/L	3	Loveland Products
LINK	28291	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	4	Norac Concepts Inc.
NUFARM AG-SURF	27921	nonylphenoxy polyethyoxyethanol	92%	4	NuFarm Canada
PRO-SURF II	28327	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	4	Norac Concepts Inc.
SENTRY	28343	nonylphenoxy polyethyoxyethanol	90%	4	Norac Concepts Inc.
SIDEKICK II	28914	alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol	900 g/L	4	Norac Concepts Inc.
SUFFIX	28184	nonylphenoxy polyethyoxyethanol	90%	4	Norac Concepts Inc.
SUPER SPREADER	17402	ocylphenoxy-polyethoxy ethanol	50%	4	Loveland Products
WEEDAWAY AG SURF	22881	nonylphenoxy polyethyoxyethanol	92%	3	Interprovincial Coop

[1] Mention of a trade name in this table does not constitute a guarantee or warranty of the product. Neither does this use signify that these products are approved to the exclusion of comparable products. All trade names are capitalized in this guide.

[2] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label should always be used for the most accurate and current PCP number.

[3] Designated under the *Pesticide Control Product Act* (PCPA) as pesticides of the Commercial Class for use in commercial activities that are specified on the label or Restricted Class when the label specifies essential conditions respecting the display, distribution or limitations on the use of, or qualifications of persons who may use the product. The Ontario Classification is current as of time of printing and may change over time. Refer to the Ontario Pesticide Advisory Committee Website, opac.gov.on.ca, for most current classifications.

TABLE 5–1. Adjuvants Used in Ontario (cont'd)

LEGEND: N/A = not applicable. These types of products are not required to be classified under the *Pesticide Control Product Act* (PCPA).

Trade Names[1]	Registration (PCP) Number[2]	Chemical Composition	Concentration	Ontario Class[3]	Manufacturer/ Agent Code[4]
Solvents (Oils)/Surfactants					
ADDIT ADJUVANT	29263	surfactant	36.9%	4	Adama Canada
AMIGO	22644	phosphate ester surfactant	30%	2	Arysta LifeScience
ASSIST OIL CONCENTRATE	16937	paraffin base mineral oil + surfactant blend	83% + 17%	4	BASF Canada Inc.
CARRIER	30639	mineral oil + surfactant blend	50% + 40%	4	NuFarm Canada
CONTENDER MSO	32198	methylated seed oil of soybean	70%	4	Interprovincial Coop
HASTEN NT ULTRA	31760	methyl and ethyl oleate	75.2%	4	Norac Concepts Inc.
MERGE	24702	surfactant blend + solvent (petroleum hydrocarbons)	50% + 50%	4	BASF Canada Inc.
MERGE1	21058	surfactant blend + solvent (petroleum hydrocarbons)	50% + 50%	4	BASF Canada Inc.
MSO CONCENTRATE	28385	methylated seed oil of soybean	70%	4	Loveland Products
SURE-MIX	25467	paraffinic petroleum oil + surfactant blend	60% + 35.6%	4	AMVAC Canada
TURBOCHARGE	23135	paraffin base mineral oil + surfactant blend	50% + 39.5%	4	Syngenta Canada Inc.
X-ACT	28225	phosphate ester surfactant	30%	2	Adama Canada
XA OIL CONCENTRATE	11769	paraffin base mineral oil + surfactant blend	83% + 17%	4	Loveland Products
XIAMETER OFX-0309	23078	silicone polyether + surfactant blend	76% + 24%	4	Norac Concepts Inc.
Combatibility Agents					
ALLIANCE	N/A	aliphatic phosphate ester, isopropanol and glycol ethers	69%	N/A	Norac Concepts Inc.
UNITE	N/A	acid polyglycols and methyl alcohol	83.70%	N/A	Loveland Products
Water Buffering Agents					
AQUA-STABLE	N/A	aliphatic polycarboxylate and calcium chloride	28%	N/A	Norac Concepts Inc.
Water Conditioning Agents					
AQUASOFT	N/A	hydroxy carboxylic acid, phosphoric acids and ammonium sulfate polyacrylic acid	63%	N/A	Norac Concepts Inc.
CHOICE	N/A	polyacrylic, hydroxy carboxylic, propionic acids, phosphate ester and ammonium sulfate	50%	N/A	UAG
CRIMSON	N/A	ammonimum sulphate: proprietary blend of agents	50:50%	N/A	Windfield Solutions
N TANK	N/A	monocarbamide dihydrogen sulphate, amine phosphates and viscosity reducing agents	81%	N/A	Adjuvants Plus

[1] Mention of a trade name in this table does not constitute a guarantee or warranty of the product. Neither does this use signify that these products are approved to the exclusion of comparable products. All trade names are capitalized in this guide.

[2] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label should always be used for the most accurate and current PCP number.

[3] Designated under the *Pesticide Control Product Act* (PCPA) as pesticides of the Commercial Class for use in commercial activities that are specified on the label or Restricted Class when the label specifies essential conditions respecting the display, distribution or limitations on the use of, or qualifications of persons who may use the product. The Ontario Classification is current as of time of printing and may change over time. Refer to the Ontario Pesticide Advisory Committee Website, opac.gov.on.ca, for most current classifications.

TABLE 5–1. Adjuvants Used in Ontario (cont'd)

LEGEND: N/A = not applicable. These types of products are not required to be classified under the *Pesticide Control Product Act* (PCPA).

Trade Names[1]	Registration (PCP) Number[2]	Chemical Composition	Concentration	Ontario Class[3]	Manufacturer/ Agent Code[4]
Defoamers (Anti-Foamers)					
BREAKER	N/A	dimethylpolysiloxane	10%	N/A	Loveland Products
DIALED-IN	N/A	proprietary blend	100%	N/A	Windfield Solutions
FIGHTER F	N/A	dimethylpolysiloxane	12.5%	N/A	Loveland Products
FOMAINATOR	N/A	dimethylpolysiloxane, polypropylene glycol, silicon dioxide	15%	N/A	Windfield Solutions
FLAT-OUT	N/A	dimethylpolysiloxane	20%	N/A	Norac Concepts Inc.
HALT	N/A	silicone base, neutral	30%	N/A	Corteva
VALID	N/A	lecithin, emulsifiers, glycols and dimethylpolysiloxane defoamer	100%	N/A	Loveland Products
ZAP	N/A	proprietary blend	100%	N/A	Norac Concepts Inc.
Deposition Aid & Drift Control Agent					
INTERLOCK	N/A	Modified vegetable oil and emulsifiers	100%	N/A	Windfield Solutions
Foam Marker Dye					
IN-SIGHT	N/A	dye, surfactants, and coupling agents	100%	N/A	Norac Concepts Inc.
TREKKER TRAX	N/A	alcohols, mixed anionic and nonionic surfactants	54%	N/A	Loveland Products
TRAMLINE	N/A	nonionic and anionic surfactants	35% + 65%	N/A	Norac Concepts Inc.

[1] Mention of a trade name in this table does not constitute a guarantee or warranty of the product. Neither does this use signify that these products are approved to the exclusion of comparable products. All trade names are capitalized in this guide.

[2] The product registration number for this trade name under the *Pesticide Control Product Act,* commonly referred to as a "PCP number". The PCP number has been placed in the guide for convenience, but the pesticide label should always be used for the most accurate and current PCP number.

[3] Designated under the *Pesticide Control Product Act* (PCPA) as pesticides of the Commercial Class for use in commercial activities that are specified on the label or Restricted Class when the label specifies essential conditions respecting the display, distribution or limitations on the use of, or qualifications of persons who may use the product. The Ontario Classification is current as of time of printing and may change over time. Refer to the Ontario Pesticide Advisory Committee Website, opac.gov.on.ca, for most current classifications.

TABLE 5–2. Adjuvant Rates per Sprayer Tank Volume

% Adjuvant / Water	0.1% v/v	0.2% v/v	0.25% v/v	0.5% v/v	1.25% v/v
L Adjuvant / L Water	1 L/1,000 L	2 L/1,000 L	2.5 L/1,000 L	5 L/1,000 L	12.5 L/1,000 L
L Adjuvant / U.S. gal. Water	0.38 L /100 U.S. gal.	0.76 L /100 U.S. gal.	0.95 L /100 U.S. gal.	1.9 L/100 U.S. gal.	4.75 L/100 U.S. gal.

AGRAL 90

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 90%.
Registered Uses: For use with REGLONE, glyphosate, REFLEX and other control products as labelled. Also used for washing sprayer tanks and equipment.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.
Mixing: Use 200– 2,500 mL/1,000 L of water as specified on label. Will mix with all types of water (i.e., hard and soft). Add AGRAL 90 to the spray mixture and agitate thoroughly. With glyphosate, use 350 mL/50–100 L water if targeting quackgrass in minimum or zero tillage seeding and summerfallow uses. Use 500 mL/100 L for quackgrass when water volumes are high (i.e., 150–300 L/ha).
Unique Characteristics: Do not exceed the labelled rates of AGRAL 90 as too much wetting agent can lead to loss of spray due to excessive run-off.

ALLIANCE 400

Type of Adjuvant: Compatibility agent.
Chemical Composition: Aliphatic phosphate ester, isopropanol and glycol ethers 69%.
Benefit: Emulsifies and disperses liquid fertilizers and emulsifiable pesticides in solution to produce uniform tank-mixes.
Mixing: Mix 60–375 mL of Alliance/100 L of solution depending on fertilizer and number of pesticides. Add alliance to the fertilizer solution before the pesticide.

AMIGO

Type of Adjuvant: Surfactant.
Chemical Composition: 30% phosphate ester surfactant.
Registered Uses: For use with SELECT and SELECT tank-mixes.
Benefit: Improves chemical effectiveness under varying environmental conditions.
Mode of Action: Improves spreading of spray droplets on the leaf surface and increases contact area. Enhances penetration of herbicide through the leaf cuticle layer.
Mixing: Half-fill spray tank with water and start agitation. Add the correct amount of herbicide, agitate and then add the correct amount of AMIGO with the remaining water. Continue to agitate.

AQUASOFT

Type of Adjuvant: Water conditioning agent.
Chemical Composition: Proprietary blend of hydroxy carboxylic acid, phosphoric acids and ammonium sulfate polyacrylic acid 63%.
Benefit: Eliminates hard water antagonism as well as formulation instability due to high pH.
Mode of Action: Conditions water by sequestering and chelating hard water ions and reducing the pH.
Mixing: 100–750 mL/100 L of spray solution, depending on water hardness. Always check compatibility with a jar test.

AQUA-STABLE

Type of Adjuvant: Buffering agent.
Chemical Composition: Aliphatic polycarboxylate and calcium chloride 28%.
Benefit: Lowers the pH of the spray water and reduces pesticide breakdown from alkaline spray solutions.
Mode of Action: Acidifies and buffers spray solution.
Mixing: 60–250 mL/100 L of spray solution, depending on the alkalinity.

ASSIST OIL CONCENTRATE

Type of Adjuvant: Mineral oil/surfactant (non-herbicidal).
Chemical Composition: 83% paraffin base mineral oil plus 17% surfactant blend.
Registered Uses: ASSIST OIL CONCENTRATE is registered for use with BASAGRAN, BLAZER, IMPACT, POAST and atrazine.
Benefit: Using ASSIST results in improved postemergence activity and a greater degree of consistency under varying environmental conditions. ASSIST also aids in providing a faster weed kill.
Mode of Action: Reduces the evaporation of spray droplets on the leaf surface leading to a longer period for penetration. Improves penetration through the leaf cuticle layer. ASSIST also aids in spreading a spray droplet on the leaf surface so that it covers a greater surface area.
Mixing: Half-fill the spray tank with water and begin agitation. Add the desired amount of herbicide and continue filling. Add ASSIST last. After filling, continue agitation. Agitate thoroughly after any stoppage in spraying.
Unique Characteristics: May cause increased temporary topical burn to crop plants under hot, humid weather conditions.

BREAKER

Type of Adjuvant: Antifoamer/defoamer.
Registered Uses: To reduce foaming when preparing herbicide spray mixes.
Benefit: Small quantities of BREAKER added before adding herbicides will prevent foam from forming.
Mixing: Add 7 mL/500 L of spray mix.
Unique Characteristics: Can be added after foam has formed but more time will be required to eliminate the foam.

CHOICE

Type of Adjuvant: Water conditioning agent.
Chemical Composition: Blend of polyacrylic, hydroxy carboxylic, propionic acids, phosphate ester and ammonium sulfate.
Benefit: Eliminates hard water antagonism and instrability due to high pH.
Mode of Action: Conditions water by sequestering or chelating hard water ions and by the reduction in pH.
Mixing: 2.5–7.5 L/1,000 mL water.

CITOWETT PLUS

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Ocylphenoxy-polyethoxy ethanol 50%.
Registered Uses: For use with atrazine, BASAGRAN, TELAR, MUSTER, REFINE, PINNACLE and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a spreading and sticking agent that improves coverage of spray mixes.

COMPANION

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Octylphenoxy-polyethoxy-(9)-ethanol 70%.
Registered Uses: Glyphosate, TELAR, MUSTER and other products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.
Mixing: With glyphosate, for the control of annual grasses and broadleaf weeds, add 450 mL of COMPANION in 50–100 L of water/ha. With TELAR, add 100 mL of COMPANION to 100 L of water for the control of broadleaf weeds. Use constant agitation.
Unique Characteristics: Do not exceed the labelled rates of COMPANION as too much may reduce the effectiveness of the herbicide due to excessive run-off.

CONTACT

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol at 900 g/L.
Registered Uses: For use with glyphosate*. TELAR, REFINE, MUSTER and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a spreading and sticking agent that improves coverage of spray mixes.

CRIMSON

Type of Adjuvant: Water conditioning agent.
Chemical Composition: 50%: Ammonium Sulphate (AMS), and proprietary blend of water conditioning, coupling, and antifoam agents. 50%: Other Constituents.
Benefit: Many spray waters contain calcium, iron, potassium, sodium, and magnesium ions that tie up (antagonize) herbicide active ingredients such as glyphosate and glufosinate. Micronutrients also can antagonize glyphosate. AMS conditions the water to prevent hard-water and micronutrient antagonism.
Mixing: 1–1.5 L/100 L water.

DIALED-IN

Type of Adjuvant: Deposition aid and drift control agent.
Chemical Composition: 100%: proprietary blend.
Benefit: Dialed-In will reduce the amount of spray droplets that have a high potential to move off target in ground applications when applied through nozzles that are classified to produce extremely course and ultra course droplet spectrums.
Mixing: Use at a rate of 0.5% v/v.

DRIFT-CONTROL AGENTS

See DIALED-IN, VALID.

ENHANCE NON-IONIC SPRAY ADJUVANT

Type of Adjuvant: Non-ionic multipurpose adjuvant.
Chemical Composition: Triglyceride Ethoxylate 80%.
Registered Uses: ENHANCE can be used with glyphosate (numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario,* for a complete list of products), REGLONE, PURSUIT, ACCENT, ULTIM, REFINE and a wide range of other products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: ENHANCE works by several modes of action which results in improving wetting, spreading and penetrative properties.
Mixing: Use 200–2,500 mL/1,000 L of water as specified on label. Will mix with all types of water (i.e., hard and soft). Add AGRAL 90 to the spray mixture and agitate thoroughly. For use with ROUDNUP and other glyphosate products use 350 mL/50–100 L for quackgrass, minimum or zero tillage seeding and summerfallow uses. Use 500 mL/100 L for quackgrass for water volume of 150–300 L/ha.
Unique Characteristics: ENHANCE contains no nonylphenoxy polyethoxy ethanol (NPE's). Do not exceed labelled rates of ENHANCE as this may cause run-off.

FIGHTER F

Type of Adjuvant: Antifoamer/defoamer.
Chemical Composition: Dimethyl-polysiloxane 10%.
Registered Uses: To control foam in water, oil, fertilizer and pesticide spray mixtures.
Benefit: Controls foam when mixing sprays, eliminates material waste, provides more accurate metering of agricultural sprays, and eliminates foam overflow at fill site.
Mixing: To control foam when mixing spray solution, add defoamer either just before or during addition of any other spray adjuvant. To cut existing foam, add defoamer to tank and recirculate solution until foam dissipates.

FLAT-OUT

Type of Adjuvant: Antifoamer/defoamer.
Chemical Composition: Dimethylpolysiloxane 20% Silicone base neutral.
Registered Uses: To control foam formation or existing foam, use as premix or add while spray tank is being filled.
Benefit: The reduction of foam allows for faster tank fill, ensures fill volumes are correct and reduces the possibility of chemical overflow, therefore more accurate application. It also makes the cleaning process easier.
Mixing: Add 5–10 mL/100 L of solution. Adjust the amount required according to individual conditions. May be used before mixing to prevent foam, or after to cut foam. May be used with any herbicide unless contra-indicated on the label.

HALT

Type of Adjuvant: Defoamer.
Chemical Composition: Silicone base, neutral.
Registered Uses: To reduce foaming when preparing herbicide spray mixes.
Benefit: The reduction of foaming allows faster tank fill-ups, ensures correct fill volumes, reduces the possibility of chemical overflow and gives more accurate herbicide application.
Mixing: Add 7 mL/500 L of spray mix. May be added to spray tank during filling to prevent foaming, or after to cut foam.
Unique Characteristics: May be used with any herbicide unless otherwise stated on the product label.

HASTEN NT

Type of Adjuvant: Non-ionic esterified vegetable oil.
Chemical Composition: Methyl and ethyl oleate 71.44%.
Registered Uses: For use with REFINE SG, ESCORT, TELAR and other herbicides as labelled.
Benefit: Improves herbicide uptake.
Mixing: Use 5 L/1,000 L of spray solution.

HIACTIVATE

Type of Adjuvant: Non-ionic liquid spreader/activator.
Chemical Composition: Alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol; 900g/L.
Registered Uses: For use with PURSUIT, ACCENT, ASSURE II, ULTIM, REGLONE and other products as labelled.
Benefit: Improves spray chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixtures.
Mixing: Make sure the spray tank is thoroughly cleaned before mixing. Fill the spray tank half full with water. Add the required amount of herbicide as directed by its label with the agitator running. Ensure that the herbicide is completely mixed before proceeding to the next step. Slowly add the HIACTIVATE, agitating during the entire process. Continue to agitate while filling the tank with water and agitate before and during each application to ensure a uniform spray.
Unique Characteristics: Do not exceed labelled rates of HIACTIVATE, as too much may reduce the effectiveness of the herbicide due to excessive run-off. Consult product label for full directions.

ICON

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 90%.
Registered Uses: For use with REGLONE, glyphosate, REFLEX and other control products as labelled. Also used for washing sprayer tanks and equipment.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.
Mixing: Use 2,000–2,500 mL/1,000 L of water as specified on label. Will mix with all types of water. Add ICON to the spray mixture and agitate thoroughly. With glyphosate, use 350 mL/50–100 L water if targeting quackgrass in minimum or zero tillage seeding and summerfallow uses. Use 500 mL/100 L for quackgrass when water volumes are high (i.e., 150–300 L/ha).
Unique Characteristics: Do not exceed the labelled rates of ICON as too much wetting agent can lead to loss of spray due to excessive run-off.

INDEX

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol at 900 g/L
Registered Uses: For use with ASSURE, PURSUIT, ULTIM, ACCENT and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a spreading and sticking agent that improves coverage of spray mixes.

IN-SIGHT

Type of Adjuvant: Foam marker dye.
Active Ingredients: Dye, surfactants, and coupling agents.
Uses: As a colour dye marker for foam markers and as a dye marking agent for turf applications.
Benefit: Allows foam marking systems to show up under poor visibility conditions of low light, heavy trash, no-till, snow or fog.
Mixing: Use 15–30 mL/100 L of spray solution.

INTERLOCK

Type of Adjuvant: Deposition aid and drift control agent.
Chemical Composition: 100%: modified vegetable oil and emulsifiers.
Benefit: InterLock is a spray adjuvant designed to improve deposition of the spray application onto the intended target. InterLock improves coverage and reduces drift and evaporation of pesticides being applied by ground or air.
Mixing: Use 200–300 mL/ha (80–120 mL/acre), do not add at a rate that exceeds 1% of the finished spray solution.

IPCO AG-SURF

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 92%.
Registered Uses: For use with REGLONE, glyphosate (numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario,* for a complete list of products) and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.

LI700

Type of Adjuvant: Non-ionic surfactant and pH adjuster/acidifier.
Chemical Composition: Phosphatidylcholine, methylacetic acid and alkyl polyoxyethylene ether 80%.
Registered Uses: REGLONE and for use with glyphosate products. LI700 neutralizes or slightly acidifies the spray solution and prevents the breakdown hydrolysis of pH-sensitive products in the spray tank. Add LI700 before adding the pesticide.
Benefit: Improves chemical effectiveness.
Mixing: As a penetrating surfactant: Use 5 L/1,000 L of water or 500 mL/100 L of water. As a pH adjuster/acidifier: Highly alkaline water, (pH 8 or higher). Use: 625 mL–1.25 L/1,000 L water mixture.

MERGE, MERGE 1

Type of Adjuvant: Surfactant/solvent.
Chemical Composition: 50% surfactant blend plus 50% solvent (petroleum hydrocarbons).
Registered Uses: For use with ERAGON LQ, IMPACT, POAST ULTRA and other products as labelled.
Benefit: Improves chemical effectiveness and provides a greater degree of consistency under varying environmental conditions.
Mode of Action: Improves spreading of spray droplets on the leaf surface and increases contact surface area. Improves penetration of herbicide through the leaf cuticle layer. Acts as a protectant against photodegradation of POAST ULTRA by UV light.
Mixing: Half-fill spray tank with water, start agitation. Add required amount of herbicide and continue agitation. Add MERGE, along with remaining water, last to the tank. Agitate thoroughly after any stoppage in spraying.
Unique Characteristics: May cause temporary topical burn to crop plants under hot, humid weather conditions.

N TANK

Type of Adjuvant: Water conditioning and compatibility agent.
Chemical Composition: A blend of monocarbamide dihydrogen sulphate, amine phosphates and viscosity reducing agents at 81%.
Benefit: Eliminates hard water antagonism. Prevents loss of herbicide activity that can occur when certain micronutrients are tank-mixed with glyphosate.
Mode of Action: Conditions water by sequestering and chelating hard water ions and added miconutrients.
Mixing: Add 0.25–1 L per 100 L spray solution prior to the addition of micronutirents and certain pesticides, the exception being sulphonylurea herbicides (e.g., ACCENT, PINNACLE SG) which should be added first and fully dissolved prior to adding N TANK. Always check mixing compatibility first with a jar test.

NUFARM AG-SURF

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 92%.
Registered Uses: For use with REGLONE, glyphosate (numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario,* for a complete list of products) and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.

PRO-SURF II

Type of Adjuvant: Non-ionic liquid spreader/activator.
Chemical Composition: Alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol; 900g/L.
Registered Uses: For use with PURSUIT, ACCENT, ASSURE II, ULTIM, and other products as labelled.
Benefit: Improves spray chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixtures.
Mixing: Make sure the spray tank is thoroughly cleaned before mixing. Fill the spray tank half full with water. Add the required amount of herbicide as directed by its label with the agitator running. Ensure that the herbicide is completely mixed before proceeding to the next step. Slowly add the PRO-SURF II, agitating during the entire process. Continue to agitate while filling the tank with water and agitate before and during each application to ensure a uniform spray.
Unique Characteristics: Do not exceed labelled rates of PRO-SURF II, as too much may reduce the effectiveness of the herbicide due to excessive run-off. Consult product label for full directions.

SENTRY

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 90%.
Registered Uses: For use with REGLONE, glyphosate and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.

SIDEKICK II

Type of Adjuvant: Non-ionic liquid spreader/activator.
Chemical Composition: Alkylarylpolyoxyethylene glycols, free fatty acids and isopropyl alcohol; 900 g/L.
Registered Uses: For use with PURSUIT, ACCENT, ASSURE II, ULTIM and other products as labelled.
Benefit: Improves spray chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixtures.
Mixing: Make sure the spray tank is thoroughly cleaned before mixing. Fill the spray tank half full with water. Add the required amount of herbicide as directed by its label with the agitator running. Ensure that the herbicide is completely mixed before proceeding to the next step. Slowly add the SIDEKICK II, agitating during the entire process. Continue to agitate while filling the tank with water and agitate before and during each application to insure a uniform spray.
Unique Characteristics: Do not exceed labelled rates of SIDEKICK II, as too much may reduce the effectiveness of the herbicide due to excessive run-off. Consult product label for full directions.

SUFFIX

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 90%.
Registered Uses: For use with REGLONE, glyphosate (numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario,* for a complete list of products) and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.

SUPER SPREADER

Type of Adjuvant: Non-ionic spreader sticker surfactant.
Chemical Composition: Octyl phenoxypoly ethoxy ethanol 50%.
Registered Uses: For use with ACCENT, atrazine, BASAGRAN, MUSTER, PINNACLE, TELAR, PRISM, PYRAMIN FL, REFLEX, ULTIM and other products as labelled.
Benefit: Improves postemergence control of weeds that have reached their upper limit in size for susceptibility.
Mode of Action: Causes the spray mix to form a continuous film on leaf surfaces; also makes herbicide more rainfast.
Mixing: Use 1–2.5 L/ha. Half-fill tank with water; add herbicide with continuous agitation; complete filling of tank with water; add SUPER SPREADER with continuous agitation.
Unique Characteristics: Use the high rate (2.5 L/ha) with hard water.

SURE-MIX

Type of Adjuvant: Paraffinic petroleum oil/surfactant (non-herbicidal).
Chemical Composition: 60% Paraffinic petroleum oil plus 35.6% surfactant blend.
Registered Uses: SURE-MIX is registered for use with ASSURE II, and CLASSIC plus PINNACLE when tank-mixed with ASSURE II.
Benefit: The use of SURE-MIX results in improved activity of ASSURE II and a greater degree of consistency under varying environmental conditions.
Mode of Action: Reduces the evaporation of spray droplets from the leaf surface and decreases the surface tension of spray droplets thus improving penetration through the cuticle of leaf surfaces.
Mixing: Add the required amount of water to the spray tank with agitator running. Add ASSURE II and after well mixed add 5 L of SURE-MIX for each 1,000 L of spray solution.
Unique Characteristics: May cause some minor leaf speckling under hot and humid weather conditions.

TRAMLINE

Type of Adjuvant: Foam marker.
Chemical Composition: Nonionic and anionic surfactants, 35% + 65% alcohols and other constituents.
Benefit: Improves placement of herbicides by indicating area of field sprayed, preventing overlaps and misses.
Mixing: Depending on water hardness and mineral content mix 0.63–1 L/100 L of water.

TREKKER TRAX

Type of Adjuvant: Foam marker.
Chemical Composition: 24% alcohols and 30% mixed anionic and nonionic surfactants.
Benefit: Improves placement of herbicides by indicating area of field sprayed.
Mixing: Add 1–2 L of Trekker Trax to 100–150 L water. Use the higher rate of product if mixing with hard water.

TURBOCHARGE

Type of Adjuvant: Surfactant/solvent.
Chemical Composition: 39.5% surfactant blend plus 50% solvent (mineral oil).
Registered Uses: For use with ACHIEVE 40 DG herbicide.
Benefit: Improves chemical effectiveness and provides a greater degree of consistency under varying environmental conditions.
Mode of Action: Improves spreading of spray droplets on the leaf surface and increases contact surface area. Improves penetration of herbicide through the leaf cuticle layer.
Mixing: Half-fill spray tank with water, start agitation. Add required amount of herbicide and continue agitation. Add TURBOCHARGE along with remaining water last to the tank. Agitate thoroughly after any stoppage in spraying. Use at a rate of 0.5 L TURBOCHARGE/100 L of spray mixture. If tank-mixing with other herbicides, always add the TURBOCHARGE last.

UNITE

Type of Adjuvant: Compatibility agent.
Chemical Composition: 83.7% acid polyglycols and methyl alcohol.
Benefit: Improves the compatibility of liquid fertilizer-pesticide mixtures.
Mixing: 240–1,420 mL/378.5 L. Perform a test of physical compatibility of various pesticides and fertilizer mixtures in a small quantity to determine the exact amount of UNITE and the mixing method to be used.

VALID

Type of Adjuvant: Deposition and drift reduction agent, antifoam-defoamer.
Chemical Composition: Lecithin, emulsifiers, glycols and dimethylpolysiloxane defoamer.
Benefit: Small quantities of VALID added before adding pesticides will prevent foam from forming. Adding VALID to the spray tank will also reduce the production of fine spray droplets that may drift.
Mixing: Mix 125 mL/100 L of spray mixture.

WATER CONDITIONING AGENTS

See AQUASOFT, CHOICE and N TANK.

WEEDAWAY AG-SURF

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Nonylphenoxy polyethyoxyethanol 92%.
Registered Uses: For use with REGLONE, glyphosate (numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario,* for a complete list of products) and other control products as labelled.
Benefit: Improves chemical effectiveness.
Mode of Action: It is a wetting and spreading agent that improves coverage of spray mixes.

X-ACT

Type of Adjuvant: Surfactant.
Chemical Composition: 30% phosphate ester surfactant.
Registered Uses: For use with ARROW and ARROW tank-mixes.
Benefit: Improves chemical effectiveness under varying environmental conditions.
Mode of Action: Improves spreading of spray droplets on the leaf surface and increases contact area. Enhances penetration of herbicide through the leaf cuticle layer.
Mixing: Half-fill spray tank with water and start agitation. Add the correct amount of herbicide, agitate and then add the correct amount of MANA X-ACT with the remaining water. Continue to agitate.

XA OIL CONCENTRATE

Type of Adjuvant: Mineral oil/surfactant (non-herbicidal).
Chemical Composition: 83% paraffin-base mineral oil plus 17% surfactant blend.
Registered Uses: atrazine, YUMA GL, BASAGRAN and other products as labelled.
Benefit: May result in improved postemergence activity.
Mode of Action: Reduces the evaporation of spray droplets from the leaf surface and decreases the surface tension of spray droplets, thus improving the penetration through the cuticle of leaf surfaces.

XIAMATER OFX-0309

Type of Adjuvant: Non-ionic surfactant.
Chemical Composition: Siloxylated polyether 76% + surfactant mixture 24%.
Registered Uses: For use with PURSUIT on soybeans for annual broadleaf and grass control; and glyphosate for quackgrass control and annual broadleaf weed control in summer fallow; and with TORDON 101 for faster burndown of coniferous species on right-of-ways, Basagran on soybeans, Vision Silviculture and Vision Max Silviculture, Vantage Forestry, Ranman 400 SC, Fulfill 50 WG.
Benefits: Improves chemical effectiveness by increasing the amount and rate of uptake of water-soluble herbicides.
Mixing: Use 2.5 L/1,000 L of spray solution for most applications; add this amount last to the spray tank after the herbicide has been thoroughly mixed. Apply the spray solution as soon as possible after mixing.
Unique Characteristics: This organosilicone formulation has lowest surface tension of any adjuvant available.

ZAP

Type of Adjuvant: Antifoamer/defoamer.
Chemical Composition: Proprietary blend of ingredients.
Registered Uses: To control foam formation or existing foam Use as premix or add while spray tank is being filled. For agricultural/industrial uses.
Benefit: The reduction of foam allows for faster tank fill, ensures fill volumes are correct and reduces the possibility of chemical overflow. It also makes the cleaning process easier.
Mixing: Add 2–5 mL/100 L of solution. Adjust the amount required according to individual conditions. May be used before mixing to prevent foam, or after to cut foam. May be used with any herbicide unless contra-indicated on the label. Is particularly effective with glyphosate products, which often foam in solution.

6. PREPLANT & POSTHARVEST WEED CONTROL

TABLE 6–1. Herbicides Available for Preplant Site Preparation

LEGEND: ✓= Registered for use as a preplant application prior to this crop. x = not indicated for use on this crop
* = Numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario* for a complete list of products.

CROP	2,4-D Ester	AIM	BLACKHAWK	dicamba*	ELEVORE	ENLIST DUO	ERAGON LQ	EXPRESS SG	glyphosate*	PARDNER
Field Crops										
adzuki bean	x	✓	x	x	x	x	x	x	✓	x
alfalfa	x	x	x	x	x	x	x	x	✓	x
barley	✓	✓	✓	✓	x	✓	✓	✓	✓	✓
canola	x	✓	x	x	x	x	x	x	✓	✓
corn (conventional)	x	✓	✓	✓	✓	✓	✓	x	✓	x
corn (Enlist Duo)	x	✓	✓	✓	✓	✓	✓	x	✓	x
corn (Liberty Link)	x	✓	✓	✓	✓	✓	✓	x	✓	x
Corn (Roundup Ready)	x	✓	✓	✓	✓	✓	✓	x	✓	x
dry beans (Phaselous spp.)	x	✓	x	x	x	x	x	✓	✓	x
flax	x	✓	x	x	x	x	x	x	✓	x
mustard	x	✓	x	x	x	x	x	x	✓	x
oats	x	✓	✓	✓	x	x	✓	✓	✓	x
peas (field)	x	x	x	x	x	x	x	✓	✓	x
rye	✓	✓	✓	✓	x	✓	x	x	✓	x
sorghum and millet	x	✓	x	x	x	x	x	x	✓	x
soybeans (conventional)	✓	✓	✓	x	✓	x	✓	✓	✓	x
soybeans (Enlist Duo)	✓	✓	✓	x	✓	✓	✓	✓	✓	x
soybeans (Liberty Link)	✓	✓	✓	x	✓	x	✓	✓	✓	x
soybeans (Roundup Ready)	✓	✓	✓	x	✓	x	✓	✓	✓	x
soybeans (Xtend)	✓	✓	✓	✓	x	x	✓	✓	✓	x
sunflower	x	✓	x	x	x	x	x	x	✓	x
wheat	✓	✓	✓	✓	x	✓	✓	✓	✓	✓

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 6–2. Preplant Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings ✓ = species is controlled if emerged x = species is NOT controlled – = insufficient information available to make a rating

		Annuals		Volunteer Crops				Glyphosate resistant				Perennials													
Trade Name	**WSSA group(s)**	**annual grasses**	**annual broadleaves**	**alfalfa**	**camola**	**cereals**	**red clover**	**Canada fleabane**	**ragweed, common**	**ragweed, giant**	**waterhemp**	**bindweed, field**	**chickweed, mouse-eared**	**dandelion**	**goldenrod**	**ground-ivy (creeping charlie)**	**horsetail**	**mallow**	**milkweed**	**nutsedge**	**plantains**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**vetches**
Preplant Herbicides																									
2,4-D ESTER 700[4]	4	x	✓	9	8	0	6	6	8	9	8	–	3	6	–	–	–	–	–	0	8	0	7[3]	8[3]	7
AIM EC	14	x	✓	0	8	0	0	0	–	–	8	–	–	–	–	–	–	8	–	0	–	0	–	–	–
BLACKHAWK	4,14	x	✓	9	8	0	6	6	8	9	8	–	–	6	–	–	–	8	–	0	8	0	7[3]	7[3]	–
dicamba[4]	4	x	✓	9	4	0	9	9	8	8	8	8[5]	–	–	–	–	–	–	–	0	–	0	8[5]	8[5]	8[5]
ELEVORE	4	x	✓	7	8	0	7	7	8	–	–	–	–	–	–	–	–	–	–	0	–	0	–	–	–
ENLIST DUO	4,9	✓	✓	9	8	9	6	5	8	9	8	8[5]	9	8	–	–	8	8[5]	8[5]	8[5]	8	9	8[5]	8[5]	8[5]
ERAGON LQ[1]	14	x	✓	3	8	1	3	8	8	6	4	✓[1]	9	7[2]	–	–	✓[3]	–	✓[1]	–	–	0	✓[3]	✓[3]	✓[3]
EXPRESS SG[4] + glyphosate	2 + 9	✓	✓	–	9	9	–	–	–	–	–	–	9	8	–	–	–	–	–	–	–	8[1,5]	8[1,2,5]	8[1,5]	–
glyphosate[4]	9	✓	✓	9[6]	9[6]	9	8	0	0	0	0	8[1,5]	9	8[2]	–	5	0	5	8[1,5]	8[1,2,5]	9	8[1,5]	8[1,2,5]	8[1,5]	5
PARDNER	6	x	✓	0	8	0	0	6	8	6	–	–	–	–	–	–	–	–	–	0	–	0	–	–	–

[1] Optimum growth stages for best control of these weeds will not likely be attained prior to planting in early to mid spring.
[2] Use the 3.33 L/ha (1.34 L/acre) of glyphosate (540 g/L) for plants over 15 cm tall or across.
[3] Top growth only, regrowth can be expected.
[4] Numerous products exist. Refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
[5] Repeated applications may be necessary.
[6] Will not control glyphosate tolerant varieties.

TABLE 6–3. Specific Notes on Weeds Controlled and Product Rates Associated with Various Glyphosate Concentrations

LEGEND: * = Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.

Glyphosate* Concentration	Product Rate/ha (/acre)	Weeds Controlled & Notes
360 g/L	0.75–3.5 L/ha (0.3–1.4 L/acre)	• For control of **annual weeds**. • Apply in 50–100 L/ha (20–40 L/acre) of water, or use surfactant with larger water volumes. • The highest rate is required for weeds over 15 cm in height. • For weeds smaller than 15 cm in height consult the product label for weed specific rates. • For actively growing weeds in the fall, or spring prior to emergence of any crop. • Allow 5–7 days translocation time after application before doing any tillage when conditions are good. If cool temperatures follow application, allow additional time for translocation to be completed before disturbing treated weeds. • Only weeds emerged at application time will be controlled.
450 g/L	0.6–2.8 L/ha (0.24–1.12 L/acre)	
480 g/L	0.55–2.6 L/ha (0.22–1.05 L/acre)	
500 g/L	0.55–2.5 L/ha (0.22–1 L/acre)	
540 g/L	0.5–2.3 L/ha (0.2–0.93 L/acre)	
360 g/L	2.5–7 L/ha (1–2.8 L/acre)	• For **dandelions**, **quackgrass** and other perennial weeds. • Apply when quackgrass has 3–4 new leaves. The low rate will provide a minimum of one season control while higher rates will provide longer term control of quackgrass. • For dandelions, apply the low rate when less than than 15 cm in diameter and higher rates if greater than 15 cm in diameter.
450 g/L	2–5.6 L/ha (0.8–2.25 L/acre)	
480 g/L	1.88–5.25 L/ha (0.75–2.1 L/acre)	
500 g/L	1.8–5 L/ha (0.72–2 L/acre)	
540 g/L	1.67–4.68 L/ha (0.67–1.87 L/acre)	

TABLE 6–4. Herbicide Treatment Rates for Preplant Weed Control

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant – Site Preparation Prior To Crop Emergence			
2,4-D (528 g/ha)	2,4-D ESTER 700 (660 g/L)	soybean: 0.8 L/ha (0.32 L/acre) cereals: 0.8–1.1 L/ha (0.32–0.44 L/acre)	• Apply a minimum of 7 days before planting soybean. • Apply to emerged giant ragweed. This treatment will not provide residual control of giant ragweed. • Do NOT use in sandy soils with less than 1% organic matter. Plant soybean seeds as deep as possible, but not less than 2.5 cm (1 in.). Adjust planter to ensure adequate coverage of planted seed. • University of Guelph research has demonstrated that the addition of metribuzin at 412.5 g a.i./ha improves the consistency of glyphosate resistant Canada fleabane control in soybean.
carfentrazone-ethyl (8.9–28 g/ha) + non-ionic surfactant (0.25% v/v)	AIM EC (240 g/L) + AGRAL 90	37–117 mL/ha (5–47 mL/acre) + 2.5 L/1,000 L	• Apply to actively growing weed up to 10 cm tall. • Coverage of the weeds is essential for good control.
	AIM EC (240 g/L) + AG-SURF		
carfentrazone-ethyl (8.9–28 g/ha) + surfactant/solvent (0.1 % v/v)	AIM EC (240 g/L) + MERGE	37–117 mL/ha (5–47 mL/acre) + 1 L/1,000 L	
pyraflufen-ethyl (6.1 g/L) (6.71 g/ha) /2,4-D ester (473 g/L) (520 g/ha)	BLACKHAWK	1.1 L/ha (440 mL/acre)	• CEREALS: Can be applied prior to or after planting but before crop emergence, with the exception of oats, where BLACKHAWK must be applied a minimum of 7 days before planting. • CORN: Can be applied prior to or after planting but before crop emergence. • SOYBEANS: Apply a maximum of 3 days after planting soybean. • For best results apply to emerged, young, actively growing weeds that are less than 10 cm tall or across. Thorough coverage of target weeds is essential. • Tank-mix with glyphosate to control a broader spectrum of emerged weeds. • Do NOT graze or cut treated crops for forage or hay until 30 days after application. • University of Guelph research has demonstrated that the addition of metribuzin at 412.5 g a.i./ha improves the consistency of glyphosate resistant Canada fleabane control in soybean
dicamba (0.288-0.6 kg/ha)	ENGENIA (600 g/L)	0.48–1 L/ha (190–400 mL/acre)	• Dicamba + glyphosate may be applied to emerged annual grass and annual broadleaf weeds in reduced tillage systems prior to seeding of wheat, barley, rye, oats, and field corn only. • Do not apply prior to seeding sweet corn. For field corn, apply to medium to fine textured soils containing more than 2.5% organic matter. Do NOT use on sandy or sandy loam soil.
	FEXIPAN (350 g/L)	0.82–1.71 L/ha (330–0.69L/acre)	
	XTENDIMAX (350 g/L)		
halauxifen (5 g/ha)	ELEVORE (68.5 g/L) + methylated seed oil	73 mL/ha (29 mL/acre) 5–10 L/1,000 L	• Apply a minimum of 7 days before planting corn and soybeans and when weeds are actively growing at the 1–8 leaf stage. Plant to a minimum of 4 cm deep. • Applications made to very coarse-textured soils, low in organic matter (<3%) , or in fields with poor soil condtions may increase the risk of crop injury. • Use the higher rate of methylated seed oil when weed populations are high or environmental conditions are unfavourable. • ELEVORE only controls weeds emerged at the time of application. University of Guelph research has demonstrated that the addition of metribuzin at 412.5 g a.i./ha improves the consistency of glyphosate resistant Canada fleabane control in soybean.

TABLE 6–4. Herbicide Treatment Rates for Preplant Weed Control (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant – Site Preparation Prior To Crop Emergence (cont'd)			
2,4-D choline/ glyphosate (2,4-D: 427–640 g/ha) (glyphosate: 449–673 g/ha)	ENLIST DUO (194/204 g/L)	2.2–3.3 L/ha (0.88–1.32 L/acre)	• Apply before or after planting but before emergence of wheat, barley, rye and field corn. • Can be applied before and after the emergence of Enlist soybean varieties only. • The low rate controls sensitive weeds up to 8 cm in height. • The high rate controls sensitive weeds up to 15 cm in height. • University of Guelph research has demonstrated that the addition of metribuzin at 412.5 g a.i./ha improves the consistency of glyphosate resistant Canada fleabane control in soybean.
saflufenacil (25.2–49.7–101.1 g/ha) + glyphosate (0.9 kg/ha) + MERGE (1 L/ha)	ERAGON LQ + glyphosate (360 g/L) + MERGE	73–145–295 mL/ha (29.5–58–118 mL/acre) +2.5 L/ha (1 L/acre) + 1 L/ha (0.4 L/acre)	• SOYBEANS: **Do NOT** apply more than the 36 g/ha (14.6 g/acre) rate of ERAGON or the 73 mL/ha (29.5 mL/acre) of ERAGON LQ. Apply as a surface application up to 21 days before planting. University of Guelph research has demonstrated that the addition of metribuzin at 412.5 g a.i./ha improves the consistency of glyphosate resistant Canada fleabane control in soybean. • CEREALS: **Do NOT** apply more than the 145 mL/ha (58 mL/acre) of ERAGON LQ. • CORN: Apply between 145 mL/ha (58 mL/acre) and 295 mL/ha (118 mL/acre) of ERAGON LQ. Apply before crop emergence. The low rate will only provide limited residual weed control.
tribenuron-methyl (7.5 g/ha) + glyphosate (450 g/ha)	EXPRESS SG (50%) + glyphosate (540 g/L)*	15 g/ha (6 g/acre) + 0.83 L/ha (0.33 L/acre)	• Apply as a PP burndown a minimum of 1 day prior to planting. • Apply in a total spray volume of 55–110 L/ha (22–44 L/acre). • EXPRESS SG will not provide residual weed control, but will enhance control of certain broadleaf weeds, allowing for a lower rate of glyphosate to be used. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
glyphosate (0.27–4.32 kg/ha)	glyphosate*	Refer to Table 6–3.	• For specific information on product rate and notes for annual and perennial weed control, refer to Table 6–3. Specific Notes on Weeds Controlled and Product Rates Associated with Various Glyphosate Concentrations. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
bromoxynil (288 – 336 g/ha)	PARDNER (280 g/L)	1–1.2 L/ha (0.4–0.48 L/acre)	• Application can be made up to one day prior to seeding. DO NOT apply after seeding or crop emergence. • Apply at 1.0–1.25 L/ha (0.4–0.5 L/acre) tank-mixed with glyphosate (540 g/L) at 0.83–3.3 L/ha (0.33–1.32 L/acre). Under adverse growing conditions or heavy weed populations use of the higher recommended rate will improve control. PARDNER should be added to the spray tank first, then add glyphosate. Refer to the glyphosate label for the appropriate glyphosate use rate, precautions, mixing instructions and other use instructions.

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 6–5. Postharvest Weed Control Ratings

LEGEND: – = insufficient information available to make a rating
** = Use higher rates for weeds larger than 15 cm tall or across.
* = Various products available, see Table 4–1. Herbicides Used in Ontario

		Grasses			Perennial Broadleaf Weeds											
Treatment	**WSSA GROUP**	**quackgrass**	**volunteer wheat**	**wire stem muhly**	**alfalfa**	**bindweed, field**	**chickweed, mouse-eared**	**coltsfoot**	**clover, red**	**dandelion**	**hemp dogbane**	**milkweed**	**ground cherry**	**thistle, Canada**	**sow-thistle**	**vetch**
Postharvest Herbicides																
glyphosate*	9	9	9	9	9	9	9	8	8	8/9**	8	8	7	9	9	5
2,4-D*	4	0	0	0	9	7	2	–	5	7	–	0	–	6	7	7
BLACKHAWK	4, 14	0	0	0	9	7	2	–	5	7	–	0	–	7	7	7
ENGENIA, FEXAPAN or XTENDIMAX	4	0	0	0	9	8	9	7	9	8	8	7	6	8	9	8
DISTINCT 70WG	19, 4	0	0	0	–	8	9	7	9	8	8	7	6	8	9	8
LONTREL XC	4	0	0	0	9	–	–	–	9	–	–	–	–	9	9	9

TABLE 6–6. Specific Notes on Weeds Controlled and Product Rates Associated with Various Glyphosate Concentrations

LEGEND: * = Numerous products exist, refer to Table 4–1. *Herbicides Used in Ontario* for a complete list of products.

Glyphosate* Concentration	Product Rate/ha (/acre)	Weeds Controlled & Notes
360 g/L	0.75–3.5 L/ha (0.3–1.4 L/acre)	• For control of **annual weeds.** • Apply in 50–100 L/ha (20–40 L/acre) of water, or use surfactant with larger water volumes. • The highest rate is required for weeds over 15 cm in height. • For weeds smaller than 15 cm in height consult the product label for weed specific rates. • For actively growing weeds in the fall, or spring prior to emergence of any crop. • Allow 5–7 days translocation time after application before doing any tillage when conditions are good. If cool temperatures follow application, allow additional time for translocation to be completed before disturbing treated weeds. • Only weeds emerged at application time will be controlled.
450 g/L	0.6–2.8 L/ha (0.24–1.12 L/acre)	
480 g/L	0.55–2.6 L/ha (0.22–1.05 L/acre)	
500 g/L	0.55–0.2.5 L/ha (0.22–1 L/acre)	
540 g/L	0.5–2.3 L/ha (0.2–0.93 L/acre)	
360 g/L	2.5–7 L/ha (1–2.8 L/acre)	• For **dandelions** and **quackgrass**. • Apply when **quackgrass** has 3–4 new leaves. • The low rate will provide a minimum of one season control while higher rates will provide longer term control of quackgrass. • For dandelions, apply the low rate if smaller than 15 cm in diameter and higher rates if greater than 15 cm in diameter.
450 g/L	2–5.6 L/ha (0.8–2.25 L/acre)	
480 g/L	1.88–5.25 L/ha (0.75–2.1 L/acre)	
500 g/L	1.8–5 L/ha (0.72–2 L/acre)	
540 g/L	1.67–4.68 L/ha (0.67–1.87 L/acre)	
360 g/L	7–12 L/ha (2.8–4.8 L/acre)	• For **perennial broadleaf weeds**. • **Canada thistle** and **sow-thistle** should be at least in early bud, milkweed at bud, bindweed at full flower and **dogbane** past full bloom for best results. • For undisturbed perennials (such as in sod or non-crop areas) use the highest rate and repeat when the plants re-grow to the optimum growth stages mentioned above.
450 g/L	5.6–9.6 L/ha (2.25–3.85 L/acre)	
480 g/L	5.25–9 L/ha (2.1–3.6 L/acre)	
500 g/L	5–8.75 L/ha (2–3.5 L/acre)	
540 g/L	4.68–8 L/ha (1.87–3.2 L/acre)	

TABLE 6–7. Herbicide Treatment Rates for Postharvest Weed Control

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postharvest Grass and Broadleaf Herbicides			
glyphosate (0.27–4.32 kg/ha)	glyphosate*	See Table 6–6.	· For specific information on product rate and notes for annual and perennial weed control, refer to Table 6–6. Specific Notes on Weeds Controlled and Product Rates Associated with Various Glyphosate Concentrations. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
Postharvest Broadleaf Herbicides			
2,4-D (0.85–1.655 kg/ha)	2,4-D ESTER 600* (564 g/L)	1.5–2.9 L/ha (0.6–1.16 L/acre)	· Apply in the fall at the time of rapid growth. · Use the higher rate for legumes and perennial weeds. · For best results apply to actively growing vegetation at least 2 weeks before a killing frost. • **Do NOT** apply before fall wheat or barley. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
	2,4-D ESTER 700* (660 g/L)	1.29–2.5 L/ha (0.52–1.0 L/acre)	
pyraflufen-ethyl (6.1 g/L) (6.71 g/ha) /2,4-D ester (473 g/L) (520 g/ha)	BLACKHAWK	1.1 L/ha (440 mL/acre)	· For best results apply to emerged, young, actively growing weeds that are less than 10 cm tall or across. Thorough coverage of target weeds is essential. · Tank-mix with glyphosate to control a broader spectrum of emerged weeds. · Do NOT graze or cut treated crops for forage or hay until 30 days after application.
dicamba (1.2 kg/ha)	ENGENIA (600 g/L)	2 L/ha (0.8 L/acre)	· Apply in the fall to actively growing vegetation at least 2 weeks prior to a killing frost. • **Do NOT** apply before fall seeded crops. · Only cereals, soybeans, field corn, sweet corn or white beans may be grown in the year after application.
	FEXAPAN (350 g/L)	3.43 L/ha (1.37 L/acre)	
	XTENDIMAX (350 g/L)		
clopyralid (150 g/ha)	LONTREL XC (600 g/L)	250 mL/ha (100 mL/acre)	· For the control of Canada thistle, scentless chamomile, common groundsel, wild buckwheat, volunteer alfalfa and perennial sow-thistle. · Legume crop species (alfalfa, dry beans, soybeans etc) are very sensitive to LONTREL XC carryover. Soybeans can be planted 10 months after application of LONTREL XC. Refer to Table 4–4 for more information.

TABLE 6–7. Herbicide Treatment Rates for Postharvest Weed Control (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postharvest Tank-mixes			
dicamba (0.6 kg/ha) + glyphosate (0.6 kg/ha) + non-ionic surfactant (0.35 L/ha)	ENGENIA (600 g/L) + glyphosate (540 g/L)* + non-ionic surfactant	1 L/ha (0.4 L/acre) + 1.11 L/ha (0.44 L/acre) + 0.35 L/ha (0.14 L/acre)	· Apply to actively growing vegetation at least 2 weeks prior to a killing frost. · For the control of red clover, volunteer cereals and annual broadleaf weeds. • **Do NOT** apply before fall seeded crops. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
	FEXAPAN (350 g/L) + glyphosate (540 g/L)* + non-ionic surfactant	1.71 L/ha (0.68 L/acre) + 1.11 L/ha (0.44 L/acre) + 0.35 L/ha (0.14 L/acre)	
	XTENDIMAX (350 g/L) + glyphosate (540 g/L)* + non-ionic surfactant		
diflufenzopyr/dicamba (100–200 g/ha) + glyphosate (900 g/ha) + surfactant/solvent	DISTINCT (70 WG) + glyphosate (540 g/L) + MERGE	143–285 g/ha (58–115 L/acre) + 1.34 L/ha (0.67 L/acre) + 0.5 L/ha (0.2 L/acre)	· Apply to actively growing vegetation at least 2 weeks prior to a killing frost. · For the control of red clover, volunteer cereals and annual broadleaf weeds. • **Do NOT** apply before fall seeded crops.
	DISTINCT (70 WG) + glyphosate (540 g/L) + a non-ionic surfactant	143–285 g/ha (58–115 L/acre) + 1.34 L/ha (0.67 L/acre) + 0.25% v/v	
Spot Treatments with Hand-Held Equipment			
glyphosate (0.36–0.72 kg/100 L)	glyphosate (360 g/L)*	1 L–2 L/100 L	· For actively growing weeds. Direct spray to avoid desirable vegetation. · Allow 5–7 days translocation time after application before doing any mowing or tillage when conditions are good. If cool temperatures follow application, allow additional time for translocation to be completed before disturbing treated weeds. · Canada thistle and sow-thistle should be at least in early bud, milkweed at bud, bindweed at full flower, and dogbane past full bloom, and quackgrass with 3–4 new leaves for best results. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
	glyphosate (450 g/L)*	0.8–1.6 L/100 L	
	glyphosate (480 g/L)*	0.75–1.5 L/100 L	
	glyphosate (500 g/L)*	0.72–1.44 L/100 L	
	glyphosate (540 g/L)*	0.67–1.34 L/100 L	

TABLE 6–7. Herbicide Treatment Rates for Postharvest Weed Control (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Wick Wiper and Roller Application			
glyphosate (0.36 kg/2 L water)	glyphosate (360 g/L)*	1 L/2 L water	· Wick wiper applications for use on soybeans, white beans, apple, cherry, peach, pear, plum, grape, strawberries and cranberries. · Apply to weeds that extend above the crop sufficiently to allow good contact with the application equipment. • **Do NOT** contact the crop with the equipment or allow the chemical solution to drip from the applicator onto the crop. · A 33% herbicide mixture (1 L/2 L of water) provides good control of most weeds. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of products.
	or glyphosate (450 g/L)*	0.8 L/2 L water	
	or glyphosate (480 g/L)*	0.75 L/2 L water	
	or glyphosate (500 g/L)*	0.72 L/2 L water	
	or glyphosate (540 g/L)*	0.67 L/2 L water	

7. BEANS (ADZUKI, DRY COMMON, LIMA & SNAP)

NOTE: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold or poor application), the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 7–1. Herbicide Weed Control Ratings for Beans (Adzuki, Dry, Lima and Snap)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop
R = populations resistant to this herbicide treatment exist in Ontario and won't be adequately controlled if present.

		Crop Registrations										Annual Grasses								Annual Broadleaves																Perennials							
Trade Name	**WSSA GROUP**	**adzuki beans**	**black beans[1]**	**cranberry beans[1]**	**kidney beans[1]**	**lima beans**	**otebo beans[1]**	**pinto beans[1]**	**small red Mexican[1]**	**snap beans[1]**	**white beans[1]**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**proso millet**	**witchgrass**	**buckwheat, wild**	**chickweed**	**cocklebur**	**fleabane, Canada**	**lady's-thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preplant Incorporated Grass Herbicides																																									
DUAL II MAGNUM	15	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	9	8[2]	8	9	9	4	9	2	–	–	0	2	7	2	8[3]	7	4	3	2	6	0	0	0	8	0	0	0	G
EPTAM	8	x	✓	✓	✓	x	x	✓	x	✓	✓	9	9	8	9	9	9	7	9	4	–	–	0	7	7	5	7	7	5	3	5	–	–	–	0	8	5	–	–	E
FRONTIER MAX	15	x	✓	✓	✓	x	✓	✓	✓	✓	✓	9	9	8[2]	8	9	9	4	9	2	–	–	0	2	7	2	8[3]	7	4	3	2	6	0	0	0	8	0	0	0	G
PROWL H20	3	✓	x	x	✓	✓	x	x	x	✓	✓	9	9	9	8	8	8	5	–	–	9	–	–	–	7	–	–	8	–	–	–	7	–	–	–	–	–	–	–	E
TREFLAN, BONANZA 480, RIVAL EC or TRIFLUREX 40 EC	3	x	✓	x	✓	✓	x	x	x	x	✓	9	9	9	9	9	9	7	9	5	9	–	0	2	8	2	2	8	2	1	2	8	2	2	2	2	2	2	2	E
Preplant Incorporated Grass and Broadleaf Herbicides																																									
PURSUIT, PHANTOM or NU-IMAGE	2	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	8	7	7	9[R]	9[R]	9	7	8	8	9	7[R]	2	9	9[R]	9	9[R]	9[R]	7[R]	6[R]	9	2[R]	2	2	2	7	6	2	2	G

[1] Indicates a *Phaseolus vulgaris* dry common bean.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Use PPI timing for optimum control.
[5] Weeds cannot be emerged at the time of application to achieve this level of control.
* Numerous equivalents to this product exist, refer to Table 4–1. *Herbicides Used in Ontario* for a complete list of products.

TABLE 7–1. Herbicide Weed Control Ratings for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

LEGEND: Numbers (0–9) = weed control ratings Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor – = insufficient information available to make a rating
✓ = can be used on this crop x = not indicated for use on this crop
R = populations resistant to this herbicide treatment exist in Ontario and won't be adequately controlled if present.

		Crop Registrations										Annual Grasses								Annual Broadleaves													Perennials							
Trade Name	**WSSA GROUP**	**adzuki beans**	**black beans[1]**	**cranberry beans[1]**	**kidney beans[1]**	**lima beans**	**otebo beans[1]**	**pinto beans[1]**	**small red Mexican[1]**	**snap beans[1]**	**white beans[1]**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**proso millet**	**witchgrass**	**buckwheat, wild**	**chickweed**	**cocklebur**	**fleabane, Canada**	**lady's-thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preplant Incorporated Tank-Mixes																																						
DUAL II MAGNUM + PURSUIT (imazethapyr*)	15+2	x	✓	✓	✓	x	✓	✓	✓	✓	✓	9	9	8[2]	9	9	9	7	9	8	9	7[R]	2	9	9[R]	9	9	9	7[R]	6[R]	9	6	–	–	–	8	7	–	–	E
EPTAM + TREFLAN (trifluralin*)	8+3	x	x	x	✓	x	x	x	x	x	✓	9	9	9	9	9	9	7	9	5	9	–	5	7	8	5	7	8	5	3	5	8	–	–	–	8	7	–	–	E
EPTAM + PERMIT	8+2	x	x	x	✓	x	x	x	x	x	✓	9	9	8	9	9	9	7	9	5	8[2]	8[R]	8[R]	8	8[R]	8	7	8[R]	8[R]	8[R]	8[R]	–	6	6	7	9	–	–	–	E
FRONTIER MAX + PURSUIT	15+2	x	✓	✓	✓	x	✓	✓	✓	✓	✓	9	9	8[2]	9	9	9	7	9	8	9	7[R]	2	9	9[R]	9	9	9	7[R]	6[R]	9	6	–	–	–	8	7	–	–	E
PERMIT + TREFLAN (trifluralin*)	2+3	x	x	x	x	x	x	x	x	x	✓	9	9	9	9	9	9	7	9	5	8[2]	8[R]	8[R]	8	8	8	2	8[R]	8[R]	8[R]	8[R]		6	6	7	9	–	–	–	E
PURSUIT (imazethapyr*) + TREFLAN (trifluralin*)	2+3	x	x	x	x	x	x	x	x	x	✓	9	9	9	9	9	9	7	9	8	9	7[R]	5	9	9	9	9[R]	9	7[R]	6[R]	9	8	2	2	2	7	6	2	2	G
Preemergence Grass Herbicides																																						
DUAL II MAGNUM	15	x	✓	✓	✓	x	✓	✓	✓	x	✓	9	9	8[2]	8	9	9	4	9	2	0	0	0	2	7	2	8	7	4	3	2	6	0	0	0	7[4]	0	0	0	G
Preemergence Broadleaf Herbicides																																						
PERMIT	2	x	✓	✓	✓	x	✓	✓	✓	✓	✓	–	–	–	–	–	–	–	–	–	8[2]	8[R]	8[R]	8	8[R]	8	2	8[R]	8[R]	8[R]	8[R]	–	6	6	7	9	–	–	–	E
Preemergence Grass and Broadleaf Herbicides																																						
PURSUIT, PHANTOM or NU-IMAGE	2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	8	7	7	9[R]	9[R]	9	7	8	8	9	7[R]	2	9	9[R]	9	9[R]	9[R]	7[R]	6[R]	9	2[R]	2	2	2	7	6	2	2	G

[1] Indicates a *Phaseolus vulgaris* dry common bean.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Use PPI timing for optimum control.
[5] Weeds cannot be emerged at the time of application to achieve this level of control.
* Numerous equivalents to this product exist, refer to Table 4–1. *Herbicides Used in Ontario* for a complete list of products.

TABLE 7–1. Herbicide Weed Control Ratings for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop
R = populations resistant to this herbicide treatment exist in Ontario and won't be adequately controlled if present.

		Crop Registrations										Annual Grasses								Annual Broadleaves													Perennials							
Trade Name	**WSSA GROUP**	**adzuki beans**	**black beans[1]**	**cranberry beans[1]**	**kidney beans[1]**	**lima beans**	**otebo beans[1]**	**pinto beans[1]**	**small red Mexican[1]**	**snap beans[1]**	**white beans[1]**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**proso millet**	**witchgrass**	**buckwheat, wild**	**chickweed**	**cocklebur**	**fleabane, Canada**	**lady's-thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preemergence Tank-Mixes																																						
DUAL II MAGNUM + PURSUIT (imazethapyr*)	15 + 2	x	x	✓	✓	x	x	x	x	x	x	9	9	8[2]	9	9	9	7	9	8	9	7[R]	2	9	9[R]	9	9	9	7[R]	6[R]	9	6	–	–	–	8[4]	7	–	–	E
Postemergence Grass Herbicides																																						
ASSURE II, CONTENDER or YUMA GL	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	8	9	9	9	8	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	E
POAST ULTRA	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	9	8	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	E
SELECT, STATUE, ANTLER or ARROW ALL-IN	1	x	✓	✓	✓	x	✓	✓	✓	✓	✓	9	8	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	E
VENTURE L	1	✓	✓	✓	✓	x	✓	✓	✓	x	✓	9	8	9	8	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	E
Postemergence Broadleaf Herbicides																																						
BASAGRAN	6	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	0	0	0	0	0	0	0	7	–	9	5	9	7	9	7	7	8	6	9	1	6	2	2	8	0	5	7	G
BASAGRAN FORTÉ	6	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	0	0	0	0	0	0	0	7	–	9	5	9	7	9	7	7	8	6	9	1	6	2	2	8	0	5	7	G
PERMIT	2	x	✓	✓	✓	x	✓	✓	✓	✓	✓	0	0	0	0	0	0	0	0	–	8[2]	8[R]	8[R]	8	8	8	7	8[R]	8[R]	8[R]	8[R]	–	6	6	7	9	5	–	–	E
REFLEX	14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	0	0	0	0	0	0	0	0	8	–	7	2	8	6	9	8	9	9	7	6	8	3	6	2	–	0	5	3	F
Postemergence Tank-Mixes																																						
BASAGRAN + REFLEX	6+14	x	x	x	✓	x	x	x	x	x	✓	0	0	0	0	0	0	0	0	8	–	9	5	9	7	9	8	9	9	7	9	8	5	2	2	8	1	5	7	F
REFLEX + VENTURE	14+1	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	9	8	9	8	8	9	9	9	8	–	7	2	8	6	9	8	9	9	7	6	8	3	6	2	–	0	5	3	F

[1] Indicates a *Phaseolus vulgaris* dry common bean.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Use PPI timing for optimum control.
[5] Weeds cannot be emerged at the time of application to achieve this level of control.
* Numerous equivalents to this product exist, refer to Table 4–1. *Herbicides Used in Ontario* for a complete list of products.

Beans (Adzuki, Dry, Lima and Snap)

Dry beans (*Phaseolus vulgaris*) include black, cranberry, kidney, otebo, pinto, snap, small red Mexican and white bean market classes.

Apply all treatments in 150–300 L/ha (60–120 L/acre) water, unless otherwise specified.

Yield losses typically reach around 55% when weeds are not properly managed in edible beans. To minimize any yield losses from weed competition in edible beans they should be kept weed free from emergence to first flower.

Research by the University of Guelph (Ridgetown campus) has demonstrated that weed control is maximized in edible beans when a soil-applied herbicide program is used that targets the most prominent weeds in a field, followed by regular scouting commencing 10–14 days after application to look for new weed seedling emergence, so that herbicides can be applied to those weeds between the 4–8 leaf stage of growth when they are most susceptible.

Imazethapyr (e.g., Pursuit) and halosulfuron (Permit) are considered foundational soil applied herbicides in edible beans because they control a wide range of grass and/or broadleaf weeds. However, in the last 20 years, populations of weeds that are resistant to both of these "Group 2" herbicides have become more prominent, requiring other herbicides be tank mixed, or post-emergence broadleaf herbicides be applied to pick up any deficiencies in weed control.

To minimize the risk of crop injury from herbicides applied in edible beans, the University of Guelph (Ridgetown campus) has found that:

•Dual II Magnum and Frontier when applied pre-plant incorporated offer better crop safety than when applied pre-emergence.

•There is a range in sensitivity to imazethapyr among the edible bean market classes grown in Ontario. The following rates of imazethapyr have been shown in field trials to minimize crop injury while maximizing yield and weed control when tank mixed with other herbicides (e.g., Prowl, Treflan, Dual, Frontier or Eptam):

- Adzuki beans — (Pursuit: 126 mL/acre)

- Large seeded edible beans (e.g., cranberry, kidney, yellow-eye) — (Pursuit: 100 mL/acre)

- Small seeded edible beans (e.g., white, black, pinto) — (Pursuit: 75 mL/acre)

You will note that the rate of imazethapyr provided in this chapter is the labeled rate of 126 mL/acre when tank mixed with other herbicides. When rates are used which are lower than what is on the label, the manufacturer is not responsible for any reduced weed control or any crop loss that may occur as a result. Therefore, it is recommended that you discuss herbicide programs with the organization you have contracted your edible bean crop with, as they will have the most experience with the best regional weed control strategy.

When developing a weed control program, consider cultivation, rotation and other cultural practices along with herbicide treatments. Any single method of weed control, or the continuous use of the same chemical, can lead to the build-up of weeds resistant or tolerant to that control method. Rotating crops and/or other control methods reduce the chance of developing new or unique weed infestations.

High speed (10–20 km/h), shallow (2.5–3 cm) cultivation with a rotary hoe when beans are in the 1–2-leaf stage helps control small weed seedlings. This technique does not reduce herbicide action and may, in some years, enhance chemical weed control and improve crop safety.

Inter-row cultivation may be needed when weeds escape herbicide treatment. Consider weeds "escapes" when they are 5–7 cm high. Shallow cultivation will control the escaped weeds and prevents newly germinated ones from surviving.

Band treatment of chemical over the row reduces costs by one-half to two-thirds, depending on row spacing and width of band. Shallow inter-row cultivation will be required to control weeds between the bands.

Cultivation will give some control of established perennial weeds but may also help spread them to previously uninfested areas. Machinery sanitation is important when moving from one field to another.

Please refer to Table 7–1. *Herbicide Weed Control Ratings for Beans (Adzuki, Dry, Lima and Snap),* to determine which market classes of edible beans are registered for the herbicide treatments listed.

Herbicide Application Timings

- **Preplant (PP)** – Also see *Chapter 6 Preplant & Postharvest Weed Control*, for details of products, rates and remarks.
- **Preplant Incorporated (PPI)** – Unless stated otherwise, two incorporations at right angles operating at a depth of 10 cm using a double disk (7–10 km/h) or vibrating shank S-tine cultivator (10–13 km/h) are required. Cultivation equipment used for herbicide incorporation is known to spread perennial weeds to previously uninfested areas. Pay special attention to machinery cleanliness and/or treating fields with perennial weeds last.
- **Preemergence (PRE)** – Rainfall of 15–20 mm within 10 days after application is necessary to activate preemergence treatments. Shallow cultivation, rotary hoeing or harrowing will control weed escapes and improve herbicide activity in the absence of rainfall.
- **Postemergence (POST)** – Leaf stage of the weeds is critical for good weed control. Smaller weeds are usually more sensitive to herbicide injury. Apply according to labelled leaf stages. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant. See the product label for more details. Always use appropriate drift management technology.
- **Preharvest** – It is important to follow the correct pre harvest interval (PHI), use rates and appropriate crop staging provided on the product label of pre harvest treatments so as to ensure a quality, marketable dry bean crop that is easy to harvest.

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides*.
Soil-Applied Grass Herbicides			
s-metolachlor/benoxacor (1.05–1.6 kg/ha)	DUAL II MAGNUM (915 g/L)	1.15–1.75 L/ha (0.46–0.7 L/acre)	· Apply PPI or PRE on all dry common bean (*Phaseolus vulgaris*) market classes. · DUAL II MAGNUM must be applied PPI to lima beans. **Do NOT** apply PRE to lima beans. · Apply PPI to minimize the potential for crop injury. · **Do NOT** use on adzuki beans. · **Do NOT** use on muck, peat or high organic matter soils. · Use the low rate on coarse-textured soils low in organic matter. · Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. · Improved yellow nutsedge control is obtained when DUAL MAGNUM is applied PPI. · Use the higher rate for the control of nightshade.
	KOMODO/UPI-S MET (915 g/L)	1.1–1.67 L/ha (0.44–0.67 L/acre)	
EPTC (3.4–4.4 kg/ha)	EPTAM (800 g/L)	4.25–5.5 L/ha (1.7–2.2 L/acre)	· Apply PPI. Incorporate immediately. · **Do NOT** use on adzuki, lima, otebo and small red Mexican beans. · If dry weather has preceded the application of EPTC, delay seeding 7–10 days. · Temporary injury can occur in the emerging crop. · Use the high rate for nutsedge control.
dimethenamid-P (544–693 g/ha)	FRONTIER MAX (720 g/L)	756–963 mL/ha (305–390 mL/acre)	· Apply PPI on all dry common bean (*Phaseolus vulgaris*) market classes. · Minimum PPI rate is 860 mL/ha (348 mL/acre). · **Do NOT** use on adzuki and lima beans. · **Do NOT** use on muck, peat or high organic matter soils. · Use the low rate on coarse-textured soils low in organic matter. · Use the higher rate of FRONTIER MAX for the control of nightshade and pigweed. · Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days.

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Soil-Applied Grass Herbicides (cont'd)			
pendimethalin (1.08 kg/ha)	PROWL H2O (455 g/L)	2.37 L/ha (0.95 L/acre)	· PPI **ONLY**. · **Do NOT** harvest adzuki beans within 90 days of application, snap beans within 50 days of application and lima beans within 80 days of application.
trifluralin (0.6–1.155 kg/ha)	TREFLAN EC (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	· Apply PPI. Incorporate as soon as possible, within 24 hr. · **Do NOT** use on adzuki, Dutch brown, cranberry, otebo, pinto, small red Mexican, snap and yellow-eye beans. · **Do NOT** exceed 1.25 L/ha (0.5 L/acre) of trifluralin (480 g/L) on medium-textured soils and 1.7 L/ha (0.68 L/acre) on heavy-textured soils for lima beans.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.48–0.92 L/acre)	
	BONANZA 480 (480g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	1.45-2.8 L/ha (0.58-1.12 L/acre)	
Soil-Applied Grass and Broadleaf Herbicides			
halosulfuron (26.25–35.25 g/ha)	PERMIT (72.6%)	35–47 g/ha (14–19 g/acre)	· Apply PRE after seeding but prior to soil cracking. Use the lower rate on lighter textured soils with low organic matter.
imazethapyr (0.075 kg/ha)	PURSUIT (240 g/L)	0.312 L/ha (0.126 L/acre)	· Apply PPI or PRE to adzuki and all dry bean (*Phaseolus vulgaris*) market classes. · Must be applied PRE to lima beans. **Do NOT** apply PPI to lima beans. · Delayed maturity or stunting may occur if cold and/or wet conditions are experienced within first week after application. · There is a range in sensitivity to imazethapyr among the edible bean market classes grown in Ontario. The following rates of imazethapyr have been shown in field trials to minimize crop injury while maximizing yield and weed control when tank mixed with other herbicides (e.g., Prowl, Treflan, Dual, Frontier or Eptam): Adzuki beans — (Pursuit: 126 mL/acre); Large seeded edible beans (e.g., cranberry, kidney) — (Pursuit: 100 mL/acre); Small seeded edible beans (e.g., white, black, pinto) — (Pursuit: 75 mL/acre) · Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. · **Do NOT** harvest within 100 days of application. · **Some rotational cropping restrictions apply** (see Table 4–4. *Herbicide Crop Rotation and Soil pH Restrictions – Field Crops*).
	PHANTOM (240 g/L)		
	NU-IMAGE (240 g/L)		
Soil-Applied Tank-Mixes			
s-metolachlor/benoxacor (1.05–1.60 kg/ha) + imazethapyr (0.075 kg/ha)	DUAL II MAGNUM (915 EC) + PURSUIT (240 g/L)	1.15–1.75 L/ha (0.46–0.7 L/acre) + 0.312 L/ha (0.126 L/acre)	· Apply PRE **ONLY** to cranberry or kidney beans. · Apply PPI to all dry common bean (*Phaseolus vulgaris*) market classes. · **Do NOT** use on adzuki and lima beans. · **Do NOT** use on muck, peat or high organic matter soils. · Use the low rate on coarse-textured soils low in organic matter. · Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. · **Do NOT** harvest within 100 days of application. · **Some rotational cropping restrictions apply** (see Table 4–4. *Herbicide Crop Rotation and Soil pH Restrictions – Field Crops).*
	DUAL II MAGNUM (915 EC) + PHANTOM (240 g/L)		
	DUAL II MAGNUM (915 EC) + NU-IMAGE (240 g/L)		
	KOMODO/UPI-S MET (915 g/L) + PURSUIT (240 g/L)	1.1–1.67 L/ha (0.44–0.67 L/acre) + 0.312 L/ha (0.126 L/acre)	

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Soil-Applied Tank-Mixes (cont'd)			
EPTC (2.4 kg/ha) + trifluralin (0.6 kg/ha)	EPTAM (800 g/L) + TREFLAN EC (480 g/L)	3 L/ha (1.2 L/acre) + 1.25 L/ha (0.5 L/acre)	· Apply PPI. Incorporate immediately. · Use **ONLY** on white bean and red kidney bean. · If dry weather has preceded the application of EPTC, delay seeding 7–10 days.
	EPTAM (800 g/L) + RIVAL (500 g/L)	3 L/ha (1.2 L/acre) + 1.2 L/ha (0.48 L/acre)	
	EPTAM (800 g/L) + BONANZA 480 (480 g/L)	3 L/ha (1.2 L/acre) + 1.25 L/ha (0.5 L/acre)	
	EPTAM (800 g/L) + TRIFLUREX 40 EC (412 g/L)	3 L/ha (1.2 L/acre) + 1.45 L/ha (0.58 L/acre)	
EPTC (3.4–4.2 kg/ha) + halosulfuron (26.25–35.25 g/ha)	EPTAM (800 g/L) + PERMIT (72.6%)	4.25–5.25 L/ha (1.7–2.1 L/acre) + 35–47 g/ha (14–19 g/acre)	· Apply PPI to a depth of approximately 5 cm just before planting. · Use lower rate on lighter textured soils with low organic matter. · Refer to EPTAM 8-E label for specific incorporation directions. · Rotary hoe lightly during or shortly after emergence of the beans to break any crust which occurs.
dimethenamid-P (544–693 g/ha) + imazethapyr (0.075 kg/ha)	FRONTIER MAX (720 g/L) + PURSUIT (240 g/L)	756–963 mL/ha (305–390 mL/acre) + 0.312 L/ha (0.126 L/acre)	· Apply PPI on all dry common bean (*Phaseolus vulgaris*) market classes. · **Do NOT** use on adzuki and lima beans. · **Do NOT** use on muck, peat or high organic matter soils. · Use the low rate on coarse-textured soils low in organic matter. · Requires rainfall for activation. Rotary hoe if no rainfall occurs within 7 days. · **Do NOT** harvest within 100 days of application. · **Some rotational cropping restrictions apply** (see Table 4–4. *Herbicide Crop Rotation and Soil pH Restrictions – Field Crops*).
halosulfuron (37.5 g/ha) + trifluralin (0.84 kg/ha)	PERMIT (72.6%) + TREFLAN EC (480 g/L)	52.5 g/ha (21 g/acre) + 1.75 L/ha (0.7 L/acre)	· Apply PPI and incorporate as soon as possible within 24 hr. · Use **ONLY** on white beans. · This tank-mix provides broad spectrum control of both grassy and broadleaf weeds in white beans.
	PERMIT (72.6%) + RIVAL (500 g/L)	52.5 g/ha (21 g/acre) + 1.68 L/ha (0.67 L/acre)	
	PERMIT (72.6%) + BONANZA 480 (480 g/L)	52.5 g/ha (21 g/acre) + 1.75 L/ha (0.7 L/acre)	
	PERMIT (72.6%) + TRIFLUREX 40 EC (412 g/L)	52.5 g/ha (21 g/acre) + 2.05 L/ha (0.82 L/acre)	

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Soil-Applied Tank-Mixes (cont'd)			
imazethapyr (0.075 kg/ha) + trifluralin (0.6–1.15 kg/ha)	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + TREFLAN EC (480 g/L)	0.312 L/ha (0.126 L/acre) + 1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI and incorporate as soon as possible within 24 hr. • Use **ONLY** on white beans. • **Do NOT** harvest within 100 days of application. • **Some rotational cropping restrictions apply** (see Table 4–4. *Herbicide Crop Rotation and Soil pH Restrictions – Field Crops*).
	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + RIVAL (500 g/L)	0.312 L/ha (0.126 L/acre) + 1.2–2.3 L/ha (0.48–0.92 L/acre)	
	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + BONANZA 480 (480 g/L)	0.312 L/ha (0.126 L/acre) + 1.25–2.4 L/ha (0.5–0.96 L/acre)	
	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + TRIFLUREX 40 EC (412 g/L)	0.312 L/ha (0.126 L/acre) + 1.45 L/ha (0.58 L/acre)	
Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.07 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.38–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	• Apply to emerged annual grasses and volunteer cereals in 2-leaf to tillering stage and volunteer corn and quackgrass in the 2–6-leaf stage. • For use on adzuki, lima and all dry common bean (*Phaseolus vulgaris*) market classes. • Use the 0.38 L/ha (0.15 L/acre) rate for control of volunteer corn, volunteer cereals and green foxtail. • The 0.5 L/ha (0.2 L/acre) rate will suppress quackgrass and also control barnyard grass. • Use the 0.75 L/ha (0.3 L/acre) rate for control of quackgrass.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + surfactant		
sethoxydim (0.15–0.5 kg/ha) + surfactant (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–1.1 L/ha (0.13–0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• Apply POST when annual grasses and volunteer cereals are in the 1–6-leaf stage and quackgrass is in the 1–3-leaf stage. • Apply POST to adzuki, lima and all dry common bean (*Phaseolus vulgaris*) market classes. • Use the intermediate rate of 0.47 L/ha (0.19 L/acre) for volunteer spring cereals. • Use the high rate of 1.1 L/ha (0.45 L/acre) for quackgrass. • Thorough preplant tillage will ensure more uniform quackgrass emergence. Follow with a cultivation 7 days after treatment in wide row crops. • **Do NOT** apply if rain is expected within 1 hour after application.

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Postemergence Grass Herbicides (cont'd)			
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000 L	• Apply POST to all dry common bean (*Phaseolus vulgaris*) market classes and when annual grasses and volunteer cereals are in the 1–6-leaf stage. • **Do NOT** apply if rain is expected within 1 hr after application. • **Do NOT** use on adzuki and lima beans. • **Do NOT** harvest within 60 days of application. • For control of quackgrass, apply at 375 mL/ha (150 L/acre) with the appropriate surfactant at 10 L/1,000 L water. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT or STATUE.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-P-butyl (0.075–0.25 kg/ha)	VENTURE L (125 g/L)	0.6–2 L/ha (0.243–0.8 L/acre)	• Apply POST to adzuki and all dry common bean (*Phaseolus vulgaris*) market classes. • **Do NOT** apply to adzuki or dry common beans past the third trifoliate leaf stage. • **Do NOT** use on lima beans. • The 0.6 L/ha (0.243 L/acre) rate is for the control of volunteer corn at the 2–5-leaf stage. • The 1 L/ha (0.4 L/acre) rate is for the control of annual grasses at the 2–4-leaf stage. • The 2 L/ha (0.8 L/acre) rate is for the control of quackgrass or wirestem muhly at the 3–5-leaf stage. • **Do NOT** harvest adzuki and dry beans within 75 days of application.
Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha) + adjuvant (2 L/ha)	BASAGRAN FORTÉ (480 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre) + 2 L/ha (0.8 L/acre)	• Apply POST when beans are in the unifoliate to 4-trifoliate leaf stage. • Apply POST to all dry common bean (*Phaseolus vulgaris*) market classes. • **Do NOT** use on adzuki beans. • Apply when weeds are small and actively growing. • Two applications of 1.75 L/ha (0.7 L/acre) 10 days apart may be required to control the perennial weeds. • No adjuvant is required with BASAGRAN FORTÉ. • BROADLOOM: The addition of ammonium sulphate at 1.5% v/v will result in more consistent weed control. The addition of ammonium sulphate may cause some leaf burn, but new growth is normal and yield is not reduced. The potential for leaf burn is increased when relative humidity and temperature are high. Use with ASSIST Oil Concentrate. • **Do NOT** apply if rain is expected within 6 hr after application.
	BROADLOOM (480 g/L)		
	BASAGRAN (480 g/L) + ASSIST		
halosulfuron (26.25–50.82 g/ha)	PERMIT (72.6%)	35–70 g/ha (14–28 g/acre)	• Apply as a directed spray when plants have 2–4 trifoliate leaves and before flowering. Make one broadcast application. Directed sprays are recommended to limit crop injury. • Use a nonionic surfactant (NIS). • Use 35–46.7 g/ha for broadleaved weeds. Where nutsedge is present, use up to 70 g/ha. • Following the final application allow 30 days before harvesting. • Make **ONLY** one PERMIT Herbicide application per crop cycle. Apply either Pre-Emergence or Post-Emergence, but not both. • PERMIT Herbicide will not control ALS resistant weeds. • **Do NOT** apply more than 70 g of PERMIT Herbicide per hectare per season.

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Postemergence Broadleaf Herbicides (Cont'd)			
fomesafen (0.24 kg/ha) + adjuvant (0.25% v/v)	REFLEX (240 g/L) + TURBOCHARGE	1 L/ha (0.4 L/acre) + 5 L/1,000 L	• Apply POST when beans are in the 1–2 trifoliate leaf stage. • Apply when weeds are small and actively growing. • Apply in 200–350 L water/ha (80–140 L/acre water). • **Do NOT** apply if rain is expected within 4 hr after application. • **Do NOT** apply REFLEX to any field more often than once every 2 years. • **Do NOT** apply to crop under stress. • Some rotational cropping restrictions apply. • **Do NOT** harvest adzuki and dry beans within 84 days of application. • **Do NOT** harvest snap beans within 30 days of application.
Postemergence Tank-Mixes			
bentazon (0.84 kg/ha) + fomesafen (0.21–0.24 kg/ha) + oil concentrate (2 L/ha)	BASAGRAN (480 g/L) + REFLEX (240 g/L) + ASSIST	1.75 L/ha (0.7 L/acre) + 0.875–1 L/ha (0.35–0.4 L/acre) + 2 L/ha (0.8 L/acre)	• Apply POST when beans are in the 1–2 trifoliate leaf stage. • Use **ONLY** on white and kidney beans. • Refer to the BASAGRAN label and the REFLEX label for information on specific weed stage and height. • **Do NOT** apply if rain is expected within 6 hr after application.
fomesafen (0.24 kg/ha) + fluazifop-p-butyl (6 g/ha) + surfactant (0.5% v/v)	REFLEX (240 g/L) + VENTURE L (125 g/L) + TURBOCHARGE	1 L/ha (0.4 L/acre) + 0.6–2.0 L/ha (0.243–0.8 L/acre) + 5 L/1,000 L	• Apply POST to adzuki and all dry common bean (*Phaseolus vulgaris*) market classes when in the 1–2 trifoliate leaf stage. • **Do NOT** apply to adzuki or dry common beans past the third trifoliate leaf stage. • **Do NOT** use on lima beans. • Apply in 200 L/ha (80 L/acre) water. • The 0.6 L/ha (0.243 L/acre) rate is for the control of volunteer corn at the 2–5-leaf stage. • The 1 L/ha (0.4 L/acre) rate is for the control of annual grasses at the 2–4-leaf stage. • The 2 L/ha (0.8 L/acre) rate is for the control of quackgrass or wirestem muhly at the 3–5-leaf stage. • **Do NOT** harvest adzuki and dry beans within 84 days of application.
Preharvest			
carfentrazone-ethyl (0.0175–0.028 kg/ha) + non-ionic surfactant (0.25% v/v)	AIM EC (240 g/L) + non-ionic surfactant	73–117 mL/ha (30–47 mL/acre) + 2.5 L/1,000 L	• Apply to actively growing weeds, up to 10 cm. • Coverage of weed and crop foliage is essential for control. • **Do NOT** harvest within 1 day of application.
carfentrazone-ethyl (0.0175–0.028 kg/ha) + MERGE (0.1% v/v)	AIM EC (240 g/L) + MERGE	73–117 mL/ha (30–47 mL/acre) + 10 L/1,000 L	

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Preharvest (cont'd)			
saflufenacil (25–50 g/ha) + adjuvant (0.5% v/v)	ERAGON LQ (342 g/L) + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1 L/ha (0.4 L/acre)	• Apply when the stems are green to brown in colour and pods are mature (yellow-brown) and 80%–90% of the original leaves have dropped. • Apply in 200 L/ha (80 L/acre) of water. • **Do NOT** harvest within 3 days of application. • Tips to improve performance: 1) Increase carrier volume to 250 L/ha (100 L/acre) of water; 2) Apply during the warmest part of the day and ideally when humid and sunny, 3) Avoid applications during cloudy, overcast conditions and 4) Use nozzles that deliver a medium to coarse droplets.
saflufenacil (25–50 g/ha) + glyphosate (900 g/ha) + adjuvant (0.5% v/v)	ERAGON LQ (342 g/L) + glyphosate (540 g/L)* + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply when the stems are green to brown in colour and pods are mature (yellow-brown) and 80%–90% of the original leaves have dropped. • Apply in 200 L/ha (80 L/acre) of water. • **Do NOT** harvest within 7 days of application. • Refer to preharvest precautions for glyphosate. * See Table 4–1. *Herbicides Used in Ontario* for formulations available. See label for specific uses and rates.
glyphosate (0.9 kg/ha)	glyphosate (360 g/L)	2.5 L/ha (1 L/acre)	• Apply Preharvest when the crop is 30% grain moisture or less (yellow to brown pod colour, 80%–90% leaf drop) and at least 7 days prior to harvest. • **Do NOT** use on snap beans. • **Do NOT** apply to crops grown for seed. • **Do NOT** apply by air. • Apply in 50–100 L/ha of water. • **Do NOT** apply if rain is expected shortly after application. * See Table 4–1. *Herbicides Used in Ontario* for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)	1.86 L/ha (0.75 L/acre)	
	glyphosate (540 g/L)	1.67 L/ha (0.67 L/acre)	
glufosinate ammonium (0.37–0.45 kg/ha)	IGNITE (150 g/L)	2.5–3 L/ha (1–1.2 L/acre)	• Apply Preharvest when approximately 50%–75% of the bean pods have naturally changed colour from green to yellow or brown and at least 9 days before harvest. • **Do NOT** use on snap beans. • **Do NOT** apply to dry beans grown for seed. • Use the higher rate when the crop canopy is dense and/or there are high populations of weeds present at application. • Apply in a minimum of 110 L/ha (44 L/acre) of water at a pressure of 275 kPa (40 psi). Where crop canopy is dense, or weed growth is heavy, apply 170–220 L/ha (68–88 L/acre) of water. • **Do NOT** apply by air. • **Do NOT** apply if rain is expected within 4 hours after application.

TABLE 7–2. Herbicide Treatment Rates for Beans (Adzuki, Dry, Lima and Snap) (cont'd)

Active Ingredient (rate)	TRADE NAME (concentration)	PRODUCT RATE	PRECAUTIONS For more information, see *Notes on Herbicides.*
Preharvest (cont'd)			
diquat (0.3–0.55 kg/ha) + surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25–2.3 L/ha (0.5–0.92 L/acre) + 1 L/1,000 L	• Apply Preharvest when 80% natural leaf defoliation and 80% of the pods have turned yellow. • **Do NOT** use on lima or snap beans. • Avoid regrowth by targeting spray within 7 days of bean variety maturity date and harvest 5–7 days after application. • Use 1.25–1.7 L/ha (0.5 - 0.7 L/acre) by ground and 1.7–2.3 L/ha (0.7 - 0.92 L/acre) for aerial applications. • Use a minimum of 225 L/ha of spray volume. • Use the higher rate for heavy canopy of crop or weeds. • **Do NOT** apply if rain is expected within 15 minutes after application.
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY DESICCANT (240 g/L) + AGRAL 90		
flumioxazin (53.7 g/ha) + methylated seed oil (2.5 L/ha)	VALTERA (51.1% DF) + MSO Concentrate	105 g/ha (42 g/acre) + 2.5 L/ha (1 L/acre)	• Apply in 140–280 L/ha (56–112 L/acre) of water. • **Do NOT** harvest within 5 days of application. • Tips to improve performance: 1) Increase carrier volume to 250 L/ha (100 L/acre) of water; 2) Apply during the warmest part of the day and ideally when humid and sunny, 3) Avoid applications during cloudy, overcast conditions and 4) Use nozzles that deliver a medium to coarse droplets.
	VALTERA EZ (480 g/L) + MSO Concentrate	112 mL/ha (45 mL/acre) + 2,5 L/ha (1 L/acre)	
flumioxazin (53.7 g/ha) + glyphosate (900 g/ha) + methylated seed oil (2.5 L/ha)	VALTERA (51.1% DF) + glyphosate (540 g/L)* + MSO Concentrate	105 g/ha (42 g/acre) + 1.67 L/ha (0.67 L/acre) + 2.5 L/ha (1 L/acre)	• Apply in 140–280 L/ha (56–112 L/acre) of water. • **Do NOT** harvest within 7 days of application. • Refer to preharvest precautions for glyphosate, on this page. * See Table 4–1. *Herbicides Used in Ontario* for formulations available. See label for specific uses and rates.
	VALTERA EZ (480) + glyphosate (540 g/L)* + MSO Concentrate	112 mL/ha (45 mL/acre) + 1,67 L/ha (0,67 L/acre) + 2,5 L/ha (1 L/acre)	

8. CEREAL CROPS

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 8–1. Herbicide Weed Control Ratings for Grassy Weeds in Cereal Crops

LEGEND: Numbers (0–9) = weed control ratings ✓ = can be used on this crop | Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor x = not indicated for use on this crop | – = insufficient information available to make a rating

Trade Name	WSSA GROUP	Crop Registrations								Annual and Perennial Grasses															Crop Tolerance
		oats	spring barley	spring wheat	winter barley	winter rye	winter wheat	alfalfa (underseeded)	red clover (underseeded)	barnyard grass	bentgrass, loose silky	bluegrass species	chess/cheat	crabgrass	downy brome	fall panicum	fowl meadow grass	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	quackgrass	wild oats	
Soil Applied Grass Herbicides																									
FOCUS	15	x	x	✓	x	x	✓	x	x	9	–	7	6	8	9	8	–	9	9	9	9	–	0	7	G
TREFLAN, RIVAL, BONANZA or TRIFLUREX	3	x	x	x	x	✓	✓	x	x	9	8	–	–	9	–	9	–	9	9	9	9	7	2	8	F
Postemergence Grass Herbicides																									
ACHIEVE LIQUID or BISON 400 L	1	x	✓	✓	x	✓	✓	✓	✓	8	–	–	–	–	–	–	8	–	9	9	–	–	0	9	G
AXIAL BIA	1	x	✓	✓	✓	x	✓	x	x	9	–	–	–	–	–	–	–	–	9	9	–	9	0	9	G
BENGAL or VIGIL	1	x	x	✓	x	x	x	x	x	9	–	–	–	–	–	–	–	–	9	9	–	–	0	9	G
PUMA ADVANCE	1	x	✓	✓	x	x	x	x	x	9	–	–	–	–	–	–	–	–	9	9	–	–	0	9	G
SIMPLICITY GODRI	2	x	x	✓	x	x	✓[4]	x	x	–	8	6	8	–	8	–	–	8	8	8	–	–	–	9	G
VARRO	2	x	x	✓	x	x	✓[4]	x	x	–	–	–	–	–	–	–	–	8	8	8	–	–	–	9	G

[1] Various formulations are available, see Table 4–1. Herbicides Used in Ontario.
[2] Indicates product sold as a co-pack under this trade name.
[3] The rate of MCPA Ester included in REFINE M may not provide this level of control.
[4] This herbicide can be applied to emerged winter wheat in the fall.

TABLE 8–2. Herbicide Weed Control Ratings for Cereals

LEGEND: Numbers (0–9) = weed control ratings ✓ = can be used on this crop Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor x = not indicated for use on this crop – = insufficient information available to make a rating

Trade Name	WSSA Group(s)	Crop Registrations								Annual Broadleaf Weeds																											Perennial Weeds									Crop Tolerance
		oats	spring barley	spring wheat	winter barley	winter rye	winter wheat	alfalfa (underseeded)	red clover (underseeded)	atriplex, spreading	buckwheat, wild	canola, volunteer	cocklebur	chamomile, scentless	chickweed, common	cleavers	corn spurry	fleabane, Canada	hempnettle	lady's thumb	lamb's-quarters	lettuce, prickly	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	shepherd's purse	stinkweed	velvetleaf	violet, field	waterhemp	bindweed, field	carrot, wild	curled dock	dandelion	ground-ivy (creeping-charlie)	horsetail	sow-thistle	thistle, Canada	vetches	
Soil Applied Broadleaf Herbicides																																													
ERAGON LQ + glyphosate[1] + MERGE	14 + 9	x	✓	✓	✓	x	✓	x	x	–	9	9	9	–	–	–	–	9	–	9	9	9	9	9	9	9	7/8	9	9	9	8	–	–	–	–	8	–	7	8	9	–	E
TREFLAN or RIVAL or BONANZA or TRIFLUREX	3	x	x	x	✓	✓	✓	x	x	–	5	0	2	–	–	–	–	0	5	2	8	–	2	2	8	2	1	–	–	2	–	–	2	–	0	0	–	2	2	2	–	F
Postemergence Broadleaf Herbicides																																												
2,4-D[1]	4	x	✓	✓	x	✓	✓	x	x	7	4	8	8	–	2	2	2	8	2	4	9	9	9	7	9	8	9	9	9	8	–	9	7	1	7	6	–	2	5	7	7	F
BOOST M[2]	2,2 + 4	x	✓	✓	x	x	✓	x	x	8	9	9	8	7	7	6	9	6	9	9	9	9	9	9	9	7	9	9	8	7	6	7	7	7	6	–	2	8	7	6	G
BUCTRIL M or BADGE or MEXTROL or LOGIC M	4,6	✓	✓	✓	x	✓	✓[4]	x	✓	6	9	9	8	5	2	4	2	6	7	9	9	8	9	9	8	9	7	9	9	9	5	6	7	1	–	4	–	7	7	5	5	E
EMBUTOX or CALIBER or COBUTOX	4	✓	✓	✓	✓	✓	✓	✓	✓	–	6	7	9	–	2	–	2	–	2	4	9	–	7	7	9	8	–	8	6	8	–	–	–	–	6	5	–	2	5	–	2	G
ENFORCER M	4,6	x	✓	✓	✓	x	✓	x	x	–	9	9	9	8	8	9	–	9	9	9	9	–	9	–	7	7	7	9	9	9	–	–	–	–	–	–	–	–	7	7	8	E
ESTAPROP XT or DICHLORPROP-DX or TURBOPROP	4,4	x	✓	✓	x	x	✓	x	x	8	8	9	–	6	2	3	2	8	7	8	9	9	9	–	9	9	9	9	9	–	6	8	7	3	–	7	–	2	8	8	7	G
INFINITY	27,6	x	✓	✓	x	x	✓[4]	x	x	7	9	9	–	6	9	8	–	9	9	9	9	8	9	9	9	9	7	9	9	9	5	9	–	2	–	7	–	–	7	7	5	E
INFINITY FX	27,6,4	x	✓	✓	x	x	✓	x	x	7	9	9	–	–	9	8	–	9	9	9	9	–	9	–	9	9	7	9	9	–	–	9	–	–	–	7	–	–	7	7	–	E
LONTREL XC	4	x	✓	✓	x	x	✓	x	x	3	8	0	5	8	2	–	–	9	–	5	2	–	2	2	2	8	9	–	–	–	–	9	–	–	–	4	–	–	9	9	9	F
MCPA[1]	4	✓	✓	✓	x	✓	✓	x	x	–	2	9	7	–	2	3	7	7	8	2	9	9	9	–	9	9	9	9	9	8	–	6	7	1	–	4	–	8	7	7	5	F
MCPA SODIUM	4	✓	✓	✓	x	✓	✓	x	✓	–	2	9	7	–	2	–	7	7	8	2	9	–	9	–	9	8	–	9	9	8	–	–	–	–	–	–	–	–	–	–	–	–	G

[1] Various formulations are available, see Table 4–1. Herbicides Used in Ontario.
[2] Indicates product sold as a co-pack under this trade name.
[3] The rate of MCPA Ester included in REFINE M may not provide this level of control.
[4] This herbicide can be applied to emerged winter wheat in the fall.

TABLE 8–2. Herbicide Weed Control Ratings for Cereals (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop

Trade Name	WSSA Group(s)	Crop Registrations								Annual Broadleaf Weeds																									Perennial Weeds									Crop Tolerance
		oats	spring barley	spring wheat	winter barley	winter rye	winter wheat	alfalfa (underseeded)	red clover (underseeded)	atriplex, spreading	buckwheat, wild	canola, volunteer	cocklebur	chamomile, scentless	chickweed, common	cleavers	corn spurry	fleabane, Canada	hempnettle	lady's thumb	lamb's-quarters	lettuce, prickly	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	shepherd's purse	stinkweed	velvetleaf	violet, field	waterhemp	bindweed, field	carrot, wild	curled dock	dandelion	ground-ivy (creeping-charlie)	horsestail	sow-thistle	thistle, Canada	vetches	
Postemergence Broadleaf Herbicides (cont'd)																																											
PARDNER or BROMOTRIL or BROTEX or KORIL or BROMAX	6	✓	✓	✓	x	✓	✓[4]	x	x	–	8	7	8	–	2	–	2	–	2	8	9	–	7	9	7	9	–	8	8	9	–	–	5	–	–	–	–	0	6	5	–	E
PIXXARO	4,6	x	x	x	x	x	✓	x	x	–	9	9	9	–	8	8	–	9	8	7	9	9	9	–	9	9	9	9	–	9	–	9	–	–	–	–	–	–	–	7	8	E
REFINE M[2]		x	✓	✓	x	x	✓	x	x	8[3]	9	9	8[3]	7	7	6	9	6	9	9	9	9	9	9	9	9[3]	7[3]	9	9	8	7	6	7	7	7	6	–	2	8	7	6	G
REFINE SG	2,2	✓	✓	✓	x	x	✓[4]	x	x	–	9	9	–	7	9	6	9	4	9	9	9	8	8	–	9	2	–	9	9	8	7	–	2	8	–	5	–	–	8	7	5	E
SIMPLICITY GODRI	2	x	x	✓	x	x	✓[4]	x	x	–	6	–	–	–	–	–	–	–	–	8	–	–	–	–	8	–	–	8	8	–	–	–	–	–	–	6	–	–	–	6	–	G
TROPHY[2]	4 + 4	x	x	x	x	x	✓	x	x	8	7	9	9	–	–	9	–	8	8	7	9	8	9	–	9	9	–	9	9	–	8	8	–	–	–	5	9	–	8	8	8	G
TROPOTOX PLUS or CLOVITOX PLUS or TOPSIDE	4	✓	✓	✓	✓	✓	✓[4]	x	✓	–	7	9	–	–	2	–	2	–	8	2	9	–	9	–	9	8	–	9	9	9	–	–	8	–	–	–	–	–	9	9	5	G
VARRO	2	x	x	✓	x	x	✓	x	x	–	8	–	–	–	–	8	–	–	–	–	6	–	8	–	8	–	–	8	8	–	–	–	–	–	–	–	–	–	–	–	–	–	G
Postemergence Broadleaf Herbicide Tank-Mixes																																											
BUCTRIL M[1] + MCPA[1]	4 + 4	✓	✓	✓	x	✓	✓	x	x	6	9	9	8	7	2	4	2	6	7	9	9	9	9	9	9	9	9	9	9	9	9	5	6	7	1	7	6	–	7	7	8	–	F
(EMBUTOX or CALIBER or COBUTOX) + MCPA	4 + 4	✓	✓	✓	✓	x	✓	✓	x	–	6	9	9	–	2	–	2	–	2	4	9	–	9	7	9	8	–	8	6	8	–	6	–	–	6	5	–	2	5	–	2	G
LONTREL XC + 2,4-D[1] or MCPA[1]	4 + 4	x	✓	✓	x	x	x	x	x	7	8	8	8	2	2	3	2	9	2	7	9	9	9	7	9	9	9	9	9	8	–	9	7	–	7	6	–	2	9	9	9	F

[1] Various formulations are available, see Table 4–1. Herbicides Used in Ontario.
[2] Indicates product sold as a co-pack under this trade name.
[3] The rate of MCPA Ester included in REFINE M may not provide this level of control.
[4] This herbicide can be applied to emerged winter wheat in the fall.

TABLE 8–2. Herbicide Weed Control Ratings for Cereals (cont'd)

LEGEND: Numbers (0–9) = weed control ratings ✓ = can be used on this crop Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor x = not indicated for use on this crop – = insufficient information available to make a rating

		Crop Registrations								Annual Broadleaf Weeds																										Perennial Weeds									
Trade Name	**WSSA Group(s)**	**oats**	**spring barley**	**spring wheat**	**winter barley**	**winter rye**	**winter wheat**	**alfalfa (underseeded)**	**red clover (underseeded)**	**atriplex, spreading**	**buckwheat, wild**	**canola, volunteer**	**cocklebur**	**chamomile, scentless**	**chickweed, common**	**cleavers**	**corn spurry**	**fleabane, Canada**	**hempnettle**	**lady's thumb**	**lamb's-quarters**	**lettuce, prickly**	**mustards**	**nightshades**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**shepherd's purse**	**stinkweed**	**velvetleaf**	**violet, field**	**waterhemp**	**bindweed, field**	**carrot, wild**	**curled dock**	**dandelion**	**ground-ivy (creeping-charlie)**	**horsestail**	**sow-thistle**	**thistle, Canada**	**vetches**	**Crop Tolerance**
Postemergence Broadleaf Herbicide Tank-Mixes (Cont'd)																																											
PARDNER[1] + 2,4-D[1] or MCPA[1]	6 + 4	x	✓	✓	x	✓	✓	x	x	6	8	9	8	–	2	2	2	6–	2	8	9	9	9	9	9	9	–	9	9	9	–	6	7	1	7	6	–	2	6	8	0	F
PEAK 75WG + PARDNER	2 + 6	x	x	x	x	x	✓[4]	x	x	–	9	9	9	–	9	–	–	6	–	9	9	8	9	9	9	9	7	8	8	7	–	6	–	8	–	5	–	–	8	–	6	E
REFINE SG + 2,4-D[1]	2,2 + 4	x	✓	✓	x	x	✓	x	x	–	9	9	8	7	9	6	9	6	9	9	9	9	9	7	9	9	–	9	9	8	7	6	7	8	7	6	–	2	8	7	6	F
REFINE M[2,3]/BOOST M[2]	2,2 + 4	✓	✓	✓	x	x	✓	x	x	8[3]	9	9	8[3]	7	9	6	9	6[3]	9	9	9	9	9	7	9	9[3]	7[3]	9	9	8	7		7	8	7	6	–	2	8	7	6	G

[1] Various formulations are available, see Table 4–1. Herbicides Used in Ontario.
[2] Indicates product sold as a co-pack under this trade name.
[3] The rate of MCPA Ester included in REFINE M may not provide this level of control.
[4] This herbicide can be applied to emerged winter wheat in the fall.

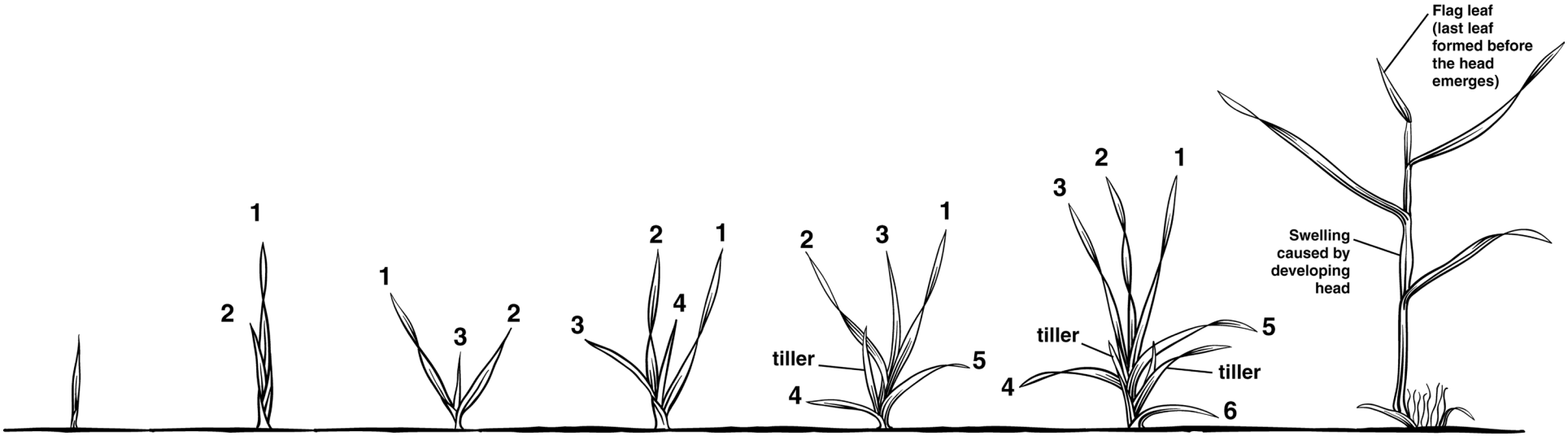

FIGURE 8–1. Cereal Crop Growth Stages.

Cereals

Apply all treatments in 100–200 L/ha (40–80 L/acre) of water except where otherwise noted.

Crop rotation is a valuable technique used to prevent the build up of weed populations associated with small grain production. Wild oats can increase in population and severely limit production on fields where small grains are grown continuously. Some weeds (e.g., proso millet) will be well controlled by cereal competition.

Blind harrowing with a light harrow, before emergence of cereals, can help to control small germinating weeds. A light harrow can also be used in cereals up to the 3 leaf stage, or a weeder harrow (L shaped flexible tines) at the 4 leaf stage to provide better control of small annual broadleaf weeds. The timing of these harrowing operations is critical. The weeds must be small and the soil surface must be dry and easily worked.

Weeds must be emerged from the soil surface and in early stages of growth to be killed by the rates of the herbicides used on cereal grains. Weeds that are growing during early periods of cereal growth (up to 5 leaf stage) have the greatest effect on the cereal yield.

The growth stage for maximum safety varies with the cereal and the herbicide. Check the label for appropriate timing. When counting the leaves on cereal plants, some confusion can occur if tiller leaves are present. These leaves are not counted. Figure 8–1. *Cereal Crop Growth Stages,* on this page, is useful for identifying the cereal leaf stages that are mentioned in this chapter.

Cereal grains have an advantage in that they do not make use of the full growing season. This is particularly true of the winter cereals where preplant cultivation and postharvest cultivation can be used to stimulate germination of weed seeds and reduce perennial weed populations.

Herbicide Application Timings

- **Preplant (PP)** – Also see Chapter 6 *Preplant & Postharvest Weed Control,* for details of products, rates and remarks.
- **Preplant Incorporated (PPI)**
- **Preemergence (PRE)**

Postemergence (POST) – Leaf stage of the weeds is critical for good weed control. Smaller weeds are usually more sensitive to herbicides. Apply according to labelled leaf stages. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant, see the product label for more details. Always use appropriate drift management technology.

TABLE 8–3. Herbicide Treatment Rates for Cereals

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Grass and Broadleaf Herbicides			
saflufenacil (25–50 g/ha) + glyphosate (900 g/ha) + adjuvant (0.5% v/v)	ERAGON LQ (342 g/L) + glyphosate (540 g/L)* + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP and PRE. • This treatment will provide suppression of secondary germination (flushes) of lamb's-quarters, red root pigweed, stinkweed, wild buckwheat and wild mustard. Use higher rate for longer residual activity. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
trifluralin (0.383–0.546 kg/ha)	TREFLAN (480 g/L)	0.8–1.14 L/ha (0.32–0.46 L/acre)	• For use only on winter wheat and fall rye. • For loose silky bentgrass control in the fall. • Apply as soon as possible after planting. • Incorporate shallowly into the soil surface with drag harrows. • Seed the crop approximately 5 cm deep to separate the germinating seed from the chemical.
	RIVAL (500 g/L)	1.2 L/ha (0.485 L/acre)	
	BONANZA 480 (480 g/L)	0.8–1.14 L/ha (0.38–0.55 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	0.93-1.33 L/ha (0.37-0.53 L/acre)	
Postemergence Grass Herbicides			
tralkoxydim (0.2 kg/ha) + adjuvant (0.5% v/v)	ACHIEVE LIQUID (400 g/L) + TURBOCHARGE	0.5 L/ha (0.2 L/acre) + 5 L/1,000 L (5 L/1,000 L)	• **Do NOT** use on tame oats, winter barley and fall rye. • Apply at 1–6 leaf stage of wild oats. • Apply up to and including GS 32 (stem elongation) in 50–100 L/ha of water. • Herbicides not listed on the label may be applied separately 7 days after application of ACHIEVE LIQUID or BISON. • **Do NOT** tank-mix REFINE SG or REFINE M with ACHIEVE LIQUID or BISON. • **Do NOT** harvest within 60 days of application. • **Do NOT** feed or graze underseeded forage in year of treatment. • Mature straw may be fed to livestock. One application per year.
	BISON (400 g/L) + ADDIT ADJUVANT		

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass Herbicides (cont'd)			
Pinoxaden (60 g/ha)	AXIAL (50 g/L)	1200 mL/ha (500 mL/acre)	· For use on barley, spring and winter wheat. · Apply from the 1 leaf to flag leaf stage of cereals when labelled weeds are in the 1–6 leaf stage of growth. · There are no crop rotation restrictions the year following AXIAL application. · When tank-mixing with a broadleaf herbicide, always add the broadleaf herbicide to the spray tank first; followed by AXIAL. · AXIAL BIA can be tank-mixed with either REFINE SG at 30 g/ha (12 g/acre), INFINITY at 0.83 L/ha (0.33 L/acre) or BUCTRIL M at 1 L/ha (0.4 L/acre). · **Do NOT** add any adjuvants, chemical additives or fertilizers to mixtures with AXIAL. · Observe a minimum interval to harvest of 60 days after treatment for grain and straw and of 30 days after treatment for hay. · Observe a minimum of 7 days before grazing livestock. · The label warns against applyng to a cereal crop that has been stressed by frost.
Postemergence Grass Herbicides (cont'd)			
fenoxaprop-p-ethyl/ safener (92.4 g/L)	BENGAL (120 g/L) VIGIL (120 g/L)	0.77 L/ha (0.31 L/acre)	· For use **ONLY** on spring wheat. · Use for control of wild oats and other grassy weeds. · Apply at the 1–6 leaf stage of spring wheat. · **Do NOT** harvest within 60 days of application. · BENGAL and VIGIL contain a safener that enhances the cereal crops ability to metabolize fenoxaprop-p-ethyl.
fenoxaprop-p-ethyl/ safener (91.8. g/ha)	PUMA ADVANCE (90 g/L)	1.02 L/ha (0.412 L/acre)	· For use **ONLY** on spring wheat and spring barley. · Use for control of wild oats and other grassy weeds. · Apply at the 1–6 leaf stage of spring wheat. · **Do NOT** harvest within 60 days of application. · PUMA ADVANCE contains a safener that enhances the cereal crops ability to metabolize fenoxaprop-p-ethyl.
Postemergence Broadleaf Herbicides			
2,4-D (0.34–0.5 kg/ha)	2,4-D Amine 600 (564 g/L)*	0.6–0.9 L/ha (0.24–0.36 L/acre)	· **Do NOT** use on oats, winter barley and cereals underseeded with legumes. · Use the lower rate when weeds are <8 cm tall, the higher rate for harder to control species. · Apply when spring cereals are in the 3 leaf to early flag leaf stage of growth. **For Winter Cereals:** · **Do NOT** apply to seedling winter cereals in the fall. · Apply from early tillering to just before the flag leaf stage of growth. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
2,4-D (0.528–0.726 kg/ha)	2,4-D Ester 700 (660 g/L)*	0.75–1.1 L/ha (0.32–0.44 L/acre	· **Do NOT** use on oats, winter barley and cereals underseeded with legumes. · Use the lower rate when weeds are <8 cm tall, the higher rate for harder to control species. · Apply when spring cereals are in the 3 leaf to early flag leaf stage of growth. **For Winter Cereals:** · **Do NOT** apply to seedling winter cereals in the fall. · Apply from early tillering to just before the flag leaf stage of growth. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
bromoxynil/MCPA (0.56 kg/ha)	BUCTRIL M (560 g/L)	1 L/ha (0.4 L/acre)	· Apply when weeds are in the 2–6 leaf stage and cereals are in the 2 to early flag leaf stage. For control of winter annual weeds, apply before flower buds appear. · Best results are obtained with applications at the 2–5 leaf cereal stage since thorough spray coverage of weed foliage is required for optimum weed control. · **Do NOT** harvest within 30 days of application. **Underseeded Red Clover (Winter Wheat Only):** · **Do NOT** use on fall rye or spring cereals underseeded with red clover. · Apply in the spring when the red clover is in the 1st–3rd trifoliate stage and when the winter wheat provides a protective canopy over the clover. · **Do NOT** apply in less than 200 L/ha water (80 L/acre). · **Do NOT** apply if clover is under stress, and avoid overlaps as injury may result.
	BADGE (450 g/L)	1.25 L/ha (0.5 L/acre)	
	MEXTROL (450 g/L)		
	LOGIC M (450 g/L)		
2,4-DB (1.1–1.4 kg/ha)	EMBUTOX (625 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	· Apply 2,4-DB at the 5 leaf to early flag stage of cereals. · Oats may be damaged if treated before the 5 leaf stage. · Apply when the legumes are in the 1–4 trifoliate stage. · Use **ONLY** if cereals are underseeded to alfalfa, bird's foot trefoil, alsike, red or ladino clover and grasses. Red clover may be damaged by 2,4-DB. · Apply in 150–200 L/ha (60–80 L/acre) water. · Wild mustard plants are not controlled if sprayed when they are beyond the 4 leaf stage.
	CALIBER 625 (625 g/L)		
	COBUTOX 625 (625 g/L)		
fluroxypyr/bromoxynil/ MCPA (600 g/ha)	ENFORCER M (480 g/L)	1.25 L/ha (0.5 L/acre)	· **Do NOT** use on oats or rye. · Apply from the 2 leaf stage to early flag leaf stage of growth. Apply when weeds are in the seedling stage (up to 6 leaf stage) and actively growing. · **Do NOT** harvest for forage, hay or graze for 30 days after application. · **Do NOT** harvest within 60 days of application.
dichlorprop/2,4-D (740 g/ha)	ESTAPROP XT (610 g/L)	1.2 L/ha (0.48 L/acre)	· **Do NOT** use on oats, winter barley and fall rye. · **Do NOT** use on spring barley or wheat underseeded with legumes. · **Do NOT** harvest within 60 days of application. · Apply to emerged weeds at the 4 leaf to early flag leaf stage of spring cereals. **For Winter Wheat:** · Apply in early spring to emerged weeds. · May be used up to the early flag leaf stage. · **Do NOT** use if underseeded with legumes.
	DICHLORPROP DX (610 g/L)		

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
dichlorprop/2,4-D (1.017 kg/ha)	TURBOPROP (582 g/L)	1.75 L/ha (0.7 L/acre)	· **Do NOT** use on oats, winter barley and fall rye. · **Do NOT** use on spring barley or wheat underseeded with legumes. · **Do NOT** harvest within 60 days of application. · Apply to emerged weeds at the 4 leaf to early flag leaf stage of spring cereals. **For Winter Wheat:** · Apply in early spring to emerged weeds. · May be used up to the early flag leaf stage. · **Do NOT** use if underseeded with legumes.
pyrasulfotole/bromoxynil (213 g/ha)	INFINITY	0.83 L/ha (0.33 L/acre)	· **Do NOT** use on oats, winter barley, fall rye or cereals underseeded with legumes. · Apply postemergence and prior to flag leaf emergence. · The addition of ammonium sulphate at 1 L/ha (0.4 L/acre) is required for the control of cleavers at the 4–6 whorl growth stage. · **Do NOT** graze the treated crops or cut for forage or hay within 25 days of application. · **Do NOT** harvest spring barley for grain or straw within 45 days of application. · **Do NOT** harvest wheat for grain or straw within 50 days of application.
pyrasulfotole/bromoxynil /fluroxypyr (277.4 g/ha)	INFINITY FX (277.4 g/L)	1 L/ha (400 mL/acre)	· **Do NOT** use on oats, winter barley, fall rye or cereals underseeded with legumes. · Apply postemergence and prior to flag leaf emergence. · The addition of ammonium sulphate at 1 L/ha (0.4 L/acre) will improve the control of Canad fleabane, giant ragweed and spreading atriplex. · **Do NOT** graze the treated crops or cut for forage or hay within 30 days of application. · **Do NOT** harvest for grain or straw within 60 days of application.
clopyralid (0.15–0.2 kg/ha)	LONTREL XC (600 g/L)	250–340 mL/ha (100–135 mL/acre)	· **Do NOT** use on oats, rye or cereals underseeded with forage crops. · Apply when wheat or barley are at the 3 leaf to flag leaf emergence stages. · For the control of Canada thistle and perennial sow-thistle (top growth only). · **Do NOT** harvest within 60 days of application.
MCPA (0.35–0.85 kg/ha)	MCPA AMINE (500 g/L)*	0.7–1.7 L/ha (0.28–0.68 L/acre)	· **Do NOT** use on cereals underseeded with forage crops. · Apply when the crop is in the 2–5 leaf stage of growth. · The maximum rate that you can apply to oats is 1.1 L/ha (0.44 L/acre). · A 0.7 L/ha (0.28 L/acre) rate should be used to control susceptible weeds in the seedling stage (2–4 leaf) and then increased to 1.1 L/ha (0.44 L/acre) if heavy infestations or poor environmental conditions exist. · A 1.25 L/ha (0.5 L/acre) rate should be used for hard-to-kill weeds in the seedling stage (2–4 leaf) and then increased to 1.7 L/ha (0.68 L/acre) if weeds are at the bud stage or poor environmental conditions exist. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
MCPA (0.29–0.525 kg/ha)	MCPA ESTER (500 g/L)*	0.58–1.05 L/ha (0.232–0.42 L/acre)	• **Do NOT** use on cereals underseeded with forage crops. • Apply when the crop is in the 2–5 leaf stage of growth. • The maximum rate that you can apply to oats is 0.9 L/ha (360 mL/acre). • A 0.58 L/ha (0.232 L/acre) rate should be used to control susceptible weeds in the seedling stage (2–4 leaf) and then increased to 1.1 L/ha (0.44 L/acre) if heavy infestations or poor environmental conditions exist. • A 1.25 L/ha (0.5 L/acre) rate should be used for hard-to-kill weeds in the seedling stage (2–4 leaf) and then increased to 1.7 L/ha (0.68 L/acre) if weeds are at the bud stage or poor environmental conditions exist. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
MCPA (0.3–0.45 kg/ha)	MCPA SODIUM 300 (300 g/L)*	1–1.5 L/ha (0.4–0.6 L/acre)	• For use on cereals underseeded to red clover. • Treat at an early stage of clover development when it is covered by a canopy of crop. • Apply in the spring when crop growth commences until early flag leaf stage. • Apply in 180–240 L/ha water (72–96 L/acre). • The lower rate may not kill ragweed. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
bromoxynil (288 – 336 g/ha)	PARDNER (280 g/L)	1–1.2 L/ha (0.4–0.48 L/acre)	• Apply when the weeds are in the 1–4 leaf stage and cereals are in the 2 to early flag leaf stage. Use the higher rate when weeds are past the 4 leaf stage. • **Spring Cereals:** Best results are in the 2–5 leaf cereal stage since thorough coverage of weed foliage is required for optimum weed control. • **Winter Wheat:** More effective on winter annuals when applied as a fall treatment.
	BROMOTRIL (240 g/L)	1.2–1.4 L/ha (0.48–0.56 L/acre)	
	BROTEX 240 (240 g/L)		
	KORIL (235 g/L)		
	BROMAX (480 g/L)	0.6–0.7 L/ha (0.24–0.28 L/acre)	
	BROTEX 480 (480 g/L)		
halauxifen/fluroxypyr (82 g/ha) + MCPA (372 g/ha)	PIXXARO (sold as co-pack) PIXXARO A (16.25/250 g/L) + MCPA Ester 600 (600 g/L)	308 mL/ha (124 mL/acre) 620 mL/ha (250 mL/acre)	• Apply to actively growing winter wheat from the 3 leaf stage to just prior to flag leaf emergence. • Extreme growing conditions such as drought or near freezing temperature prior to at or following application may reduce weed control and increase the risk of crop injury at all stages of growth. • If foliage is wet at the time of application control may be decreased. • Only weeds which are emerged at the time of application will be affected.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
thifensulfuron-methyl/ tribenuron-methyl (15 g/ha) + MCPA (285 g/ha) + non ionic surfactant (0.2% v/v)	REFINE M (sold as a co-pack): REFINE SG (50%) + MCPA ESTER (600 g/L) + non ionic surfactant	30 g/ha (12 g/acre) + 475 mL/ha (190 mL/acre) + 2 L/1,000 L (2 L/1,000 L)	• **Do NOT** use on winter barley, fall rye and cereals underseeded with forage crops. • Apply tank-mixes from the full 3 leaf stage to the early flag leaf stage of the crop. • **Do NOT** harvest within 7 days of application.
	BOOST M (sold as co-pack) BOOST (75%) + MCPA ESTER (600 g/L)* + non ionic surfactant	20 g/ha (8 g/acre) + 925 mL/ha (375 mL/acre) + 2 L/1,000 L	
thifensulfuron–methyl/ tribenuron–methyl (15 g/ha) + non ionic surfactant (0.2% v/v)	REFINE SG (50%) + non ionic surfactant	30 g/ha (12 g/acre) + 2 L/1,000 L	• **Do NOT** use on winter barley, fall rye and cereals underseeded with forage crops. • Apply when the cereal crop is in the 2 leaf to flag leaf stage. • **Winter Wheat:** Apply once either in the fall or spring. • Apply to young actively growing weeds that are less than 10 cm tall or across. • Canada thistle, sow-thistle and round-leaved mallow are suppressed.
pyroxsulam (15.05 g/ha) + non ionic surfactant (0.5% v/v)	SIMPLICITY GODRI (21.5%)	70 g/ha (28 g/acre) + 5 L/1,000 L	• **Do NOT** use on oats, barley, fall rye or cereals underseeded with legumes. • Apply when cereals are emerged from the 3 leaf stage up to just before flag leaf emergence. • For winter wheat: apply in the fall or spring. Control of downy brome, chess and other winter annuals is better when applied in the fall. • Near freezing temperature prior to, at or following application may reduce weed control and increase the risk of crop injury at all stages of growth. • Occasionally slight yellowing or height reduction may be observed in the treated crop. These transient symptoms disappear within 14 days with no reduction to yield. • **Do NOT** harvest within 60 days of application.
fluroxypyr (108 g/ha) + MCPA (560 g/ha)	TROPHY (sold as a co-pack): TROPHY A (180 g/L) + TROPHY B (500 g/L)	0.6 L/ha (0.24 L/acre) + 1.12 L/ha (0.45 L/acre)	• For use only on winter wheat. • Apply from the 3-tiller until the early flag leaf stage of winter wheat. • **Do NOT** apply to winter wheat underseeded to red clover. • **Do NOT** apply within 60 days of harvest and only once per year. .
MCPB/MCPA (1.1–1.7 kg/ha)	TROPOTOX PLUS (400 g/L)	2.75–4.25 L/ha (1.1–1.7 L/acre)	• Apply MCPB/MCPA from the 2 leaf stage to flag leaf stage of spring cereals. • **Winter Cereals:** Apply in the spring when the crop is in the 2 leaf to flag leaf stage. • Use **ONLY** if cereals are underseeded to red, alsike, ladino or white Dutch clover and grasses. • Apply when legumes are in the unifoliate to the 4th trifoliate leaf stage. • Apply in 150–200 L/ha (60–80 L/acre) water.
	CLOVITOX PLUS (400 g/L)		
	TOPSIDE (400 g/L)		

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
thiencarbazone-methyl (5 g/ha)	VARRO (10 g/L)	0.5 L/ha (0.2 L/acre)	• For use only on spring and winter wheat. • Apply Varro from the 1 - 6 leaf stage on the main stem up to emergence of the third tiller, but before appearance of the first node (jointing). • Avoid crop injury: do not apply an ALS herbicide such as Varro following the appearance of the first node • Under drought conditions: do not spray Varro herbicide if >35 days between seeding and spraying, as drought hastens crop development • Do not spray within three days before or after cold temperatures (3°C or lower). • **Do NOT** harvest within 60 days of application.
Postemergence Grass and Broadleaf Herbicide Tank-Mixes			
tralkoxydim* (0.2 kg/ha) + bromoxynil/MCPA* (0.56 kg/ha) + adjuvant (0.5% v/v)	ACHIEVE LIQUID (400 g/L) + BUCTRIL M (560 g/L) + TURBOCHARGE	0.5 L/ha (0.2 L/acre) + 1 L/ha (0.4 L/acre) + 5 L/1,000 L	• **Do NOT** use on oats, winter barley or fall rye. • Apply when the wild oats are in the 1–6 leaf stage, broadleaf weeds in the 1–4 leaf stage and when the cereals are in the 2 to early flag leaf stage. • **Do NOT** harvest within 60 days of application.. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
tralkoxydim* (0.2 kg/ha) + bromoxynil* (0.28–0.336 kg/ha) + adjuvant (0.5% v/v)	ACHIEVE LIQUID (400 g/L) + PARDNER (280 g/L) + TURBOCHARGE	0.5 L/ha (0.2 L/acre) + 1–1.12 L/ha (0.4–0.48 L/acre) + 5 L/1,000 L	• **Do NOT** use on oats, winter barley or fall rye. • Apply when the wild oats are in the 1–6 leaf stage, broadleaf weeds in the 1–4 leaf stage and when the cereals are in the 2 leaf to early flag leaf stage. • Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. • **Do NOT** harvest within 60 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
tralkoxydim* (0.2 kg/ha) + pyrasulfotole/ bromoxynil (213 g/ha) + adjuvant (0.5% v/v)	ACHIEVE LIQUID (400 g/L) + INFINITY + TURBOCHARGE	0.5 L/ha (0.2 L/acre) + 0.83 L/ha (0.33 L/acre) + 5 L/1,000 L	• **Do NOT** use on oats, winter barley, fall rye or cereals underseeded with legumes. • Apply postemergence and prior to flag leaf emergence. • The addition of ammonium sulphate at 1 L/ha (0.4 L/acre) is required for the control of cleavers at the 4–6 whorl growth stage. • **Do NOT** graze the treated crops or cut for forage or hay within 25 days of application. • Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. • **Do NOT** harvest within 60 days of application.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicide Tank-Mixes (cont'd)			
fenoxaprop-p-ethyl/ SAFENER* (92.4 g/L) + bromoxynil/MCPA* (0.56 kg/ha)	BENGAL (120 g/L) + BUCTRIL M (560 g/L)	0.77 L/ha (0.31 L/acre) + 1 L/ha (0.4 L/acre)	· For use **ONLY** on spring wheat. · Use for control of wild oats, grassy and broadleaf weeds. · Apply at the 1–6 leaf stage of spring wheat. · Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. · **Do NOT** harvest within 60 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
fenoxaprop-p-ethyl/ safener (91.8 g/ha) + bromoxynil/MCPA* (0.56 kg/ha)	PUMA ADVANCE (90 g/L) + BUCTRIL M (560 g/L)	1.02 L/ha (0.412 L/acre) + 1 L/ha (0.4 L/acre)	· For use **ONLY** on winter wheat. · Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. · **Do NOT** harvest within 60 days of application. · **Do NOT** apply if rain is expected within 4 hours after application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
fenoxaprop-p-ethyl/ safener (91.8 g/ha) + pyrasulfotole/ bromoxynil (213 g/ha)	PUMA ADVANCE (90 g/L) + INFINITY	1.02 L/ha (0.412 L/acre) + 0.83 L/ha (0.33 L/acre)	· For use **ONLY** on winter wheat. · Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. · **Do NOT** harvest within 60 days of application.
fenoxaprop-p-ethyl/ safener (91.8 g/ha) + MCPA* (420 g/ha)	PUMA ADVANCE (90 g/L) + MCPA 500	1.02 L/ha (0.412 L/acre) + 0.84 L/ha (0.336 L/acre)	· For use **ONLY** on winter wheat. · Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. · **Do NOT** harvest within 60 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
fenoxaprop-p-ethyl/ safener (91.8 g/ha) + thifensulfuron-methyl/ tribenuron-methyl (15 g/ha) + MCPA (420 g/ha)	PUMA ADVANCE (90 g/L) + REFINE M (co-pack): [REFINE SG (50%) + MCPA (500 g/L)]	1.02 L/ha (0.412 L/acre) + [30 g/ha (12 g/acre) + 0.84 L/ha (0.336 L/acre)]	· For use **ONLY** on winter wheat. · Avoid applying when temperatures of 4°C or less up to 48 hours before or after application or crop injurymay occur. · **Do NOT** harvest within 60 days of application.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicide Tank-Mixes (cont'd)			
bromoxynil/MCPA* (0.56 kg/ha) + MCPA (0.28 kg/ha)	BUCTRIL M (560 g/L) + MCPA AMINE (500 g/L)*	1 L/ha (0.4 L/acre) + 0.55 L/ha (0.22 L/acre)	• **Do NOT** use on cereals underseeded with forage crops (including red clover). • Add MCPA for improved control of hempnettle (up to the 4 leaf stage) and volunteer canola (up to the 8 leaf stage). • Add MCPA to the spray tank first, followed by BUCTRIL M. • **Do NOT** harvest within 30 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
2,4-DB* (0.8 kg/ha) + MCPA (35 g/ha)	EMBUTOX (625 g/L) + MCPA AMINE (500 g/L)*	1.25 L/ha (0.5 L/acre) + 70 mL/ha (28 mL/acre)	• Apply when the legumes are in the 1–4 leaf stage. • Use if cereals are underseeded only to alfalfa, bird's foot trefoil, alsike or ladino clover and grasses. • The addition of MCPA gives better control of common mustard than 2,4-DB alone. • Apply in 150–200 L/ha (60–80 L/acre) water. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
clopyralid (0.1–0.15 kg/ha) + 2,4-D (0.35–0.85 kg/ha)	LONTREL XC (600 g/L) + 2,4-D (470 g/L)*	170–250 mL/ha (68–100 mL/acre) + 0.75–1.81 L/ha (0.3–0.72 L/acre)	• For use **ONLY** on spring barley and spring wheat. • LONTREL is not registered for use on oats in Eastern Canada. • **Do NOT** use products containing 2,4-D on oats due to the probability of crop injury. • In combination with 2,4-D or MCPA, the lower rate of LONTREL XC will provide control of Canada thistle for 6–8 weeks and the higher rate of LONTREL XC will provide season long control of Canada thistle. • **Do NOT** harvest within 60 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
clopyralid (0.1–0.15 kg/ha) + MCPA (0.35–0.85 kg/ha)	LONTREL XC (600 g/L) + MCPA AMINE (500 g/L)*	170–250 mL/ha (68–100 mL/acre) + 0.7–1.7 L/ha (0.28–0.68 L/acre)	
bromoxynil* (0.28 kg/ha) + 2,4-D* (0.28 kg/ha)	PARDNER (280 g/L) + 2,4-D (470 g/L)*	1–1.2 L/ha (0.4–0.48 L/acre) + 0.6 L/ha (0.24 L/acre)	• **Do NOT** use on winter barley and fall rye. • **Do NOT** use on cereals underseeded with forage crops. • **Do NOT** use the 2,4-D tank mix on oats. • Apply to cereals in the spring from the 4 leaf to early flag leaf stage. • Include 2,4-D or the lower rate of MCPA if mustards are present. • Use the higher rate of MCPA if hempnettle is present. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
bromoxynil* (0.28 kg/ha) + MCPA* (0.28–0.55 kg/ha)	PARDNER (280 g/L) + MCPA AMINE (500 g/L)*	1–1.2 L/ha (0.4–0.48 L/acre) + 0.55–1.1 L/ha (0.22–0.44 L/acre)	
prosulfuron (10 g/ha) + bromoxynil (140 g/ha) + non-ionic surfactant (0.2% v/v)	PEAK 75 WG + PARDNER (280 g/L) + non-ionic surfactant	13.3 g/ha (5.3 g/acre) + 0.5 L/ha (0.2 L/acre) + 2 L/1,000 L	• For use **ONLY** on winter wheat. • Apply POST up until stem elongation of winter wheat. • **Do NOT** apply to winter wheat underseeded to red clover or other legumes. • **Do NOT** harvest within 75 days of application.

TABLE 8–3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicide Tank-Mixes (cont'd)			
thifensulfuron-methyl/ tribenuron-methyl (15 g/ha) + 2,4-D* (0.42–0.55 kg/ha) + non ionic surfactant (0.2% v/v)	REFINE SG (50%) + 2,4-D (470 g/L)* + non ionic surfactant	30 g/ha (12 g/acre) + 0.84–1.1 L/ha (0.34–0.45 L/acre) + 2 L/1,000 L	• **Do NOT** use on winter barley, fall rye and cereals underseeded with forage crops. • **Do NOT** apply 2,4-D tank-mix on oats. • Apply tank-mixes from the full 3 leaf stage to the early flag leaf stage of the crop. • **Do NOT** harvest within 7 days of application. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
	REFINE SG (50%) + 2,4-D (564 g/L)* + non ionic surfactant	30 g/ha (12 g/acre) + 0.7–0.9 L/ha (0.28–0.36 L/acre) + 2 L/1,000 L	
	REFINE SG (50%) + 2,4-D (660 g/L)* + non ionic surfactant	30 g/ha (12 g/acre) + 0.6–0.8 L/ha (0.24–0.32 L/acre) + 2 L/1,000 L	
Preharvest			
carfentrazone-ethyl (17.5–28 g/ha) + non-ionic surfactant (0.25% v/v)	AIM EC (240 g/L) + non-ionic surfactant	73–117 mL/ha (30–47 mL/acre) + 2.5 L/1,000 L (2.5 L/1,000 L)	• Apply to actively growing weeds, up to 10 cm. • Coverage of weed and crop foliage is essential for control. • **Do NOT** harvest within 3 days of application.
carfentrazone-ethyl (17.5–28 g/ha) + MERGE (0.1% v/v)	AIM EC (240 g/L) + MERGE	73–117 mL/ha (30–47 mL/acre) + 10 L/1,000 L	
Saflufenacil (25.2 – 49.7 g/ha) + adjuvant (1 L/ha)	ERAGON LQ (342 g/L) + MERGE	73–146 mL/ha (29.5–59 mL/acre) +1 L/ha (0.4 L/acre)	• Apply at hard dough stage when crop is at 30% grain moisture or less • Apply in 200 L/ha (80 L/acre) of water. • Preharvest interval (PHI) is 3 days. • For use only on wheat (durum, spring, winter), barley (spring, winter, malting), and triticale
Saflufenacil (25.2 – 49.7 g/ha) + glyphosate (900 g/ha) + adjuvant (1 L/ha)	ERAGON LQ (342 g/L) +GLYPHOSATE (540 g/L)* + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1.67 L/ha (0.67 L/acre) +1 L/ha (0.4 L/acre)	• Apply at hard dough stage when crop is at 30% grain moisture or less • Apply in 200 L/ha (80 L/acre) of water. • **Do NOT** apply to crops grown for seed. • Refer to preharvest precautions for glyphosate. • For use only on wheat (durum, spring, winter), barley (spring, winter, malting), and triticale
glyphosate (0.9 kg/ha)	glyphosate (360 g/L)*	2.5 L/ha (1 L/acre)	• Apply in 50–100 L/ha (20–40 L/acre) water when crop is at 30% grain moisture or less. • Apply at least 7 days prior to harvest and use ground application only. • **Do NOT** apply to seed crops. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
	glyphosate (480 g/L)*	1.88 L/ha (0.75 L/acre)	
	glyphosate (540 g/L)*	1.67 L/ha (0.67 L/acre)	

COVER CROPS: Cover crops can suppress weed growth and reduce the amount of weed seeds returned to the soil. Typically, cover crops that are planted after cereal harvest provided the most benefit in reducing the amount of weed seeds produced and returned to the soil. A comparison of cover crops and their ability suppress weed growth can be found in Table 8–4.

TABLE 8–4. Relative ranking of cover crops and their ability to suppress weeds. Adapted from the Midwest Cover Crops Council Cover Crop Decision Tool.

Cover Crop	Ability to Suppress Weeds
Rye, Winter cereal	Excellent
Triticale, Winter	Excellent
Buckwheat*	Excellent
Mustard, Oriental*	Excellent
Radish, Oilseed*	Excellent
Barley (spring or winter)	Very Good
Oats	Very Good
Triticale, Spring	Very Good
Red clover	Very Good
Ryegrass, Annual	Good
Peas, Field	Good

Source: mccc.dev.amr.msu.edu

* Do not allow these cover crops to go to seed otherwise they will produce weedy volunteers in the next season.

Q: I want to plant cover crops after cereal harvest. Should I be concerned about any herbicide residues that would make it harder to get them established?

A: Two important factors influence the potential for herbicide carryover that could negatively affect establishment of a desired cover crop: 1) The sensitivity of the cover crop to herbicide residues and 2) the persistence of the herbicide in the soil.

An increasing amount of research is being done across North America to look into the issue, with some very good Ontario work to draw from. In particular, studies in Ontario and Arkansas found no concerns with establishing cereal crops (e.g. oats, barley, cereal rye) in soils where common corn, soybean and cereal herbicides had been applied earlier in the season. The exception would be the soybean herbicide "Command" (active ingredient: clomazone), which has rotational restrictions for cereal crops. Otherwise, establishing a cereal cover crop after soybeans, edible beans, corn or cereal harvest should not be influenced by the herbicide that was applied to those crops.

Broadleaf cover crop species tend to be more sensitive to herbicide carryover. Imazethapyr (the active ingredient found in PURSUIT, ASSIGNMENT, CLEANSWEEP, CONQUEST LQ, FREESTYLE, PHANTOM AND NU-IMAGE) negatively affected the establishment of fall-seeded oilseed radish and hairy vetch in an Ontario study. An Arkansas study found that atrazine (e.g. AATREX 480, CONVERGE 480) caused the greatest reduction in the biomass of hairy vetch (25 per cent), crimson clover (30 per cent), buckwheat (32 per cent) and berseem clover (40 per cent).

Several factors will influence the rate at which a herbicide dissipates in the soil, such as rainfall, soil texture, organic matter and soil pH. Thus, in a dry year and on a coarse soil with low organic matter and high pH, you could see unacceptable injury to a desired cover crop that might not be evident if you were planting into a finer textured soil with high organic matter, a neutral pH and plenty of rainfall throughout the season.

Last, checking the "rotational restrictions" section of the herbicide label and in Table 4–4 and 4–5 of this guide may identify any known negative effects from herbicide carryover.

9. CORN (FIELD, SEED & SWEET)

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control, and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and given general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

Trade Name	WSSA group(s)	Crop			Annual Grasses									Annual Broadleaves														Perennials						Crop Tolerance
		seed corn	sweet corn	field corn	barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Preplant Burndown Herbicides – Refer to Tables 6–1. *Non-Selective Herbicides Available for Preplant Site Preparation* and 6–2. *Preplant Herbicide Weed Control Ratings*, for a list of herbicides and weed control ratings.																																		
Soil Applied Grass and Broadleaf Herbicides (Preemergence Timing Only)																																		
ACURON	27,27, 15,5	✓	✓	✓	9	9	9	8[2]	8	8	8	9	7	9	8	–	9	9	9	9	9	9	9	9	9	9	2	0	8	0	0	0	E
FIERCE	14,15	x	x	✓	9	9	9	8[2]	9	9	9	8	–	8	5	–	–	8	9	9	9	9	8	5	7	9	–	–	–	–	–	–	G
FOCUS	15,14	x	x	✓	9	9	8	–	9	9	9	–	–	8	–	–	–	–	8	9	9[2,3]	9	7	–	6	7[2]	–	–	8[4]	7[4]	–	–	E
INTEGRITY	14,15	x	✓	✓	9	9	9	8	8	9	9	9	4	9	8	–	9	8	8	9	9[1]	9	8	5	9	8	6	5	8[1]	0	0	0	E
SIMAZINE 480	14,15	✓	✓	✓	9	9	9	8[2]	8	8	8	9	4	9	8	7[4]	–	9	9	9	9	9	9	9	8[4]	9	–	2	0	8[1,2]	0	0	0	E
Soil Applied Tank-Mixes (Preemergence Timing Only)																																		
DUAL II MAGNUM + LOROX + AATREX	15 + 7 + 5	x	✓	x	9	9	9	8	8	9	9	9	2	9	5	9	–	9	9	9	9	9	9	–	6	7	0	0	7	0	0	0	E
PRIMEXTRA II MAGNUM + LOROX	15,5 + 7	x	x	✓	9	9	9	8	8	9	9	9	2	9	5	9	–	9	9	9	9	9	9	–	6	7	0	0	7	0	0	0	E

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

Trade Name	WSSA group(s)	Crop			Annual Grasses									Annual Broadleaves																Perennials						Crop Tolerance
		seed corn	sweet corn	field corn	barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Soil Applied Broadleaf Herbicides (Preemergence timing only)																																				
AATREX	5	✓	✓	✓	2	2	2	2	2	2	2	2	2	9	5	9	5	9	9R	9	9	9R	9R	6	5	5	2	0	0	2	2	0	E
BROADSTRIKE RC	2	x	x	✓	0	0	0	0	0	2	0	0	0	–	7	–	5R	8	9R	8	7R	9R	8R	7R	9	–	–	8	–	–	–	–	G
CALLISTO + AATREX	27+5	✓	✓	✓	2	0	8[4]	0	2	2	2	2	2	8	7	–	9	9	9	9	9	9	8	8	9	8	2	0	0	0	0	0	E
dicamba (ENGENIA, FEXAPAN or XTENDIMAX)	4	x	x	✓	0	0	0	0	0	0	0	0	0	8	6	8	9	9	9	6	9	9	9	7	8	3	2	0	0	0	2	2	G
MARKSMAN	4,5	x	x	✓	2	2	2	2	2	2	2	2	2	9	6	9	9	9	9	9	9	9	9	7	8	7	2	0	0	2	2	2	G
VALTERA EZ	14	x	x	✓	3	3	3	5	5	6	6	3	–	8	5	–	7[3]	8	9	9	9	9	8	5	7	8	–	–	–	–	–	–	G
Preemergence and Early Postemergence Grass Herbicides																																				
DUAL II MAGNUM	15	✓	✓	✓	9	9	8	8[2]	8	9	9	9	4	2	2	2	–	2	7	2	9[2,3]	8[2]	4	3	3	7[2]	0	0	8[1,2]	0	0	0	E
FRONTIER MAX	15	✓	✓	✓	9	9	7	8[2]	8	9	9	9	4	2	2	2	–	2	7	2	9[2,3]	8[2]	4	3	3	7[2]	0	0	8[1,2]	0	0	0	E
PROWL H20	3	x	x	✓	9	9	6	9	8	8	8	–	5	–	–	–	–	6	9	0	8	8	2	–	6	–	–	–	–	–	–	–	E
ZIDUA SC	15	x	x	✓	9	9	9	8[2]	8	9	9	9	4	2	2	2	–	2	7	2	9[2,3]	8[2]	4	3	3	7[2]	0	0	8[1,2]	0	0	0	E
Preemergence and Early Postemergence Grass and Broadleaf Herbicides																																				
ACURON	27,27, 15,5	x	x	✓	9	9	9	8[2]	8	8	8	9	4	9	8	–	9	9	9	9	9	9	9	9	9	9	2	0	8	0	0	0	E
CONVERGE XT*	27+5	✓	x	✓	9	9	9	9[2]	9	9	9	9	8[2]	8	7	–	7	9	9	9	9	9	9	7	9	8	–	0	0	0	0	0	E
ENGARDE	2+27	x	x	✓	9	8	8	9	9	9	7	9	9	9	5	8	–	9	9	9	9	9	8	–	9	6	–	–	8[4]	7[4]	–	–	E
PRIMEXTRA II MAGNUM	15,5	✓	✓	✓	9	9	9	8	8	9	9	9	2	9	5	9	6	9	9R	9	9	9	9R	–	2	7	0	0	8[1,2]	0	0	0	E

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

		Crop			Annual Grasses									Annual Broadleaves													Perennials						
Trade Name	**WSSA group(s)**	**seed corn**	**sweet corn**	**field corn**	**barnyard grass**	**smooth crabgrass**	**large crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**corn spurry**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preemergence and Early Postemergence Tank-Mixes (for Control of Grass and Broadleaf Weeds)																																	
ARMEZON PRO + AATREX	15,27 + 5	x	x	✓	9	9	9	8[2]	8	8	8	9	7	9	7	9	6	9	9	9	9	9	9	5	7	8	–	0	8[1,2]	0	8[4]	8[4]	E
ARMEZON PRO + MARKSMAN	15,27 + 4,5	x	x	✓	9	9	9	8[2]	8	8	8	9	7	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	8	8[4]	0	8[1,2]	0	8[4]	8[4]	E
BROADSTRIKE RC +DUAL II MAGNUM	2 +15	x	x	✓	9	9	9	8[2]	8	8	8	9	2	–	4	–	7[R]	8	9[R]	8	9[2,3]	9[R]	8[R]	7[R]	9	6	–	8	8[1,2]	–	–	–	G
BROADSTRIKE RC +PRIMEXTRA II MAGNUM	2 +15,5	x	x	✓	9	9	9	8[2]	8	9	9	9	2	9	5	9	7[R]	9	9[R]	9	9	9	9[R]	–	9	7[2]	0	8	8[1,2]	0	0	0	G
DUAL II MAGNUM + CALLISTO + AATREX	15 +27,5	x	x	✓	9	9	9	8[2]	8	8	8	9	4	9	8	–	7	9	9	9	9	9	9	8[4]	9	8	2	0	8[1,2]	0	0	0	E
DUAL II MAGNUM + dicamba[6]	15 +4	x	x	✓	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	6	9	9	9	9[4]	9[4]	7[2]	8[4]	0	8[1,2]	0	9[4]	8[4]	G
DUAL II MAGNUM + MARKSMAN	15 +4,5	x	x	✓	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	7[2]	8[4]	0	8[1,2]	0	8[4]	8[4]	G
FRONTIER MAX + AATREX	15+ 5	x	x	✓	9	9	9	8[2]	8	9	9	9	4	9	6	9	3	9	9[R]	9	9	9	9[R]	6	5	7[2]	2	0	8[1,2]	2	2	0	E
FRONTIER MAX + dicamba[6]	15+ 4	x	x	✓	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	6	9	9	9	9[4]	9[4]	7[2]	8[4]	0	8[1,2]	0	9[4]	8[4]	G
FRONTIER MAX + MARKSMAN	15 +4,5	x	x	✓	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	7[2]	8[4]	0	8[1,2]	0	8[4]	8[4]	E
PRIMEXTRA II MAGNUM + CALLISTO	15,5 +27	✓	✓	✓	9	9	9	8[2]	8	8	8	9	4	9	8	7[4]	7	9	9	9	9	9	9	8[4]	9	8	2	0	8[1,2]	0	0	0	E

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

		Crop			Annual Grasses									Annual Broadleaves														Perennials						
Trade Name	**WSSA group(s)**	**seed corn**	**sweet corn**	**field corn**	**barnyard grass**	**smooth crabgrass**	**large crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**corn spurry**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preemergence and Early Postemergence Tank-Mixes (cont'd)																																		
PRIMEXTRA II MAGNUM + dicamba[6]	15+ 4	x	x	✓	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	7	8[4]	0	8[1,2]	0	8[4]	8[4]	G
PROWL H20 + AATREX	3+5	x	x	✓	9	8	8	9	8	8	8	7	5	9	7	9	3	9	9	9	9	9	9[R]	6	6	–	2	–	–	2	2	–	E
PROWL H20 + dicamba[6]	3+4	x	x	✓	9	8	8	9	8	8	8	–	5	8	9	8	9	9	9	6	9	9	9	9[4]	9[4]	–	–	–	–	–	–	–	E
PROWL H20 + MARKSMAN	3 +4,5	x	x	✓	9	8	8	9	8	8	8	8	5	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	–	–	–	–	–	–	–	E
Postemergence Grass Herbicides																																		
ACCENT	2	✓	✓[5]	✓	9	0	7/8	9	9[R]	9[R]	8	9	9	0	0	0	0	0	0	0	0	9[R]	0	0	0	–	0	0	0	9	0	0	E
STEADFAST IS	2	x	x	✓	9	0	7/8	9	9[R]	9[R]	7	9	9	0	0	0	0	5	5	7	2	9[R]	0	0	5	–	0	0	0	9	0	0	G
ULTIM	2	x	x	✓	9	0	7/8	9	9[R]	9[R]	7	9	9	0	0	0	0	5	5	7	2	9[R]	0	0	5	–	0	0	0	9	0	0	G
Postemergence Broadleaf Herbicides and Tank-mixes																																		
2,4-D AMINE[6]	4	x	x	✓	0	0	0	0	0	0	0	0	0	4	8	2	7	4	9	9	7	9	8	–	8	8	7	0	0	0	8	8	F
AATREX + crop oil	5	✓	✓	✓	4	4	4	0	4	4	4	4	4	9	6	9	3	9	9[R]	9	9	9[R]	9[R]	8	7	6	7	5	5	5	7	2	G
AATREX + PARDNER (bromoxynil[6])	5+6	✓	✓	✓	4	4	4	0	4	4	4	4	4	9	7	9	9	9	9	9	9	9	9	–	9	6	7	5	5	5	7	2	E
AATREX + BUCTRIL M (bromoxynil/MCPA[6])	5+4,6	x	✓	✓	4	4	4	0	4	4	4	4	4	9	9	9	–	9	9	9	9	9	9	–	9	–	7	7	5	5	7	7	G
AATREX + dicamba[6]	5+4	x	x	✓	4	4	4	0	4	4	4	4	4	9	9	9	9	9	9	9	9	9	9	9	9	8	8	5	5	5	9	8	G
ARMEZON + AATREX	27+5	✓	✓	✓	7	7	7	7	8	7	7	7	7	8	7	–	6	9	9	9	9	9	9	9	7	8	–	–	–	–	–	–	E
BASAGRAN FORTÉ	6	✓	✓	✓	0	0	0	0	0	0	0	0	0	7	9	9	5	9	7	9	7	8[R]	8	8	9	–	6	0	6	0	6	8	E

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

Trade Name	WSSA group(s)	Crop			Annual Grasses									Annual Broadleaves														Perennials						Crop Tolerance
		seed corn	sweet corn	field corn	barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Postemergence Broadleaf Herbicides and Tank-mixes (cont'd)																																		
BUCTRIL M (bromoxynil/MCPA[6])	4,6	x	✓	✓	0	0	0	0	0	0	0	0	0	9	9	–	6	9	9	9	9	8	9	–	9	–	7	7	0	0	7	7	F
CALLISTO + AATREX	27,5	✓	✓	✓	2	0	8[4]	0	2	2	2	2	2	8	8	–	7	9	9	9	9	9	8	7	9	9	2	0	0	0	0	0	E
DISTINCT	19,4	x	x	✓	–	–	–	–	–	–	–	–	–	9	8	9	9	9	9	6	9	9	9	9	9	7	8	0	0	0	9	9	E
EMBUTOX (2,4-DB[6])	4	x	x	✓	0	0	0	0	0	0	0	0	0	4	8	0	–	0	7	8	7	9	8	–	8	–	8	0	0	0	8	8	G
ENGENIA (dicamba[6])	4	x	x	✓	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	6	9	9	9	9	9	8	8	0	0	0	9	8	G
ENGENIA (dicamba[6]) + 2,4-D AMINE[7]	4+4	x	x	✓	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	9	9	9	9	–	8	0	0	0	9	8	F
MARKSMAN	4,5	x	x	✓	7	0	0	0	7	7	7	7	0	9	9	9	9	9	9	9	9	9	9	9	9	8	8	0	0	0	8	8	E
MCPA[6]	4	x	x	✓	0	0	0	0	0	0	0	0	0	2	7	7	7	0	9	9	–	7	9	–	7	–	7	6	0	0	7	7	P
PARDNER (bromoxynil[6])	6	✓	✓	✓	0	0	0	0	0	0	0	0	0	9	7	–	–	9	9	8	9	8[R]	9	–	9	–	7	0	0	0	7	7	E
PEAK	2	✓	x	✓	0	0	0	0	0	0	0	0	0	–	9	–	–	9	9	9	–	9	9	9	9	5	–	–	0	0	–	–	E
PERMIT	2	x	✓	✓	0	0	0	0	0	0	0	0	0	–	8	–	3	8	8[R]	8	–	8[R]	8[R]	8[R]	8	3	–	–	8	0	–	–	E
TROPOTOX PLUS **or** CLOVITOX PLUS **or** TOPSIDE	4	x	x	✓	0	0	0	0	0	0	0	0	0	8	8	0	–	0	7	8	7	9	9	–	9	–	8	7	0	0	8	8	G

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

Trade Name	WSSA group(s)	Crop			Annual Grasses									Annual Broadleaves														Perennials						Crop Tolerance
		seed corn	sweet corn	field corn	barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Postemergence Grass and Broadleaf Herbicides and Tank-Mixes																																		
ACCENT + CALLISTO + AATREX	2+27 +5	✓	✓[5]	✓	9	0	7/8	9	9R	9R	8	9	9	8	8	–	7	9	9	9	9	9	8	–	9	9	2	0	0	9	0	0	E
ACCENT + DISTINCT	2+ 19,4	x	x	✓	9	0	7/8	9	9R	9R	8	9	9	9	8	9	9	9	9	6	9	9	9	9	9	7	8	0	0	9	9	9	E
ACCENT + ENGENIA, FEXAPAN or XTENDIMAX	2+4	x	x	✓	9	0	7/8	9	9R	9R	8	9	9	9	9	9	9	9	9	6	9	9	9	–	9	–	8	0	0	9	9	8	G
ACCENT + MARKSMAN	2+4,5	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	–	8	0	0	9	8	8	E
ACCENT + PARDNER (bromoxynil[6])	2+6	x	x	✓	9	0	7/8	9	9R	9R	8	9	9	9	7	–	–	9	9	8	9	8	9	–	9	–	7	0	0	9	7	7	E
DESTRA IS	2+27	x	x	✓	9	0	7/8	9	9R	9R	7	9	5	8	8	–	7	9	9	9	9	9	8	7	9	–	2	0	6	9	6	2	E
OPTION + AATREX	2+5	x	x	✓	9	0	7	9	9R	9R	7	9	9	9	6	–	6	9	9R	9	9	9R	9	–	9	–	7	5	5	7/8	7	2	E
OPTION + CALLISTO + AATREX	2+27 +4	x	x	✓	9	0	7	9	9R	9R	8	9	9	8	8	–	7	9	9	9	9	9	9	8	9	9	2	0	0	9	0	0	E
OPTION + DISTINCT	2+ 19,4	x	x	✓	9	0	7	9	9R	9R	8	9	9	8	8	9	9	9	9	9	9	9	9	9	9	7	8	0	0	9	0	0	E
OPTION + + ENGENIA, FEXAPAN or XTENDIMAX	2+4	x	x	✓	9	0	7	9	9R	9R	8	9	9	9	9	9	9	9	9	9	9	9	9	–	9	–	8	0	0	9	9	8	E
OPTION + MARKSMAN	2+4,5	x	x	✓	9	0	7	9	9R	9R	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	–	8	–	0	7/8	8	8	E
OPTION + PARDNER (bromoxynil[6])	2+6	x	x	✓	9	0	7	9	9R	9R	7	9	9	9	7	–	9	9	9	9	9	9	9	–	9	–	7	5	5	8	7	5	E
PROWL H20 + ACCENT + dicamba[6]	3+2 +4	x	x	✓	9	9	9	9	8	8	8	9	7	8	9	8	9	9	9	6	9	9	9	9	8	–	–	–	–	–	–	–	–	G

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–1. Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
✓ = can be used on this crop; x = not indicated for use on this crop; * = sold as a co-pack under this trade name
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

		Crop			Annual Grasses									Annual Broadleaves														Perennials						
Trade Name	**WSSA group(s)**	**seed corn**	**sweet corn**	**field corn**	**barnyard grass**	**smooth crabgrass**	**large crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**corn spurry**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Postemergence Grass and Broadleaf Herbicides and Tank-Mixes (cont'd)																																		
SHIELDEX + AATREX	27+5	✓	✓	✓	6	–	8	–	6	8	6	–	–	–	9	–	9	–	9	–	–	9	9	9	–	9	–	–	–	–	–	–	E
ULTIM + CALLISTO + AATREX	2+27 +5	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	8	8	–	7	9	9	9	9	9	8	8	9	9	–	–	–	9	–	–	G
ULTIM + DISTINCT	2+ 19,4	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	8	9	9	9	9	7	9	9	9	9	9	7	8	8	0	9	9	9	G
ULTIM + + ENGENIA, FEXAPAN or XTENDIMAX	2+4	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	9	9	9	9	9	7	9	9	9	9	9	–	8	0	0	9	9	8	G
ULTIM + MARKSMAN	2+4,5	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9	–	8	0	0	9	8	8	G
ULTIM + PARDNER (bromoxynil[6])	2+6	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	8	7	–	9	9	8	9	8	9	–	9	–	7	0	0	9	7	7	G
ULTIM + PARDNER (bromoxynil[6]) +AATREX	2+6 +5	x	x	✓	9	0	7/8	9	9R	9R	7	9	9	9	8	9	9	9	9	9	9	9	9	–	9	6	7	5	5	9	7	2	G

[1] PPI timing is needed to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Use PRE timing for optimum control.
[4] Weed must be emerged to achieve this level of control. Re-growth of perennial sow-thistle and Canada thistle is likely.
[5] For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety manufacturer for more information on the tolerance of a specific variety.
[6] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*. See label for specific uses and rates.
[7] The addition of atrazine is required to achieve this level of control.

TABLE 9–2. Additional Weed Control Ratings for Conventional Corn (Field, Seed and Sweet)

LEGEND: * = herbicides sold as a co-pack under this trade name

Weed Species	Timing	Herbicides (control rating — out of 10)
atriplex, spreading	Preemergence	CONVERGE XT* (7), MARKSMAN (6)
	Postemergence	PARDNER + AATREX (9), MARKSMAN (7), ENGENIA/FEXAPAN (6), DISTINCT (5), AATREX + oil (2)
adzuki beans, volunteer	Postemergence	CALLISTO + AATREX (9), DISTINCT (9)
bur-cucumber	Preemergence	AATREX (5), CONVERGE XT* (5), MARKSMAN (5), PRIMEXTRA II MAGNUM (5)
	Postemergence	PARDNER + AATREX (8), PEAK + DICAMBA (7), MARKSMAN (6), AATREX + oil (5), CALLISTO + AATREX (4), ENGENIA (2), DISTINCT (2)
clover, red (volunteer)	Postemergence	ENGENIA/FEXAPAN (9), DISTINCT (9), MARKSMAN (9)
dandelion	Postemergence	OPTION + DISTINCT (7), DISTINCT (7)
flower of an hour	Postemergence	ENGENIA/FEXAPAN (9), MARKSMAN (9), PARDNER + AATREX (8), AATREX + oil (7), DISTINCT (2)
horsenettle	Postemergence	ULTIM + DISTINCT (8), ULTIM + MARKSMAN (7), DISTINCT (5)
prickly lettuce	Postemergence	ULTIM + DISTINCT (9), MARKSMAN (9), PEAK + DICAMBA (8), ENGENIA/FEXAPAN (8), DISTINCT (8), PARDNER + AATREX (8)
red top	Postemergence	OPTION (9), ULTIM (9), ACCENT (8)
sandbur	Preemergence	DUAL II MAGNUM (5), FRONTIER MAX (5), PROWL H20 (5)
	Postemergence	OPTION (9), ULTIM (8), ACCENT (7)
stink and tufted love grass	Preemergence	DUAL II MAGNUM (9), FRONTIER MAX (9), PROWL H20 (9)
	Postemergence	ACCENT (9), ULTIM (9)
swamp smartweed	Preemergence	CALLISTO + AATREX (4), CONVERGE XT (4), MARKSMAN (3), AATREX (2)
	Postemergence	PEAK + ENGENIA (6), ENGENIA/FEXAPAN (6), DISTINCT (5), MARKSMAN (3), PARDNER + AATREX (1), AATREX + oil (0)
three-seeded mercury	Preemergence	ACURON (9), CALLISTO + AATREX (9), CONVERGE XT1(9), MARKSMAN (9), AATREX (9)
	Postemergence	AATREX + oil (9), DISTINCT (9), MARKSMAN (9), PARDNER + AATREX (9), ENGENIA/FEXAPAN (7), CALLISTO + AATREX (0)
wild carrot	Postemergence	MARKSMAN (9), PEAK + DICAMBA (9), ACURON (8), CALLISTO + AATREX (8), DISTINCT (8), ULTIM OR ACCENT + CALLISTO + AATREX (8), PARDNER + AATREX (7), ENGENIA/FEXAPAN (6), AATREX + oil (2)
wirestem muhly	Postemergence	OPTION (9), ULTIM (6), ACCENT (6)
wood-sorrel	Preemergence	AATREX (9), CONVERGE XT* (9), MARKSMAN (9)
	Postemergence	AATREX + oil (9), ENGENIA/FEXAPAN (9)
vetch, tufted	Postemergence	LONTREL XC (9), ENGENIA/FEXAPAN (8), DISTINCT (8), MARKSMAN (8), CALLISTO + AATREX (6)
volunteer wheat	Postemergence	ACCENT (8), OPTION (8), ULTIM (8) – cereals must be at tillering or smaller to achieve this level of control

Conventional Corn (Field, Seed and Sweet)

Critical Stage: The Critical Stage to control weeds in corn is from emergence until the 8 leaf over stage

Apply all treatments in 150–300 L/ha (60–120 L/acre) water unless otherwise specified.

Cultural and Organic Control Methods

Any single method of weed control or the continuous use of the same herbicides can lead to the build-up of weeds resistant or tolerant to that control method. Triazine-resistant lamb's-quarters and pigweed, for example, are problematic due to continuous corn and repeated use of triazine herbicides. Rotating to other crops and/or other control methods reduces the chance of new or unique weed infestations.

To control small annual weed seedlings, blind harrow with a set of light harrows at a shallow depth before the corn has emerged, or use a weeder harrow (with L-shaped flexible tines) when the crop is 5–10 cm high. High speed (10 km/h), shallow (2.5–3 cm) cultivation with the rotary hoe when corn is 7–8 cm high also helps control small weed seedlings. These techniques will not reduce herbicide action and often enhances weed control. Inter-row cultivation can be used to complement other weed control measures. Row cultivation is most effective when weeds are small. Shallow cultivation will reduce: germination of new weed seeds, moisture loss and corn root injury.

Inter-row cultivation may be required when weeds escape herbicide treatment; consider weeds escapes when they are 5–7 cm high.

Cultivation gives some control of established perennial weeds but may also help to spread them to previously uninfested areas. Machinery sanitation is important when moving from one field to another. Many perennials (e.g., quackgrass, sow-thistle) can be spread on tillage equipment. Machinery operators should be particularly careful when moving from one farm to another.

Seed Corn

Some field corn registrations are applicable to seed corn, however, certain inbreds are susceptible to some herbicides. Check with the contracting company before applying any herbicide. For information on specific weeds see Table 9–1. *Conventional Corn (Field, Seed and Sweet) Herbicide Weed Control Rating* and then refer to the appropriate section for details about herbicide treatment.

Mixing Herbicides With Nitrogen

Nitrogen solution can be used as a carrier, instead of water, for preplant and preemergence application of some herbicides. Weed control activity is not increased. Spray before crop emergence. Consult the herbicide label for proper methods of application and use of dispersing agents. Calibrate the sprayer to apply the required amount of nitrogen. Use stainless steel flood jet nozzles of adequate size. Nitrogen solution is mildly corrosive, especially to brass; clean the sprayer immediately after use. UNITE may be used to improve liquid fertilizer herbicide compatibility and stability when a simultaneous application of a liquid fertilizer and liquid or wettable powder herbicide is desired. Because formulations and rates vary, it is essential to read the label to determine the exact amount and method to be used.

Do not apply nitrogen solution with postemergence herbicides as significant crop injury and reduced weed control can occur.

Special Notes For Corn, Field and Sweet

PRECAUTIONS: Do not use 2,4-D, MCPA, MCPB, 2,4-DB or dicamba later than 2 weeks prior to the first appearance of tassels or ear silk. Use extreme care when applying these herbicides near susceptible crops because of possible herbicide movement. Soybeans, tomatoes and tobacco are extremely sensitive to dicamba and injury symptoms may persist for several weeks. Do not use dicamba in the area of susceptible crops when temperatures exceed 25°C on the day of application or if high humidity is expected, due to the possibility of dicamba volatilizing and injuring susceptible crops nearby. Leave several rows of corn unsprayed when adjacent to soybean fields or other susceptible crops.

Atrazine and Simazine Soil Residues

Atrazine and simazine residues may last for more than one year, particularly if high rates are used more than once and dry weather occurs. If atrazine or simazine is used year after year as in a continuous corn program, triazine residues may be higher. Atrazine when used at rates of 1 kg/ha (active ingredient) or lower on corn do not cause injury to succeeding crops of oats, barley, mixed grains, or soybeans. However certain crops are sensitive when grown the year after Atrazine has been applied at rates above 1 kg/ha (active ingredient). Refer to the product label and Tables 4–4 and 4–5. *Herbicide Crop Rotation and Soil pH Restrictions* for specific rotational crop restrictions.

Injury has been reported on tomatoes, white beans, forage seedlings, peas, tobacco, cucumbers, onions, and turnips following applications of atrazine at more than 1.1 kg/ha (active ingredient) on corn the previous year.

To reduce the hazard of atrazine residues on succeeding crops:

- Fall plowing will reduce triazine injury more than spring plowing will.

- Deeper tillage will reduce the concentration of herbicide in the upper soil area compared to shallow tillage.
- Ensure that the sprayer used is adequate and is properly calibrated and adjusted. Spray uniformly without overlaps and do not spray while the sprayer is stopped.

Herbicide Treatments Include

- Preplant (PP) – Also see Chapter 6 *Preplant & Postharvest Weed Control* for details of products, rates and remarks.
- Preplant Incorporated (PPI) – Two incorporations at right angles operating at a depth of 10 cm using a double disk (7–10 km/h) or vibrating shank S-tine cultivator (10–13 km/h) are required unless otherwise stated on a product's label. Cultivation equipment used for herbicide incorporation are known to spread perennial weeds to previously uninfested areas. Pay special attention to machinery cleanliness, and treat fields with perennial weeds last.
- Preemergence (PRE) – Rainfall of 15–20 mm within 10 days after application is necessary to activate preemergence treatments. Shallow cultivation, rotary hoeing or harrowing controls weed escapes and improves herbicide activity in the absence of rainfall.
- Postemergence (POST) –Apply herbicide when weeds are small and actively growing. Avoid applying herbicides past the maximum weed leaf stage listed on the label or control will be reduced. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant, see the product label for more details. Always use appropriate drift management technology.

Corn Leaf Stages

Counting leaves on a corn plant may sound like an easy task, but there are complications that can cause miscounting. There are several methods of counting leaves. It is important to know which leaf counting method is being referred to.

This publication uses the leaf over method, (see Figure 9–1) where counting starts with leaves that have emerged from the whorl and the leaf tip is starting to arch over. This normally occurs when leaves are about 50% emerged. Most product labels also use this method of leaf counting, but check the label or with the product representative to be sure. The comparative growth stages table in the next column gives a comparison among the count methods.

Another complication with leaf counting is where on the plant leaf counting begins. In this publication, the first leaf is the bottom leaf of the plant. The first leaf is shorter than other leaves and has a round leaf tip. However, as the plant grows the bottom leaves die and drop to the ground. For example, a 10 leaf corn plant may be incorrectly identified as a 7 leaf corn plant because 3 leaves may be "senesced" or fallen off. These leaves may not be immediately apparent and care must be taken to count them.

Start counting from the bottom leaf and check the first leaf to look for the rounded leaf tip.

It takes about 75–80 Crop Heat Units to produce each corn leaf. Therefore at temperatures of 30°C day, and 20°C at night, there is one new leaf every 2–3 days; and at 20°C day, and 10°C at night, one new leaf every 5–6 days.

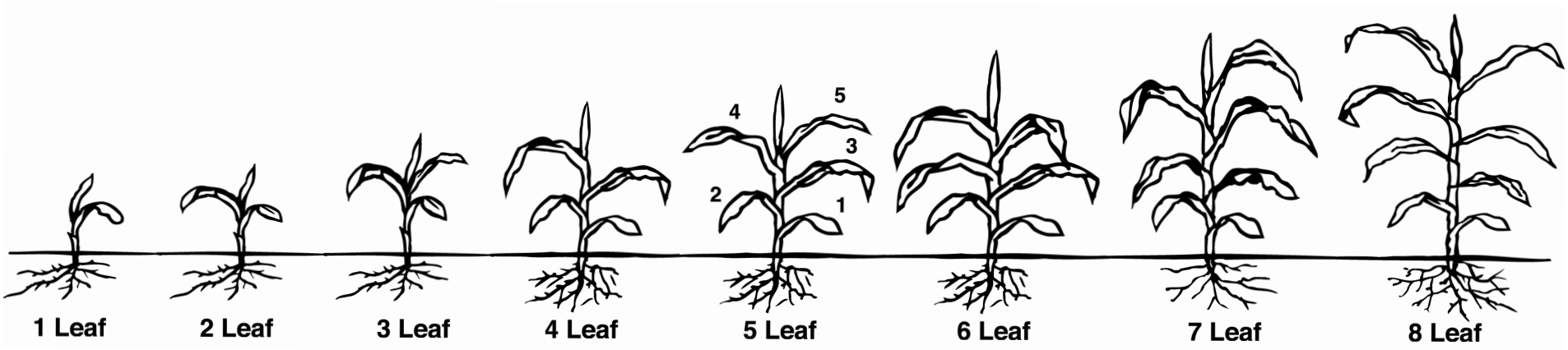

FIGURE 9–1. Leaf Over Method of Counting Corn Leaves.

Some product labels also use plant height to indicate crop growth stages. In general, plant height is more variable depending on plant genetics and on the weather of the season. The following Table 9–3 gives some comparative heights for each leaf stage but individual plants may be slightly more or less than the stage given depending on genetics and weather. The standing height is measured from the ground surface to the top of the plant as it stands. Leaf extended refers to the height of the plant with the leaves pulled up to their full height.

TABLE 9–3.
Comparative Growth Stages

Leaf Over[1]	Leaf Collar	Leaf Tip[2]	Standing Height (cm)	Leaf Extended (cm)
2	1	3	5–6	5–11
4	3	5–6	9–17	16–25
6	4–5	7–8	18–33	29–46
8	5–6	9–10	36–54	54–77
10	8	12	58–85	86–112
12	10	14–15	99–114	121–149

[1] Number of leaf tips emerged from the whorl.
[2] Number of leaf whorls emerged from the whorl.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown and Residual Control			
Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a "one pass" weed management program. Refer also to Chapter 6, *Preplant & Postharvest Weed Control* for preplant application rates for glyphosate. It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (e.g., AATREX, CONVERGE 480, MARKSMAN, PRIMEXTRA II MAGNUM) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
Soil Applied Grass and Broadleaf Herbicides (Preemergence Timing Only)			
bicyclopyrone (7.1 g/L) (35 g/ha) mesotrione (28.5 g/L) (140 g/ha) s-metolachlor (257 g/L) (1262 g/ha) atrazine (120 g/L) (589 g/ha)	ACURON	4.91 L/ha (1.96 L/acre)	• Apply PRE to field, seed or sweet corn, Do NOT mix with ammonium sulphate (AMS). • Apply in a minimum of 150 L/ha (60 L/acre) or water or urea ammonium nitrate (UAN). • Nitrogen solutions (such as 28-0-0 UAN), excluding suspension and sulphur containing fertilizers, may replace water as a carrier for pre-emergence applications. Do not use nitrogen solutions as a carrier to corn that has emerged. Always predetermine the compatibility of ACURON Herbicide tank mixes with your liquid fertilizer carrier by mixing small proportional quantities in advance. • Pre harvest intervals: 50 days (sweet corn); 90 days (silage corn).
flumioxazin/ pyroxasulfone (159.6 g/ha)	FIERCE (76%)	210 g/ha (85 g/acre)	• Apply between 7 and 30 days prior to planting field corn into no-till or minimum tillage fields. Provides preemergence control of susceptible weeds in field corn. • **Do NOT** apply to conventional tilled corn fields. • When weeds are already emerged, apply in a tank mix with a glyphosate product, present as isopropyl amine or potassium salt, at a rate 1.2 kg a.e./ha (e.g. glyphosate 540 g/L at 2.2 L/ha or 0.89 L/acre).
pyroxasulfone (125–150 g/ha) carfentrazone-ethyl (14.8–17.8 g/ha) atrazine (1.01–1.49 kg/ha)	FOCUS (447 g/L: 53 g/L) + AATREX (480 g/L)	280–336 mL/ha (112–134 mL/acre) + 2.1–3.1 L/ha (0.84–1.24 L/acre)	• **Do NOT use on seed or sweet corn.** • Apply PP or PRE. • **Do NOT** use on peat or muck soils and soils with 7% or more organic matter content. • Moisture is necessary to acretivate the active ingredient pyroxasulfone in soil for weed control. • **Pre harvest interval:** 60 days
saflufenacil/ dimethenamid-P (735 g/ha)	INTEGRITY (668 g/L)	1.1 L/ha (0.44 L/acre)	• Apply PPI or PRE. • A PPI application is required for the control of yellow nutsedge and Eastern black nightshade. • **Do NOT** incorporate greater than 3 cm deep or control will be reduced. • INTEGRITY may be used with liquid fertilizer as a carrier. Conduct a liquid fertilizer compatibility test by mixing a small quantity of herbicide with a proportional quantity of liquid fertilizer in a jar prior to loading a spray tank. • **Pre harvest interval:** 60 days (sweet corn), 100 days (field corn)
simazine (1.6–4 kg/ha)	SIMAZINE 480 (480 g/L)	3.4–8.3 L/ha (1.36–3.32 L/acre)	• Low rates should be used on sandy soils while the higher rates may be used on loams and clays. • Full season annual weed control can be expected except for crabgrass or fall panicum where infestations have built up. • Caution is advised when considering rates beyond 2.0 kg/ha (0.8 kg/acre) as high soil residues may be created and rotational crops may be affected.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Tank-Mixes (Preemergence Timing Only)			
s-metolachlor/benoxacor (1.14 kg/ha) + linuron (0.38–0.75 kg/ha) + atrazine (0.99–1.53 kg/ha)	DUAL II MAGNUM (915 g/L) + LOROX L (480 g/L) + AATREX (480 g/L)	1.25 L/ha (0.5 L/acre) + 0.79–1.56 L/ha (0.32–0.63 L/acre) + 2.06–3.19 L/ha (0.83–1.28 L/acre)	• Use **ONLY** on sweet corn. • Make **ONLY** one application per year. • Apply in a minimum of 150 L water/ha. • **Do NOT** harvest sweet corn within 50 days of treatment. • Apply by ground equipment **ONLY**.
s-metolachlor/ benoxacor/atrazine (2.16–2.88 kg/ha) + linuron (0.37–0.75 kg/ha)	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L) + LOROX L (480 g/L)	3–4 L/ha (1.2–1.6 L/acre) + 0.77–1.56 L/ha (0.31–0.63 L/acre)	• **Do NOT use on seed corn or sweet corn.** • This tank-mix can be used on light textured soils with organic matter greater than 1.0%. • Linuron controls triazine resistant lamb's-quarters and redroot pigweed. Fall panicum or velvetleaf may not be controlled for the full season. • **Pre harvest interval:** 45 days
Soil Applied Broadleaf Herbicides (Preemergence timing only)			
atrazine (1.01–1.49 kg/ha)	AATREX (480 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre)	• Apply PPI, PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • **Pre harvest interval:** 60 days (grain), 45 days (sweet),
atrazine (1.01–1.49 kg/ha) + dicamba (0.6 kg/ha)	AATREX (480 g/L) + ENGENIA (600 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PRE. • **Do NOT use on seed corn or sweet corn.** • This treatment should provide good control of triazine resistant broadleaf weeds and velvetleaf. • See notes on atrazine with respect to residues. • See precautions for FEXAPAN, XTENDIMAX or ENGENIA applied alone. • **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. • **Pre harvest interval:** 30 days
	AATREX (480 g/L) + XTENDIMAX (350 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 1.71 L/ha (0.68 L/acre))	
	AATREX (480 g/L) + FEXAPAN (350 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 1.71 L/ha (0.69 L/acre)	
flumetsulam (50 g/ha)	BROADSTRIKE RC (80%)	62.5 g/ha (25 g/acre)	• Apply PP, PPI or PRE. • **Do NOT use on seed corn or sweet corn.** • **Do NOT** use where the soil pH is greater than 7.8 or where the organic matter is less than 2%. • **Do NOT** apply to peat or muck soils or where the soil organic matter is greater than 5%. • **Do NOT** apply more then once a year. • **Pre harvest interval:** 90 days

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Broadleaf Herbicides (Preemergence timing only) (cont'd)			
mesotrione (0.140 kg/ha) + atrazine (1.0–1.49 kg/ha)	CALLISTO (480 g/L) + AATREX (480 g/L)	0.3 L/ha (0.12 L/acre) + 2.1–3.1 L/ha (0.85–1.25 L/acre)	· Apply PRE to field, seed or sweet corn. · For annual grass control and improved control of certain broadleaf weeds CALLISTO should be tank-mixed with Primextra II Magnum. · **Pre harvest interval:** 100 days (grain), 90 days (silage)
dicamba (0.6 kg/ha)	ENGENIA (600 g/L)	1 L/ha (0.4 L/acre	· Apply PRE. · **Do NOT use on seed corn or sweet corn.** · If corn seed is less than 4 cm below the soil surface, delay application until the spike stage of corn. · Apply to medium to fine textured soils containing more than 2.5% organic matter. · **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. · **Do NOT** incorporate. · **Pre harvest interval:** 30 days
	XTENDIMAX (350 g/L)	1.71 L/ha (0.68L/acre)	
	FEXAPAN (350 g/L)		
dicamba/atrazine (1.5–1.8 kg/ha)	MARKSMAN (393 g/L)	3.7–4.5 L/ha (1.5–1.8 L/acre)	· Apply PRE. · **Do NOT use on seed corn or sweet corn.** · See notes on atrazine with respect to residues. · See precautions for FEXAPAN, XTENDIMAX or ENGENIA applied alone. · **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. · **Pre harvest interval:** 60 days
flumioxazin (71.4–107.1 g/ha)	VALTERA (51.1%) or VALTERA EZ (480 g/L)	140–210 g/ha (56–84 g/acre) 150–225 mL/ha (60–90 mL/acre)	· Apply between 7 and 30 days prior to planting field corn into no-till or minimum tillage fields. Provides preemergence control of susceptible weeds in field corn. · Do NOT apply to conventional tilled corn fields. · When weeds are already emerged, apply in a tank mix with a glyphosate product, present as isopropyl amine or potassium salt, at a rate 1.2 kg a.e./ha (e.g. glyphosate 540 g/L at 2.2 L/ha or 0.89 L/acre).
Preemergence and Early Postemergence Grass Herbicides			
s-metolachlor/benoxacor (1.14–1.6 kg/ha)	DUAL II MAGNUM (915 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre)	· Apply PPI, PRE. · Apply POST (up to 3 leaf corn) on field corn **ONLY**. · For PPI timing, set incorporation equipment to work soil no deeper than 10 cm. · Improved control of yellow nutsedge is obtained when DUAL II MAGNUM is applied PPI. · Grassy weeds beyond the 2 leaf stage will not be controlled. · Optimal control of nightshade is obtained when DUAL II MAGNUM is applied PRE. · **Do NOT** use on muck, peat, or high organic matter soils. · See tank-mixes for treatments to provide annual broadleaf control or follow with sequential postemergence broadleaf herbicide. · Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. · **Pre harvest interval:** 85 days (grain), 45 days (sweet)

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence and Early Postemergence Grass Herbicides (cont'd)			
dimethenamid (544–693 g/ha)	FRONTIER MAX (720 g/L)	756–963 mL/ha (305–390 mL/acre)	• Apply PPI or PRE to seed, sweet and field corn. • Apply POST (up to 3 leaf corn) on field corn **ONLY**. • For PPI timing, set incorporation equipment to work soil no deeper than 10 cm. • Improved control of yellow nutsedge is obtained when FRONTIER MAX is applied PPI at the highest rate. • Sensitive weeds beyond the 2 leaf stage will not be controlled. • Apply higher rates on fine textured or high organic matter soils or when targeting nightshade, nutsedge and pigweed. • **Do NOT** use on muck, peat, or high organic matter soils. • See tank-mixes for treatments to provide annual broadleaf control or follow with sequential postemergence broadleaf herbicide. • **Maximum use rate** of FRONTIER MAX for seed corn is 756 mL/ha (305 mL/acre). • Consult the seed corn company for information on the tolerance of seed corn inbred lines prior to the use of FRONTIER MAX herbicide.
pendimethalin (1.68 kg/ha)	PROWL H2O (455 g/L)	3.7 L/ha (1.48 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply PRE or POST up to the 4 leaf stage of field corn. • PROWL H2O alone will not control emerged weeds. Tank-mixing or use of a sequential herbicide program to acrehieve broad spectrum control is suggested. Plant corn at least 4 cm deep and ensure good seed coverage. PROWL H2O may be applied in water or liquid fertilizer as a carrier. Conduct a liquid fertilizer compatibility test with any of the registered PROWL H2O tank-mix combinations. If there is no rain within 7 days, rotary hoeing or shallow cultivation is required. • **Pre harvest interval:** 100 days
pyroxasulfone (125, 166, 208.5 or 246.5 g/ha)	ZIDUA SC (500 g/L)	Coarse: 250 mL/ha (100 mL/acre) Med: 332 mL/ha (133 mL/acre) (> 3% O.M.): 417 mL/ha (167 mL/acre) Fine: 493 mL/ha (197 mL/acre)	• **Do NOT** use on seed corn or sweet corn. • Apply PP, PRE or early POST up to the 4 leaf stage of field corn. • **Do NOT** use on peat or muck soils with 7% organic matter content. • Can be tank mixed with glyphosate or Aatrex 480
Preemergence and Early Postemergence Grass and Broadleaf Herbicides			
bicyclopyrone (7.1 g/L) (35 g/ha) mesotrione (28.5 g/L) (140 g/ha) s-metolachlor (257 g/L) (1262 g/ha) atrazine (120 g/L) (589 g/ha)	ACURON	4.91 L/ha (1.96 L/acre)	• Apply PRE or POST up to the 6 leaf stage of corn. Will not control grassy weeds beyond the 2 leaf stage of growth. Broadleaf weeds should be between the 2–6 leaf stage. • Do NOT apply to emerged seed or sweet corn. • No adjuvant is required. • Do NOT mix with ammonium sulphate (AMS). • Apply in a minimum of 150 L/ha (60 L/acre) or water or urea ammonium nitrate (UAN). • Pre harvest intervals: 50 days (sweet corn); 90 days (silage corn).

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence and Early Postemergence Grass and Broadleaf Herbicides (cont'd)			
isoxaflutole (79–105 g/ha) + atrazine (800–1063 g/ha)	CONVERGE XT (sold as a co-pack): CONVERGE FLEXX (240 g/L) + CONVERGE 480 (480 g/L)	330–440 mL/ha (134–178 mL/acre) + 1.67–2.21 L/ha (0.67–0.89 L/acre)	• Apply PRE-PLANT or PRE to seed corn. • Not all seed corn inbred lines have been tested for tolerance to Converge Flexx. Use of this product must be approved by the contracting seed corn company and comply with their directions for use. • Apply PRE-PLANT, PRE or POST up to the 3 leaf stage of field corn. • **Do NOT** incorporate treatments prior to planting. • Use the higher application rates for control of fall panicum and proso millet. • CONVERGE XT is a co-pack of CONVERGE FLEXX and CONVERGE 480. • **Do NOT** use CONVERGE XT on sands, loamy sands and/or soils with less than 2% organic matter. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • **Pre harvest interval:** 30 days
rimsulfuron (15 g/ha) + mesotrione (144 g/ha)	ENGARDE (4.31%:41.38%)	348 g/ha (139 g/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply PRE or Early POST up to the 2 leaf stage of corn. • A non-ionic surfactant must be used at 0.2% v.v when weeds are emerged at the time of application. • Engarde can be applied with 28% UAN as a carrier **(PRE only).** • Can be tank-mixed with glyphosate for emerged annual and perennial weeds. See Chapter 6, Preplant & Postharvest Weed Control for more information. • **Pre harvest interval:** 100 days (grain), 90 days (silage)
s-metolachlor/ benoxacor/atrazine (2.16–2.88 kg/ha)	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L)	3–4 L/ha (1.2–1.6 L/acre)	• Apply PPI, PRE or POST up to the 3 leaf stage of corn. • Use the higher rate where annual grass build up or nutsedge infestation is evident. • Grassy weeds beyond the 2 leaf stage will not be controlled. • The equivant rate of PRIMEXTRA II MAGNUM can be acrehieved by adding DUAL II MAGNUM at 1.25–1.75 L/ha (0.5–0.7 L/acre) with AATREX at 2.1–3.1 L/ha (0.84–1.24 L/acre). • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • **Pre harvest interval:** 100 days

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence and Early Postemergence Tank-Mixes (for Control of Grass and Broadleaf Weeds)			
dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + atrazine (480 g/L) (480 g/ha)	AREMZON PRO + AATREX	1 L/ha (0.4 L/acre) + 1 L/ha (0.4 L/acre	· Apply POST up to the 7 leaf stage of field corn. · In conventional corn, if weeds are emerged add Merge or Assist plus 28% UAN. · Grassy weeds are sensitive up to the 1–4 leaf stage and broadleaf weeds are sensitive up to the 1–8 leaf stage. · **Pre harvest interval:** 80 days
dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + dicamba (133 g/L) (488 g/ha) +atrazine (261 g/L) (966 g/ha)	ARMEZON PRO + MARKSMAN	1 L/ha (0.4 L/acre) + 2.5 L/ha (1 L/acre	· Apply POST up to the 3 leaf stage of field corn. · Grassy weeds are sensitive up to the 1–4 leaf stage and broadleaf weeds are sensitive up to the 1–8 leaf stage. · **Pre harvest interval:** 80 days
flumetsulam (50 g/ha) + s-metolachlor/ benoxacor (1.14–1.6 kg/ha)	BROADSTRIKE RC (80%) + DUAL II MAGNUM (915 g/L)	62.5 g/ha (25 g/acre) + 1.25–1.75 L/ha (0.5–0.7 L/acre)	· Apply PP, PPI, PRE or POST up to the 2 leaf stage of corn. · **Do NOT use on seed corn or sweet corn.** · See precautions for BROADSTRIKE RC alone and DUAL II MAGNUM alone. · **Pre harvest interval:** 90 days
flumetsulam (50 g/ha) + s-metolachlor/ benoxacor/atrazine (2.16–2.88 kg/ha)	BROADSTRIKE RC (80%) + PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L)	62.5 g/ha (25 g/acre) + 3–4 L/ha (1.2–1.6 L/acre)	· Apply PP, PPI, PRE or POST up to the 2 leaf stage of corn. · **Do NOT use on seed corn or sweet corn.** · See precautions for BROADSTRIKE RC alone and PRIMEXTRA II MAGNUM alone. · **Pre harvest interval:** 90 days
s-metolachlor/benoxacor (1.14–1.6 kg/ha) + dicamba (0.6 kg/ha)	DUAL II MAGNUM (915 g/L) + ENGENIA (600 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 1 L/ha (0.4 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply PRE or POST up to the 3 leaf stage of field corn. · Use higher rates on heavy grass infestations and for fall panicum. Fall panicum may not be controlled all season. · Grassy weeds beyond the 2 leaf stage will not be controlled. · See precautions for ENGENIA, FEXAPAN or XTENDIMAX applied alone. · **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. · **Pre harvest interval:** 85 days
	DUAL II MAGNUM (915 g/L) + FEXAPAN (350 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 1.7 L/ha (0.68 L/acre)	
	DUAL II MAGNUM (915 g/L) + XTENDIMAX (350 g/L)		

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence and Early Postemergence Tank-Mixes (for Control of Grass and Broadleaf Weeds) (cont'd)			
s-metolachlor/benoxacor (1.14–1.6 kg/ha) + dicamba (0.6 kg/ha) + atrazine (1.01–1.49 kg/ha)	DUAL II MAGNUM (915 g/L) + ENGENIA (600 g/L) + AATREX (480 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 1 L/ha (0.4 L/acre) + 2.1–3.1 L/ha (0.84–1.24 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply PRE or POST up to the 3 leaf stage of field corn. • Use higher rates on heavy grass infestations and for fall panicum. Fall panicum may not be controlled all season. • Grassy weeds beyond the 2 leaf stage will not be controlled. • See precautions for ENGENIA, FEXAPAN or XTENDIMAX applied alone. • **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. • **Pre harvest interval:** 85 days
	DUAL II MAGNUM (915 g/L) + FEXAPAN (350 g/L) + AATREX (480 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 1.7 L/ha (0.68 L/acre) + 2.1–3.1 L/ha (0.84–1.24 L/acre)	
	DUAL II MAGNUM (915 g/L) + XTENDIMAX (350 g/L) + AATREX (480 g/L)		
s-metolachlor/benoxacor (1.14–1.60 kg/ha) + mesotrione (0.140 kg/ha) + atrazine (1.0–1.49 kg/ha)	DUAL II MAGNUM (915 g/L) + CALLISTO (480 g/L) + AATREX (480 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 0.3 L/ha (0.12 L/acre) + 2.1–3.1 L/ha (0.85–1.25 L/acre)	• Apply PRE to field, seed and sweet corn. • Apply PRE or POST up to the 3 leaf stage of field corn **ONLY**. • Use high rates for heavy grass infestations. • Grassy weeds beyond the 2 leaf stage will not be controlled. • **Do NOT** apply to corn treated with an organophosphorous insecticide. • **Pre harvest interval:** 100 days (grain), 90 days (silage)
s-metolachlor/benoxacor (1.14–1.6 kg/ha) + dicamba/atrazine (1.48–1.8 kg/ha)	DUAL II MAGNUM (915 g/L) + MARKSMAN (393 g/L)	1.25–1.75 L/ha (0.5–0.7 L/acre) + 3.7–4.5 L/ha (1.5–1.8 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply PRE or POST up to the 3 leaf stage of field corn. • Use higher rates on heavy grass infestations and for fall panicum. Fall panicum may not be controlled all season. • Grassy weeds beyond the 2 leaf stage will not be controlled. • See precautions for ENGENIA, FEXAPAN or XTENDIMAX alone. • **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. • **Pre harvest interval:** 85 days
dimethenamid (544–693 g/ha) + atrazine (1–1.53 kg/ha)	FRONTIER MAX (720 g/L) + AATREX (480 g/L)	756–963 mL/ha (305–390 mL/acre) + 2.08–3.19 L/ha (0.832–1.28 L/acre)	• Apply PP, PPI, PRE or POST up to the 3 leaf stage of corn. • Use the higher rate of FRONTIER MAX for heavier weed populations. Control of non-emerged triazine resistant weeds will be limited to pigweed. • Grassy weeds beyond the 2 leaf stage will not be controlled. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • **Pre harvest interval:** 60 days (grain)
dimethenamid (544–693 g/ha) + dicamba (0.6 kg/ha)	FRONTIER MAX (720 g/L) + ENGENIA (480 g/L)	756–963 mL/ha (305–390 mL/acre) + 1 L/ha (0.4 L/acre)	• **Do NOT** use on seed corn, popcorn or sweet corn. • Apply PP, PRE or POST up to the 3 leaf stage of field corn. • Use the higher rate of FRONTIER MAX for heavier weed populations. For improved burndown control, the addition of glyphosate may be required. • Grassy weeds beyond the 2 leaf stage will not be controlled. • See precautions for ENGENIA applied alone. • **Pre harvest interval:** 30 days (grain)

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence and Early Postemergence Tank-Mixes (for Control of Grass and Broadleaf Weeds) (cont'd)			
dimethenamid (544–693 g/ha) + dicamba/atrazine (1.8 kg/ha)	FRONTIER MAX (720 g/L) + MARKSMAN (393 g/L)	756–963 mL/ha (305–390 mL/acre) + 4.5 L/ha (1.8 L/acre)	· **Do NOT** use on seed or sweet corn. · Apply PP, PRE or POST up to the 3 leaf stage of field corn. · Use the higher rate of FRONTIER MAX for heavier weed populations. For improved burndown control, adding glyphosate may be required. · Grassy weeds beyond the 2 leaf stage will not be controlled. · See precautions for ENGENIA, FEXAPAN or XTENDIMAX applied alone. · **Pre harvest interval:** 60 days (grain)
s-metolachlor/ benoxacor/atrazine (2.16–2.88 kg/ha) + mesotrione (0.140 kg/ha)	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L) + CALLISTO (480 g/L)	3–4 L/ha (1.2–1.6 L/acre) + 0.3 L/ha (0.12 L/acre)	· Apply PRE to seed and sweet corn. · Apply PRE or POST up to the 3 leaf stage of field corn. · Use high rates for heavy grass infestations. · Grassy weeds beyond the 2 leaf stage will not be controlled. · **Do NOT** apply to corn treated with an organophosphorous insecticide. · **Pre harvest interval:** 100 days (grain), 90 days (silage)
s-metolachlor/ benoxacor/atrazine (2.16–2.88 kg/ha) + dicamba (0.6 kg/ha)	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L) + ENGENIA (600 g/L)	3–4 L/ha (1.2–1.6 L/acre) + 1 L/ha (0.4 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply PRE or POST up to the 3 leaf stage of field corn. · Use higher rates on heavy grass infestations and for fall panicum. Fall panicum may not be controlled all season. · Grassy weeds beyond the 2 leaf stage will not be controlled. · See precautions for ENGENIA, FEXAPAN or XTENDIMAX alone. · **Do NOT** apply to coarse (sand) textured soils with less than 2% organic matter. · **Pre harvest interval:** 80 days (grain)
	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L) + FEXAPAN (350 g/L)	3–4 L/ha (1.2–1.6 L/acre) + 1.7 L/ha (0.68 L/acre)	
	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L) + XTENDIMAX (350 g/L)		
pendimethalin (1.68 kg/ha) + atrazine (1.53 kg/ha)	PROWL H2O (455 g/L) + AATREX (480 g/L)	3.7 L/ha (1.48 L/acre) + 3.19 L/ha (1.28 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply PRE or POST up to the 4 leaf stage of field corn. · See precautions for PROWL H20 alone. · **Pre harvest interval:** 100 days (grain)
pendimethalin 1.68 kg/ha + dicamba (0.6 kg/ha)	PROWL H2O (455 g/L) + ENGENIA (600 g/L)	3.7 L/ha (1.48 L/acre) + 1 L/ha (0.5 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply PRE or POST up to the 4 leaf stage of field corn. · See precautions for PROWL H20 alone, and ENGENIA, FEXAPAN or XTENDIMAX alone. · **Pre harvest interval:** 100 days (grain)
	PROWL H2O (455 g/L) + FEXAPAN (350 g/L)	3.7 L/ha (1.48 L/acre) + 1.7 L/ha (0.68 L/acre)	
	PROWL H2O (455 g/L) + XTENDIMAX (350 g/L)		
pendimethalin (1.68 kg/ha) + dicamba/atrazine (1.48–1.8 kg/ha)	PROWL H2O (455 g/L) + MARKSMAN (393 g/L)	3.7 L/ha (1.48 L/acre) + 3.7–4.5 L/ha (1.5–1.8 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply PRE or POST up to the 4 leaf stage of field corn. · See precautions for PROWL H20 alone and ENGENIA, FEXAPAN or XTENDIMAX alone. · **Pre harvest interval:** 100 days (grain)

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass Herbicides			
nicosulfuron (25 g/ha) + non-ionic surfactant (0.2% v/v) + liquid urea ammonium (5 L/ha)	ACCENT (75 DF) + non-ionic surfactant + liquid urea ammonium nitrate (UAN)	33 g/ha (13 g/acre) + 2 L/1,000 L + 5 L/ha (2 L/acre)	• **Do NOT** add liquid urea ammonium nitrate (UAN) when applying ACCENT to seed or sweet corn. • For use on all sweet corn varieties, however not all varieties have been tested. Contact the variety supplier for more information on the tolerance of a specific variety. • Adding UAN will give improved control of yellow foxtail in field corn. • Adapt oil concentrate (1% v/v), Merge or Sure-Mix (0.5% v/v) can be used in place of a non-ionic surfactant (field corn only). • Always add water soluble packages to clean water with the agitator running. Corn should be within the 1–8 leaf stage of growth. Apply ACCENT when annual grasses are in the 1–6-leaf stage and quackgrass is in the 3–6 leaf stage. • If corn has been injured by frost, wait 48–72 hours before applying. • Apply ONLY when the temperature in the 24 hours before AND after application ranges between 5°C and 28°C. Temperatures outside this range increase the potential for crop injury. • A rapid fluctuation in temperature (greater than 20°C difference within 24–36 hours) will stress the corn crop. For maximum crop safety, allow 24 hours for the corn to acclimatize before spraying. • **Pre harvest interval:** 30 days (grain), 40 days (sweet)
rimsulfuron (12.5%)/ nicosulfuron (25.2%) (15–25 g/ha) + non-ionic surfactant (0.2% v/v)	STEADFAST IS ((2:1) 37.7 DF) + non-ionic surfactant	40–66.5 g/ha (16–26.6 g/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply POST up to the 8 leaf stage of field corn. • Use the higher rate for dense weed populations or late weed growth stages for more consistent control. • Has soil residual activity but requires rainfall for activation of the herbicide in the top 5-10 cm of the soil profile.Rainfall must occur before weed germination. Weeds which germinate and emerge before activation by rainfall will not be controlled. • Apply ONLY when the temperature in the 24 hours before AND after application ranges between 5°C and 28°C. Temperatures beyond this range increase the potential for crop injury. • A rapid fluctuation in temperature (greater than 20°C difference within 24–36 hours) will stress the corn crop. For maximum crop safety, allow 24 hours for the corn to acclimatize before spraying. • **Pre harvest interval:** 30 days
nicosulfuron/rimsulfuron (25 g/ha) + non-ionic surfactant (0.2% v/v)	ULTIM ((1:1) 75 DF) + non-ionic surfactant	33 g/ha (13 g/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Always add water soluble packages to clean water with the agitator running. Corn should be within the 1–6 leaf stage. Apply ULTIM when annual grasses are in the 1–6 leaf stage, and quackgrass is in the 3–6 leaf stage. • If corn has been injured by frost, wait 48–72 hours before applying. • Apply ONLY when the temperature in the 24 hours before AND after application ranges between 5°C and 28°C. Temperatures outside this range increase the potential for crop injury. • A rapid fluctuation in temperature (greater than 20°C difference within 24–36 hours) will stress the corn crop. For maximum crop safety, allow 24 hours for the corn to acclimatize before spraying. • **Pre harvest interval:** 120 days (grain), 75 days (silage)

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides and Tank-Mixes			
2,4-D (0.28–0.56 kg/ha)	2,4-D AMINE 600 (564 g/L)*	0.5–1 L/ha (0.2–0.4 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply as an overall spray until corn is 15 cm high (leaf extended); thereafter, use drop nozzles. • Use the higher rate for larger weeds, heavy infestations are during unfavourable environmental conditions (e.g., dry weather). • See special notes on postemergence use of 2,4-D and related herbicides. • **Do NOT** add oil or surfactant. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
atrazine (1.01–1.49 kg/ha) + oil (10–17 L/ha)	AATREX (480 g/L) + oil	2.1–3.1 L/ha (0.84–1.24 L/acre) + 10–17 L/ha (4–6.8 L/acre)	• For increased acretivity and extended period of acretivity, apply in an oil water emulsion of 10–17 L/ha (4–6.8 L/acre) of emulsifiable light mineral oil and 150–200 L/ha water (60–80 L/acre). Apply when most weeds have emerged. The low rate can be used successfully if subsequent cultivation is planned. • **Pre harvest interval:** 60 days (grain), 54 days (sweet corn)
atrazine 1.1–1.49 kg/ha + bromoxynil/MCPA (0.56 kg/ha)	AATREX (480 g/L) + BUCTRIL M ((1:1) 560 g/L)	2.29–3.1 L/ha (0.96–1.24 L/acre) + 1 L/ha (0.4 L/acre)	• **Do NOT use on seed corn.** • Apply from the 4–6 leaf stage of corn but injury may occur if applied after the 6 leaf stage. • Controls a wider spectrum of broadleaf weeds than bromoxynil/MCPA alone. • **Do NOT** add oil or surfactant. • If harvesting sweet corn by hand, re-entry into the field is not permitted until 15 days after application. • **Pre harvest interval:** 60 days (grain)
	AATREX (480 g/L) + BADGE (450 g/L)	2.29–3.1 L/ha (0.96–1.24 L/acre) + 1.25 L/ha (0.5 L/acre)	
	AATREX (480 g/L) + MEXTROL (450 g/L)		
	AATREX (480 g/L) + LOGIC M (450 g/L)		
atrazine (1.01–1.49 kg/ha) + dicamba (0.288 kg/ha)	AATREX (480 g/L) + ENGENIA (600 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 0.48 L/ha (0.19 L/acre)	• **Do NOT use on seed corn.** • This treatment will provide good to excellent control of broadleaf weeds including those triazine resistant and velvetleaf. Use the higher rate for residual control. • See special notes for corn regarding dicamba applications and precautions for ENGENIA, FEXAPAN or XTENDIMAX alone POST. • **Pre harvest interval:** 60 days (grain)
	AATREX (480 g/L) + FEXAPAN (350 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 0.82 L/ha (0.33 L/acre)	
	AATREX (480 g/L) + XTENDIMAX (350 g/L)		
atrazine (1.01–1.49 kg/ha) + bromoxynil (0.28 kg/ha)	AATREX (480 g/L) + PARDNER (280 g/L)	2.1–3.1 L/ha (0.84–1.24 L/acre) + 1–1.2 L/ha (0.4–0.48 L/acre)	• Apply from the 4–8 leaf stage of corn. A reduced rate of atrazine at 0.5 kg/ha (half the low rate) can be used to control weeds listed for PARDNER (or KORIL) alone plus ragweed up to the 8 leaf stage, velvetleaf and triazine susceptible red root pigweed up to 6 leaves. • **Do NOT** add oil or surfactant. • See precautions for bromoxynil. • **Pre harvest interval:** 60 days (grain), 45 days (sweet) * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
	AATREX (480 g/L) + bromoxynil (240 g/L)*	2.1–3.1 L/ha (0.84–1.24 L/acre) + 1.2–1.4 L/ha (0.48–0.56 L/acre)	
	AATREX (480 g/L) + bromoxynil (480 g/L)*	2.1–3.1 L/ha (0.84 - 1.24 L/acre) + 0.6–0.7 L/ha (0.24–0.28 L/acre)	

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides and Tank-Mixes (cont'd)			
topramezone (12.5 g/ha) + atrazine (0.5 kg/ha)	ARMEZON (336 g/L) + AATREX (480 g/L) + MERGE **or** + ASSIST OIL + liquid urea ammonium nitrate (UAN)	37 mL/ha (15 mL/acre) + 1.04 L/ha (0.42 L/acre) + 5 L/1,000 L **or** + 12.5 L/1,000 L + 12.5 L/1,000 L	• Apply to emerged grassy (up to 4 leaf) and broadleaf (up to 8 leaf) weeds. • Apply between the spike and 7 leaf stage of seed, sweet and field corn. • **For seed and sweet corn:** ASSIST + UAN must be used instead of MERGE at a rate of 12.5 L/1,000 L. The use of MERGE will increase the risk of crop injury to seed and sweet corn. • If using the adjuvant MERGE, **do NOT** add liquid ammonium nitrate (UAN). • **Pre harvest interval:** 45 days (grain, silage)
	IMPACT (336 g/L) + AATREX (480 g/L) + MERGE **or** + ASSIST OIL + liquid urea ammonium nitrate (UAN)	37 mL/ha (15 mL/acre) + 1.04 L/ha (0.42 L/acre) + 5 L/1,000 L **or** + 12.5 L/1,000 L + 12.5 L/1,000 L	
bentazon (0.84–1.08 kg/ha)	BASAGRAN FORTÉ (480 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	• Top growth of nutsedge and Canada thistle are controlled and field bindweed may be suppressed by 2 applications of 1.75 L/ha (0.7 L/acre) (0.84 kg active/ha) applied 10 days apart. • Cool weather or drought may reduce control.
bromoxynil/MCPA (0.558 kg/ha)	BUCTRIL M ((1:1) 560 g/L)	1 L/ha (0.4 L/acre)	• **Do NOT use on seed corn.** • Apply from the 4–6 leaf stage of corn but injury may occur if applied after the 6 leaf stage. • Controls most annual broadleaf weeds up to the 4 leaf stage (lamb's-quarters and mustards to 8 leaf stage). • If harvesting sweet corn by hand, re-entry into the field is not permitted until 15 days after application.
	BADGE (450 g/L)	1.25 L/ha (0.5 L/acre)	
	MEXTROL (450 g/L)		
	LOGIC M (450 g/L)		
flumetsulam (78.125 g/ha)	BROADSTRIKE RC (80%)	62.5 g/ha (25 g/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply POST up to the 2 leaf stage of corn. • **Do NOT** use where the soil pH is greater than 7.8 or where the organic matter is less than 2%. • **Do NOT** apply to peat/muck soils or where the soil organic matter is greater than 5%. • **Do NOT** apply more then once a year. • **Pre harvest interval:** 90 days

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides and Tank-Mixes (cont'd)			
mesotrione (0.1 kg/ha) + atrazine (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	CALLISTO (480 g/L) + AATREX (480 g/L) + non-ionic surfactant	0.21 L/ha (0.085 L/acre) + 0.58 L/ha (0.235 L/acre) + 2 L/1,000 L	• Apply from the 3–8 leaf stage of field corn. • Apply from the 3–6 leaf stage of seed or sweet corn. • **Do NOT** apply to Delmonte 2038 sweet corn. • **Do NOT** harvest sweet corn within 50 days of treatment. • Seed corn inbred and sweet corn varieties vary in their tolerance to CALLISTO, consult your seed supplier for more information. • Apply in 100–200 L/ha of water. • **Do NOT** apply to corn treated with an organophosphorous insecticide. • **Pre harvest interval:** 100 days (grain), 90 days (silage)
diflufenzopyr/dicamba (0.2 kg/ha) + non-ionic surfactant (0.25% v/v) + liquid urea ammonium (1.25% v/v)	DISTINCT (70 WG) + non-ionic surfactant + liquid urea ammonium nitrate (UAN)	0.285 kg/ha (0.115 kg/acre) + 2.5 L/1,000 L + 12.5 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply to actively growing weeds when corn is in the 2–6 leaf stage. • Apply when temperatures above 4°C are predicted for the 24 hours before and after application. • **Pre harvest interval:** 120 days
2,4-DB (1.1–1.5 kg/ha)	EMBUTOX (625 g/L) CALIBER 625 (625 g/L) COBUTOX (625 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	• **Do NOT use on seed corn or sweet corn.** • See special notes on postemergence use of 2,4-DB and related hormone chemicals. • **Do NOT** add oil or surfactant.
dicamba (0.288-0.6 kg/ha)	ENGENIA (600 g/L) FEXAPAN (350 g/L) XTENDIMAX (350 g/L)	0.48 – 1 L/ha (0.19 – 0.4 L/acre 0.82 – 1.71 L/ha (0.33 – 0.68L/acre)	• **Do NOT use on seed corn or sweet corn.** • Application can be made from the spike to 5 leaf stage of corn. Use drop pipes when corn is 10–50 cm tall. • See special notes on postemergence use of dicamba, 2,4-D and related herbicides. • **Do NOT** use dicamba if temperatures exceed 25°C at the time of application, or if high humidity is expected, due to the possibility of dicamba volatilizing and injury to susceptible crops nearby. • **Do NOT** add oil or surfactant. • **Pre harvest interval:** 30 days
dicamba (0.14 kg/ha) + 2,4-D (0.4 kg/ha)	ENGENIA (600 g/L) + 2,4-D AMINE 600 (564 g/L)* FEXAPAN (350 g/L) + 2,4-D AMINE 600 (564 g/L)* XTENDIMAX (350 g/L) + 2,4-D AMINE 600 (564 g/L)*	0.23 L/ha (93 mL/acre) + 0.70 L/ha (0.29 L/acre) 0.4 L/ha (160 mL/acre) + 0.70 L/ha (0.29 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Application can be made from the spike to 5 leaf stage of corn. Use drop pipes when corn is 10–50 cm tall. • See special notes on postemergence use of dicamba, 2,4-D and related herbicides. • **Do NOT** add oil or surfactant. • **Pre harvest interval:** 30 days * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides and Tank-Mixes (cont'd)			
dicamba/atrazine (1.5 kg/ha)	MARKSMAN (393 g/L)	3.7 L/ha (1.5 L/acre)	· Apply POST up to the 5 leaf stage of corn. · Do NOT use on seed corn or sweet corn. · See notes on atrazine with respect to residues. · See precautions for FEXAPAN, XTENDIMAX or ENGENIA applied alone. · Do NOT apply to coarse (sand) textured soils with less than 2% organic matter. · Pre harvest interval: 60 days
MCPA (0.38–0.63 kg/ha)	MCPA AMINE (500 g/L)	0.76–1.26 L/ha (0.3–0.5 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Treat before corn reaches 15 cm tall or the 4 leaf stage of growth. · Use the lower rate for small, actively growing weeds and the higher rate for larger weeds or when growing under adverse weather conditions. · Top growth control of fully developed horsetail (15-25 cm tall) can be achieved with 1 L/ha (0.4 L/acre) of product.
bromoxynil (0.28–0.34 kg/ha)	PARDNER (280 g/L)	1–1.2 L/ha (0.4–0.48 L/acre)	· Controls most annual broadleaf weeds, including triazine resistant species at the 1–4 leaf stage. · Some bromoxynil products are not registered for use on seed or sweet corn, refer to Chapter 4, Notes on Herbicides and the product label for registered crop uses. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
	bromoxynil (240 g/L)*	1.2–1.4 L/ha (0.48–0.56)	
	bromoxynil (480 g/L)*	0.6–0.7 L/ha (0.24–0.28 L/acre)	
prosulfuron (10 g/ha) + non-ionic surfactant (0.2% v/v)	PEAK (75 WG) + non-ionic surfactant	13.3 g/ha (5.3 g/acre) + 2 L/1,000 L	· **Do NOT** apply to sweet corn. · Apply when the corn is in the 2–7 leaf stage. · Controls most annual broadleaf weeds including triazine resistant lamb's-quarters and pigweed up to the 6 leaf stage; cocklebur and velvetleaf up to the 6 leaf stage; and ragweed up to the 8 leaf stage. · **Do NOT** apply to corn treated with organophosphorus insecticides.
halosulfuron (34–67.5 g/ha) + non-ionic surfactant (0.25% v/v)	PERMIT (72.6% WG) + non-ionic surfactant	47–93 g/ha (19–38 g/acre) + 2.5 L/1,000 L	· Apply when the corn is in the spike–10 leaf stage. · For sweet corn, the maximum use rate is 70 g/ha (28 g/acre). · The 47 g/ha (19 g/acre) rate will control labelled broadleaf weeds and nutsedge that is shorter than 15 cm. · The 70–90 g/ha (28–38 g/acre) will control nutsedge that is 15–30 cm tall. · Permit can be applied up to twice per season, but not to exceed a total of 140 g/ha (56 g/acre) in sweet corn and 186 g/ha (76 g/acre) in seed or field corn.
MCPB/MCPA (15:1) (1.1–1.7 kg/ha)	TROPOTOX PLUS (400 g/L)	2.75–4.25 L/ha (1.1–1.7 L/acre)	· **Do NOT** use on seed corn or sweet corn. · Apply when corn is 30–60 cm high, using drop pipes. · See special notes on postemergence use of MCPB/MCPA and related herbicides, . · **Do NOT** add oil or surfactant.
	CLOVITOX PLUS (400 g/L)		
	TOPSIDE (400 g/L)		

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes			
nicosulfuron (25 g/ha) + mesotrione (0.1 kg/ha) + atrazine (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	ACCENT (75 DF) + CALLISTO (480 g/L) + AATREX LIQUID (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.21 L/ha (0.085 L/acre) + 0.58 L/ha (0.235 L/acre) + 2 L/1,000 L	• Apply from the 3–8 leaf stage of corn. • Apply in 100–200 L/ha of water. • See precautions for ACCENT and CALLISTO + AATREX LIQUID. • For use on all sweet corn varieties, however not all varieties have been tested. Contact the seed supplier for more information on the tolerance of a specific variety. • **Pre harvest interval:** 100 days (grain), 90 days (silage)
nicosulfuron (25 g/ha) + diflufenzopyr/dicamba (0.2 kg/ha) + non-ionic surfactant (0.2% v/v) + urea ammonium nitrate (5 L/ha)	ACCENT (75 DF) + DISTINCT (70 WG) + non-ionic surfactant + urea ammonium nitrate (UAN)	33 g/ha (13 g/acre) + 0.285 kg/ha (0.115 kg/acre) + 2.5 L/1,000 L + 5 L/ha (2 L/acre)	• **Do NOT** use on seed corn or sweet corn. • Apply to active growth stage of seedling broadleaf weeds (less than 5 cm tall). • Apply to annual grasses in the 1–6 leaf stage and to quackgrass in the 3–6 leaf stage (10–20 cm). • Apply when corn is in the 2–8 leaf stage. • See precautions for ACCENT and DISTINCT. • **Pre harvest interval:** 120 days
nicosulfuron (25 g/ha) + dicamba (0.288 kg/ha) + non-ionic surfactant (0.2% v/v)	ACCENT (75 DF) + ENGENIA (600 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.48 L/ha (190 mL/acre) + 2 L/1,000 L	• **Do NOT** use on seed corn or sweet corn. • See precautions for ACCENT and ENGENIA. • **Do NOT** apply to corn beyond the 6 leaf stage. • **Pre harvest interval:** 60 days
nicosulfuron (25 g/ha) + dicamba/atrazine (1 kg/ha) + non-ionic surfactant (0.2% v/v)	ACCENT (75 DF) + MARKSMAN (393 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 2.5 L/ha (1 L/acre) + 2 L/1,000 L	• **Do NOT use on seed or sweet corn.** • See precautions for ACCENT and MARKSMAN. • **Do NOT** apply to corn beyond the 6 leaf stage. • **Pre harvest interval:** 60 days

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes (cont'd)			
nicosulfuron (25 g/ha) + bromoxynil (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	ACCENT (75 DF) + PARDNER (280 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 1 L/ha (0.4 L/acre) + 2 L/1,000 L	• Use **ONLY** when the corn is between the 4 and 8 leaf stage. • See precautions for ACCENT and PARDNER/bromoxynil. • For use on all sweet corn varieties, however not all varieties have been tested. Contact the seed supplier for more information on the tolerance of a specific variety. • **Pre harvest interval:** 30 days * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
	ACCENT (75 DF) bromoxynil (240 g/L)* + non-ionic surfactant	33 g/ha (13 g/acre) + 1.2 L/ha (0.5 L/acre) + 2 L/1,000 L	
	ACCENT (75 DF) bromoxynil (480 g/L)* + non-ionic surfactant	33 g/ha (13 g/acre) + 0.6 L/ha (0.24 L/acre) + 2 L/1,000 L	
rimsulfuron (5.45%)/ (15 g/ha) mesotrione (36.36%) (100 g/ha)	DESTRA IS + non-ionic surfactant	275 g/ha (110 g/acre) +2 L/1,000 L	• Apply from the 3 to 8 leaf stage of corn. • Apply when grassy weeds are in the 1–4 leaf stage, when quackgrass is in the 3 to 6 leaf stage and up to the 8 leaf stage of broadleaf weeds. Provides residual control of fall panicum, green foxtail, lamb's-quarters and pigweed spp. • A rapid fluctuation in temperature (greater than 20°C difference within 24–36 hours) will stress the corn crop. For maximum crop safety, allow 24 hours for the corn to acclimatize before spraying Destra™ IS Herbicide as a postemergence application on emerged corn.
foramsulfuron (35 g/ha) + atrazine (0.84–1.12 kg/ha) + liquid urea ammonium (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + AATREX (480 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 1.75–2.33 L/ha (0.7–0.93 L/acre) + 2.5 L/ha (1 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply up to the 8 leaf stage of corn. • **Pre harvest interval:** 70 days
foramsulfuron (35 g/ha) + mesotrione (0.1 kg/ha) + atrazine (0.28 L/ha) + liquid urea ammonium (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + CALLISTO (480 g/L) + AATREX (480 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.21 L/ha (0.085 L/acre) + 0.58 L/ha (0.235 L/acre) + 2.5 L/ha (1 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply up to the 8 leaf stage of corn. • Apply in 175 L/ha (70 L/acre) of water. • See precautions for CALLISTO + AATREX LIQUID.
foramsulfuron (35 g/ha) + diflufenzopyr/dicamba (0.2 kg/ha) + UAN (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + DISTINCT (70 WG) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.285 kg/ha (0.115 kg/acre) + 2.5 L/ha (1 L/acre)	• **Do NOT use on seed corn or sweet corn.** • Apply up to the 6 leaf stage of corn. • See precautions for DISTINCT.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes (cont'd)			
foramsulfuron (35 g/ha) + dicamba (0.144 kg/ha) + liquid urea ammonium (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + ENGENIA (600 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.24 L/ha (96 mL/acre) + 2.5 L/ha (1 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply up to the 8 leaf stage of corn. · See precautions for ENGENIA
foramsulfuron (35 g/ha) + dicamba/atrazine (1 kg/ha) + UAN (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + MARKSMAN (393 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 2.5 L/ha (1 L/acre) + 2.5 L/ha (1 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply up to the 5 leaf stage of corn. · See precautions for MARKSMAN.
foramsulfuron (35 g/ha) + bromoxynil (0.14 kg/ha) + atrazine (0.5 kg/ha) + UAN (2.5 L/ha)	OPTION 2.25 OD (22.5 g/L) + PARDNER (280 g/L) + AATREX (480 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.5 L/ha (0.2 L/acre) + 1.04 L/ha (0.42 L/acre) + 2.5 L/ha (1 L/acre)	· **Do NOT use on seed corn or sweet corn.** · Apply up to the 8 leaf stage of corn. · See precautions for PARDNER/bromoxynil. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario, for a complete list of available products.
	OPTION 2.25 OD (22.5 g/L) + bromoxynil (240 g/L)* + AATREX (480 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.6 L/ha (0.24 L/acre) + 1.04 L/ha (0.42 L/acre) + 2.5 L/ha (1 L/acre)	
	OPTION 2.25 OD (22.5 g/L) + bromoxynil (480 g/L)* + AATREX (480 g/L) + urea ammonium nitrate (UAN)	1.56 L/ha (0.63 L/acre) + 0.3 L/ha (0.12 L/acre) + 1.04 L/ha (0.42 L/acre) + 2.5 L/ha (1 L/acre)	
pendimethalin (1 kg/ha) + nicosulfuron (12.5 g/ha) + dicamba (300 g/ha) + non-ionic surfactant (0.2% v/v)	PROWL H2O (455 g/L) + ACCENT (75 DF) + ENGENIA (600 g/L) + non-ionic surfactant	2.2 L/ha (0.88 L/acre) + 16.7 g/ha (6.7 g/acre) + 0.5 L/ha (0.2 L/acre) + 2 L/1,000 L	· **Do NOT use on seed corn or sweet corn.** · Apply early postemergence from the spike to 4 leaf stage of corn. · See precautions for PROWL H20, ACCENT, and ENGENIA.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes (cont'd)			
tolpyralate (30–40 g/ha) + atrazine (0.56 kg/ha)	SHIELDEX (400 g/L) + AATREX 480	75–100 mL/ha (30–40 mL/acre) + 1.16 L/ha (466 mL/acre)	• Apply Shieldex 400SC Herbicide to field, sweet or pop corn up to 50 cm tall or that is exhibiting up to and including 6 leaf collars (V6), whichever is more restrictive. • Apply in 140–470 L/ha (56–188 L/acre) of water. Use the higher water volumes under heavy weed populations or adverse weather condiions. • Broadleaf weeds should be no larger than 10 cm and grasses should be no taller than 10 centimeters and prior to first tillering. Good coverage is essential to achieve optimum weed control. • Weed control may be improved by adding a nitrogen source. Use 12.5 to 25 L/1000 L spray solution of urea ammonium nitrate (UAN), such as 28% N or 32% N, or 8.4 to 20.4 kg/1000 L of a spray grade ammonium sulfate (AMS). • Avoid disturbing treated areas for at least 7 days after application to allow maximum herbicide uptake and translocation. • Pre harvest intervals: 45 days (field, popcorn); 35 days (sweet corn); 21 days (silage corn). Rainfast: 1 hour
nicosulfuron/rimsulfuron (25 g/ha) + mesotrione (0.1 kg/ha) + atrazine (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	ULTIM (75 DF) + CALLISTO (480 g/L) + AATREX (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.21 L/ha (0.085 L/acre) + 0.58 L/ha (0.235 L/acre) + 2 L/1,000 L	• Apply from the 3–6 leaf stage of corn. • **Do NOT use on seed corn or sweet corn.** • Apply in 100–200 L/ha of water. • See precautions for ULTIM alone and CALLISTO + AATREX LIQUID.
nicosulfuron/rimsulfuron (25 g/ha) + diflufenzopyr/dicamba (0.2 kg/ha) + non-ionic surfactant (0.25% v/v) + urea ammonium nitrate (12.5 L/1,000 L)	ULTIM (75 DF) + DISTINCT (70 WG) + non-ionic surfactant + urea ammonium nitrate (UAN)	33 g/ha (13 g/acre) + 0.285 kg/ha (0.115 kg/acre) + 2.5 L/1,000 L + 12.5 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply to active growth stage of seedling broadleaf weeds (less than 5 cm tall). • Apply to annual grasses in the 1–6 leaf stage and to quackgrass in the 3–6 leaf stage. • 1 bag of ULTIM TOTAL treats 10 acres. • See precautions for ULTIM alone and DISTINCT alone.

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes (cont'd)			
nicosulfuron/rimsulfuron (25 g/ha) + dicamba (0.288 kg/ha) + non-ionic surfactant (0.2% v/v)	ULTIM (75 DF) + ENGENIA (600 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.48 L/ha (190 mL/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Refer to product label(s) for weeds controlled, timing of application, and use precautions. If grass and broadleaf weed growth stages do not coincide, then a sequential application of ULTIM and ENGENIA, FEXAPAN or XTENDIMAX is required. • See precautions for ULTIM alone, and ENGENIA, FEXAPAN or XTENDIMAX.
	ULTIM (75 DF) + FEXAPAN (350 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.82 L/ha (0.33L/acre) + 2 L/1,000 L	
	ULTIM (75 DF) + XTENDIMAX (350 g/L) + non-ionic surfactant		
nicosulfuron/rimsulfuron (25 g/ha) + dicamba/atrazine (1.003 kg/ha) + non-ionic surfactant (0.2% v/v)	ULTIM (75 DF) + MARKSMAN (393 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 2.5 L/ha (1 L/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply up to the 5 leaf stage of corn. • One solupak of ULTIM treats 1 ha (2.5 acre). If grass and broadleaf weed growth stages do not coincide, then a sequential application of ULTIM and MARKSMAN is required. • See precautions for ULTIM alone and MARKSMAN alone,
nicosulfuron/rimsulfuron (25 g/ha) + bromoxynil (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	ULTIM ((1:1) 75 DF) + PARDNER (280 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 1 L/ha (0.4 L/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply from the 3–6 leaf stage of corn for optimum control. • One solupak of ULTIM treats 1 ha (2.5 acre). Refer to product label(s) for weeds controlled, timing of application, and use precautions. If grass and broadleaf weed growth stages do not coincide, then a sequential application of ULTIM and PARDNER or BROMOTRIL, BROTEX or KORIL is required. • **Do NOT** apply ULTIM to corn treated with organophosphorous insecticides. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
	ULTIM ((1:1) 75 DF) + bromoxynil (240 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 1.2 L/ha (0.5 L/acre) + 2 L/1,000 L	
	ULTIM ((1:1) 75 DF) + bromoxynil (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.6 L/ha (0.24 L/acre) + 2 L/1,000 L	

TABLE 9–4. Herbicide Treatment Rates for Conventional Corn (Field, Seed and Sweet) (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass and Broadleaf Herbicides and Tank-mixes (cont'd)			
nicosulfuron/rimsulfuron (25 g/ha) + bromoxynil (0.14 kg/ha) + atrazine (0.5 kg/ha) + non-ionic surfactant (0.2% v/v)	ULTIM ((1:1) 75 DF) + PARDNER (280 g/L) + AATREX (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.5 L/ha (0.2 L/acre) + 1.04 L/ha (0.42 L/acre) + 2 L/1,000 L	• **Do NOT use on seed corn or sweet corn.** • Apply from the 3–6 leaf stage of field corn. • This treatment provides improved control of larger velvetleaf (up to 6 leaf stage) and common ragweed (up to 8 leaf stage). If grass and broadleaf weed growth stages do not coincide, then a sequential application of ULTIM and PARDNER, BROMOTRIL, BROTEX or KORIL plus atrazine is required. • **Note:** some hybrids have shown sensitivity to ULTIM. Consult the seed supplier. • See precautions for ULTIM alone, PARDNER/bromoxynil alone and AATREX alone. * Numerous products exist, refer to Table 4–1. Herbicides Used in Ontario for a complete list of available products.
	ULTIM ((1:1) 75 DF) + bromoxynil (240 g/L)* + AATREX (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.6 L/ha (0.24 L/acre) + 1.04 L/ha (0.42 L/acre) + 2 L/1,000 L	
	ULTIM ((1:1) 75 DF) + bromoxynil (480 g/L)* + AATREX (480 g/L) + non-ionic surfactant	33 g/ha (13 g/acre) + 0.3 L/ha (0.12 L/acre) + 1.04 L/ha (0.42 L/acre) + 2 L/1,000 L	

WEED CONTROL FOR HERBICIDE TOLERANT CORN HYBRIDS

1) Glyphosate Tolerant ("Roundup Ready") Corn

Weed Management Strategies for Glyphosate Tolerant Corn

There are four main strategies that one can use to manage weeds in glyphosate tolerant corn:

- A single application of glyphosate.
- Glyphosate tank-mixed with a residual herbicide.
- Two in-crop applications of glyphosate.
- A preemergence application with a residual herbicide followed with an in crop application of glyphosate.

Public research trials evaluated the performance of these four strategies at 11 locations over 2 growing seasons. Yield data from these trials are presented in Table 9–5. *Corn Yield From Different Weed Management Strategies in Glyphosate Tolerant Corn,* on this page, as a percentage of the top yielding treatment. In general, all four strategies can provide maximum yields in any given field provided it offers excellent weed control from the 3–8 leaf stage of corn.

TABLE 9–5. Corn Yield From Different Weed Management Strategies in Glyphosate Tolerant Corn

Strategy	Pros	Cons	Yield (%)
Two Pass Glyphosate glyphosate applied at the 3–4 leaf stage of corn and again at the 7–8 leaf stage of corn	• Typically provides the best weed control and corn yields. • Better perennial weed control.	• More expensive. • Increases selection pressure of glyphosate and chance of selecting herbicide resistant weed populations.	100
PRE/POST residual herbicide applied PRE followed by glyphosate applied at the 7–8 leaf stage of corn	• Typically provides the best weed control and corn yields. • Multiple herbicide modes of action to manage resistant weed populations. • Better perennial weed control.	• More expensive.	99
One Pass Tank-Mix with Residual Herbicide glyphosate + residual herbicide applied at the 3–4 leaf stage of corn	• Only one application. • Multiple herbicide modes of action to manage resistant weed populations.	• Timing too early to control many perennial weeds. • Reduced weed control when tank-mix partner does not provide residual control of weed spectrum in the field.	97
One Pass Glyphosate (Early) glyphosate applied at the 3–4 leaf stage of corn	• Only one application.	• Season long weed control not always possible. • Weeds emerging after application can significantly reduce yield.	96
One Pass Glyphosate (Late) glyphosate applied at the 7–8 leaf stage of corn	• Not recommended.	• Not recommended.	90

Yield data collected from 11 replicated trials during the 2007 and 2008 growing seasons.
Source: Dr. P.H. Sikkema (Ridgetown Campus, University of Guelph) and Dr. R. Nurse (AAFC, Harrow).

2) Glufosinate Tolerant (“Liberty Link”) Corn

Weed Management Strategies for Glufosinate Tolerant Corn

There are four main strategies that one can use to manage weeds in glufosinate tolerant (“Liberty Link”) corn.

- A single application of LIBERTY.
- LIBERTY tank-mixed with a residual herbicide.
- Two in-crop applications of LIBERTY.
- A preemergence application with a residual herbicide followed with an in crop application of LIBERTY.

Grain yield and weed control associated with any of the above four strategies is similar to what has been observed by the University of Guelph in glyphosate tolerant corn, refer to Table 9–5. In general, Liberty provides optimum weed control under hot humid conditions, when applications are made during the day (versus the morning or evening) and when spray coverage is thorough. Cool conditions, weed size, and dew on weed leaves will reduce the level of control of Liberty even at labeled rates.

3) "Enlist" Field Corn

Weed Management Strategies for Enlist Field Corn

Enlist hybrids are tolerant to glyphosate, glufosinate ammonium (Liberty 200SN) and quizalopfop-p-ethyl (e.g., Assure II) that normally would kill corn. Enlist hybrids also have increased tolerance to 2,4-D which can be applied to other field corn hybrids. Regardless, these 4 active ingredients primarily control weeds that are emerged and many of the principles discussed above to optimize weed control in Roundup Ready Corn, equally apply to Enlist corn hybrids.

A weed management strategy that includes a preemergence application with a residual herbicide followed by an in crop application of Enlist Duo is the preferred approach. Please refer to Table 9–6. for Preemergence Herbicides with Limited Residual Weed Control. A preemergence herbicide application with limited residual control may require a post emergent Enlist Duo application (Enlist Tolerant Hybrids Only).

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control, and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and given general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 9–6. Herbicide Tolerant Corn ("Roundup Ready", "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

			Annual Grasses									Annual Broadleaves													Perennials						
Trade Name	**WSSA group(s)**	**Weed Stage**	**barnyard grass**	**smooth crabgrass**	**large crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**corn spurry**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preemergence Herbicides with Limited Residual Weed Control – May Require a Postemergence Herbicide Application																															
ACURON	27,27, 15,5	un-emerged	9	9	9	8[2]	8	8	8	9	4	9	8	–	9	9	9	9	9	9	9	9	9	9	2	0	8	0	0	0	E
ARMEZON PRO + AATREX	15,27 +4	un-emerged	9	9	9	8[2]	8	8	8	9	7	9	7	9	6	9	9	9	9	9	9	5	7	6	8[4]	0	8	0	8[4]	8[4]	E
ARMEZON PRO + MARKSMAN	15,27 +4,5	un-emerged	9	9	9	8[2]	8	8	8	9	7	9	9	9	9	9	9	9	9	9	9	9[4]	9[4]	7	8[4]	0	8	0	8[4]	8[4]	E
CONVERGE XT*	27+5	un-emerged	9	9	9	9	9	7	9	9	9	9	7	–	6	9	9	9	9	9	9	6	9	8	–	0	0	0	0	0	G
ENGARDE	2+27	un-emerged	9	8	8	9	9	9	7	9	9	9	5	8	–	9	9	9	9	9	8	–	9	6	–	–	8[1]	7[1]	–	–	E
FOCUS	15,14	un-emerged	9	9	8	–	9	9	9	–	–	8	–	–	–	–	8	9	9	9	7	–	6	7	–	–	–	–	–	–	E
INTEGRITY	15,14	un-emerged	9	8	7	–	8	8	8	9	4	9	8	–	9	9	9	9	7	9	9	5	9	8	0	5	6	0	0	0	E
PRIMEXTRA II MAGNUM	15,5	un-emerged	9	8	8	8	8	8	8	9	2	9	7	9	6	9	9[R]	9	9	9[R]	7[R]	–	5	7	0	0	3	0	0	0	E
PROWL H20 + AATREX	3,5	un-emerged	9	–	–	–	–	8	8	–	–	9	7	9	5	9	9[R]	9	9	9[R]	8[R]	6	6	–	2	0	0	0	2	2	E
PROWL H20 + MARKSMAN	3,4,5	un-emerged	9	–	–	–	–	8	8	–	–	9	9	9	9	9	9	9	9	9	8	7	8	–	8[1]	0	0	0	8[1]	8[1]	E

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on "Liberty Link" corn (glufosinate tolerant) only.
[6] For use on "Enlist" corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–6. Herbicide Tolerant Corn ("Roundup Ready", "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials						Crop Tolerance
			barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
One Pass Postemergence Non-Residual Herbicides and Tank-mixes for "Roundup Ready" (Glyphosate Tolerant) Hybrids Only																															
glyphosate[2,3]	9	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	8	9[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	7	–	8[4]	9	8	9	E[3]
		residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
LONTREL XC + glyphosate[2,3]	4 +9	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	8	9	8	9	9	9	9	8	9	9	9	–	–	–	9	9	9	E[3]
		residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
One Pass Preemergence or Postemergence Tank-Mixes with Residual Weed Control for "Roundup Ready" (Glyphosate Tolerant) Hybrids Only																															
CALLISTO GT[3]	9,27	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	8	8	8	9	9	9	9	9	8	9	7	7	–	8[4]	9	8	9	G[3]
		residual weed control	–	–	–	–	–	–	–	–	–	9	6	9	8	9	9	9	9	9	7	5	9	8	2	0	0	0	0	0	
glyphosate[2,3] + AATREX	9+5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	8	9[R]	9	9	9	9	9	9[R]	8[R]	9	9[R]	7	–	8[4]	9	8	9	E[3]
		residual weed control	2	2	2	2	2	2	2	2	2	9	7	9	5	9	9[R]	9	9	9[R]	9[R]	6	5	5	2	0	0	0	0	0	
glyphosate[2,3] + ACURON	9 + 27,27, 15,5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	7	–	8[4]	9	8	9	E[3]
		residual weed control	9	9	9	8[2]	8	8	8	9	4	9	8	–	9	9	9	9	9	9	9	8	9	9	2	0	8	0	0	0	
glyphosate[2,3] + ARMEZON PRO + AATREX	15,27 +4	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	8	9[R]	8	9	9	9	9	9	9	9	8	7	–	8[4]	9	8	9	E[3]
		un-emerged	9	9	9	8[2]	8	8	8	9	7	9	5	9	5	9	9[R]	9	9	9[R]	9[R]	6	5	5	2	0	0	2	2	0	

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on "Liberty Link" corn (glufosinate tolerant) only.
[6] For use on "Enlist" corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–6. Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings (cont’d)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won’t be adequately controlled if present

Trade Name	WSSA group(s)	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials						Crop Tolerance
			barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady’s thumb	lamb’s-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
One Pass Preemergence or Postemergence Tank-Mixes with Residual Weed Control for "Roundup Ready" (Glyphosate Tolerant) Hybrids Only (cont’d)																															
glyphosate[2,3] + ARMEZON PRO + MARKSMAN	15,27 +4,5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	–	8[4]	9	8	9	G[3]
		un-emerged	9	9	9	8[2]	8	8	8	9	7	9	6	9	9	9	9	9	9	9	9	7	8	7	2	0	0	2	2	2	
glyphosate[2,3] + CALLISTO + AATREX	9 +5 +4	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	9	7	7	–	8[4]	9	8	9	E[3]
		residual weed control	2	0	2	0	2	2	2	2	2	9	6	9	8	9	9	9	9	9	9	6	9	8	2	0	0	0	0	0	E[3]
glyphosate[2,3] + CONVERGE XT*	9 +27 +5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	8	9[R]	9	9	9	9	9	9	8[R]	9	9[R]	7	–	8[4]	9	8	9	E[3]
		residual weed control	9	–	–	9	–	9	9	9	–	9	–	–	6	9	9	9	–	9	9	6	9	8	–	0	0	0	0	0	E[3]
glyphosate[2,3] + DESTRA IS	9 + 2,27	emerged weeds	9	8	8	9	9	9	7	9	9	9	9	8	9[R]	9	9	9	9	9	8	8[R]	9	9[R]	–	–	8	9	–	–	E[3]
		residual weed control	9	8	8	9	9	9	7	9	9	9	5	8	0	9	9	9	9	9	8	–	9	–	–	–	7	–	–	–	
glyphosate[2,3] + (IMPACT/ARMEZON) + AATREX	9 +27 +5	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	8	9[R]	8	9	9	9	9	9	9	9	8	7	–	8[4]	9	8	9	E[3]
		residual weed control	6	0	6	0	6	6	0	0	0	8	7	9	6	9	9	9	9	9	9	6	6	–	0	0	0	0	0	0	
glyphosate[2,3] + MARKSMAN	9 +4,5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	–	8[4]	9	8	9	E[3]
		residual weed control	2	2	2	2	2	2	2	2	2	9	7	9	–	9	9	9	9	9	9	7	8	7	2	0	0	2	2	2	

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on “Liberty Link” corn (glufosinate tolerant) only.
[6] For use on “Enlist” corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–6. Herbicide Tolerant Corn ("Roundup Ready", "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials						Crop Tolerance
			barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
One Pass Preemergence or Postemergence Tank-Mixes with Residual Weed Control for "Roundup Ready" (Glyphosate Tolerant) Hybrids Only (cont'd)																															
glyphosate[2,3] + PRIMEXTRA II MAGNUM	9+ 15,5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9R	9	9	9	9	9	9R	8R	9	9R	7	–	8[4]	9	8	9	E[3]
		residual weed control	9	8	8	8	8	8	8	9	2	9	7	9	6	9	9	9	9	9	9R	–	5	7	0	0	3	0	0	0	
HALEX GT[3] + AATREX	9,15, 27+5	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	7	9	7	7	–	8[4]	9	8	9	E[3]
		residual weed control	9	9	9	9	9	9	9	9	4	9	8	–	8	9	9	9	9	9	8	6	9	8	2	0	3	0	0	0	
PERMIT + glyphosate[2,3]	2+9	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9R	9	9	9	9	9	9	8R	9	9R	7	–	8	9	8	9	E[3]
		residual weed control	9	9	9	9	9	9	9	9	4	–	8	–	8R	8	8R	8	–	8R	8R	8R	8	–	–	–	6	0	–	–	
ROUNDUP XTEND	9 +4	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	8	9	8	9	9	9	9	9	9	9	9R	8	–	8[4]	9	9	9	E[3]
		residual weed control	0	0	0	0	0	0	0	0	0	8	7	8	9	9	9	6	9	9	9	7	8	3	2	0	0	0	2	2	
VIOS G3 + glyphosate[2,3]	2,27 +9	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9R	9	9	9	9	9	9	8R	9	6	7	–	8[4]	9	8	9	E[3]
		residual weed control	9	8	8	9	9	9	9	9	7	9	–	–	4	9	9	9	9	9	9	–	8	–	–	–	0	–	0	–	

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on "Liberty Link" corn (glufosinate tolerant) only.
[6] For use on "Enlist" corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–6. Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings (cont’d)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won’t be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials						Crop Tolerance
			barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady’s thumb	lamb’s-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Two Pass Treatments for "Roundup Ready" (Glyphosate Tolerant) Hybrids Only																															
glyphosate[2,3] (2–3 leaf); glyphosate[2,3] (7–8 leaf)	9	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	8	8[R]	8	9	9	9	9	9	8[R]	9	9[R]	8	–	8[4]	9	9	9	E[3]
One Pass Postemergence Non-Residual Herbicides for "Liberty-Link" (Glufosinate Tolerant) Hybrids Only																															
LIBERTY 200 SN[5]	10	emerged weeds	9	9	9	9	9	9	8	9	9	8	9	–	4	8	8	9	9	9	9	–	8	4	6	6	6	6/7	8	7	E[5]
One Pass Tank-Mixes with Residual Weed Control for “Liberty Link” (Glufosinate Tolerant) Hybrids Only																															
LIBERTY 200 SN[5] + AATREX	10 +5	emerged weeds	9	9	9	9	9	9	8	9	9	8	9	9	5	8	8	9	9	9	9	–	8	4	6	6	6	6/7	8	7	E[5]
		residual weed control	2	2	2	2	2	2	2	2	2	9	7	9	5	9	9[R]	9	9	9[R]	9[R]	6	5	5	2	0	0	0	0	0	
LIBERTY 200 SN[5] + ENGENIA	10 +4	emerged weeds	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	4	8	6	6	6/7	9	8	E[5]
		residual weed control	0	0	0	0	0	0	0	0	0	8	7	8	9	9	9	6	9	9	9	7	8	3	2	0	0	0	2	2	
LIBERTY 200 SN[5] + DISTINCT	10+ 19,4	emerged weeds	9	9	9	9	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	6	6	6/7	9	9	E[5]
LIBERTY 200 SN[5] + MARKSMAN	10 +4,5	emerged weeds	9	9	9	9	9	9	8	9	9	9	9	–	9	9	9	9	9	9	9	9	9	4	8	6	6	6/7	8	8	E[5]
		residual weed control	2	2	2	2	2	2	2	2	2	9	7	9	9	9	9	9	9	9	9	7	8	7	2	0	0	2	2	2	

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on “Liberty Link” corn (glufosinate tolerant) only.
[6] For use on “Enlist” corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–6. Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) Herbicide Weed Control Ratings (cont’d)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won’t be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials						Crop Tolerance
			barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady’s thumb	lamb’s-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	nutsedge	quackgrass	sow-thistle	thistle, Canada	
One Pass Tank-Mixes with Residual Weed Control for “Liberty Link” (Glufosinate Tolerant) Hybrids Only (Cont'd)																															
LIBERTY 200 SN[5] + PROWL H20	10 +3	emerged weeds	9	9	9	9	9	9	8	9	9	8	9	–	4	8	9	9	9	9	9	–	8	4	6	6	6	6/7	8	7	E[5]
		residual weed control	9	9	9	9	8	8	8	–	5	–	–	–	0	6	9	0	8	8	2	–	6	–	–	–	–	–	–	–	
VIOS G3 + LIBERTY 200 SN[5]	2,27 +10	emerged weeds	9	9	9	9	9	9	9	9	9	8	9	–	4	9	8	9	9	9	9	–	9	6	6	6	6	6/7	8	7	E[5]
		residual weed control	9	8	8	9	9	9	9	9	7	9	–	–	4	9	9	9	9	9	9	–	8	–	–	–	0	–	0	–	
One Pass Postemergence Non-Residual Herbicides for "Enlist" (glyphosate, glufosinate and 2,4-D tolerant) Hybrids Only																															
ENLIST DUO[6]	4,9	emerged weeds	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	5	8	7	8	9	9	9	E[6]

[1] Weed must be emerged to achieve this level of control.
[2] Various formulations available, see Table 9–7.
[3] For use on ROUNDUP READY corn (glyphosate tolerant) only.
[4] Glyphosate must be applied at a rate of 1.8 kg ai/ha in order to achieve this level of control, refer to Table 9–8.
[5] For use on “Liberty Link” corn (glufosinate tolerant) only.
[6] For use on “Enlist” corn (glufosinate, glyphosate and 2,4-D tolerant) only.

TABLE 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant ("Roundup Ready") Corn

LEGEND: a.i. = active ingreditent ✓ = product contains this salt type — = not in product

	PRODUCT RATE					SALT TYPE		
Glyphosate Products	**0.9 kg/ha a.i.**	**1.35 kg/ha a.i.**	**1.8 kg/ha a.i.**	**Manufacturer**	**Rainfast**	**Dimethylamine**	**Isopropylamine**	**Potassium**
CREDIT XTREME (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	NUFARM	1 hour	—	✓	✓
CRUSH'R 540 (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	AGRI STAR	1 hour	—	—	✓
FACTOR 540 (540 g/L)	0.67 L/acre	1 L/acre	1.34 L/acre	IPCO	1 hour	—	—	—
GLYFOS (360 g/L)	1 L/acre	1.5 L/acre	2 L/acre	CHEMINOVA	not specified	—	✓	—
MATRIX (480 g/L)	0.75 L/acre	1.13 L/acre	1.5 L/acre	IPCO	not specified	✓	—	—
POLARIS MAX (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	CORTEVA	1 hour	—	—	✓
ROUNDUP TRANSORB HC (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	BAYER	1 hour	—	—	✓
ROUNDUP WEATHERMAX (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	BAYER	1 hour	—	—	✓
STONEWALL (540 g/L)	0.67 L/acre	1 L/acre	1.34 L/acre	WINFIELD	1 hour	—	—	✓
VM 480 (480 g/L)	0.75 L/acre	1.13 L/acre	1.5 L/acre	CORTEVA	not specified	✓	—	—

[1] IMPORTANT NOTE: Only tank-mix products containing the active ingredient "dicamba" (e.g. ENGENIA, FEXAPAN or XTENDIMAX) with a glyphosate product containing a potassium salt. Tank-mixing with other glyphosate products can increase the potential for off-target drift through volatilization. Refer to each product label in the tank-mix and follow the directions of the more restrictive label.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown and Residual Control			
• Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a “one pass” weed management program. • Refer also to Chapter 6, Preplant & Postharvest Weed Control for preplant application rates for glyphosate. • It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (e.g., AATREX, CONVERGE 480, MARKSMAN, PRIMEXTRA II MAGNUM) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
Preemergence Herbicides with Limited Residual Weed Control – May Require a Postemergence Glyphosate Application (Glyphosate Tolerant Hybrids Only)			
bicyclopyrone (7.1 g/L) (35 g/ha) mesotrione (28.5 g/L) (140 g/ha) s-metolachlor (257 g/L) (1262 g/ha) atrazine (120 g/L) (589 g/ha)	ACURON	4 L/ha (1.6 L/acre)	• Apply PRE, use for early season weed control through the critical crop establishment phase and in a planned weed management program with a post-emergent glyphosate application. • Do NOT mix with ammonium sulphate (AMS). • Apply in a minimum of 150 L/ha (60 L/acre) or water or UAN. • Nitrogen solutions (such as 28-0-0 UAN), excluding suspension and sulphur containing fertilizers, may replace water as a carrier for pre-emergence applications. Do not use nitrogen solutions as a carrier to corn that has emerged. Always predetermine the compatibility of ACURON Herbicide tank mixes with your liquid fertilizer carrier by mixing small proportional quantities in advance. • Pre harvest intervals: 50 days (sweet corn); 90 days (silage corn).
dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + atrazine (480 g/L) (480 g/ha)	AREMZON PRO + AATREX	1 L/ha (0.4 L/acre) + 1 L/ha (0.4 L/acre	• Apply PRE, use for early season weed control through the critical crop establishment phase and in a planned weed management program with a post-emergent glyphosate application. . • **Pre harvest interval:** 80 days
dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + dicamba (133 g/L) (488 g/ha) +atrazine (261 g/L) (966 g/ha)	ARMEZON PRO + MARKSMAN	1 L/ha (0.4 L/acre) + 2.5 L/ha (1 L/acre	• Apply PRE, use for early season weed control through the critical crop establishment phase and in a planned weed management program with a post-emergent glyphosate application. . • **Pre harvest interval:** 80 days
isoxaflutole (52.5 g/ha) + atrazine (532 g/ha)	CONVERGE XT (sold as a co-pack): CONVERGE FLEXX (240 g/L) + CONVERGE 480 (480 g/L)	220 mL/ha (89 mL/acre) + 1.1 L/ha (0.44 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Use for early season weed control through the critical crop establishment phase. • Use in a planned weed management program with a post-emergent glyphosate application. • See precautions for CONVERGE XT.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preemergence Herbicides with Limited Residual Weed Control – May Require a Postemergence Glyphosate Application (Glyphosate Tolerant Hybrids Only) (Cont'd)			
rimsulfuron (15 g/ha) + mesotrione (144 g/ha)	ENGARDE (4.31%:41.38%)	348 g/ha (139 g/acre)	• Apply PRE or Early POST up to the 2 leaf stage of corn. • Engarde can be applied with 28% UAN as a carrier **(PRE only)**. • Can be tank-mixed with glyphosate for emerged annual and perennial weeds. See Chapter 6, Preplant & Postharvest Weed Control for more information.
pyroxasulfone (100 g/ha) carfentrazone-ethyl (11.87 g/ha)	FOCUS (447 g/L:53 g/L)	224 mL/ha (90 mL/acre)	• Apply PP or PRE. • This rate is called a "set-up treatment" which is an application to remove early weed competition to allow good crop establishment. An in-crop application of herbicide may be required subsequently to control emerged weeds.
saflufenacil/ dimethenamid-P (488 g/ha)	INTEGRITY (668 g/L)	0.73 L/ha (0.292 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • A postemergence application of glyphosate applied at the 7–8 leaf stage of corn may be necessary for the control of perennial weeds or weed escapes. • See precautions for INTEGRITY.
s-metolachlor/benoxacor/ atrazine (1.8 kg/ha)	PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L)	2.5 L/ha (1 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • This reduced rate of PRIMEXTRA II MAGNUM (1 L/acre) provides suppression of labeled weeds and is part of a planned weed management program that includes a follow-up postemergence treatment of glyphosate.
pendimethalin (1 kg/ha) + atrazine (1 kg/ha)	PROWL H2O (455 g/L) + AATREX (480 g/L)	2.2 L/ha (0.89 L/acre) + 2.1 L/ha (0.83 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • A postemergence application of glyphosate applied at the 7–8 leaf stage of corn may be necessary for the control of perennial weeds or weed escapes. • See precautions for PROWL H20 alone and AATREX alone,.
pendimethalin (1 kg/ha) + dicamba/atrazine (1 kg/ha)	PROWL H2O (455 g/L) + MARKSMAN (393 g/L)	2.2 L/ha (0.89 L/acre) + 2.5 L/ha (1 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • A postemergence application of glyphosate applied at the 7–8 leaf stage of corn may be necessary for the control of perennial weeds or weed escapes. • See precautions for PROWL H20 alone and MARKSMAN alone.
One Pass Postemergence Non-Residual Herbicides for Glyphosate Tolerant Hybrids Only			
glyphosate (0.9–1.8 kg/ha)	glyphosate (360 g/L)*	2.5–5 L/ha (1–2 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. See Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a list of registered glyphosate products. • Apply up to and including the 8 leaf stage of corn. • Applications should be timed to keep the corn crop weed-free from the 3–8 leaf stage of corn. *Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
	other glyphosate products	See Table 9–7.	

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Non-Residual Herbicides for Glyphosate Tolerant Hybrids Only (Cont'd)			
clopyralid (102 g/ha) + glyphosate (450 g/ha)	LONTREL XC (600 g/L) + VP 480 (480 g/L)	170 mL/ha (68 mL/acre) + 0.94 L/ha (0.376 L/acre)	• Use ONLY with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • For improved control of vetch, Canada thistle, perennial sow-thistle and volunteer alfalfa (including glyphosate tolerant varieties). • Apply postemergence up to the 8 leaf stage of corn. • Do NOT apply to seed, sweet or popcorn. • Do NOT allow livestock to graze until 40 days after application.
	LONTREL XC (480 g/L) + ROUNDUP TRANSORB (540 g/L)	170 mL/ha (68 mL/acre) + 0.83 L/ha (0.33 L/acre)	
One Pass Postemergence Tank-Mixes with Residual Control for Use in Glyphosate Tolerant Corn Only			
glyphosate (455 g/L) (1050 g/ha) + mesotrione (45.5 g/L) (105 g/ha) + nonionic surfactant (0.2% v/v)	CALLISTO GT + non-ionic surfactant	2.25 L/ha (0.9 L/acre) + 2 L/1,000 L	• CALLISTO GT can be applied up to and including the 8-leaf stage of GT corn. • Add a non-ionic spray surfactant, such as AGRAL 90, at a rate of 0.2% v/v. • In addition to broad-spectrum burn-down of emerged weeds, CALLISTO GT will provide residual control of Eastern Black Nightshade, redroot pigweed, velvetleaf and suppression of common ragweed.
glyphosate (0.9 kg/ha) + atrazine (0.75–1.0 kg/ha)	glyphosate (540 g/L)* + AATREX (480 g/L)	1.67 L/ha (0.67 L/acre) + 1.56–2.1 L/ha (0.63–0.85 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 5 leaf stage of corn. • Atrazine will provide residual control of broadleaf weeds. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + bicyclopyrone (7.1 g/L) (35 g/ha) mesotrione (28.5 g/L) (140 g/ha) s-metolachlor (257 g/L) (1262 g/ha) atrazine (120 g/L) (589 g/ha)	glyphosate (540 g/L)* + ACURON	1.67 L/ha (0.67 L/acre) + 4–4.91 L/ha (1.6–1.9 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply POST up to and including the 6 leaf stage of corn • Do NOT mix with ammonium sulphate (AMS). • Do not use nitrogen solutions as a carrier to corn that has emerged. • No adjuvant required. One application per year. • DO NOT apply if other mestorione containg products (e.g. CALLISTO) or s-metolachlor products (e.g. PRIMEXTRA II MAGNUM) were applied earlier in the season. Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Tank-Mixes with Residual Control for Use in Glyphosate Tolerant Corn Only (cont’d)			
glyphosate (0.9 kg/ha) + dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + atrazine (480 g/L) (480 g/ha)	glyphosate (540 g/L)* + AREMZON PRO + AATREX	1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre) + 1 L/ha (0.4 L/acre	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 8 leaf stage of field corn and when grassy weeds are in the 1–4 leaf stage and broadleaf weeds are in the 1–8 leaf stage. • **Pre harvest interval:** 80 days Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + dimethenamid-p (630 g/L) (630 g/ha) topramezone (12.5 g/L) (12.5 g/ha) + dicamba (133 g/L) (488 g/ha) +atrazine (261 g/L) (966 g/ha)	glyphosate (540 g/L)* + ARMEZON PRO + MARKSMAN	1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre) + 2.5 L/ha (1 L/acre	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 5 leaf stage of field corn and when grassy weeds are in the 1–4 leaf stage and broadleaf weeds are in the 1–8 leaf stage. • **Pre harvest interval:** 80 days Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + mesotrione (0.1 kg/ha) + atrazine (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	glyphosate (540 g/L)* + CALLISTO (480 g/L) + AATREX (480 g/L) + non-ionic surfactant	1.67 L/ha (0.67 L/acre) + 0.21 L/ha (0.085 L/acre) + 0.58 L/ha (0.235 L/acre) + 2 L/1,000 L	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 8 leaf stage of corn. • CALLISTO and Atrazine will provide residual broadleaf weed control. *Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + isoxaflutole (52.5 g/ha) + atrazine (500 g/ha)	glyphosate (540 g/L)* + CONVERGE XT (sold as a co-pack): (CONVERGE FLEXX (240 g/L) + CONVERGE 480 (480 g/L))	1.67 L/ha (0.67 L/acre) + 220 mL/ha (89 mL/acre) + 1.04 L/ha (0.42 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply at the 1–3 leaf stage of corn. • See precautions for CONVERGE XT. *Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Tank-Mixes with Residual Control for Use in Glyphosate Tolerant Corn Only (cont’d)			
glyphosate (0.9 kg/ha) + rimsulfuron (5.45%)/ (15 g/ha) mesotrione (36.36%) (100 g/ha)	glyphosate (540 g/L)* + DESTRA IS	1.67 L/ha (0.67 L/acre) + 275 g/ha (110 g/acre)	• Use ONLY with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply from 3 leaf to the 8 leaf stage of corn. • Provides residual control of fall panicum, green foxtail, lamb’s-quarters and pigweed spp. • A rapid fluctuation in temperature (greater than 20°C difference within 24-36 hours) will stress the corn crop. For maximum crop safety, allow 24 hours for the corn to acclimatize before spraying Destra™ IS Herbicide as a postemergence application on emerged corn. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) topramezone (0.0125 kg/ha) + dimethenamid (1.0 kg/ha) + atrazine (0.5 kg/ha)	glyphosate (540 g/L)* + IMPACT (336 g/L) + AATREX (480 g/L) glyphosate (360 g/L) + ARMEZON (336 g/L) + AATREX (480 g/L)	1.67 L/ha (0.67 L/acre) + 37 mL/ha (15 mL/acre) + 1.04 L/ha (0.42 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 7 leaf stage of corn. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + dicamba/atrazine (1–1.5 kg/ha)	glyphosate (540 g/L)* + MARKSMAN (393 g/L)	1.67 L/ha (0.67 L/acre) + 2.5–3.7 L/ha (1–1.5 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 5 leaf stage of corn. • Marksman will provide residual control of broadleaf weeds. • See precautions for ENGENIA, FEXAPAN or XTENDIMAX applied POST. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
glyphosate (0.9 kg/ha) + s-metolachlor/benoxacor/ atrazine (1.8 kg/ha)	glyphosate (540 g/L)* + PRIMEXTRA II MAGNUM ((1:0.8) 720 g/L)	1.67 L/ha (0.67 L/acre) + 2.5 L/ha (1.0 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 6 leaf stage of corn. • PRIMEXTRA II MAGNUM will provide residual grass and broadleaf weed control. • For tank-mixtures of PRIMEXTRA II MAGNUM plus any of the glyphosate products, to ensure optimum compatibility: Add PRIMEXTRA II MAGNUM to the tank first, then add AGRAL 90, AGSURF or COMPANION at 2.5 L/1,000 L. Continue agitation and add the glyphosate mix partner. * Numerous products exist. Refer to Table 9–8. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Tank-Mixes with Residual Control for Use in Glyphosate Tolerant Corn Only (cont’d)			
glyphosate/s-metolachlor/ mesotrione (2,205 g/ha) + atrazine (0.28 kg/ha) + non-ionic surfactant (0.2% v/v)	HALEX GT (525 g/L) + AATREX (480 g/L) + non-ionic surfactant	4.2 L/ha (1.7 L/acre) + 0.58 L/ha (0.235 L/acre) + 2 L/1,000 L	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 6 leaf stage of corn. • The addition of atrazine improves control of wild buckwheat, cocklebur, lady’s thumb, common and giant ragweed.
halosulfuron (34–67.5 g/ha) + glyphosate + non-ionic surfactant (0.25% v/v)	PERMIT (72.6% WG) + glyphosate (540 g/L)* + non-ionic surfactant	47–93 g/ha (19–38 g/acre) + 1.67 L/ha (0.67 L/acre) + 2.5 L/1,000 L	• Apply when the corn is in the spike–10 leaf stage. • For sweet corn, the maximum use rate is 70 g/ha (28 g/acre). • The 47 g/ha (19 g/acre) rate will control labelled broadleaf weeds and nutsedge that is shorter than 15 cm. • The 70–90 g/ha (28–38 g/acre) will control nutsedge that is 15–30 cm tall. • Permit can be applied up to twice per season, but not to exceed a total of 140 g/ha (56 g/acre) in sweet corn and 186 g/ha (76 g/acre) in seed or field corn. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
tembotrione (37.5 g/ha)/ thiencarbazone-methyl (7.5 g/ha) + glyphosate (900 g/ha)	VIOS G3 (420 g/L) + glyphosate (540 g/L)*	110 mL/ha (44 mL/acre) 1.67 L/ha (0.67 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. • Apply up to and including the 6 leaf stage of corn. • Apply only 1 application of VIOS G3 per season. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
Two Pass Postemergence Treatments in Glyphosate Tolerant Corn Only			
glyphosate (0.9–1.8 kg/ha)	glyphosate (540 g/L)*	1.67–3.33 L/ha (0.67–1.34 L/acre)	• Use **ONLY** with pedigreed (certified) corn seed designated as glyphosate tolerant or “Roundup Ready” corn. The initial application should occur between the 3–5 leaf to remove early competition. A second application may be applied up to the 8 leaf stage of corn. • Use 100–200 L/ha (40–80 L/acre) of water. * Numerous products exist. Refer to Table 9–7. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant (“Roundup Ready”) Corn for a complete list.
	other glyphosate products	See Table 9–8.	

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Non-Residual Herbicides for Glufosinate (“Liberty Link”) Tolerant Corn Only			
glufosinate ammonium (0.5 kg/ha)	LIBERTY 200 SN (200 g/L)	2.5 L/ha (1 L/acre)	• Use **ONLY** on field and seed corn specially developed to be tolerant to LIBERTY 200 SN. • LIBERTY 200 SN can be applied from the 1–8 leaf stage of corn. • LIBERTY 200 SN is a contact herbicide and has no residual activity. Consult the product label for rate recommendations for specific weeds and weed stages. Ammonium sulphate can be applied at 6 L/ha (2.4 L/acre) (liquid) or 3.3 kg/ha (1.3 kg/acre) (dry) for improved control of specific weeds. • **Do NOT** add oil or any other surfactants.
One Pass Tank-Mixes with Residual Control for Glufosinate (“Liberty Link”) Tolerant Corn Only			
glufosinate ammonium (0.5 kg/ha) + atrazine (0.84–1.12 kg/ha)	LIBERTY 200 SN (200 g/L) + AATREX (480 g/L)	2.5 L/ha (1 L/acre) + 1.75–2.34 L/ha (0.7–0.93 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • This tank-mix can be applied up to the 8 leaf stage of corn.
glufosinate ammonium (0.5 kg/ha) + dicamba (0.3 kg/ha)	LIBERTY 200 SN (200 g/L) + ENGENIA (600 g/L)	2.5 L/ha (1 L/acre) + 0.5 L/ha (0.2 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • This tank-mix can be applied up to the 5 leaf stage of corn. • See precautions for ENGENIA, FEXAPAN or XTENDIMAX alone POST.
diflufenzopyr/dicamba (0.2 kg/ha)	LIBERTY 200 SN (200 g/L) + DISTINCT (70 WG)	2.5 L/ha (1 L/acre) + 0.285 kg/ha (0.114 kg/ha)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • This tank-mix can be applied up to the 5 leaf stage of corn. • See precautions for DISTINCT alone POST.
glufosinate ammonium (0.5 kg/ha) + dicamba/atrazine (1–1.5 kg/ha)	LIBERTY 200 SN (200 g/L) + MARKSMAN (393 g/L)	2.5 L/ha (1 L/acre) + 2.5–3.7 L/ha (1–1.5 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • This tank-mix can be applied up to the 5 leaf stage of corn. • See precautions for ENGENIA, FEXAPAN or XTENDIMAX alone POST.
glufosinate ammonium (0.5 kg/ha) + pendimethalin (1 kg/ha)	LIBERTY 200 SN (200 g/L) + PROWL H20 (455 g/L)	2.5 L/ha (1 L/acre) + 2.2 L/ha (0.89 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • This tank-mix can be applied up to the 4 leaf stage of corn.
tembotrione (37.5 g/ha)/ thiencarbazone-methyl (7.5 g/ha) + glufosinate ammonium (0.5 kg/ha)	VIOS G3 (420 g/L) + LIBERTY 200 SN (200 g/L)	110 mL/ha (44 mL/acre) + 2.5 L/ha (1 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • Apply up to and including the 6 leaf stage of corn. • Apply only 1 application of VIOS G3 per season.

TABLE 9–8. Herbicide Treatment Rates for Herbicide Tolerant Corn (“Roundup Ready”, "Liberty-Link" and "Enlist" Hybrids) (cont’d)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Two Pass Postemergence Treatments for Glufosinate (“Liberty Link”) Tolerant Corn Only			
glufosinate ammonium (0.5 kg/ha) followed by glufosinate ammonium (0.4 kg/ha)	LIBERTY 200 SN (200 g/L) followed by LIBERTY 200 SN (200 g/L)	2.5 L/ha (1 L/acre) followed by 2 L/ha (0.8 L/acre)	• Use **ONLY** on glufosinate tolerant (“Liberty Link”) corn hybrids. • The first application may be applied on 2–4 leaf stage of corn at the proper growth stage of the weeds. The second application may be made up to the 8 leaf stage of corn to control subsequent flushes of weeds.
Postemergence Herbicides for "Enlist" Corn Hybrids Only			
2,4-D choline salt (194 g/L) + glyphosate (204 g/L)	ENLIST DUO	2.9–4.3 L/ha (1.17–1.74 L/acre)	• Apply POST up to the 8 leaf stage of Enlist corn. • Make 1 to 2 applications with a minimum of 12 days between applications. • Two applications may be necessary for control of perennial weeds or late weed flushes that emerged after the initial application. • Apply as a coarse to extremely coarse spray (ASABE S-572 Standard). • Re-entry interval is 48 hours after application. • **Do NOT** apply more than two post emergent applications per use season. • **Do NOT** apply more than 8.6 L/ha of ENLIST DUO herbicide per use season. • Read and follow the Stewardship Program (www.traitstewardship.com) that accompanies the use of field corn seed containing the DAS-40278-9 gene.

10. FORAGE CROPS

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Please see product label for more information on registered weed species, product uses and precautions.

TABLE 10–1. Forages Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop

		Crop									Grasses								Annual Broadleaves															Perennials									
Trade Name	**WSSA Group(s)**	**seedling forage grasses**	**seedling alfalfa**	**seedling birdsfoot trefoil**	**seedling clovers**	**established alfalfa**	**established birdsfoot trefoil**	**established clovers**	**forage sorghum and pearl millet**	**pasture (mostly grasses)**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**wild oats**	**buckwheat, wild**	**chickweed, common**	**cleavers**	**corn spurry**	**fleabane, Canada**	**hempnettle**	**lady's thumb**	**lamb's-quarters**	**mustards**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**bindweed, field**	**chickweed, mouseeared**	**curled dock**	**dandelion**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**
Soil Applied Grass Herbicides																																									
EPTAM	8	x	✓	✓	x	x	x	x	x	x	9	9	9	9	9	9	–	–	6	7	–	–	0	–	7	9	6	9	2	0	–	–	–	0	0	0	0	8	2	0	0
TREFLAN or RIVAL or BONANZA or TRIFLUREX	3	x	✓	x	x	x	x	x	x	x	9	9	9	9	9	9	9	8	5	–	–	–	0	5	2	8	2	8	2	1	3	–	–	0	0	0	0	0	0	0	0
Postemergence Grass Herbicides																																									
ACHIEVE LIQUID or BISON[1]	1	✓	x	x	x	x	x	x	x	x	8	–	–	–	9	9	–	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ASSURE[1] or CONTENDER[1] or YUMA GL[1]	1	x	x	x	x	✓[1]	x	x	x	x	9	8	9	9	9	9	9	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
KERB SC	15	x	x	x	x	✓	✓	x	x	x	8	8	6	–	8	8	8	8	–	8	0	0	0	0	0	0	0	6	0	5	0	0	0	0	0	0	0	0	8	0	0
VENTURE L	1	x	✓	✓	✓	✓	✓	✓	x	x	9	8	9	8	8	8	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
POAST ULTRA	1	x	✓	✓	✓	✓	x	✓	x	x	9	8	9	9	9	9	9	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
SELECT or STATUE or ARROW ALL-IN	1	x	✓	x	x	x	x	x	x	x	9	8	9	9	9	9	9	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0

[1] For seed crops only.
[2] Various formulations available, see Table 4–1, *Herbicides Used in Ontario*. See label for specific uses and rates.
[3] Do not use on sweet clover.
[4] On established legumes, use fall spot treatment only.
[5] CLOVITOX PLUS and TOPSIDE not for established clovers.
[6] Can only be applied to glyphosate tolerant alfalfa varieties (e.g. HarvXtra). Applications made to non glyphosate tolerant alfalfa will result in complete plant death.

TABLE 10–1. Forages Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop

Trade Name	WSSA Group(s)	Crop									Grasses								Annual Broadleaves																Perennials									
		seedling forage grasses	seedling alfalfa	seedling birdsfoot trefoil	seedling clovers	established alfalfa	established birdsfoot trefoil	established clovers	forage sorghum and pearl millet	pasture (mostly grasses)	barnyard grass	crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	wild oats	buckwheat, wild	chickweed, common	cleavers	corn spurry	fleabane, Canada	hempnettle	lady's thumb	lamb's-quarters	mustards	pigweeds	ragweed, common	ragweed, giant	velvetleaf	bindweed, field	chickweed, mouseeared	curled dock	dandelion	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada
Postemergence Broadleaf Herbicides																																										
2,4-D[2]	4	✓	x	x	x	x	x	x	✓	✓	0	0	0	0	0	0	0	0	4	7	–	–	–	–	4	9	9	9	8	–	8	–	–	7	7	–	0	0	0	8	8
2,4-DB: CALIBER[3,4] or COBUTOX[3,4] or EMBUTOX[3,4]	4	✓	✓	✓	✓	✓	✓	✓	x	✓	0	0	0	0	0	0	0	0	4	5	–	–	–	–	4	7	8	9	8	–	8	8	–	–	–	–	–	0	0	8	8
BASAGRAN	6	✓	✓	x	✓	✓	x	x	✓	x	0	0	0	0	0	0	0	0	7	–	–	–	5	–	9	7	9	7	8	6	9	6	–	–	–	–	2	8	0	6	7
dicamba[2] (e.g. ENGENIA)	4	x	x	x	x	x	x	x	x	✓	0	0	0	0	0	0	0	0	8	–	8	9	8	–	9	9	7	7	9	8	9	8	–	9	7	–	0	0	0	9	8
INFINITY	27,6	✓[1]	x	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	9	9	8	–	8	9	9	9	9	9	9	7	9	–	–	–	7	–	–	–	0	7	7
MCPA Amine 500[2]	4	x	x	x	x	x	x	x	x	✓	0	0	0	0	0	0	0	0	4	–	4	–	–	8	–	9	9	8	8	–	8	7	–	–	–	8	–	0	0	6	5
MILESTONE	4	x	x	x	x	x	x	x	x	✓	0	0	0	0	0	0	0	0	9	–	8	–	–	–	–	–	–	–	9	–	–	9	–	–	6	–	–	–	–	9	9
PARDNER or bromoxynil[2]	6	x	x	x	x	x	x	x	✓	x	0	0	0	0	0	0	0	0	8	2	–	2	–	2	8	9	7	7	9	–	9	5	–	–	–	0	0	0	0	6	5
PEAK	2	x	x	x	x	x	x	x	✓	x	0	0	0	0	0	0	0	0	8	9	–	–	7	–	9	9	9	9	9	7	9	–	–	–	5	–	–	–	–	7	7
TOPSIDE[5] or TROPOTOX PLUS or CLOVITOX PLUS[5]	4	✓	x	x	✓	x	x	✓	x	✓	0	0	0	0	0	0	0	0	7	2	–	–	–	8	–	9	9	9	8	–	9	8	–	–	–	–	–	0	0	9	9

[1] For seed crops only.
[2] Various formulations available, see Table 4–1, *Herbicides Used in Ontario*. See label for specific uses and rates.
[3] Do not use on sweet clover.
[4] On established legumes, use fall spot treatment only.
[5] CLOVITOX PLUS and TOPSIDE not for established clovers.
[6] Can only be applied to glyphosate tolerant alfalfa varieties (e.g. HarvXtra). Applications made to non glyphosate tolerant alfalfa will result in complete plant death.

TABLE 10–1. Forages Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop

Trade Name	WSSA Group(s)	Crop									Grasses								Annual Broadleaves														Perennials									
		seedling forage grasses	seedling alfalfa	seedling birdsfoot trefoil	seedling clovers	established alfalfa	established birdsfoot trefoil	established clovers	forage sorghum and pearl millet	pasture (mostly grasses)	barnyard grass	crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	wild oats	buckwheat, wild	chickweed, common	cleavers	corn spurry	fleabane, Canada	hempnettle	lady's thumb	lamb's-quarters	mustards	pigweeds	ragweed, common	ragweed, giant	velvetleaf	bindweed, field	chickweed, mouseeared	curled dock	dandelion	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada
Postemergence Grass and Broadleaf Herbicides																																									
SIMAZINE 480	5	x	x	x	x	✓	✓	✓	x	x	6	8	8	–	–	8	8	9	9	–	–	–	–	–	9	9	9	9	8	–	6	7	–	–	–	–	–	–	6	–	–
PURSUIT[1] **or** PHANTOM[1] **or** NU-IMAGE[1]	2	x	✓[1]	x	x	✓	x	x	x	x	8	7	7	7	9	9	8	8	8	–	–	–	2	–	9	9	9	9	8	6	9	2	–	–	6	2	2	7	5	2	2
Postemergence Grass and Broadleaf Herbicides – For use ONLY on glyphosate tolerant alfalfa varieties																																								
glyphosate[2,6] (0.9 kg/ha	9	x	✓[6]	x	x	✓[6]	x	x	x	x	9	9	9	9	9	9	9	9	8	9	9	9	9^R	9	8	9	9	9	9^R	9^R	9	7	9	8	7	5	9	7	9	8	9
glyphosate[2,6] (1.8 kg/ha)	9	x	✓[6]	x	x	✓[6]	x	x	x	x	9	9	9	9	9	9	9	9	9	9	9	9	9^R	9	9	9	9	9	9^R	9^R	9	8	9	9	9	5	9	8	9	9	9
Postemergence Tank-Mixes																																								
2,4-DB[2] + MCPA[2,3,4]	4+4	x	✓	x	x	x	x	x	x	x	0	0	0	0	0	0	0	0	8	5	–	–	–	–	–	7	9	9	9	–	–	8	–	–	–	–	–	0	0	8	8
2,4-DB[2] + MCPA SODIUM[2]	4+4	✓	✓	✓	x	x	x	x	x	x	0	0	0	0	0	0	0	0	8	5	–	–	–	–	–	7	9	9	9	–	–	8	–	–	–	–	–	0	0	8	8
MILESTONE + 2,4-D[2]	4+4	x	x	x	x	x	x	x	x	✓	0	0	0	0	0	0	0	0	9	–	–	–	–	–	9	9	9	9	9	9	9	9	–	8	8	8	–	–	–	9	9

[1] For seed crops only.
[2] Various formulations available, see Table 4–1, *Herbicides Used in Ontario*. See label for specific uses and rates.
[3] Do not use on sweet clover.
[4] On established legumes, use fall spot treatment only.
[5] CLOVITOX PLUS and TOPSIDE not for established clovers.
[6] Can only be applied to glyphosate tolerant alfalfa varieties (e.g. HarvXtra). Applications made to non glyphosate tolerant alfalfa will result in complete plant death.

TABLE 10–2. Herbicide Treatment Rates for Forages

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE GRASSES (SEED PRODUCTION ONLY)			
Herbicide Treatments include: • **Preplant (PP)** – Also see Chapter 6 *Preplant & Postharvest Weed Control*, for details of products, rates and remarks. • **Preplant Incorporated (PPI)** – Two incorporations at right angles operating at a depth of 10 cm using a double disk (7–10 km/h) or vibrating shank S-tine cultivator (10–13 km/h) are required unless otherwise stated. Cultivation-type equipment used for herbicide incorporation is known to spread perennial weeds to previously uninfested areas. Special attention should be directed toward machinery cleanliness, and/or treating fields with perennial weeds last. • **Preemergence (PRE)** • **Postemergence (POST)** – Leaf stage of the weeds is critical for good weed control. Smaller weeds are usually more sensitive to herbicide injury. Apply according to labelled leaf stages on the pesticide label. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant, see the product label for more details. Always use appropriate drift management technology. **Apply all treatments in 100–200 L/ha (40–80 L/acre) water except where otherwise noted.**			
Postemergence Grass Herbicides			
tralkoxydim (0.2 kg/ha) + adjuvant (0.5% v/v)	ACHIEVE LIQUID (400 g/L) + TURBOCHARGE BISON (400 g/L) + ADDIT ADJUVANT	0.5 L/ha (0.2 L/acre) + 0.5 L/100 L (0.5 L/100 L)	• Apply to wild oats, volunteer oats, green foxtail and yellow foxtail prior to tillering. Applications made to weeds that have tillered may result in unacceptable control. • **For the following forage grasses grown for seed only:** Seedling and established intermediate and crested wheatgrass, creeping red fescue, meadow and smooth bromegrass either underseeded to cereals or grown alone. • For establishment of northern wheatgrass, western wheatgrass and slender wheatgrass. • **Do NOT** tank mix ACHIEVE liquid with any other herbicides, insecticides, fungicides, fertilizers, micronutrients or adjuvants other than those listed on the label.
Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha) + oil concentrate (1–2 L/ha)	BASAGRAN (480 g/L) + ASSIST	1.75–2.25 L/ha (0.7–0.9 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• For seed production **ONLY**. • Apply from the 1–7 leaf stage of bromegrass, creeping red fescue, meadow foxtail, orchardgrass, timothy and crested wheatgrass. • Top growth of nutsedge and Canada thistle are controlled and field bindweed may be suppressed by 2 applications of 1.75 L/ha (0.7 L/acre), 10 days apart. • Cool weather or drought may reduce control. • Reduce rate of oil concentrate to 1 L/ha (0.4 L/acre) under abnormally hot and humid weather conditions or temporary crop injury may occur.
pyrasulfotole/bromoxynil (213 kg/ha)	INFINITY	0.83 L/ha (0.33 L/acre)	• For use **ONLY** on timothy grown for seed production. • Apply postemergence and prior to flag leaf emergence. • The addition of ammonium sulphate at 1 L/ha (0.4 L/acre) is required for the control of cleavers at the 4–6 whorl growth stage.

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (DIRECT SEEDED)			

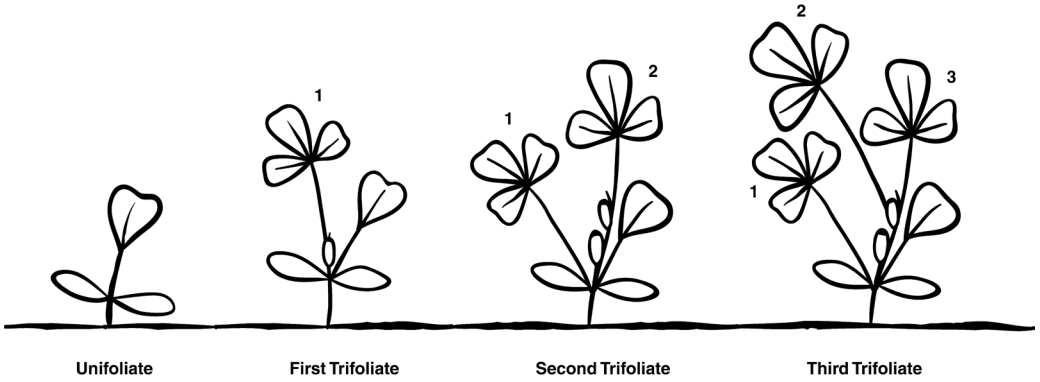

FIGURE 10–1. Stages of Alfalfa Leaf Development.

Soil Applied Grass Herbicides			
EPTC (3.4 kg/ha)	EPTAM (800 g/L)	4.25 L/ha (1.7 L/acre)	• Apply PPI. • For pure stands of alfalfa or bird's-foot trefoil **ONLY**. • Apply to a dry soil surface and incorporate into the soil immediately. • Some broadleaf weeds such as ragweed, mustards, and pigweeds frequently escape.
trifluralin (0.6–1.148 kg/ha)	TREFLAN (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI. • For pure stands of alfalfa **ONLY**. • Use lower rate on sandy soils, higher rate for loam to clay soils.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.48–0.92 L/acre)	
	BONANZA 480 (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	
	TRIFLUREX 40EC (412 g/L)	1.45–2.79 L/ha (0.58–1.12 L/acre)	
Postemergence Grass Herbicides			
sethoxydim (0.15–0.2 kg/ha) + oil concentrate (2 L/ha)	POAST ULTRA (450 g/L) + ASSIST	0.32–0.47 L/ha (0.13–0.19 L/acre) + 2 L/ha (0.8 L/acre)	• For pure stands of alfalfa, bird's-foot trefoil and clover **ONLY**. • Apply POAST ULTRA to emerged annual grasses in the 1–6 leaf stage during active growth while the crop is small enough to permit thorough spray coverage. • Alfalfa is tolerant to POAST ULTRA at any stage of growth. • Use MERGE for conditions or weeds requiring medium to high rates of POAST ULTRA. • Complete control is normally obtained 7–21 days after application. • Allow 70 days between spraying and harvest.
sethoxydim (0.15–0.2 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre)	

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (DIRECT SEEDED) (CONT'D)			
Postemergence Grass Herbicides (cont'd)			
sethoxydim (0.5 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	· For pure stands of alfalfa, bird's-foot trefoil and clover **ONLY**. · Apply at the 1–3 leaf stage of actively growing quackgrass. · Thorough preplant tillage will give more uniform quackgrass emergence. · Gives 6–8 weeks control of quackgrass. · Allow 70 days between spraying and harvest.
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000	· For pure stands of alfalfa **ONLY**. · Apply when the annual grasses and volunteer cereals are in the 2–6 leaf stage. · Alfalfa is tolerant at any growth stage. · Use the higher rate for control of quackgrass. · Allow 30 days between application and harvest.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-p-butyl (0.1–0.25 kg/ha)	VENTURE L (125 g/L)	0.8–2 L/ha (0.32–0.8 L/acre)	· For pure stands of alfalfa, bird's-foot trefoil and clover **ONLY**. · Use the higher rate (2 L/ha (0.8 L/acre)) when quackgrass is present. · Apply at 2–4 leaf stage of annual grasses and at 3–5 leaf stage of quackgrass. · VENTURE L may be tank-mixed with 2,4-DB at label rates for control of a broad range of weeds. (Consult 2,4-DB label). · **Do NOT** feed alfalfa to livestock within 41 days of treatment. · **Do NOT** feed or graze red clover or bird's-foot trefoil in the year of treatment.
Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha) + oil concentrate (1–2 L/ha)	BASAGRAN (480 g/L) + ASSIST	1.75–2.25 L/ha (0.7–0.9 L/acre) 1–2 L/ha (0.4–0.8 L/acre)	· For alfalfa, red clover, alsike clover and sainfoin seed production **ONLY**. · Apply after third trifoliate stage. · Top growth of nutsedge and Canada thistle are controlled and field bindweed may be suppressed by 2 applications of 1.75 L/ha (0.7 L/acre), 10 days apart. · Cool weather or drought may reduce control. · Reduce rate of oil concentrate to 1 L/ha (0.4 L/acre) under abnormally hot and humid weather conditions or temporary crop injury may occur.
2,4-DB (1.1–1.4 kg/ha)	EMBUTOX (625 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	· Apply in at least 150 L/ha (60 L/acre) water, when alfalfa, bird's-foot trefoil or clovers are in the 1–4 leaf stage and seedling forage grasses are at the 2–4 leaf stage. · **Do NOT** graze or cut legumes for hay within 30 days of treatment. · **NOT** intended for grass forage crops grown for hay or grazing in the year of application. · **Do NOT** apply to crops grown for seed. · **Do NOT** apply under drought conditions. · 2,4-DB usually suppresses legume growth for a period of 2–3 weeks. · Severe injury to legumes may occur under drought, high temperature or other stress conditions.
	CALIBER 625 (625 g/L)		
	COBUTOX 625 (625 g/L)		

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (DIRECT SEEDED) (cont'd)			
Postemergence Broadleaf Herbicides (cont'd)			
MCPB/MCPA (15:1) (1.1–1.7 kg/ha)	CLOVITOX PLUS (400 g/L) TROPOTOX PLUS (400 g/L) TOPSIDE (400 g/L)	2.75–4.25 L/ha (1.1–1.7 L/acre)	• Apply when clovers are at the unifoliate to the 4th trifoliate leaf stage and seedling forage grasses are at the 2–4 leaf stage. • Clovers may be suppressed for 2–3 weeks. • **Do NOT** exceed 3.5 L/ha of TOPSIDE for seedling forage grasses. • **Do NOT** apply TOPSIDE and TROPOTOX PLUS in less than 150 L/ha (60 L/acre) of water. • **Do NOT** apply CLOVITOX PLUS in less than 175 L/ha (70 L/ha) of water. • **Do NOT** apply CLOVITOX PLUS when temperatures exceed 27°C. • **Do NOT** apply under drought conditions. • **Do NOT** graze or cut for forage in the year of application.
2,4-DB (0.8 kg/ha) + MCPA (35 g/ha)	EMBUTOX (625 g/L) + MCPA AMINE (500 g/L) CALIBER 625 (625 g/L) + MCPA AMINE (500 g/L) COBUTOX 625 (625 g/L) + MCPA AMINE (500 g/L)	1.25 L/ha (0.5 L/acre) + 70 mL/ha (28 mL/acre)	• Apply when the legumes are in the 1–4 leaf stage. • **Do NOT** graze or cut for hay within 30 days of treatment. • **Do NOT** apply to crops grown for seed. • The addition of MCPA gives better control of common mustard than 2,4-DB alone. • Apply in at least 150 L/ha (60 L/acre) water.
Postemergence Grass and Broadleaf Herbicides			
imazethapyr (0.075–0.1 kg/ha) + non ionic surfactant (0.25% v/v) + liquid fertilizer (2 L/ha)	PURSUIT (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0) PHANTOM (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0) NU-IMAGE (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0)	0.312–0.42 L/ha (0.126–0.168 L/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• Apply **ONLY** after the crop has one fully developed trifoliate leaf. • For seed alfalfa **ONLY**. • One application per year. Apply when weeds are less than 7.5 cm tall. • Apply in 200 L/ha (80 L/acre) water.

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (DIRECT SEEDED) (cont'd)			
Postemergence Grass and Broadleaf Herbicides - For use ONLY on glyphosate tolerant alfalfa varieties			
glyphosate (900-1,800 g/ha)	glyphosate (360 g/L)*	2.5–5 L/ha (1–2 L/acre)	• Can only be applied to glyphosate tolerant alfalfa varieties (e.g., HarvXtra) . Applications made to non glyphosate tolerant alfalfa will result in complete plant death. • New stand establishment: Apply at or before the 4th trifoliate stage of alfalfa. • Applications should be made at least 25 days apart. Do NOT exceed 3 application per season. • Weeds are more easily controlled and weed competition avoided when applications are made when weeds are small, although weeds up to 25 cm tall will be controlled. • Apply when milkweed, perennial sow-thistle and Canada thistle are 15–60 cm. • Apply when nutsedge is 5–15 cm in height and at the high rate. • Use 40–80 L/acre water. * See Table 4-1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)*	1.88–3.75 L/ha (0.75–1.5 L/acre)	
	glyphosate (540 g/L)*	1.67–3.34 L/ha (0.67–1.34 L/acre)	
FORAGE LEGUMES (ESTABLISHED)			
Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.072 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.375–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	• Apply to emerged annual grasses and volunteer cereals in the 2 leaf to tillering stage and to quackgrass in the 2–6 leaf stage of growth. • For seed alfalfa **ONLY**. • **Do NOT** graze or cut for hay in the year of treatment. • Use the 0.375 L/ha rate (0.15 L/acre) for control of volunteer corn, volunteer cereals and green foxtail. • The 0.5 L/ha (0.2 L/acre) rate provides suppression of quackgrass and will also control barnyard grass. • Use the 0.75 L/ha (0.3 L/acre) rate for control of quackgrass.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + XA OIL CONCENTRATE		
propyzamide (1.12–1.6 kg/ha)	KERB SC (400 g/L)	2.8–4 L/ha (1.12–1.6 L/acre)	• For grass control **ONLY** in alfalfa and bird's-foot trefoil. • Apply in late September to early November before the soil freezes. • **Do NOT** graze or harvest treated forage within 90 days for the high rate and 60 days for lower rates.
sethoxydim (0.5 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• Apply at the 1–3 leaf stage of actively growing quackgrass. • Apply in 110–200 L/ha (44–80 L/acre) water. • Quackgrass control will be provided for 6–8 weeks. • Allow 70 days between spraying and harvest.
fluazifop-p-butyl (0.075–0.25 kg/ha)	VENTURE L (125 g/L)	0.6–2 L/ha (0.24–0.8 L/acre)	• Use the higher rate (2 L/ha (0.8 L/acre)) when quackgrass is present. • Apply at 2–4 leaf stage of annual grasses and at 3–5 leaf stage quackgrass. • VENTURE L may be tank-mixed with 2,4-DB at label rates for control of a broad range of weeds. (Consult 2,4-DB label). • Alfalfa may be fed to livestock 41 days after treatment. • **Do NOT feed red clover or bird's-foot trefoil to livestock in the year of treatment.**

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (ESTABLISHED) (cont'd)			
Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha) + oil concentrate (1–2 L/ha)	BASAGRAN (480 g/L) + ASSIST	1.75–2.25 L/ha (0.7–0.9 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	· For alfalfa, red clover, alsike clover and sainfoin seed production **ONLY**. · Apply when prior to alfalfa flowering and before the canopy closes. · Apply after clovers and sainfoin are 7.5 cm tall and before canopy closes. · Top growth of nutsedge and Canada thistle are controlled and field bindweed may be suppressed by 2 applications of 1.75 L/ha (0.7 L/acre), 10 days apart. · Cool weather or drought may reduce control. · Reduce rate of oil concentrate to 1 L/ha (0.4 L/acre) under abnormally hot and humid weather conditions or temporary crop injury may occur.
2,4-DB (1.4–1.7 kg/ha)	EMBUTOX (625 g/L) CALIBER 625 (625 g/L) COBUTOX 625 (625 g/L)	2.25–2.75 L/ha (0.9–1.1 L/acre)	· Apply after cutting or grazing when alfalfa is dormant and is less than 7.5 cm high. · **Do NOT** apply to established alfalfa that is actively growing or crop injury may occur. · Apply after cutting or grazing when alfalfa is dormant and is less than 7.5 cm high. · **Do NOT** graze or cut for hay within 30 days of treatment. · **Do NOT** apply to crops grown for seed. · Apply in at least 150 L/ha (60 L/acre) water.
MCPB/MCPA (15:1) (1.7 kg/ha)	TOPSIDE (400 g/L) CLOVITOX PLUS (400 g/L) TROPOTOX PLUS (400g/L)	4.25 L/ha (1.7 L/acre)	· For pure stands or mixtures containing red and alsike clovers **ONLY**. · Apply as spot treatment, or when regrowth after cutting or grazing when weeds are at a susceptible stage.
glyphosate (1.71–4.32 kg/ha)	glyphosate (360 g/L)* glyphosate (480 g/L)* glyphosate (540 g/L)*	4.75–12 L/ha (1.7–4.8 L/acre) 3.56–9 L/ha (1.42–3.6 L/acre) 3.17–8 L/ha (1.27–3.2 L/acre)	· **SPOT TREATMENT ONLY:** Apply when field bindweed has reached full bloom and other weeds are in the bud to full bloom stage. · **Do NOT** graze or harvest forage from treated spots until the treated plants turn brown. * See Table 4-1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FORAGE LEGUMES (ESTABLISHED) (cont'd)			
Postemergence Grass and Broadleaf Herbicides			
imazethapyr (0.075–0.1 kg/ha) + N.I.S. + liquid fertilizer (0.25% v/v, 2 L/ha)	PURSUIT (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0)	0.312–0.42 L/ha (0.126–0.168 L/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• Apply **ONLY** after the crop has one fully developed trifoliate leaf. • For seed alfalfa **ONLY**. • One application per year. Apply when weeds are less than 7.5 cm tall. • Apply in 200 L/ha (80 L/acre) water.
	PHANTOM (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0)		
	NU-IMAGE (240 g/L) + non-ionic surfactant + liquid fertilizer (10-34-0, 28-0-0 or 32-0-0)		
simazine (1.1 kg/ha)	SIMAZINE (480 g/L)	2.29 L/ha (0.92 L/acre)	• Apply in September to November before freeze up. • This treatment prevents legume seedlings from establishing for approximately 8 months. • **Do NOT** use in the fall before seeding another crop. • **Do NOT** apply to the same field for more than 3 consecutive years. • Allow 30 days between applications and grazing of cattle or sheep.
Postemergence Grass and Broadleaf Herbicides – For use ONLY on glyphosate tolerant alfalfa varieties			
glyphosate (900-1,800 g/ha)	glyphosate (360 g/L)*	2.5–5 L/ha (1–2 L/acre)	• Can only be applied to glyphosate tolerant alfalfa varieties (e.g., HarvXtra) . Applications made to non glyphosate tolerant alfalfa will result in complete plant death. • Established stand: Allow a minimum of 5 days between application and cutting. • Applications should be made at least 25 days apart. Do NOT exceed 3 application per season. • Weeds are more easily controlled and weed competition avoided when applications are made when weeds are small, although weeds up to 25 cm tall will be controlled. • Apply when milkweed, perennial sow-thistle and Canada thistle are 15–60 cm. • Apply when nutsedge is 5–15 cm in height and at the high rate. • Use 40–80 L/acre water.
	glyphosate (480 g/L)*	1.88–3.75 L/ha (0.75–1.5 L/acre)	
	glyphosate (540 g/L)*	1.67–3.34 L/ha (0.67–1.34 L/acre)	
Preharvest			
glyphosate (0.9–1.8 kg/ha)	glyphosate (360 g/L)*	2.5–5 L/ha (1–2 L/acre)	• Apply 3–7 days prior to last cut in the final year of the forage. Forage can be harvested as hay, haylage or grazed. * See Table 4–1. Herbicides Used in Ontario for formulations available. See label for specific uses and rates.
	glyphosate (450 g/L)*	2–4 L/ha (0.8–1.6 L/acre)	
	glyphosate (480 g/L)*	1.875–3.75 L/ha (0.75–1.5 L/acre)	
	glyphosate (500 g/L)*	1.8–3.6 L/ha (0.73–1.46 L/acre)	
	glyphosate (540 g/L)*	1.67–3.34 L/ha (0.67–1.34 L/acre)	

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
ALFALFA TERMINATION (GLYPHOSATE TOLERANT VARIETIES)			
2,4-D (0.858 kg/ha)	2,4-D Ester 700 (660 g/L)*	1.3 L/ha (0.52 L/acre)	The following precautionary statements apply to all three options for terminating glyphosate tolerant alfalfa: · Apply in a minimum of 100 L/ha or 40 L/acre (10 U.S. gal/acre) of water. Can be tank-mixed with glyphosate to control other perennial plants. · Apply to alfalfa anywhere from the pre-bud to start of flowering stage. Ontario field trials comparing the effectiveness of these herbicides found that applications made in early October when daytime air temperatures where consistently above 10 °C after application where significantly more effective then applications made in late October where air temperatures were often less than 10 °C. · Tillage at 2–3 weeks following herbicide application can improve control and consistency under stressed conditions (drought, frost, cold temperatures).
dicamba (0.6 kg/ha)	ENGENIA (600 g/L)	1 L/ha (0.4 L/acre)	
	FEXIPAN (350 g/L)	1.71 L/ha (0.68L/acre)	
	XTENDIMAX (350 g/L)		
2,4-D (0.592 kg/ha) + dicamba (0.6 kg/ha)	2,4-D Ester 700 (660 g/L)* +ENGENIA (600 g/L)	0.9 L/ha (0.52 L/acre) + 1 L/ha (0.4 L/acre)	
	2,4-D Ester 700 (660 g/L)* + FEXIPAN (350 g/L)	0.9 L/ha (0.36 L/acre) + 1 .71 L/ha (0.68 L/acre)	
	2,4-D Ester 700 (660 g/L)* + XTENDIMAX (350 g/L)		
FORAGE SORGHUM AND FORAGE MILLET			
Postemergence Broadleaf Herbicides			
2,4-D (0.28–0.56 kg/ha)	2,4-D AMINE (470 g/L)*	0.6–1.2 L/ha (0.24–0.48 L/acre)	· Apply when crop is at 4–6 leaf stage before closure of canopy. · **Do NOT** apply within 30 days of harvest. · **Do NOT** spray in hot (over 27°C), humid weather. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
bentazon (0.84–1.08 kg/ha)	BASAGRAN FORTÉ (480 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	· Apply when crop is at 3–6 leaf stage before closure of canopy. · **Do NOT** apply within 30 days of harvest. · Hot, humid weather may result in temporary leaf yellowing.
bromoxynil (0.28 kg/ha)	PARDNER (280 g/L)	1 L/ha (0.4 L/acre)	· Apply post in 200–300 L/ha of water. · Apply when the crop has more than 4 leaves, but before it is 20 cm tall. · Apply **ONLY** 1 application per year. · **Do NOT** harvest within 30 days of application. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	BROMOXYNIL (240 g/L)*	1.2 L/ha (0.48 L/acre)	
	BROMOXYNIL (480 g/L)*	0.6 L/ha (0.24 L/acre)	
prosulfuron (10 g/ha) + crop oil concentrate (1% v/v)	PEAK (75 WG) + ASSIST	13.3 g/ha (5.3 g/acre) + 10 L/1,000 L	· Apply when the crop is between 3–5 leaf stage. · Best results when applied to actively growing weeds in the 1–6 leaf stage. · **Do NOT** apply by air. · Make **ONLY** 1 application per year. · **Do NOT** harvest within 60 days of application. · A non-ionic surfactant mixed at 2 L/1,000 L spray solution can be used instead of ASSIST.

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
PASTURE RENOVATION WITH BIRD'S-FOOT TREFOIL			
The introduction of this legume into a pasture requires control of competition from weeds and forage grasses for the first 2–4 months after the legume seed begins to germinate. Control of established perennial weeds should start at least one year before the legume seeding operation. Treatments in Chapter 6 of this publication could be used. If the field cannot be plowed and worked to prepare a seedbed, one of the following chemical treatments can be used to suppress the sod. The success of these programs depends on many management factors such as inoculation of the trefoil seed as well as control of fertility and grazing.			
Postemergence Grass and Broadleaf Herbicides			
glyphosate (1.71–4.32 kg/ha)	glyphosate (360 g/L)*	4.75–12 L/ha (1.9–4.8 L/acre)	• Apply when the forage grasses have at least 2 leaves. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (450 g/L)*	3.8–9.6 L/ha (1.52–3.84 L/acre)	
	glyphosate (540 g/L)*	3.17–8 L/ha (1.27–3.2 L/acre)	
PASTURES (MOSTLY GRASSES)			
Biennials: Unless otherwise noted, most chemicals are best applied in early fall to first year growth or in late spring to second year growth. **Perennials:** Unless otherwise noted, apply in late spring (end of May to mid-June) when weeds are actively growing. Overgrazing tends to thin the grass stand and allows the establishment of weeds. Undergrazing allows weeds like wild carrot to establish and spread seed. Timely mowing can reduce the amount of weed seeds produced. • Chemicals are available to control most of the troublesome weeds in grass pastures and these can give faster kill of established weeds than any other management practice. A chemical may have to be applied more than once to kill established perennial weeds and the new crop of weeds that emerges through a thin grass stand. A poor grass stand can be improved by using a combination of chemicals, fertility and grazing management. • Extend chemical weed control into fencerows and other areas around the pasture to keep these areas from becoming sources of weed seeds. • Generally, clovers are severely damaged by chemical treatments. However, white clover and black medic show some resistance and re-establish quickly. • Consult the label to determine the period of time to keep livestock out of the treated area. • Prevent grazing where poisonous plants (water hemlock, buttercup, chokecherry, etc.) may be made more attractive to livestock after the chemical treatment. It is a good practice to prevent grazing on the field for at least a week after spraying to reduce the chances of the livestock consuming harmful plants. • Apply chemical treatments in at least 200 L/ha (80 L/acre) water and increase this rate if it is necessary to contact weeds through dense vegetation. • Avoid drift or vapour drift from 2,4-D or dicamba onto susceptible crops by using drift reducing techniques such as high spray volume, coarse droplets or anti-drift nozzles.			
2,4-D (0.85–1.1 kg/ha)	2,4-D (470 g/L)*	1.8–2.34 L/ha (0.72–0.94 L/acre)	• **Use the low rate for chicory.** • **Use the high rate for:** **Goldenrod.** **Yellow rocket:** Mow before spraying if plants are in flowering stage. **Blueweed and burdock:** Apply as low volatile ester. **Wild carrot:** Early spring or early fall. If 2,4-D resistant strains are present, mow to reduce seed spread. **Goat's-beard:** Early spring or early fall. **Milkweed:** Spray undersides of leaves. Only top growth is killed. **Water hemlock:** Apply in May or June. **Dandelion:** Can also apply in September. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	2,4-D (564 g/L)*	1.5–1.95 L/ha (0.6–0.78 L/acre)	
	2,4-D (660 g/L)*	1.29–1.67 L/ha (0.52–0.67 L/acre)	

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
PASTURES (MOSTLY GRASSES) (CONT'D)			
2,4-D (1.1–1.75 kg/ha)	2,4-D (470 g/L)*	2.34–3.72 L/ha (0.94–1.49 L/acre)	• **For ox-eye daisy and hawk's-beard:** Use 2 treatments, one in late spring and the second in early September if there is sufficient growth. * See Table 4–1. Herbicides Used in Ontario for formulations available. See label for specific uses and rates.
	2,4-D (564 g/L)*	1.95–3.1 L/ha (0.6–1.24 L/acre)	
	2,4-D (660 g/L)*	1.29–2.65 L/ha (0.52–1.06 L/acre)	
2,4-D (2.25 kg/ha)	2,4-D (470 g/L)*	4.5 L/ha (1.8 L/acre)	• **For tansy ragwort.** Apply to rosettes in spring or fall. • Retreat as necessary to control new seedlings and regrowth. * See Table 4–1. Herbicides Used in Ontario for formulations available. See label for specific uses and rates.
	2,4-D (564 g/L)*	3.99 L/ha (1.6 L/acre)	
	2,4-D (660 g/L)*	3.40 L/ha (1.36 L/acre)	
2,4-D (1.1 kg/ha) + dicamba (0.792 kg/ha)	2,4-D (564 g/L)* + ENGENIA (600 g/L)	1.95 L/ha (0.6 L/acre) + 1.32 L/ha (528 mL/acre)	• **For poison ivy and wild carrot:** Apply in early fall for control of first year plants. • Wait 14 days between treatment and harvest or grazing for dairy animals. • Meat animals may graze or feed in treated pastures 30 days after dicamba application without restrictions on slaughter. • If treated vegetation has been consumed by meat animals within 30 days of dicamba application, feed the animals with untreated diet for 30 days before slaughter. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	2,4-D (564 g/L)* + FEXAPAN (350 g/L)	1.95 L/ha (0.6 L/acre) + 2.26 L/ha (905 mL/acre)	
	2,4-D (564 g/L)* + XTENDIMAX (350 g/L)		
dicamba (0.6 kg/ha)	ENGENIA (600 g/L)	1 L/ha (0.4 L/acre)	• **FOR ALL RATES OF DICAMBA:** Meat animals may graze or feed treated pastures 30 days after dicamba application without restrictions on slaughter. If treated vegetation has been consumed by meat animals within 30 days of dicamba application, feed the animals with untreated diet for 30 days before slaughter. • **For leafy and cypress spurges:** for control of top growth, apply when weed is actively growing. • No delay is required between treatment and harvest or grazing for dairy animals.
	FEXAPAN (350 g/L)	1.7 L/ha (0.68 L/acre)	
	XTENDIMAX (350 g/L)		
dicamba (1.08 kg/ha)	ENGENIA (600 g/L)	1.68 L/ha (0.67 L/acre)	• **For goldenrod and tansy ragwort:** Apply when weed is actively growing. • **For Canada thistle and field bindweed:** Apply at bud stage of thistle and at flowering of bindweed. • Wait 14 days between treatment and harvest or grazing for dairy animals. • Meat animals may graze or feed treated pastures 30 days after dicamba application without restrictions on slaughter.
	FEXAPAN (350 g/L)	2.88 L/ha (1.15 L/acre)	
	XTENDIMAX (350 g/L)		
dicamba (2.205 kg/ha)	ENGENIA (600 g/L)	3.87 L/ha (1.47 L/acre)	• **For goat's beard:** Apply when actively growing. • Wait 14 days between treatment and harvest or grazing for dairy animals. • Meat animals may graze or feed treated pastures 30 days after dicamba application without restrictions on slaughter.
	FEXAPAN (350 g/L)	6.3 L/ha (2.52 L/acre)	
	XTENDIMAX (350 g/L)		

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
PASTURES (MOSTLY GRASSES) (CONT'D)			
2,4-DB (1.72 kg/ha)	EMBUTOX (625 g/L) CALIBER 625 (625 g/L) COBUTOX 625 (625 g/L)	2.75 L/ha (1.1 L/acre)	· **Nodding, Scotch, or bull thistles, perennial sow-thistle, and chicory:** Apply to rosette stage. · **Yellow rocket:** Apply in fall. · **Plantains:** Apply before flowering. · **Curled dock:** Apply to early growth. · Top growth only controlled for: **Canada thistle:** Apply when 15 cm high to early bud stage. **Field bindweed:** Apply in late summer. **Dandelion:** Apply before bud stage. **Horsetail:** Apply at 10–12 cm tall. · **Do NOT** graze or cut for forage in the year of treatment.
MCPB/MCPA (1.7 kg/ha)	CLOVITOX PLUS (400 g/L) TROPOTOX PLUS (400 g/L) TOPSIDE (400 g/L)	4.25 L/ha (1.7 L/acre)	· Controls top growth of weeds only. · **Canada thistle:** Apply when 15 cm high to early bud stage. · **Curled dock, plantains and perennial sow-thistle:** Apply to rosette stage. · **Buttercup and field bindweed:** Apply in spring. · **Horsetail:** Apply when 15 cm high. · This treatment has some safety on legumes. · Apply TOPSIDE after grazing or cutting when weeds are at a susceptible stage. · **Do NOT** apply TOPSIDE and TROPOTOX PLUS in less than 150 L/ha (60 L/acre) of water. · **Do NOT** apply CLOVITOX PLUS in less than 175 L/ha (70 L/acre) of water. · **Do NOT** apply CLOVITOX PLUS when temperatures exceed 27°C. · **For CLOVITOX PLUS and TOPSIDE:Do NOT** apply under drought conditions. · **Do NOT** graze or harvest for forage in the year of application.
glyphosate (1.71–4.32 kg/ha)	glyphosate (360 g/L)* glyphosate (480 g/L)* glyphosate (540 g/L)*	4.75–12 L/ha (1.9–4.8 L/acre) 3.56–9 L/ha (1.42–3.6 L/acre) 3.17–8 L/ha (1.27–3.2 L/acre)	· **SPOT TREATMENT ONLY:** · **For Canada thistle, field bindweed and milkweed.** · Always use high rate for milkweed. · Apply when thistle and milkweed are in the bud to full bloom stage and bindweed is flowering. · **For colt's-foot:** Apply when leaves are fully expanded. · **For tansy ragwort:** Apply when tansy is in bud to full bloom stage. · Wait until the treated areas have turned brown before grazing. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
MCPA (1.1 kg/ha)	MCPA (500 g/L)*	2.2 L/ha (0.88 L/acre)	· **For buttercup:** Use 2 treatments, one in June and the second in early September. · Wait 7 days after treatment before grazing. * See Table 4–1. Herbicides Used in Ontario for formulations available. See label for specific uses and rates.

TABLE 10–2. Herbicide Treatment Rates for Forages (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
PASTURES (MOSTLY GRASSES) (CONT'D)			
aminopyralid (60–120 g/ha)	MILESTONE (240 g/L)	0.25–0.5 L/ha (0.10–0.20 L/acre)	• Apply Postemergence. • **Will control:** absinth (biennial) wormwood, goldenrod, knapweed, scentless chamomile, Canada thistle, yellow star thistle, musk (nodding) thistle, sulphur cinquefoil, tropical soda apple and tansy ragwort. • **Will suppress:** Common tansy and dandelion. • **Do NOT** move manure compost containing MILESTONE onto sensitive crops, flowers, gardens, etc., or injury may occur.
aminopyralid (60–120 g/ha) + 2,4-D AMINE (840–1,440 g/ha)	MILESTONE (240 g/L) + 2,4-D AMINE (564 g/L)*	0.25–0.5 L/ha (0.10–0.20 L/acre) + 1.49–2.55 L/ha (0.596–1.02 L/acre)	• Apply Postemergence. • For wider spectrum of weed control, 2,4-D AMINE may be added at a ratio of 1 part Milestone ai/ha to 12 parts 2,4-D AMINE ai/ha. • **Do NOT** move manure compost containing MILESTONE onto sensitive crops, flowers, gardens, etc., or injury may occur. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.

11. SOYBEANS

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 11–1. Conventional Soybean Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

		Grasses								Annual Broadleaves												Perennials							
Trade Name	**WSSA group(s)**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preplant burndown and/or early preemergence (3 days after planting) Herbicides. Ratings are based on weeds being emerged at the time of application. Also refer to Table 11–4. *Soybean Herbicide Weed Control Ratings in Glyphosate Tolerant Soybeans*, for a list of herbicides along with their contact and residual weed control ratings.																													
2,4-D ESTER 700	4	0	0	0	0	0	0	0	0	–	8	7	–	8	8	–	–	8	9	–	5	–	–	–	–	–	8[4]	8[4]	G
ASSIGNMENT*	2+9	9	9	9[5]	9	9[5]	9[5]	9	9[5]	8	9	8[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	8[4]	5	8	8[1]	9	8[4]	9[4]	E
BLACKHAWK	14,4	0	0	0	0	0	0	0	0	–	8	7	–	8	8	–	9	8	9	–	7	–	7[4]	–	–	–	8[4]	8[4]	G
ELEVORE	4	0	0	0	0	0	0	0	0	–	–	7	–	8	–	–	5	8	–	–	5	–	–	–	–	–	–	–	G
ERAGON LQ	14	0	0	0	0	0	0	0	0	9	–	8	9	9	9	–	9	7	6	–	4	7[4]	7[4]	–	–	–	8[4]	–	E
EXPRESS SG + glyphosate[3]	2+9	9	9	9	9	9	9	9	9	9	9	9[R]	9	9	9	9	9	9[R]	8[R]	9	9[R]	–	–	–	–	9	8[4]	7[4]	E
glyphosate[3]	9	9	9	9	9	9	9	9	9	9	9	9[R]	9	9	9	9	9	9[R]	8[R]	9	9[R]	8[4]	5	8	8[1]	9	8[4]	9[4]	E
GUARDIAN MAX*	2+9	9[5]	9[5]	9	9	9	9	9	9[5]	9	9	9[R]	9	9	9	9	9	9[R]	9[R]	8	0	8[4]	5	8	8[1]	9	8[4]	9[4]	G
INTEGRITY	15,14	7	7	–	–	7	7	–	–	9	–	8	9	9	9	–	9	7	6	–	7	7[4]	7[4]	–	–	–	8[4]	–	E
OPTILL	14,2	8	7	7	9[R]	9[R]	9	8	7	8	7	8	9	9[R]	9	9[R]	9[R]	7	7	9	–	7[4]	7[4]	–	7	6	8[4]	2	E
Soil Applied Grass Herbicides																													
DUAL II MAGNUM	15	9	9	8[2]	8	9	9	9	4	2	2	0	2	7	2	8[2]	8[2]	4	3	2	8[2]	0	0	0	8[1,2]	0	0	0	G
FOCUS	15,14	9	9	–	9	9	9	–	–	8	–	–	–	7	8	8[2]	8[2]	7	–	–	6	–	–	–	–	–	–	–	G

[1] PPI timing and the highest labeled rate is required to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
[4] Top growth only, re-growth will occur.
[5] Will provide early season residual control of this weed.
[6] Must be applied prior to weed emergence to achieve this level of control.

TABLE 11–1. Conventional Soybean Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Grasses								Annual Broadleaves												Perennials							Crop Tolerance
		barnyard grass	crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades, annual	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Soil Applied Grass Herbicides (Cont'd)																													
FRONTIER MAX	15	9	9	8[2]	8	9	9	9	4	2	2	0	2	7	2	8[2]	8[2]	4	3	2	7[2]	0	0	0	8[1,2]	0	0	0	G
PROWL H2O	3	9	9	9	8	8	8	–	5	–	–	–	–	7	–	–	8	–	–	–	7	–	–	–	–	–	–	–	E
TREFLAN, BONANZA 480, RIVAL EC or TRIFLUREX 40 EC	3	9	9	8	9	9	9	9	6	5	2	0	2	8	2	2	8	2	1	2	–	2	2	2	2	2	2	2	G
ZIDUA SC	15	9	9	8[2]	9	9	9	9	4	2	2	0	2	7	2	8[2]	8[2]	4	3	2	7[2]	0	0	0	8[1,2]	0	0	0	G
Soil Applied Broadleaf Herbicides																													
AUTHORITY 480	14	–	8	–	–	–	–	–	–	9	–	–	–	9	–	9	9	4	–	–	6	–	–	–	–	–	–	–	G
BIFECTA*	14,2	7	6	7	5	6	6	8	3	9	7	8[6]	9	9	9	9	9	7	7	7	8	2	2	2	2	2	2	2	G
BROADSTRIKE RC	2	0	0	0	0	5	0	0	0	–	7[R]	8[R]	8	9[R]	8	7[R]	9[R]	8[R]	7[R]	9	–	–	8	–	–	–	–	–	E
CANOPY PRO*	2+5	7	6	7	5	5	5	8	3	8	7	8[R]	9	9[R]	9	3	9[R]	8[R]	8[R]	8	–	2	2	2	8	2	2	2	G
FIRSTRATE	2	0	0	0	0	0	0	0	0	–	9[R]	9[R]	–	9[R]	–	2	9[R]	9[R]	9[R]	9	1	–	2	–	–	2	6	–	E
LOROX	7	5	5	5	5	5	5	5	5	8	5	5	9	9	9	9	9[R]	8	6	6	–	2	2	2	2	2	2	2	G
SENCOR, TRICOR or SQUADRON	5	7	6	7	5	5	5	8	3	7	7	8[2]	9	9[R]	9	3	9[R]	8[R]	7	7	8[R]	2	2	2	2	2	2	2	G
VALTERA EZ	14	3	3	3	5	6	6	3	–	–	4	8[6]	7	9	6	9	9	7	3	7	8	–	–	–	–	–	–	–	G
Soil Applied Grass and Broadleaf Herbicides																													
AUTHORITY SUPREME	14,15	9	9	8[2]	9	9	9	9	4	9	–	–	–	9	6	9	9	6	–	–	8	–	–	–	8[2]	–	–	–	G
BOUNDARY LQD	15,5	9	9	8	8	9	9	9	4	–	–	5[6]	–	7	–	8[2]	8[2]	–	–	–	8	–	–	–	8[1]	–	–	–	E
COMMAND 360 ME	13	9	9	–	–	9	9	–	–	–	–	–	8	9	–	9	6	8	–	9	–	–	–	–	–	–	–	–	E
COMMENZA*	2,5,15	9	9	9	9	9	9	9	6	8	7	8[R]	9	9[R]	9	9	9[R]	9[R]	8[R]	9	8[2]	–	8	–	8[1]	–	–	–	E
CONQUEST LQ*	2,5	8	7	7	9	9	9	8	7	8	7	5	9	9[R]	9	9[R]	9[R]	9	6	9	–	2	2	2	7	6	2	2	G

[1] PPI timing and the highest labeled rate is required to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
[4] Top growth only, re-growth will occur.
[5] Will provide early season residual control of this weed.
[6] Must be applied prior to weed emergence to achieve this level of control.

TABLE 11–1. Conventional Soybean Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings
* = sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present
– = insufficient information available to make a rating

Trade Name	WSSA group(s)	Grasses								Annual Broadleaves												Perennials							Crop Tolerance
		barnyard grass	crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades, annual	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Soil Applied Grass and Broadleaf Herbicides (Cont'd)																													
FIERCE	14,15	9	9	8[2]	9	9	9	8	–	8	5	8[6]	8	9	9	9	9	8	5	7	9	–	–	–	–	–	–	–	G
FREESTYLE*	2,2	8	7	7	9[R]	9[R]	9	8	7	8	7[R]	8[R]	9	9[R]	9	9[R]	9[R]	8[R]	8[R]	9	1	2	2	2	8	6	2	2	E
PURSUIT, PHANTOM or NU-IMAGE	2	8	7	7	9[R]	9[R]	9	8	7	8	7[R]	2	9	9[R]	9	9[R]	9[R]	8[R]	6	9	1	2	2	2	7	6	2	2	E
TIEDOWN*	15+5	9	9	8	8	9	9	9	5	7	7	5[6]	9	9	9	8[2]	9	8	7	7	8[2]	2	2	2	7	2	2	2	G
TRIACTOR*	2,5,14	8	7	7	9	9	9	8	7	8	7	8[6]	9	9	9	9	9	9[R]	6	9	8	2	2	2	7	6	2	2	G
Soil Applied Tank-Mixes																													
BROADSTRIKE RC + DUAL II MAGNUM	15+5	9	9	8	8	9	9	9	6	7	7	9[R]	9	9[R]	9	9	9	8[R]	7	9	8[2]	2	8	–	8[1]	0	3	4	E
BROADSTRIKE RC + TREFLAN	2+3	9	9	8	9	9	9	9	6	5	4	8[R]	8	9	8	7	9	8[R]	7	9	–	2	2	2	2	2	2	2	E
COMMAND 360 ME + DUAL	13+15	9	9	8	9	9	9	9	4	–	–	–	–	9	–	9	8	8	–	9	–	–	–	–	8	–	–	–	E
COMMAND 360 ME + LOROX	13+7	9	9	–	–	9	9	–	–	–	–	–	–	9	–	9	9	9	–	9	–	–	–	–	–	–	–	–	G
COMMAND 360 ME + PURSUIT	13+2	9	9	7	9	9	9	8	7	8	7	–	9	9	9	9	9	8	6	9	–	–	–	–	7	–	–	–	E
COMMAND 360 ME + SENCOR	13+5	9	9	–	–	9	9	–	–	–	–	5[6]	–	9	–	9	9	9	–	9	–	–	–	–	–	–	–	–	G
DUAL II MAGNUM + LOROX	15+7	9	9	8	8	9	9	9	5	8	5	3[6]	9	9	9	8	9	8	6	6	8[2]	2	2	2	7	2	2	2	G
DUAL II MAGNUM + SENCOR	15+5	9	9	8	8	9	9	9	5	7	7	5[6]	9	9	9	8[2]	9	8	7	7	8[2]	2	2	2	7	2	2	2	G
DUAL II MAGNUM+ PURSUIT	15+2	9	9	8	8	9	9	9	7	8	7	–	9	9	9	9[2]	9	8	6	9	8[2]	2	2	2	7	6	2	2	G
FRONTIER MAX + SENCOR	15+5	9	9	8	8	9	9	9	5	7	7	5[6]	9	9[R]	9[R]	8[2]	9	8[R]	7	7	8[2]	2	2	2	8[1]	2	2	2	G
FRONTIER MAX + PURSUIT	15+2	9	9	8	9	9	9	9	7	8	7[R]	–	9	9[R]	9	9	9	8[R]	6	9	7[2]	2	2	2	7	6	2	2	G
PURSUIT + FIRSTRATE	2+2	8	7	7	9[R]	9[R]	9	8	7	8	9[R]	9[R]	9	9[R]	9	9[R]	9[R]	9[R]	9	9	1	2	2	2	7	6	2	2	E
PURSUIT + PROWL H20	2+3	9	9	9	9	9	9	8	7	8	7[R]	2	9	9	9	9[R]	9[R]	8[R]	6	9	2	2	2	2	7	6	2	2	G

[1] PPI timing and the highest labeled rate is required to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
[4] Top growth only, re-growth will occur.
[5] Will provide early season residual control of this weed.
[6] Must be applied prior to weed emergence to achieve this level of control.

TABLE 11–1. Conventional Soybean Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present

		Grasses								Annual Broadleaves												Perennials							
Trade Name	**WSSA group(s)**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Soil Applied Tank-Mixes (Cont'd)																													
PURSUIT + LOROX	2+7	8	7	7	9R	9R	9	8	7	8	7	3[6]	9	9	9	9	9	8	6	9	–	2	2	2	7	6	2	2	G
PURSUIT + SENCOR	2+5	8	7	7	9R	9R	9	8	5	8	7	5[6]	9	9R	9	9R	9R	8	7	9	–	2	2	2	7	6	2	2	G
PURSUIT + TREFLAN	2+3	9	9	8	9	9	9	9	7	8	7R	–	9	9R	9	9	9R	8R	6	9	–	2	2	2	7	6	2	2	G
TREFLAN + SENCOR	3+5	9	9	8	9	9	9	9	6	7	7	5[6]	9	9	9	3	9	8	7	8	–	2	2	2	2	2	2	2	G
Postemergence Grass Herbicides																													
ASSURE II, CONTENDER or YUMA GL	1	9	8	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	E
POAST ULTRA	1	9	8	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	E
SELECT, STATUE, ANTLER or ARROW ALL-IN	1	9	8	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	E
VENTURE L	1	9	8	9	8	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	E
Postemergent Broadleaf Herbicides																													
BASAGRAN FORTÉ or BROADLOOM	6	0	0	0	0	0	0	0	0	7	9	5	9	7	9	7	7	8	6	9	1	5	2	2	7	0	5	7	G
BLAZER, ULTRA	14	0	0	0	0	0	0	0	0	7	6	2	8	7	9	8	9	9	7	7	8	7	6	5	2	2	6	6	G
CLASSIC or CHAPERONE	2	0	0	0	0	0	0	0	0	4	8R	8R	8	3	9	3	9R	8R	8R	8	0	2	2	8	9	2	8	4	G
FIRSTRATE	2	0	0	0	0	0	0	0	0	7	9R	9R	–	2	9	2	2	9R	9R	9	0	–	2	–	–	2	7	7	E
HURRICANE	6 ,14	0	0	0	0	0	0	0	0	–	–	–	–	6	–	–	8	8	–	8	8	–	–	–	–	–	–	–	G
PINNACLE SG	2	0	0	0	0	0	0	0	0	–	5	2	8	9R	8	3	9R	5	2	8	1	2	2	2	2	2	2	2	G
REFLEX	14	0	0	0	0	0	0	0	0	8	7	2	8	6	9	8	9	9	7	6	8	3	6	2	–	0	5	3	G

[1] PPI timing and the highest labeled rate is required to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
[4] Top growth only, re-growth will occur.
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TABLE 11–1. Conventional Soybean Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings
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R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present
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		Grasses								Annual Broadleaves												Perennials							
Trade Name	**WSSA group(s)**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Postemergence Grass and Broadleaf Herbicides																													
CLEAN SWEEP*	2+6	9	8	6	9[R]	9[R]	9	9	7	8	9	5	9	8	9	9[R]	9[R]	8	6[R]	9	1	5	2	2	8	2	5	7	G
PURSUIT, PHANTOM or NU-IMAGE	2	9	8	6	9[R]	9[R]	9	9	7	8	8[R]	2	9	8[R]	9	9[R]	9[R]	8[R]	8[R]	9	0	2	2	2	7	2	2	2	G
Postemergence Tank-Mixes																													
ASSURE II + BASAGRAN FORTÉ + PINNACLE SG	1+6 +2	9	8	9	9	9	9	9	9	7	9	5	9	9	9	7	9[R]	8	6	9	1	6	2	2	7	9	5	7	G
ASSURE II + PINNACLE SG	1+2	9	8	9	9	9	9	9	9	–	5	2	8	9[R]	8	3	9[R]	5	2	8	1	2	2	2	2	9	2	2	G
ASSURE II + CLASSIC	1+2	9	8	9	9	9	9	9	9	4	9[R]	8	8	3	9	3	9[R]	8[R]	8[R]	8	0	2	2	8	9	9	8	4	G
BLAZER + BASAGRAN FORTÉ	14+6	0	0	0	0	0	0	0	0	7	9	5	9	8	9	8	9	9	6	9	–	7	6	5	7	2	6	7	F
PINNACLE + BASAGRAN FORTÉ	2+6	0	0	0	0	0	0	0	0	7	9	5	9	8	9	7	7	8	6	9	1	6	2	2	7	1	5	7	G
PINNACLE + REFLEX	2+14	0	0	0	0	0	0	0	0	8	7	2	8	9[R]	9	8	9	9	7	8	8	–	–	–	–	–	–	–	G
PURSUIT + FIRSTRATE	2+2	9	8	6	9[R]	9[R]	9	9	7	8	9[R]	9[R]	9	8[R]	9	9[R]	9[R]	9[R]	9	9	1	2	2	–	7	2	7	7	G
PURSUIT + REFLEX	2+14	9	8	6	9[R]	9[R]	9	9	7	8	8[R]	2	9	8[R]	9	9[R]	9	8	7	9	8	2	2	2	7	2	2	2	G
REFLEX + VENTURE L	14+1	9	8	9	8	8	9	9	9	8	7	2	8	6	9	8	9	9	7	6	8	3	6	2	–	0	5	3	G
VENTURE L + BASAGRAN	1+6	9	8	9	8	8	8	9	8	7	9	5	9	7	9	7	7	8	6	9	1	6	2	2	8	9	5	7	G

[1] PPI timing and the highest labeled rate is required to achieve this level of control.
[2] Use the high rate of herbicide for optimum control.
[3] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
[4] Top growth only, re-growth will occur.
[5] Will provide early season residual control of this weed.
[6] Must be applied prior to weed emergence to achieve this level of control.

TABLE 11–2. Additional Weed Control Ratings in Conventional Soybean

Notes: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

LEGEND: Numbers (0–9) = weed control ratings * = herbicides sold as a co-pack under this trade name

Weed Species	Timing	Herbicides (control rating – out of 10)
atriplex, spreading	Preplant	glyphosate + either SENCOR (8/9), BROADSTRIKE RC + DUAL MAGNUM (8), COMMENZA (8), CONQUEST LQ* (8), FIRSTRATE (7), LOROX (8) or PHANTOM/PURSUIT/NU-IMAGE (7), GUARDIAN* (7/8)
	Postemergence	PINNACLE SG (6), CLEANSWEEP* (5), BASAGRAN FORTÉ/BROADLOOM (4)
adzuki beans, volunteer	Preplant	glyphosate (8), GUARDIAN MAX* (8)
	Postemergence	CLASSIC/CHAPERONE (7), BLAZER (6), PINNACLE SG (2), BASAGRAN FORTÉ/BROADLOOM (1), FIRSTRATE (1), REFLEX (1)
beggarsticks, nodding	Preplant	GUARDIAN MAX* (8)
	Preemergence	FIRSTRATE (9), LOROX (9), SENCOR (7), DUAL II MAGNUM (3)
	Postemergence	BASAGRAN FORTÉ/BROADLOOM (9), CLASSIC/CHAPERONE (9), FIRSTRATE (9), CLEANSWEEP* (9), PINNACLE SG (8), PHANTOM/PURSUIT/NU-IMAGE (7), BLAZER (4), REFLEX (4)
bur-cucumber	Preplant	GUARDIAN MAX* (8)
	Preemergence	SENCOR/TRICOR/SQUADRON (4)
	Postemergence	CLASSIC/CHAPERONE (5), PINNACLE SG (3)
corn, volunteer	Postemergence	ASSURE II/CONTENDER/YUMA GL (9), VENTURE L (9), POAST ULTRA (7), SELECT/STATUE/ARROW ALL-IN (7)
dandelion	Preplant	GUARDIAN* (9), glyphosate[1] (9), GUARDIAN PLUS (8), EXPRESS SG + glyphosate (8), VALTERA (8[2]), glyphosate[1] + ERAGON LQ + MERGE[1] (7)
flower of an hour	Preplant	GUARDIAN* (9)
	Postemergence	BASAGRAN FORTÉ/BROADLOOM (8), CLEANSWEEP (8), FIRSTRATE (8), PINNACLE SG (8), CLASSIC/CHAPERONE (7), PHANTOM/PURSUIT/NU-IMAGE (7), REFLEX (7), BLAZER (6)
horsenettle	Preplant	GUARDIAN* (8), glyphosate[1] + either BROADSTRIKE RC + DUAL MAGNUM (8), COMMENZA (8), FIRSTRATE (8), LOROX (8) or PHANTOM/PURSUIT/NU-IMAGE (8), TRIACTOR (8), CONQUEST LQ* (7/8), SENCOR/TRICOR/SQUADRON (7/8)
	Postemergence	REFLEX (7), FIRSTRATE (6)
prickly lettuce	Preplant	glyphosate[1] alone (9), GUARDIAN MAX* (8), glyphosate[1] + either FIRSTRATE (9), CONQUEST LQ* (8),COMMENZA (8), PHANTOM/PURSUIT/NU-IMAGE (8), BROADSTRIKE RC + DUAL MAGNUM (7), LOROX (4) or SENCOR/TRICOR/SQUADRON (4)
	Postemergence	CLASSIC/CHAPERONE (6), FIRSTRATE (6), REFLEX (6), CLEANSWEEP (2), BLAZER (4), PINNACLE SG (3), BASAGRAN FORTÉ/BROADLOOM (2), PHANTOM/PURSUIT/NU-IMAGE (2)
sandbur	Preemergence	PHANTOM/PURSUIT/NU-IMAGE (7), TRIACTOR (7)
	Postemergence	ASSURE II/CONTENDER/YUMA GL (9), VENTURE L (8), POAST ULTRA (7), SELECT/STATUE/ANTLER/ARROW ALL-IN (7)

[1] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*.
[2] Provides residual control to inhibit germination of seedlings but does not control emerged plants.

TABLE 11–2. Additional Weed Control Ratings in Conventional Soybean (cont'd)

Notes: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

LEGEND: Numbers (0–9) = weed control ratings * = herbicides sold as a co-pack under this trade name

Weed Species	Timing	Herbicides (control rating – out of 10)
three-seeded mercury	Preplant	VALTERA (9), FIERCE (9), TRIACTOR (9), GUARDIAN MAX* (8), glyphosate[1] + either FIRSTRATE (9), SENCOR (8), BROADSTRIKE RC + DUAL MAGNUM (8), COMMENZA (8), CONQUEST LQ* (7), LOROX (6) or PHANTOM/PURSUIT/NU-IMAGE (5)
	Preemergence	BROADSTIKE RC + DUAL MAGNUM (8), SENCOR/TRICOR/SQUADRON (7), LOROX (5)
	Postemergence	CLASSIC/CHAPERONE (7), FIRSTRATE (7), REFLEX (7), BLAZER (6), CLEANSWEEP (6), PINNACLE SG (5), BASAGRAN FORTÉ/BROADLOOM (5), PHANTOM/PURSUIT/NU-IMAGE (5)
wild carrot	Preplant	GUARDIAN* (8), glyphosate[1] + either BROADSTRIKE RC + DUAL MAGNUM (8), COMMENZA (8), CONQUEST LQ* (7), PHANTOM/PURSUIT/NU-IMAGE (7), FIRSTRATE (6), SENCOR (5) or LOROX (1)
	Preemergence	BROADSTRIKE RC + DUAL MAGNUM (6), PHANTOM/PURSUIT/NU-IMAGE (5)
	Postemergence	CLASSIC/CHAPERONE (8), FIRSTRATE (6), CLEANSWEEP (5), PHANTOM/PURSUIT/NU-IMAGE (5), BASAGRAN FORTÉ (4), REFLEX (2), BLAZER (2), PINNACLE SG (2)
wirestem muhly	Postemergence	VENTURE L (7), ASSURE II/CONTENDER/YUMA GL (6), POAST ULTRA (3), SELECT/STATUE/ANTLER/ARROW ALL-IN (3)
wood-sorrel	Preemergence	BROADSTRIKE RC + DUAL MAGNUM (8), COMMENZA (8), LOROX (8), TRIACTOR (7), SENCOR/TRICOR/SQUADRON (6)
	Postemergence	FIRSTRATE (8), BLAZER (6), CLASSIC/CHAPERONE (5), CLEANSWEEP* (5), PHANTOM/PURSUIT/NU-IMAGE (5), BASAGRAN FORTÉ/BROADLOOM (4), PINNACLE SG (3)
violet, field	Postemergence	FIRSTRATE (8), BLAZER (6), CLASSIC/CHAPERONE (5), CLEANSWEEP* (5), PHANTOM/PURSUIT/NU-IMAGE (5), BASAGRAN FORTÉ/BROADLOOM (4), PINNACLE SG (3)

[1] Various formulations available, see Table 4–1. *Herbicides Used in Ontario*.

[2] Provides residual control to inhibit germination of seedlings but does not control emerged plants.

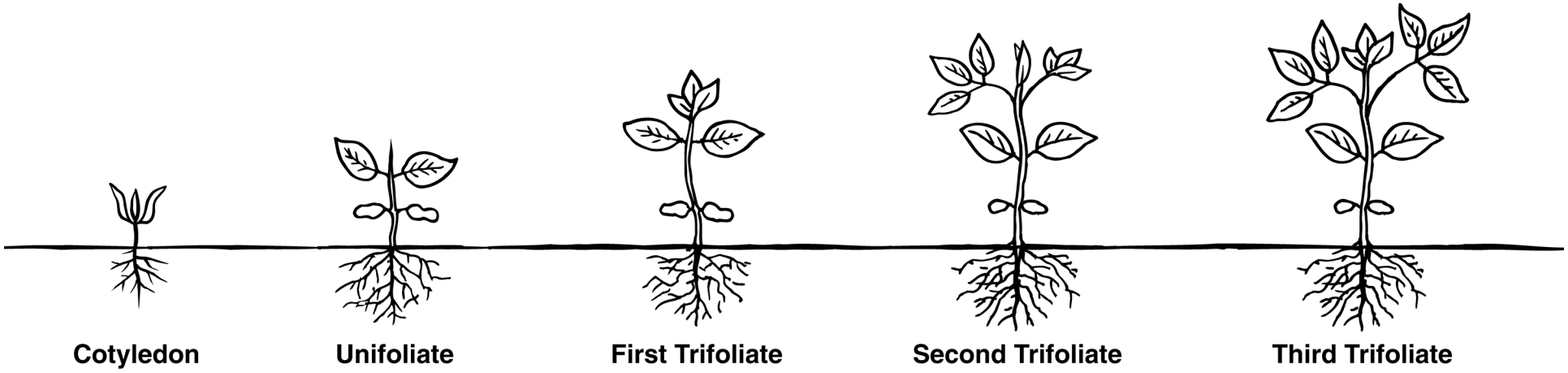


FIGURE 11–1. Soybean Development Stages.

Soybeans

Unless otherwise specified, apply all treatments in 150–300 L/ha (60–120 L/acre) water.

Thoroughly clean all equipment used to apply non soybean herbicides (e.g., ACCENT, LONTREL XC, MARKSMAN, 2,4-D etc.) immediately after use, as well as before spraying soybeans. See Cleaning the Sprayer, chapter 2.

Total Weed Control System – Although herbicides themselves may be effective, there is a benefit to using other methods of weed control. Crop rotation, herbicide rotation, early weed control with a rotary hoe, harrowing, cultivating and preventing the spread of weeds as much as possible are all a part of weed management. See Chapter 9, *Corn (Field, Seed & Sweet)* for details of each of these methods.

Resistant Weeds – Biotypes of a number of weeds have been found resistant to Group 5 (triazine), Group 2 herbicides (e.g., Pursuit), Group 14 (e.g. Reflex) and Group 9 herbicides (e.g., Roundup). Weed species that are resistant to a particular herbicide treatment are identified in the weed control rating tables with a subscript "R", meaning that the identified herbicide treatment will not control a biotype that is resistant but a weed rating without the subscript "R" will, provided the rating indicates a control level of 8 or higher.

Herbicide Treatments include:

- **Preplant (PP)** – See Preplant Chapter 6 *Preplant & Postharvest Weed Control*, for details of products, rates and remarks.

- **Preplant Incorporated (PPI)** – Two incorporations at right angles operating at a depth of 10 cm using a double disk (7–10 km/h) or vibrating shank S-tine cultivator (10–13 km/h) are required unless otherwise stated. Cultivation-type equipment used for herbicide incorporation is known to spread perennial weeds to previously uninfested areas. Ensure machines are clean and/or treat fields with perennial weeds last.

- **Preemergence (PRE)** – Rainfall of 15–20 mm within 10 days after application is necessary to activate preemergence treatments. Shallow cultivation, rotary hoeing or harrowing will control weed escapes and improves herbicide activity in the absence of rainfall.

- **Postemergence (POST)** – Leaf stage of the weeds is critical for good weed control. Smaller weeds are usually more sensitive to herbicide injury. Apply according to the leaf stage specified on the pesticide label. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant, see the product label for more details. Always use appropriate drift management technology.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant burndown and/or early preemergence (3 days after planting) Herbicides			
Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a "one pass" weed management program. Refer to Chapter 6, Preplant & Postharvest Weed Control for preplant application rates for glyphosate. It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (i.e., SENCOR) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
2,4-D (528 g/ha)	2,4-D ESTER 700 (660 g/L)	0.8 L/ha (0.32 L/acre)	• Apply a minimum of 7 days before planting soybean. • Apply to emerged giant ragweed. This treatment will not provide residual control of giant ragweed. • **Do NOT** use in sandy soils with less than 1% organic matter. Plant soybean seeds as deep as possible, but not less than 2.5 cm (1 in.). Adjust planter to ensure adequate coverage of planted seed. • **Do NOT** graze or cut treated crops for forage or hay until 30 days after application. • Tank-mix with glyphosate to control a broader spectrum of emerged broadleaf and grassy weeds.
glyphosate (0.9 kg/ha) + imazepthapyr (0.1 kg/ha)	ASSIGNMENT (sold as a co-pack): RU WEATHERMAX (540 g/L) + PURSUIT (240 g/L)	 1.67 L/ha (0.67 L/acre) + 420 mL/ha (168 mL/acre)	• Apply PP or PRE. • See precautions for PURSUIT alone. • Some rotational cropping restrictions apply (see PURSUIT label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
pyraflufen-ethyl (6.1 g/L) (6.71 g/ha) + 2,4-D ester (473 g/L) (520 g/ha)	BLACKHAWK	1.1 L/ha (0.44 L/acre)	• Apply PP or a maximum of 3 days after planting and before ground crack. • Apply to emerged, young, actively growing weeds that are less than 10 cm tall or across. Apply in a tankmix with glyphosate or a non-ionic surfactant such as Agral or Carrier at 2 L/1,000 L spray solution. • **Do NOT** use in sandy soils with less than 1% organic matter. Plant soybean seeds a minimum of 2.5 cm (1") deep. Adjust planter to ensure adequate coverage of planted seed. • **Do NOT** graze or cut treated crops for forage or hay until 30 days after application.
halauxifen (5 g/ha)	ELEVORE (68.5 g/L) + methylated seed oil	73 mL/ha (29 mL/acre) 5–10 L/1,000 L	• Apply a minimum of 7 days before planting soybeans and when weeds are actively growing at the 1–8 leaf stage. Plant to a minimum of 4 cm deep. • Applications made to very coarse-textured soils, low in organic matter (<3%) , or in fields with poor soil conidtions may increase the risk of crop injury. • Use the higher rate of methylated seed oil when weed populations are high or environmental conditions are unfavourable. • ELEVORE only controls weeds emerged at the time of application. Tank-mix with glyphosate to control a broader spectrum of emerged broadleaf and grassy weeds.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant burndown and/or early preemergence (3 days after planting) Herbicides (cont'd)			
saflufenacil (25.2 g/ha) + adjuvant (1 L/ha)	ERAGON LQ (342 g/L) + MERGE	73 mL/ha (29.5 mL/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE from 21 days prior to planting up to three days after planting. • **Do NOT** use rates higher than 73 mL/ha (29.5 mL/acre) or crop injury may result. • Tank-mix with glyphosate to control a broader spectrum of emerged broadleaf and grassy weeds. Tank-mix with glyphosate and metribuzin at 412.5 g a..i./ha for more consistent control of glyphosate resistant Canada fleabane.
tribenuron-methyl (7.5 g/ha) + glyphosate (450 g/ha)	EXPRESS SG (50%) + glyphosate (540 g/L)*	15 g/ha (6 g/acre) + 0.83 L/ha (0.33 L/acre)	• Apply as a PP burndown a minimum of 1 day prior to planting. • Apply in a total spray volume of 55–110 L/ha (22–44 L/acre). • EXPRESS SG will not provide residual weed control, but will enhance control of certain broadleaf weeds, allowing for a lower rate of glyphosate to be used.
glyphosate (0.9 kg/ha) + chlorimuron-ethyl (9 g/ha)	GUARDIAN MAX (sold as co-pack): POLARIS MAX (540 g/L) + CLASSIC (25 DF)	 1.67 L/ha (0.67 L/acre) 36 g/ha (14 g/acre)	• Apply as a PP burndown. • Some rotational restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • GUARDIAN MAX is a co-pack of POLARIS MAX + CLASSIC.
saflufenacil/ dimethenamid-P (247 g/ha) + glyphosate (900 g/ha)	INTEGRITY (668 g/L) + glyphosate (540 g/L)* + MERGE	0.37 L/ha (0.15 L/acre) 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE. • **Do NOT** use rates higher than 0.15 L/acre, as crop injury may result. * Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
saflufenacil/imazethapyr (100 g/ha) + glyphosate (900 g/ha)	OPTILL (68%) + glyphosate (540 g/L)* + MERGE	147 g/ha (60 g/acre) 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE from 21 days prior to planting up to three days after planting. • Provides early-season weed control. Refer to glyphosate label for recommended rate. * Various formulations available, see Table 4–1. *Herbicides Used in Ontario*
Soil Applied Grass Herbicides			
s-metolachlor/benoxacor (1.05–1.6 kg/ha)	DUAL II MAGNUM (915 g/L)	1.15–1.75 L/ha (0.46–0.7 L/acre)	• Apply PP, PPI or PRE. • Can be used for weed control in EDAMAME. Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • Control of yellow nutsedge is obtained when DUAL II MAGNUM is applied PPI. • Optimal control of nightshade is obtained when DUAL II MAGNUM is applied PRE. • **Do NOT** use on muck, peat or high organic matter soils. • Use the higher rate of (DUAL II MAGNUM) for heavier weed populations. • Incorporation depth should not exceed 10 cm.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Grass Herbicides (cont'd)			
pyroxasulfone (447 g/L) (100–150 g/ha) carfentrazone-ethyl (53 g/L) (8.76–21.6 g/ha)	FOCUS (500 g/L)	224–336 mL/ha (90–136 mL/acre)	• Apply PP or PRE. • Tank-mix with glyphosate to control emerged weeds prior to planting. • Do NOT apply when soybean have emerged as crop injury will occur. • Apply the 224 mL/ha (90 mL/acre) rate as a "set-up" treatment for early season weed control. A POST herbicide treatment will likely be needed. • Apply the 290 mL/ha (113 mL/acre) rate on coarse/medium textured soil with 1%–4% organic matter. • Apply the 336 mL/ha (136 mL/acre) rate on medium/fine textured soil with 4%–7% organic matter.
dimethenamid (544–693 g/ha)	FRONTIER MAX (720 g/L)	756–963 mL/ha (305–390 mL/acre)	• Apply PP, PPI or PRE. • For PPI applications, the minimum rate is 860 mL/ha (348 mL/acre) and should be cultivated into the top 5 cm of soil within 7 days of planting. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • Use higher rate for heavier weed pressure, for the control of nightshade and pigweed (PPI or PRE only) or on fine textured or high organic matter soils. • Control of nutsedge is achieved by applying FRONTIER MAX PPI at the highest rate. • Soybeans should be seeded at least 4 cm deep or crop injury may result.
pendimethalin (1,000 g/ha)	PROWL H2O (455 g/L)	2.2 L/ha (0.89 L/acre)	• Apply PP. • Provides early-season weed control only. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.
trifluralin (0.6–1.155 kg/ha)	TREFLAN (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI. • Conduct first incorporation as soon as possible after application, may be delayed up to 8–24 hours. A second incorporation should occur anytime before planting.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.48–0.92 L/acre)	
	BONANZA 480 (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	1.45–2.8 L/ha (0.58–1.12 L/acre)	
pyroxasulfone (125, 166, 208.5 or 246.5 g/ha)	ZIDUA SC (500 g/L)	Coarse: 250 mL/ha (100 mL/acre) Med: 332 mL/ha (133 mL/acre) (> 3% O.M.): 417 mL/ha (167 mL/acre) Fine: 493 mL/ha (197 mL/acre)	• Apply PP or PRE. • **Do NOT** use on peat or muck soils with 7% organic matter content. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.
Soil Applied Broadleaf Herbicides			
sulfentrazone (105 – 140 g/ha)	AUTHORITY 480 (480 g/L)	219–292 mL/ha (88–117 mL/acre)	• Apply PP or PRE but no later than 3 days after planting. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • **Do NOT** apply to soybean grown on coarse-textured (sandy) soils. • **Do NOT** apply to soils with organic matter greater than 6%. • **Do NOT** apply to soils with a pH greater than 7.8. • The highest use rate should be used when applied to soils with a pH of less than 7 and with organic matter greater than 3% but less than 6%.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Broadleaf Herbicides (cont'd)			
flumioxazin (95.8 g/ha) + metribuzin (416 g/ha)	BIFECTA (sold as a co-pack): VALTERA (51.1%) + TRICOR (75%)	187.5 g/ha (75 g/acre) + 555 g/ha (220 g/acre)	• Apply PP or PRE but no longer than 3 days after planting. Applications made to soybeans that have begun to crack or are emerged will result in severe crop injury • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds. • The risk of crop injury is minimized when Valtera is used on well drained soils and planted to a depth of 4 cm or more • When using no-till planters with coulters that incorporate the soil, weed control may be reduced, therefore applications should be done after planting, but within 3 days of planting.
flumetsulam (70 g/ha)	BROADSTRIKE RC (80%)	87.5 g/ha (35 g/acre)	• Apply PP, PPI or PRE. For PPI treatments uniformly incorporate with equipment set to work at a depth of 5–8 cm. • Can be applied up to 21 days before planting in minimum or no-tillage systems. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • **Do NOT** apply to areas where the soil pH is greater than 7.8 and organic matter is less than 2%. • **Do NOT** apply to soils containing more than 5% organic matter. • Sufficient rainfall to moisten the soil to a depth of 5 cm should be received within 7–10 days for optimum weed control. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
chlorimuron-ethyl (9 g ai/ha) + metribuzin (412 g/ha)	CANOPY PRO (sold as a co-pack): CLASSIC GRANDE (25 DF) + TRICOR 75 DF	36 g/ha (14.4 g/acre) + 550 g/ha (220 g/acre)	• Apply PP up to 14 days before planting • Some rotational restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • **Do NOT** use on sandy soils or on coarse soils with less than 2% organic matter. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds. Use higher rate of glyphosate for large perennials weeds, refer to Table 6–3. for specific details.
cloransulam-methyl (35 g/ha)	FIRSTRATE (84 WG)	41.7 g/ha (17 g/acre)	• Apply PRE. • Apply in both conventional and conservation tillage systems. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.
linuron (1.13–2.25 kg/ha)	LOROX L (480 g/L)	2.25–4.5 L/ha (0.9–1.8 L/acre)	• Apply PRE. **Do NOT** use on sands (less than 2% organic matter). • Plant soybeans at least 4 cm deep. • Heavy rainfall and adverse weather conditions may result in temporary crop injury. • Use higher rate for muck soils and clay soils. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Broadleaf Herbicides (cont'd)			
metribuzin (0.56–1.12 kg/ha)	SENCOR 75 DF (75 WG)	0.75–1.5 kg/ha (0.3–0.6 kg/acre)	• Apply PP, PPI or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • **Do NOT** use on sandy or coarse soils with less than 2% organic matter. • Use the label rate for each soil types (see label), otherwise crop injury may occur. • Excessive rainfall and adverse weather conditions may result in crop injury. • Plant soybeans at least 4 cm deep. • For preplant applications: – Apply up to 30 days prior to seeding the crop. – Use the higher rate when weeds are dense and are on soils with high organic matter (over 4%) and on soils with high clay content. – If emerged weeds are taller than 4 cm, apply in tank-mix with glyphosate. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
flumioxazin (71.4–107.1 g/ha)	VALTERA (51.1%) or VALTERA EZ (480 g/L)	140–210 g/ha (56–84 g/acre) 150–225 mL/ha (60–90 mL/acre)	• Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • Apply to soybeans prior to planting or within 3 days after planting but prior to soybean emergence. • Severe crop injury will result if applications are made to soybeans that have begun to crack through the soil surface or have emerged. • **Do NOT** apply within 100 metres of non-dormant pears. • **Do NOT** tank-mix with DUAL II MAGNUM, BOUNDARY LQD or FRONTIER MAX. • Any tillage operation performed after application will reduce weed control. • Apply only **ONCE** per growing season.
Soil Applied Grass and Broadleaf Herbicides			
pyroxasulfone (250 g)/ sulfentrazone (250 g) (250 – 300 g/ha)	AUTHORITY SUPREME	500 – 600 mL/ha (200 – 240 mL/acre)	• Apply PP or PRE but no later than 3 days after planting. • DO NOT use on peat or muck soils and soils with 7% or more organic matter content. • If adequate moisture is not received within 7 to 10 days of application, a shallow incorporation no deeper than 5 cm may be needed to obtain adequate weed control. • Soybean seeds must be planted a minimum of 2.5 cm deep. • Use the lower rate on coarse/medium textured soils with 1–4% organic matter. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.
s-metolachlor/metribuzin (1,443 g/ha–1943 g/ha)	BOUNDARY LQD (628 g/L + 149 g/L)	1.85–2.5 L/ha (0.74–1 L/acre)	• Apply PP or PRE. • **Do NOT** apply if soybeans have emerged. • **Do NOT** apply to coarse textured soils with less than 1% organic matter. • Can be tank-mixed with glyphosate or GRAMOXONE for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Grass and Broadleaf Herbicides (cont'd)			
clomazone (0.576–0.846 kg/ha)	COMMAND 360 ME (360 g/L)	1.6–2.35 L/ha (0.64–0.94 L/acre)	• **Do NOT** use on natto soybeans. • Apply PRE. • **Do NOT** incorporate. • For light textured soils – apply COMMAND at 1.6 L/ha (0.64 L/acre). • For medium textured soils – apply COMMAND at 2.3 L/ha (0.92 L/acre). • For heavy textured soils – apply COMMAND at 2.35 L/ha (0.94 L/acre). • Control of yellow foxtail is achieved when COMMAND is applied at 2.3–2.35 L/ha (0.92 - 0.94 L/acre). • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
flumetsulam (70 g/ha) + metribuzin (420 g/ha) + s-metolachlor (1.24 kg/ha)	COMMENZA (sold as a co-pack): BROADSTRIKE RC (80%) + TRICOR (75%) + S-METOLACHLOR 960 (960 g/L)	88 g/ha (35.75 g/acre) + 560 g/ha (227 g/acre) + 1.3 L/ha (0.525 L/acre)	• Apply PP, PPI or PRE. For PPI treatments uniformly incorporate with equipment set to work at a depth of 5–8 cm. • Can be applied up to 21 days before planting in minimum or no-tillage systems. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • **Do NOT** apply to areas where the soil pH is greater than 7.8 and organic matter is less than 2%. • **Do NOT** apply to soils containing more than 5% organic matter. • Sufficient rainfall to moisten the soil to a depth of 5 cm should be received within 7–10 days to achieve optimum weed control. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
imazethapyr (0.075–0.1 kg/ha) + metribuzin (0.425–0.542 kg/ha)	CONQUEST LQ (sold as a co-pack): (PURSUIT (240 g/L) + SENCOR 480 F (480 g/L))	0.312–0.42 L/ha (0.126–0.168 L/acre) + 0.815–1.14 L/ha (0.33–0.46 L/acre)	• Apply PPI or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • For use on medium and heavy textured soils only. • Use higher rates for heavier weed pressure, for fine textured soils or soils high in organic matter. • See PURSUIT for additional comments.
flumioxazin/pyroxasulfone (159.6 g/ha)	FIERCE (76%)	210 g/ha (85 g/acre)	• Apply PP or PRE but no longer than 3 days after planting. Applications made to soybeans that have begun to crack or are emerged will result in severe crop injury • The risk of crop injury is minimized when used on well drained soils and planted to a depth of 4 cm or more • When using no-till planters with coulters that incorporate the soil, weed control may be reduced, therefore applications should be done after planting, but within 3 days of planting. • Do not use FIERCE herbicide in soybeans in the same field that BOUNDARY, DUAL II MAGNUM or FRONTIER MAX will be used preemergee, or soybean injury may occur.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Grass and Broadleaf Herbicides (cont'd)			
chlorimuron-ethyl (9 g ai/ha) + imazethapyr (75 g/ha)	FREESTYLE (sold as a co-pack); CLASSIC GRANDE (25 DF) + DUPONT IMAZETHAPYR (240 g/L)	36 g/ha (14.4 g/acre) + 312 mL/ha (126 mL/acre)	• Apply as a Pre-Plant or PRE. • Some rotational restrictions apply (refer to CLASSIC and PURSUIT in Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds.
imazethapyr (0.075–0.1 kg/ha)	PURSUIT (240 g/L)	0.312–0.42 L/ha (0.126–0.168 L/acre)	• Apply PP, PPI or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • Addition of non-ionic surfactant and liquid fertilizer is required if emerged weeds are present at application. • For preplant applications: – apply PURSUIT at 0.168 L/acre. – apply up to 30 days prior to planting. – for minimum tillage, only 1 working of the soil to prepare a seedbed is suggested following application. Make this final seedbed preparation no deeper than 10 cm and do not turn untreated soil to the surface. • For preplant incorporated applications apply PURSUIT at 0.126 L/acre. • For preemergence applications, heavy infestations of ragweed and/or barnyard grass require a tank-mix. • For preplant incorporated applications, heavy infestations of lamb's-quarters, ragweed or barnyard grass may require a tank-mix. • **Do NOT** apply as preplant incorporated application more than 1 year in sequence. Use only **ONCE** per season.
	PHANTOM (240 g/L)		
	NU-IMAGE (240 g/L)		
s-metolachlor (1.25 kg/ha) + metribuzin (0.420 kg/ha)	TIEDOWN (sold as a co-pack): UPI S-MET (960 g/L) + TRICOR (75%)	1.3 L/ha (0.525 L/acre) + 0.56 kg/ha (0.225 kg/acre)	• Apply PPI or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information.
flumioxazin (95.8 g/ha) + metribuzin (413 g/ha) + imazethapyr (76.8 g/ha)	TRIACTOR (sold as a co-pack): VALTERA (51.1%) + TRICOR (75%) + NU-IMAGE (240 g/L)	187.5 g/ha (75 g/acre) + 550 g/ha (220 g/acre) + 320 mL/ha (128 mL/acre)	• Apply PP or PRE but no longer than 3 days after planting. Applications made to planted soybeans where the soil has begun to crack or where beans are emerged will result in severe crop injury. • The risk of crop injury is minimized when VALTERA is used on well drained soils and planted to a depth of 4 cm or more. • When using no-till planters with coulters that incorporate the soil, weed control may be reduced, therefore applications should be done after planting, but within 3 days of planting. • Tank-mix with glyphosate to control emerged broadleaf and grassy weeds.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Tank-Mix Options			
flumetsulam (70 g/ha) + s-metolachlor/benoxacor (1.05–1.6 kg/ha)	BROADSTRIKE RC (80%) + DUAL II MAGNUM (915 g/L)	87.5 g/ha (35 g/acre) + 1.15–1.75 L/ha (0.46–0.7 L/acre)	• Apply PP, PPI or PRE. For PPI treatments uniformly incorporate with equipment set to work at a depth of 5–8 cm. • Can be applied up to 21 days before planting in minimum or no-tillage systems. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds. • **Do NOT** apply to areas where the soil pH is greater than 7.8 and organic matter less than 2%. • **Do NOT** apply to soils containing more than 5% organic matter. • Sufficient rainfall to moisten the soil to a depth of 5 cm should be received within 7–10 days for optimum weed control. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
flumetsulam (70 g/ha) + trifluralin* (0.6–1.155 kg/ha)	BROADSTRIKE RC (80%) + TREFLAN (480 g/L)	87.5 g/ha (35 g/acre) 1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI, uniformly incorporate with equipment set to work at a depth of 5–8 cm. • Must be incorporated within 24 hours of application. • Can be applied up to 21 days before planting. • **Do NOT** apply to areas where the soil pH is greater than 7.8 and organic matter is less than 2%. • **Do NOT** apply to soils containing more than 5% organic matter. • Sufficient rainfall to moisten the soil to a depth of 5 cm should be received within 7–10 days for optimum weed control. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
clomazone (0.576–0.846 kg/ha) + s-metolachlor/benoxacor (1.6 kg/ha)	COMMAND 360 ME (360 g/L) + DUAL II MAGNUM (915 g/L)	1.6–2.35 L/ha (0.64–0.94 L/acre) + 1.75 L/ha (0.7 L/acre)	• **Do NOT** use on natto soybeans. • Apply PRE. • **Do NOT** incorporate. • For light textured soils – Apply COMMAND at 1.6 L/ha (0.64 L/acre). • For medium textured soils – Apply COMMAND at 2.3 L/ha (0.92 L/acre). • For heavy textured soils – Apply COMMAND at 2.35 L/ha (0.94 L/acre). • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
clomazone (0.576–0.846 kg/ha) + linuron (0.96–1.080 kg/ha)	COMMAND 360 ME (360 g/L) + LOROX L (480 g/L)	1.6–2.35 L/ha (0.64–0.94 L/acre) + 2–2.25 L/ha (0.8–0.9 L/acre)	• **Do NOT** use on natto soybeans. • Apply PRE. • **Do NOT** incorporate. • For light textured soils – Apply COMMAND at 1.6 L/ha (0.64 L/acre) and LOROX L at 2 L/ha (0.8 L/acre). • For medium textured soils – Apply COMMAND at 2.3 L/ha (0.92 L/acre) and LOROX L at 2.25 L/ha (0.9 L/acre). • For heavy textured soils – Apply COMMAND at 2.35 L/ha (0.94 L/acre) and LOROX L at 2.25 L/ha (0.9 L/acre). • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Tank-Mix Options (cont'd)			
clomazone (0.576–0.846 kg/ha) + imazethapyr (0.075 kg/ha)	COMMAND 360 ME (360 g/L) + PURSUIT (240 g/L)	1.6–2.35 L/ha (0.64–0.94 L/acre) + 0.312 L/ha (0.126 L/acre)	• **Do NOT** use on natto soybeans. • Apply PRE. • **Do NOT** incorporate. • For light textured soils – Apply COMMAND at 1.6 L/ha (0.64 L/acre) (0.64 L/acre). • For medium textured soils – Apply COMMAND at 2.3 L/ha (0.94 L/acre). • For heavy textured soils – Apply COMMAND at 2.35 L/ha (0.94 L/acre). • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
clomazone (0.576–0.846 kg/ha) + metribuzin (0.281–0.398 kg/ha)	COMMAND 360 ME (360 g/L) + SENCOR 75 DF (75 WG)	1.6–2.35 L/ha (0.64–0.94 L/acre) + 0.375–0.530 kg/ha (0.15–0.212 kg/acre)	• **Do NOT** use on natto soybeans. • Apply PRE. • **Do NOT** incorporate. • For light textured soils – Apply COMMAND at 1.6 L/ha (0.64 L/acre) and SENCOR at 0.375 kg/ha (150 g/acre). • For medium textured soils – Apply COMMAND at 2.3 L/ha (0.92 L/acre) and SENCOR at 0.530 kg/ha (212 g/acre). • For heavy textured soils – Apply COMMAND at 2.35 L/ha (0.94 L/acre) and SENCOR at 0.530 kg/ha (212 g/acre). • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
s-metolachlor/benoxacor (1.05–1.6 kg/ha) + linuron (0.85–1.15 kg/ha)	DUAL II MAGNUM (915 g/L) + LOROX L (480 g/L)	1.15–1.75 L/ha (0.46–0.7 L/acre) + 1.77–2.39 L/ha (0.71–0.96 L/acre)	• Apply PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information.
s-metolachlor/benoxacor (1.05–1.6 kg/ha) + metribuzin (0.41–1.13 kg/ha)	DUAL II MAGNUM (915 g/L) + SENCOR 75 DF (75 WG)	1.15–1.75 L/ha (0.46–0.7 L/acre) + 0.55–1.5 kg/ha (0.22–0.6 kg/acre)	• Apply PPI or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information.
s-metolachlor/benoxacor (1.05–1.6 kg/ha) + imazethapyr (0.075–0.1 kg/ha)	DUAL II MAGNUM (915 g/L) + PURSUIT (240 g/L)	1.15–1.75 L/ha (0.46–0.7 L/acre) + 0.312–0.42 L/ha (0.126–0.168 L/acre)	• Apply PP, PPI or PRE. • Maximum PURSUIT rate for PPI treatments is 0.312 L/ha.
dimethenamid-P (544–693 g/ha) + metribuzin (408–528 g/ha)	FRONTIER MAX (720 g/L) + SENCOR 480 F (480 g/L)	756–963 mL/ha (305–390 mL/acre) + 850 mL–1.1 L/ha (340–440 mL/acre)	• Apply PP, PPI or PRE. • Refer to precautions for FRONTIER MAX and SENCOR.
	FRONTIER MAX (720 g/L) + SENCOR 75 DF (75%)	756–963 mL/ha (305–390 mL/acre) + 550–700 g/ha (220–280 g/acre)	
dimethenamid-P (544–693 g/ha) + imazethapyr (0.075–0.1 kg/ha)	FRONTIER MAX (720 g/L) + PURSUIT (240 g/L)	756–963 mL/ha (305–390 mL/acre) + 0.312–0.42 L/ha (0.126–0.168 L/acre)	• Apply PP, PPI or PRE. • Refer to precautions for FRONTIER MAX and PURSUIT.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Tank-Mix Options (cont'd)			
imazethapyr (75 g/ha) + cloransulam-methyl (17.5 g/ha)	PURSUIT (240 g/L) + FIRSTRATE (84 WG)	0.312 L/ha (0.126 L/acre) + 20.8 g/ha (8.5 g/acre)	• Apply PP or PRE. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information.
	PHANTOM (240 g/L) + FIRSTRATE (84 WG)		
	NU-IMAGE (240 g/L) + FIRSTRATE (84 WG)		
imazethapyr (75 g/ha) + pendimethalin (1,000 g/ha)	PURSUIT (240 g/L) + PROWL H2O (455 g/L)	0.312 L/ha (0.126 L/acre) + 2.2 L/ha (0.89 L/acre)	• Apply PPI up to 45 days before planting. • Can be tank-mixed with glyphosate for PP burndown of emerged annual and perennial weeds, see Chapter 6, Preplant & Postharvest Weed Control for more information. • Allow 24 months between applications. • See PURSUIT for additional comments. • Refer to Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops for rotation restrictions.
imazethapyr (0.075–0.1 kg/ha) + linuron (0.85–1.15 kg/ha)	PURSUIT (240 g/L) + LOROX L (480 g/L)	0.312–0.42 L/ha (0.126–0.168 L/acre) + 1.77–2.39 L/ha (0.71–0.96 L/acre)	• Apply PRE.
	PHANTOM (240 g/L) + LOROX L (480 g/L)		
	NU-IMAGE (240 g/L) + LOROX L (480 g/L)		
imazethapyr (0.075–0.1 kg/ha) + metribuzin (0.4–1.13 kg/ha)	PURSUIT (240 g/L) + SENCOR 75 DF (75 WG)	0.31–0.42 L/ha (0.126–0.168 L/acre) + 0.53–1.5 kg/ha (0.21–0.6 kg/acre)	• Apply PP, PPI or PRE. • For preplant applications the maximum Sencor rate is 1.3 kg/ha (520 g/acre).
	PHANTOM (240 g/L) + SENCOR 75 DF (75 WG)		
	NU-IMAGE (240 g/L) + SENCOR 75 DF (75 WG)		

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Soil Applied Tank-Mix Options (cont'd)			
imazethapyr (0.075 kg/ha) + trifluralin (0.6–1.155 kg/ha)	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + TREFLAN (480 g/L)	0.312 L/ha (0.126 L/acre) + 1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI.
	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + RIVAL (500 g/L)	0.312 L/ha (0.126 L/acre) + 1.2–2.3 L/ha (0.48–0.92 L/acre)	
	PURSUIT (240 g/L) **or** PHANTOM (240 g/L) **or** NU-IMAGE (240 g/L) + BONANZA 480 (480 g/L)	0.312 L/ha (0.126 L/acre) + 1.25–2.4 L/ha (0.5–0.96 L/acre)	
metribuzin (0.33–0.75 kg/ha) + linuron (0.5–1.2 kg/ha)	SENCOR 75 DF (75 WG) + LOROX L (480 g/L)	0.44–1 kg/ha (0.18–0.4 kg/acre) + 1.04–2.5 L/ha (0.42–1 L/acre)	• Apply PRE.
trifluralin (0.6–1.155 kg/ha) + metribuzin (0.42–0.55 kg/ha)	TREFLAN EC (480 g/L) + SENCOR 75 DF (75 WG)	1.25–2.4 L/ha (0.5–0.96 L/acre) + 0.56–0.73 kg/ha (0.22–0.29 kg/acre)	• Apply PPI.
	RIVAL (500 g/L) + SENCOR 75 DF (75 WG)	1.2–2.3 L/ha (0.48–0.92 L/acre) + 0.56–0.73 kg/ha (0.22–0.29 kg/acre)	
	BONANZA 480 (480 g/L) + SENCOR 75 DF (75 WG)	1.25–2.4 L/ha (0.5–0.96 L/acre) + 0.56–0.73 kg/ha (0.22–0.29 kg/acre)	
Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.072 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.38–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	• Apply to emerged annual grasses and volunteer cereals in 2 leaf to tillering stage and volunteer corn and quackgrass in the 2–6 leaf stage. • Use the 0.38 L/ha (0.15 L/acre) rate of ASSURE II for control of volunteer corn, volunteer cereals, long spined sandbur and green foxtail. • Volunteer "ENLIST" corn **WILL NOT** be controlled by this herbicide. • The 0.5 L/ha (0.2 L/acre) rate of ASSURE II will suppress quackgrass and also control barnyard grass. • Use the 0.75 L/ha (0.3 L/acre) rate of ASSURE II for control of quackgrass. • **Do NOT** apply to soybeans within 80 days of harvest.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + XA OIL CONCENTRATE		

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Grass Herbicides (cont'd)			
sethoxydim (0.15–0.2 kg/ha) + oil concentrate (2 L/ha)	POAST ULTRA (450 g/L) + ASSIST	0.32–0.47 L/ha (0.13–0.19 L/acre) + 2 L/ha (0.8 L/acre)	• Apply the 0.47 L/ha (0.19 L/acre) rate for wild oats or volunteer cereal control. • Apply POAST ULTRA to emerged grasses in the 1–6 leaf stage during active growth while crop is small enough to permit thorough spray coverage. • Complete control is normally obtained 7–21 days after application. A second application may be necessary to control grasses that emerge after the first treatment. • Use MERGE for conditions or weeds requiring medium to high rates of POAST ULTRA. • Water rates of 100–200 L/ha (40–80 L/acre) provide the best results.
sethoxydim (0.15–0.2 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre)	
sethoxydim (0.5 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• Apply at 1–3 leaf stage of actively growing quackgrass in 110–200 L/ha (44–80 L/acre) water. • Thorough preplant tillage will result in more uniform quackgrass emergence. • Crop competition and inter-row cultivation 7–14 days after application will assist in quackgrass control for 6–8 weeks.
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	190--375 mL/ha (75-150 mL/acre) + 5-10 L/1,000 L	• Soybeans are tolerant at any growth stage. • Apply when annual grasses and volunteer cereals are in the 2–6 leaf stage. • Use the higher rate for quackgrass control. Apply to quackgrass in the 2–5 leaf stage. • Add the surfactant at 5 L/1,000 L of spray solution to the low herbicide rate and 10 L/1,000 L of spray solution to the high herbicide rate for quackgrass control. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT, STATUE or ANTLER.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-P-butyl (0.075–0.25 kg/ha)	VENTURE L (125 g/L)	0.6–2 L/ha (0.243–0.8 L/acre)	• The 0.6 L/ha (0.243 L/acre) rate is for the control of volunteer corn at the 2–5 leaf stage. **WILL NOT** control volunteer "ENLIST" corn. • The 1 L/ha (0.4 L/acre) rate is for the control of annual grasses at the 2–4 leaf stage. • The 2 L/ha (0.8 L/acre) rate is for the control of quackgrass or wirestem muhly at the 3–5 leaf stage.
Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha)	BASAGRAN FORTÉ (480 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	• Apply when soybeans are in unifoliate to 4th trifoliate leaf stage and when weeds are small and actively growing. • Temporary crop injury may occur under abnormally hot, humid conditions. • Cool weather or drought may delay control. • For improved and more consistent control of velvetleaf and lamb's-quarters, 10 L/ha of 28% urea ammonium nitrate (UAN) or 6 L/ha of liquid ammonium sulphate may be added. The addition of either nitrogen source may cause slight leaf burn, but new growth is normal and crop vigour is not reduced. • Use the higher rate of BASAGRAN FORTÉ when weed pressure is high, weeds are large or conditions for activity are unfavourable.
	BROADLOAM (480 g/L)		

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (Cont'd)			
acifluorfen (0.6 kg/ha)	BLAZER, ULTRA (240 g/L)	2.5 L/ha (1 L/acre)	• Apply to emerged weeds up to 10 cm in height (refer to labels for weed heights) when soybeans are in the 1–3 trifoliate leaf stage. • **Do NOT** apply before the first trifoliate leaf stage of the soybeans. • Good spray coverage on the weeds is important for good weed control. • Soybeans may exhibit speckling, bronzing and/or leaf burn. The trifoliate leaf emerging at the time of application may be distorted. Soybeans usually outgrow these conditions and continue to grow at a normal rate with no adverse effect on vigour, maturity, or crop yield. • **Do NOT** apply BLAZER to soybeans that have been subjected to stress (see product label). • **Do NOT** add oils or surfactants to applications of BLAZER at 2.5 L/ha alone.
acifluorfen (0.3 kg/ha) + oil concentrate (0.5% v/v)	BLAZER, ULTRA (240 g/L) + ASSIST	1.25 L/ha (0.5 L/acre) + 5 L/1,000 L	• Apply to emerged redroot pigweed up to and including the 4 leaf stage and to common ragweed up to and including the 8 leaf stage when soybeans are in the 1–3 trifoliate leaf stage. • **Do NOT** apply before the first trifoliate leaf stage of the soybeans. • Good spray coverage on the weeds is important for good weed control. • Soybeans may exhibit speckling, bronzing and/or leaf burn. The trifoliate leaf emerging at the time of application may be distorted. Soybeans usually outgrow these conditions and continue to grow at a normal rate with no adverse affects on vigour, maturity or crop yield.
chlorimuron-ethyl (9 g/ha) + non-ionic surfactant (0.2% v/v)	CLASSIC (25 DF) + non-ionic surfactant CHAPERONE (25 DF) + non-ionic surfactant	36 g/ha (14 g/acre) + 2 L/1,000 L	• Apply to small emerged weeds (2–6 leaf) and ideally when soybeans have the 1st trifoliate leaf fully expanded. Applications may occur prior to the 1st trifoliate leaf stage if targeted weed species are at the maximum leaf stage for control. • **Do NOT** apply after the initiation of flowering. • Addition of 28% UAN may improve control of velvetleaf. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions).
cloransulam-methyl (17.5 g/ha) + non ionic surfactant (0.25% v/v) + liquid fertilizer (2.5% v/v)	FIRSTRATE (84 WG) + non-ionic surfactant + liquid fertilizer (28-0-0 or 32-0-0)	20.8 g/ha (8.5 g/acre) + 2.5 L/1,000 L + 25 L/1,000 L	• Apply up to the 8 leaf stage for common ragweed and cocklebur, 6 leaf stage for giant ragweed, and 4 leaf stage for velvetleaf. • Apply any time prior to flowering stage of soybeans. • Application prior to full emergence of first trifoliate may cause temporary yellowing of soybeans.
bentazon (320 g/L) (561.6 g/ha)/ acifluorfen (160 g/L) (280.8 g/ha)	HURRICANE (480 g/L) + MERGE + 28% UAN HURRICANE (480 g/L) + SURE-MIX + 28% UAN	1.755 L/ha (0.7 L/acre) + 5–10 L/1,000 L + 4.68–9.36 L/ha (1.87–3.7 L/acre) 1.755 L/ha (0.7 L/acre) + 5–10 L/1,000 L + 4.68–9.36 L/ha (1.87–3.7 L/acre)	• Apply when susceptible broadleaf weeds are 5–10 cm tall. (velvetleaf and lamb's-quarters should be no larger than 5 cm tall). • Apply between the 1–2 triolfiate stage of soybean. • HURRICANE can be tank-mixed with ASSURE II, CLASSIC, FIRSTRATE, PINNACLE, POAST ULTRA or PURSUIT for a broader spectrum of weed control. • When tankimixing with CLASSIC, FIRSTRATE, PINNACLE or PURSUIT, a non-ionic surfactant should be used instead of MERGE or SURE-MIX. • If the air temperature and relative humidity added together exceed "100" (e.g. 29°C + 75% R.H.) at time of application, than use the lower adjuvant rate.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
thifensulfuron-methyl (4.1–6 g/ha) + surfactant (0.1% v/v)	PINNACLE SG TOSS-N-GO (50%) + non ionic surfactant	8.25–12 g/ha (3.3–4.8 g/acre) + 1 L/1,000 L	• Apply to small emerged weeds (2–6 leaf) and ideally when soybeans have the 1st trifoliate leaf fully expanded. Applications may occur prior to the 1st trifoliate leaf stage if targeted weed species are at the maximum leaf stage for control. • **Do NOT** apply to soybeans, which have initiated flowering. • Use the higher rate for lamb's-quarters and velvetleaf. • The addition of UAN (28-0-0) at 4% v/v will enhance the control of velvetleaf.
fomesafen (0.24 kg/ha) + mineral oil/surfactant (0.5% v/v)	REFLEX (240 g/L) + TURBOCHARGE	1 L/ha (0.4 L/acre) + 5 L/1,000 L	• Apply early postemergence at 1–2 trifoliate to crop when weeds are small and actively growing (2–4 leaf stage). • Use 200–350 L/ha (80–140 L/acre) water. Use higher rates of water and pressure for a heavy weed or crop canopy. • Some bronzing may occur to soybean leaves at the time of application, but plants outgrow these effects without harming maturity or yield. • **Do NOT** apply REFLEX to any field more often than once every 2 years. • **Do NOT** apply to soybeans under stress. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions).
Postemergence Grass and Broadleaf Herbicides			
imazethapyr/ bentazon (0.075 + 0.84 kg/ha) + liquid fertilizer (2 L/ha)	CLEAN SWEEP (sold as a co-pack): (PURSUIT (240 g/L) + BASAGRAN FORTÉ (480 g/L) + liquid fertilizer (28-0-0, 10-34-0 or 32-0-0)	0.312 L/ha (0.126 L/acre) + 1.75 L/ha (0.7 L/acre) + 2 L/ha (0.8 L/acre)	• Available as a co-pack containing PURSUIT and BASAGRAN FORTÉ. • Apply postemergence to actively growing weeds in the 2–6 leaf stage. • Some rotational cropping restrictions apply (see label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
imazethapyr (0.075–0.1 kg/ha) + non-ionic surfactant (0.25% v/v) + liquid fertilizer (2 L/ha)	PURSUIT (240 g/L) + non-ionic surfactant + liquid fertilizer (28-0-0, 10-34-0, or 32-0-0) PHANTOM (240 g/L) + non-ionic surfactant + liquid fertilizer (28-0-0, 10-34-0, or 32-0-0) NU-IMAGE (240 g/L) + non-ionic surfactant + liquid fertilizer (28-0-0, 10-34-0, or 32-0-0)	0.312–0.42 L/ha (126–168 mL/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• Apply when the weeds are up to the 2-true leaf stage. • Some rotational cropping restrictions apply (see label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • Use only **ONCE** per season. • **Do NOT** apply to soybeans after the 3rd trifoliate stage of growth as severe crop injury and yield loss can occur.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Tank-Mix Options			
quizalofop-p-ethyl (0.06 kg/ha) + thifensulfuron-methyl (4.1–6 g/ha) + bentazon (0.84–1.08 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L)* + PINNACLE SG (50%) + BASAGRAN FORTÉ (480 g/L) + SURE-MIX	0.63 L/ha (0.25 L/acre) + 8.25–12 g/ha (3.3–4.8 g/acre) + 1.75–2.25 L/ha (0.7–0.9 L/acre) + 5 L/1,000 L	• Apply to soybeans from the 1–4 trifoliate leaf stage. Applications may occur prior to the 1st trifoliate leaf stage of soybean if targeted weed species are at the maximum leaf stage for control. • **Do NOT** apply to soybeans, which have initiated flowering. • If leaf stages of the grass and broadleaf weeds do not coincide, a sequential application of the grass and broadleaf herbicides is required to ensure satisfactory control. • *CONTENDER and YUMA GL are equiavlents of ASSURE II and can be used interchangeably.
quizalofop-p-ethyl (0.048 kg/ha) + thifensulfuron-methyl (4.1–6 g/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + PINNACLE SG (50%) + SURE-MIX	0.5 L/ha (0.2 L/acre) + 8.25–12 g/ha (3.3–4.8 g/acre) + 5 L/1,000 L	• Apply to soybeans from the 1–3 trifoliate leaf stage. Applications may occur prior to the 1st trifoliate leaf stage of soybean if targeted weed species are at the maximum leaf stage for control. • **Do NOT** apply to soybeans that have initiated flowering. • If leaf stages of the grass and broadleaf weeds do not coincide, a sequential application of the grass and broadleaf herbicides is required to ensure satisfactory control. • Velvetleaf control may be reduced with a tank-mix application. • For optimum control, make separate applications of PINNACLE and ASSURE. • *CONTENDER and YUMA GL are equiavlents of ASSURE II and can be used interchangeably.
quizalofop-p-ethyl (0.036–0.060 kg/ha) + chlorimuron-ethyl (9.0 g/ha) + oil concentrate (0.5%–1.0%)	ASSURE II (96 g/L)* + CLASSIC (25 DF)* + SURE-MIX	0.38–0.63 L/ha (0.15–0.255 L/acre) + 36 g/ha (14 g/acre) + 5 L/1,000 L	• Apply to soybeans from the 1–3 trifoliate leaf stage. Applications may occur prior to the 1st trifoliate leaf stage of soybean if targeted weed species are at the maximum leaf stage for control. • **Do NOT** apply to soybeans that have initiated flowering. • If leaf stages of the grass and broadleaf weeds do not coincide, a sequential application of the grass and broadleaf herbicides is required to ensure satisfactory control. • If targeting yellow foxtail or quackgrass use ASSURE II at a rate of 0.63 L/ha. • *CONTENDER and YUMA GL are equiavlents of ASSURE II and can be used interchangeably. * CHAPERONE is a generic equivalent of CLASSIC.
acifluorfen (0.3 kg/ha) + bentazon (0.6 kg/ha)	BLAZER (240 g/L) + BASAGRAN FORTÉ (480 g/L)	1.25 L/ha (0.5 L/acre) + 1.25 L/ha (0.5 L/acre)	• Use when common ragweed and/or redroot pigweed are the dominant weed(s). • BROADLOAM herbicide is a generic equivalent of BASAGRAN FORTÉ and can be used interchangeably.
acifluorfen (0.15 kg/ha) + bentazon (0.84 kg/ha)	BLAZER (240 g/L) + BASAGRAN FORTÉ (480 g/L)	0.63 L/ha (0.25 L/acre) + 1.75 L/ha (0.7 L/acre)	• Use when lamb's-quarters is the dominant weed. • BROADLOAM herbicide is a generic equivalent of BASAGRAN FORTÉ and can be used interchangeably.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Tank-Mix Options (cont'd)			
thifensulfuron-methyl (4.1–6 g/ha) + bentazon (0.84–1.08 kg/ha)	PINNACLE SG (50%) + BASAGRAN FORTÉ (480 g/L)	8.25–12 g/ha (3.3–4.8 g/acre) + 1.75–2.25 L/ha (0.7–0.9 L/acre)	• Apply to emerged weeds when soybeans have the first trifoliate leaf fully expanded. • **Do NOT** apply to soybeans that have initiated flowering. • If Canada thistle, yellow nutsedge and field bindweed are target species a 2nd application may be required. • BROADLOAM herbicide is a generic equivalent of BASAGRAN FORTÉ and can be used interchangeably.
fomesafen (0.24 kg/ha) + thifensulfuron-methyl (6 g/ha) + non-ionic surfactant (0.25% v/v)	REFLEX (240 g/L) + PINNACLE SG (50%) + AGRAL 90	1 L/ha (0.4 L/acre) + 12 g/ha (4.8 g/acre) + 2.5 L/1,000 L	• Apply early postemergence at the 2–4 leaf stage of weeds and 1–2 trifoliate stage of the crop.
fomesafen (0.24 kg/ha) + fluazifop-p-butyl (6 g/ha) + surfactant (0.5% v/v)	REFLEX (240 g/L) + VENTURE L (125 g/L) + TURBOCHARGE-	1 L/ha (0.4 L/acre) + 0.6–2.0 L/ha (0.243–0.8 L/acre) + 5 L/1,000 L	• Apply early postemergence at the 2–4 leaf stage of weeds and 1–2 trifoliate stage of the crop. • Apply in 200 L/ha (80 L/acre) water.
imazethapyr (75 g/ha) + cloransulan-methyl (17.5 g/ha) + non-ionic surfactant (0.25% v/v) + liquid fertilizer (2 L/ha)	PURSUIT (240 g/L) + FIRSTRATE (84 WG) + non-ionic surfactant + liquid fertilizer (28-0-0 or 32-0-0)	0.312 L/ha (0.126 L/acre) + 20.8 g/ha (8.5 g/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• Apply when weeds are up to the 2-true leaf stage. • Use for control of annual grasses, lamb's-quarters and redroot pigweed.
imazethapyr (0.075 kg/ha) + fomesafen (0.19–0.24 kg/ha) + non-ionic surfactant (0.25% v/v) + liquid fertilizer (2 L/ha)	PURSUIT (240 g/L) + REFLEX (240 g/L) + AGRAL 90 + liquid fertilizer	0.312 L/ha (0.126 L/acre) + 0.8–1 L/ha (0.32–0.4 L/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• Use the lower rate of REFLEX for ragweed only. • Use the higher rate of REFLEX for lamb's-quarters.

TABLE 11–3. Herbicide Treatment Rates for Conventional (Non-GMO) Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Tank-Mix Options (cont'd)			
fluazifop-p-butyl (0.125–0.25 kg/ha) + bentazon (0.84–1.08 kg/ha) + oil concentrate (0.5% v/v)	VENTURE L (125 g/L) + BASAGRAN (480 g/L) + ASSIST	1–2 L/ha (0.4–0.8 L/acre) + 1.75–2.25 L/ha (0.7–0.9 L/acre) + 5 L/1,000 L	• Apply when soybeans are at the unifoliate to 3rd trifoliate stage and when weeds are small and actively growing. • Use the 0.8 L/acre rate of VENTURE L to control wirestem muhly. • Temporary crop injury may occur under abnormally hot and humid conditions.
Spot Treatments – see Spot Treatments with Hand-Held Equipment, chapter 6 for a list of options.			
Wick Wiper and Roller Application – see Wick Wiper and Roller Application, chapter 6 for a list of options.			
Preharvest			
carfentrazone-ethyl (0.0175–0.028 kg/ha) + adjuvant	AIM EC (240 g/L) + non-ionic surfactant	0.073–0.117 L/ha (30–47 mL/acre) + 2.5 L/1,000 L	• Apply to actively growing weeds, up to 10 cm. • Coverage of weed and crop foliage is essential for control. • Preharvest interval (PHI) is 3 days.
	AIM EC (240 g/L) + MERGE	0.073–0.117 L/ha (30–47 mL/acre) + 10 L/1,000 L	
saflufenacil (25.2–49.7 g/ha) + adjuvant (1 L/ha)	ERAGON LQ (342 g/L) + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1 L/ha (0.4 L/acre)	• Apply when the stems are green to brown in colour and pods are mature (yellow-brown) and 80%–90% of the original leaves have dropped. • Apply in 200 L/ha (80 L/acre) of water. • Preharvest interval (PHI) is 3 days.
saflufenacil (25.2–49.7 g/ha) + glyphosate (900 g/ha) + adjuvant (1 L/ha)	ERAGON LQ (342 g/L) + glyphosate (540 g/L)* + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply when the stems are green to brown in colour and pods are mature (yellow-brown) and 80%–90% of the original leaves have dropped. • Apply in 200 L/ha (80 L/acre) of water. • **Do NOT** apply to crops grown for seed. • Refer to preharvest precautions for glyphosate, below. * Numerous products exist, refer to Table 4–1.
glyphosate (0.9 kg/ha)	glyphosate (540 g/L)*	1.67 L/ha (0.67 L/acre)	• Apply in 50–100 L/ha (20–40 L/acre) water when the crop is 30% grain moisture or less. • **Do NOT** apply to crops grown for seed. • Apply at least 7 days prior to harvest when pod tissue is dry and brown and 80%–90% of original leaves have dropped. * Numerous products exist, refer to Table 11–5. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	other glyphosate products	See Table 11–5.	
diquat (0.30–0.55 kg/ha) + surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25–2.3 L/ha (0.5–0.92 L/acre) + 1 L/1,000 L	• Apply in 225 L/ha water to burn off weeds when 80% natural crop leaf defoliation has occurred and 80% of the pods have turned yellow. • Avoid regrowth by targeting spray within 7 days of variety maturity date and harvest 5–7 days after application. • For ground application use 1.25–1.7 L/ha (0.5–0.68 L/acre). • For aerial application use 1.7–2.3 L/ha (0.68–0.92 L/acre).
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY DESICCANT (240 g/L) + AGRAL 90		

Glyphosate Tolerant ("Roundup Ready") Soybean

Weed Management Strategies for Glyphosate Tolerant Soybean

University of Guelph research trials have shown that when weed competition is high, two applications of glyphosate in glyphosate tolerant soybeans maximized yields and gross returns over 5 years at multiple locations in Ontario, see table 11–4. below.

TABLE 11–4. Soybean Yield From Different Weed Management Strategies in Glyphosate Tolerant Soybeans

Time of Glyphosate Application	Weed Control (% visual)	Yield (%)
Preplant followed by a Post application at the 1–3 trifoliate stage	96	100
Unifoliate followed by a Post application at the 1–3 trifoliate stage	96	98
Post at the 1–3 trifoliate stage (no Preplant Burndown applied)	93	83

Source: Swanton and Deen, 1999, University of Guelph.

In fields with historically low weed pressure and where the in-crop glyphosate application is not delayed past the third trifoliate stage there is little benefit to applying a residual herbicide. In fields with historically high weed pressure and when there is a risk of delayed in-crop glyphosate application (for reasons such as poor spraying conditions or a large amount of acres over a large geographic area) the application of a residual herbicide will minimize any risk of yield losses due to early season weed competition. It is important to select a residual herbicide that addresses the weed spectrum in your field. Refer to the weed control ratings for soil applied herbicide in Table 11–1. *Conventional Soybean Herbicide Weed Control Ratings*.

Glyphosate Resistant Weeds

Giant Ragweed – Populations resistant to glyphosate exist in southwestern Ontario. University of Guelph research has shown that, to date, an application of 2,4-D Ester 700 or BLACKHAWK + glyphosate prior to planting soybeans, is the most effective way to control emerged glyphosate resistant giant ragweed prior to seeding. FIRSTRATE provides the best control of glyphosate resistant giant ragweed postemergence in glyphosate tolerant soybeans. However, there are populations of giant ragweed that are also resistant to group 2 herbicides such as FIRSTRATE. LOROX provides effective residual control of giant ragweed when the highest label rate is used.

Canada Fleabane

Glyphosate resistant Canada fleabane is most difficult to control in soybean because of a lack of options to control it once the soybean crop has emerged. Therefore it must be controlled prior to planting. When research trials were initially conducted, the pre-plant tank-mix of glyphosate + ERAGON LQ + MERGE was the most effective option. However, as that treatment was evaluated over several seasons and locations, about one third of the time, glyphosate+ ERAGON LQ + MERGE failed to provide commercially acceptable control of glyphosate resistant Canada fleabane. To address this inconsistency, different tank-mix options were evaluated over two seasons and the addition of SENCOR 75 DF (metribuzin) at 38 g/ha (15 g/acre) to the pre-plant tank-mix of glyphosate + ERAGON LQ + MERGE improved control of glyphosate resistant Canada fleabane. The equivalent rate of metribuzin used in SENCOR 75 DF can also be found in a number of soil applied herbicides.

Common Ragweed

If glyphosate resistant common ragweed is emerged prior to planting then the tank-mix of glyphosate + ERAGON LQ + MERGE is the best option to control populations of this resistant species. SENCOR 75 DF (metribuzin) applied pre-plant at the highest labelled rate has provided effective residual control of glyphosate resistant common ragweed, however this rate can only be safely used on clay soils that have greater than 4% organic matter, otherwise unacceptable crop injury is likely. When glyphosate resistant common ragweed is present when the soybean crop has emerged then either FLEXSTAR GT + TURBOCHARGE or glyphosate + REFLEX + TURBOCHARGE has provided the best control of this species in Roundup Ready Soybeans.

Waterhemp

Control of glyphosate resistant waterhemp is best achieved with a two-pass herbicide program where one of AUTHORITY SUPREME, BOUNDARY LQD, FIERCE, FOCUS, FRONTIER MAX or VALTERA is applied preemergence. If a second flush of waterhemp emerges once the crop has emerged, then one of REFLEX or ULTRA BLAZER can be applied.

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions

TABLE 11–5. Soybean Herbicide Weed Control Ratings in Glyphosate Tolerant Soybeans

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

		Grasses								Annual Broadleaves												Perennials							
Trade Name	**Stage**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preplant Burndown Herbicides																													
2,4-D Ester 700 + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	7	8	9	9	9	9	9	9	9	9R	8	5	8	82	9	8	9	G
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
ASSIGNMENT*	emerged weeds	9	9	9	9	9	9	9	9	8	9	9R	8	9	9	9	9	9R	9R	9	9R	7/8	5	8	81	9	8	9	E
	residual weed control	–	–	8	–	9	9	–	7	–	4	2	9	8R	9	9R	9R	8R	5R	8	0	0	0	0	–	0	0	0	
BLACKHAWK	emerged weeds	–	–	–	–	–	–	–	–	–	9	7	9	9	–	9	9	9	9	9	5	–	–	–	–	–	–	–	G
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
BIFECTA* + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	7	9	9R	9	9	9	9	9R	9R	9R	9	9R	7/8	5	8	81	9	8	9	G
	residual weed control	7	6	7	5	6	6	8	3	9	9	8	9	9	9	9	9	8	6	7	8	2	2	2	2	2	2	2	
BOUNDARY LQD + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9R	8	9	9	9	9	9R	8R	9	9R	7/8	5	8	81	9	8	9	E
	residual weed control	9	9	8	8	9	9	9	4	–	–	56	–	7	–	82	82	–	–	–	8	–	–	–	81	–	–	–	
CANOPY PRO* + glyphosate	emerged weeds	9	9	9	9	9	9	9	9	8	9	9R	8	9	9	9	9	9R	9R	9	9R	7/8	5	8	9	9	8	9	G
	residual weed control	7	6	7	5	5	5	8	3	8	7R	8	9	9R	9	9R	9R	8R	6	9	–	2	2	2	6	8	2	2	
DILIGENT + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9R	8	9	9	9	9	9R	9R	9	9R	7/8	5	8	9	9	8	9	G
	residual weed control	7	7	6	5	5	6	6	7	8	8	8	8	9	9	9	9	7	4	7	–	5	3	8	6	5	5	5	
ELEVORE + glyphosate	emerged weeds	9	9	9	9	9	9	9	9	8	9	7	8	9	9	9	9	8	9R	9	5	7/8	5	8	81	9	8	9	G
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	

[1] A glyphosate rate of 1.8 kg/ha is required to achieve this level of control.
[2] Use only on certified soybean seed designated as "Roundup Ready" Soybean.
[3] Numerous products exist. See Table 11–5. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.

TABLE 11–5. Soybean Herbicide Weed Control Ratings in Glyphosate Tolerant Soybeans (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; * = sold as a co-pack under this trade name; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.; – = insufficient information available to make a rating

		Grasses								Annual Broadleaves												Perennials							
Trade Name	**Stage**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Preplant Burndown Herbicides (cont'd)																													
ERAGON LQ + glyphosate + MERGE	emerged weeds	9	9	9	9	9	9	9	9	8	9	9	8	9	9	9	9	9	6	9	5	7/8	7	8	8[1]	9	8	9	E
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
EXPRESS SG + glyphosate	emerged weeds	9	9	9	9	9	9	9	9	9	9	9[R]	9	9	9	9	9	9[R]	8[R]	9	9[R]	–	–	–	–	9	8[4]	7[4]	E
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
FIERCE + glyphosate	emerged weeds	9	9	9	9	9	9	9	9	9	9	9[R]	9	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	G
	residual weed control	9	9	–	9	9	9	–	–	8	5	8	8	9	9	9	9	8	4	7	9	–	–	–	–	–	–	–	
FLEXSTAR GT	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9	9[R]	9	8	7/8	7	8	8[1]	9	8	9	E
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	8	–	–	–	–	–	–	–	–	–	–	
FREESTYLE* + glyphosate	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	5	8	8	9	8	9	E
	residual weed control	8	7	7	9[R]	9[R]	9	8	7	8	7[R]	7[R]	9	9[R]	9	9[R]	9[R]	8[R]	8[R]	9	0	2	2	2	7	2	2	2	
GUARDIAN MAX*	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	5	8	9	9	8	9	G
	residual weed control	7	7	6	6[R]	6[R]	6	6	7	8	4	8[R]	8	7[R]	9	2	7[R]	7[R]	7[R]	7	0	5	3	8	8	5	5	5	
INTEGRITY + glyphosate[3] + MERGE	emerged weeds	9	9	9	9	9	9	9	9	8	9	8	9	9	9	9	9	9	7	9	9[R]	7/8	7	8	8[1]	9	8	9	E
	residual weed control	–	–	–	5	8	–	–	–	–	–	–	–	6	–	–	5	5	–	3	7	–	–	–	–	–	–	–	
OPTILL + glyphosate[3] + MERGE	emerged weeds	9	9	9	9	9	9	9	9	8	9	8	9	9	9	9	9	9[R]	7	9	9[R]	7/8	7	8	8[1]	9	8	9	E
	residual weed control	8	7	7	9[R]	9[R]	9	8	7	8	7	–	9	9[R]	9	9[R]	9[R]	8[R]	7	9	–	–	–	–	–	–	–	–	
PROWL H2O + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	9	9	9[R]	9	9	9	9	9	9[R]	8[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	E
	residual weed control	9	9	9	9	9	9	–	5	–	–	–	–	7	–	–	8	–	–	–	2	–	–	–	–	–	–	–	
TIEDOWN* + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	G
	residual weed control	9	9	8	8	9	9	9	5	7	7	5[6]	9	9	9	8[2]	9	8	7	7	8[2]	2	2	2	7	2	2	2	

[1] A glyphosate rate of 1.8 kg/ha is required to achieve this level of control.
[2] Use only on certified soybean seed designated as "Roundup Ready" Soybean.
[3] Numerous products exist. See Table 11–5. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.

TABLE 11–5. Soybean Herbicide Weed Control Ratings in Glyphosate Tolerant Soybeans (cont'd)

LEGEND: Numbers (0–9) = weed control ratings; Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor; – = insufficient information available to make a rating
* = sold as a co-pack under this trade name; R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

Trade Name	Stage	Grasses								Annual Broadleaves												Perennials							Crop Tolerance
		barnyard grass	crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades, annual	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Preplant Burndown Herbicides (cont'd)																													
VALTERA EZ + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	9	9	9[R]	8	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	G
	residual weed control	–	–	–	5	6	6	–	–	–	4	8	7	9	–	9	9	7	3	7	8	–	–	–	–	–	–	–	
ZIDUA SC + glyphosate[3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	9	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	7	8	8[1]	9	8	9	G
	residual weed control	9	9	8[2]	8	9	9	9	4	2	2	0	2	7	2	8[2]	8[2]	4	3	2	7[2]	0	0	0	8	0	0	0	
Postemergence Grass and Broadleaf Herbicides (no residual weed control) for "Roundup Ready" (Glyphosate Tolerant) Varieties Only																													
glyphosate[2,3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	E[2]
HURRICANE + + glyphosate[2,3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9	8[R]	9	8	7/8	7	8	8[1]	9	8	9	G[2]
Postemergence Tank-Mixes with residual weed control for "Roundup Ready" (glyphosate tolerant) varieties only																													
ASSIGNMENT*[,2]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	8	9	9[R]	7/8	5	8	8[1]	9	8	9	E[2]
	residual weed control	–	–	8	–	–	–	–	7	–	–	–	–	8[R]	–	9[R]	9[R]	–	5	8	0	0	0	0	–	0	0	0	
FIRSTRATE + glyphosate[2,3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	9[R]	9	9[R]	7/8	5	8	8[1]	9	8	9	E[2]
	residual weed control	0	0	0	0	0	0	0	0	7	9[R]	9[R]	–	2	9	2	2	9[R]	9[R]	9	0	–	2	–	–	2	7	7	
FLEXSTAR GT[2]	emerged weeds	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9	8[R]	9	8	7/8	7	8	8[1]	9	8	9	G[2]
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	8	–	–	–	–	–	–	–	–	–	–	
GUARDIAN MAX*[2,3]	emerged weeds	9	9	9	9	9	9	9	9	8	9	8[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	7/8	5	8	8	9	8	9	G[2]
	residual weed control	7	7	6	6[R]	6[R]	6	6	7	8	7	8[R]	8	7[R]	9	2	7[R]	7[R]	7[R]	7	0	5	3	8	8	5	5	5	

[1] A glyphosate rate of 1.8 kg/ha is required to achieve this level of control.
[2] Use only on certified soybean seed designated as "Roundup Ready" Soybean.
[3] Numerous products exist. See Table 11–5. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.

TABLE 11–6. Glyphosate Product Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant ("Roundup Ready") Soybean

LEGEND: a.i. = active ingredient ✓ **=** salt type — = not in product

	PRODUCT RATE					SALT TYPE		
Glyphosate Products	**0.9 kg/ha a.i.**	**1.35 kg/ha a.i.**	**1.8 kg/ha a.i.**	**Manufacturer**	**Rainfast**	**Dimethylamine**	**Isopropylamine**	**Potassium**
CREDIT XTREME (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	NUFARM	1 hour	—	✓	✓
CRUSH'R 540 (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	AGRI STAR	1 hour	—	—	✓
FACTOR 540 (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	IPCO	1 hour	—	—	✓
GLYFOS (360 g/L)	1 L/acre	1.5 L/acre	2 L/acre	CHEMINOVA	not specified	—	✓	—
MATRIX (480 g/L)	0.75 L/acre	1.13 L/acre	1.5 L/acre	IPCO	not specified	✓	—	—
POLARIS MAX (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	CORTEVA	1 hour	—	—	✓
ROUNDUP TRANSORB HC (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	MONSANTO	1 hour	—	—	✓
ROUNDUP WEATHERMAX (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	MONSANTO	1 hour	—	—	✓
STONEWALL (540 g/L)[1]	0.67 L/acre	1 L/acre	1.34 L/acre	WINFIELD	1 hour	—	—	✓
VP 480 (480 g/L)	0.75 L/acre	1.13 L/acre	1.5 L/acre	CORTEVA	not specified	✓	—	—

[1] IMPORTANT NOTE: Only tank-mix products containing the active ingredient "dicamba" (e.g. ENGENIA, FEXAPAN or XTENDIMAX) with a glyphosate product containing a potassium salt. Tank-mixing with other glyphosate products can increase the potential for off-target drift through volatilization. Refer to each product label in the tank-mix and follow the directions of the more restrictive label.

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer also to Chapter 6, Preplant & Postharvest Weed Control.			
• Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a "one pass" weed management program. Refer to Chapter 6, Preplant & Postharvest Weed Control, for preplant application rates for glyphosate. • It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (i.e., SENCOR, LOROX L) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
2,4-D (528 g/ha) + glyphosate (0.9 - 1.8 kg/ha)	2,4-D ESTER 700 (660 g/L) + glyphosate (540 g/L)*	0.8 L/ha (0.32 L/acre) + 1.67–3.3 L/ha (0.67–1.34 L/acre)	• Apply a minimum of 7 days before planting soybean. • Apply to emerged giant ragweed. This treatment will not provide residual control of giant ragweed. • **Do NOT** use in sandy soils with less than 1% organic matter. Plant soybean seeds as deep as possible, but not less than 2.5 cm (1 in.). Adjust planter to ensure adequate coverage of planted seed. • **Do NOT** graze or cut treated crops for forage or hay until 67 days after application. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
glyphosate (0.9 kg/ha) + imazepthapyr (0.1 kg/ha)	ASSIGNMENT (sold as a co-pack): RU WEATHERMAX (540 g/L) + PURSUIT (240 g/L)	1.67 L/ha (0.67 L/acre) + 420 mL/ha (168 mL/acre)	• See precautions for PURSUIT alone. • Some rotational cropping restrictions apply (see PURSUIT label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
pyraflufen-ethyl (6.1 g/L) (6.71 g/ha) + 2,4-D ester (473 g/L) (520 g/ha)	BLACKHAWK + glyphosate (540 g/L)*	1.1 L/ha (0.44 L/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PP or a maximum of 3 days after planting. • Apply to emerged, young, actively growing weeds that are less than 10 cm tall or across. • **Do NOT** use in sandy soils with less than 1% organic matter. Plant soybean seeds a minimum of 2.5 cm (1") deep. Adjust planter to ensure adequate coverage of planted seed. • **Do NOT** graze or cut treated crops for forage or hay until 67 days after application.
flumioxazin (95.8 g/ha) + metribuzin (416 g/ha) + glyphosate (900 g/ha)	BIFECTA (sold as a co-pack): VALTERA (51.1%) + TRICOR (75%) + glyphosate (540 g/L)*	187.5 g/ha (75 g/acre) + 555 g/ha (220 g/acre) + 1.34 L/ha (0.67 L/acre)	• Apply PP or PRE but no longer than 3 days after planting. Applications made to planted soybeans where the soil has begun to crack or where beans are emerged will result in severe crop injury. • The risk of crop injury is minimized when Valtera is used on well drained soils and planted to a depth of 4 cm or more • When using no-till planters with coulters that incorporate the soil, weed control may be reduced, therefore applications should be done after planting, but within 3 days of planting. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
s-metolachlor/metribuzin (1,443 g/ha–1943 g/ha) + glyphosate (0.9 kg/ha)	BOUNDARY LQD (628 g/L + 149 g/L) + glyphosate (540 g/L)*	1.85–2.5 L/ha (0.74–1 L/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PP or PRE. • **Do NOT** apply if soybeans have emerged. • **Do NOT** apply to coarse textured soils with less than 1% organic matter.

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer also to Chapter 6, Preplant & Postharvest Weed Control (cont'd).			
chlorimuron-ethyl (9 g ai/ha) + metribuzin (412 g/ha) + glyphosate (900 g/ha)	CANOPY PRO (sold as a co-pack): CLASSIC GRANDE (25 DF) + TRICOR 75 DF + glyphosate (540 g/L)*	36 g/ha (14.4 g/acre) + 550 g/ha (220 g/acre) + 1.67 L/ha (0.67 L/acre)	• Apply as a Pre-Plant burndown up to 14 days before planting • Some rotational restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • **Do NOT** use on sandy soils or on coarse soils with less than 2% organic matter. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
chlorimuron-ethyl(5.14%) /flumioxazin (40.6%) (80.5 g/ha) + glyphosate (0.9 kg/ha)	DILIGENT (sold as a co-pack): + glyphosate (540 g/L)*	176 g/ha (70.4 g/acre) + 1.67 L/ha (0.67 L/acre)	• Apply as a PP burndown. • Some rotational restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • Refer to precautionary statements for VALTERA. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
halauxifen (5 g/ha) + glyphosate (0.9 - 1.8 kg/ha)	ELEVORE (68.5 g/L) + glyphosate (540 g/L)* + methylated seed oil	73 mL/ha (29 mL/acre) + 1.67 L/ha (0.67 L/acre) + 5–10 L/1,000 L	• Apply a minimum of 7 days before planting soybeans and when weeds are actively growing at the 1–8 leaf stage. Plant to a minimum of 4 cm deep. • Applications made to very coarse-textured soils, low in organic matter (<3%) , or in fields with poor soil conidtions may increase the risk of crop injury. • Use the higher rate of methylated seed oil when weed populations are high or environmental conditions are unfavourable. • This tank-mix only controls weeds emerged at the time of application. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
saflufenacil (25 g/ha) + glyphosate (0.9 - 1.8 kg/ha)	ERAGON LQ (342 g/L) + glyphosate (540 g/L)* + MERGE	73 mL/ha (29.5 mL/acre) + 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE, from 21 days prior to planting up to three days after planting. • **Do NOT** use rates higher than 73 mL/ha (29.5 mL/acre) or crop injury may result. • For more consistent control of glyphosate resistant Canada fleabane, tank-mix SENCOR 75 DF at 550 g/ha (200 g/acre) or SENCOR 480 F 850 mL/ha (340 mL/acre) * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer also to Chapter 6, Preplant & Postharvest Weed Control (cont'd).			
tribenuron-methyl (7.5 g/ha) + glyphosate (450 g/ha)	EXPRESS SG (50%) + glyphosate (540 g/L)*	15 g/ha (6 g/acre) + 0.83 L/ha (0.33 L/acre)	• Apply as a PP burndown a minimum of 1 day prior to planting. Ideally weeds are less than 10 cm. tall at the time of application to maximize control. • Apply in a total spray volume of 55–110 L/ha (22–44 L/acre). • EXPRESS SG will not provide residual weed control, but will enhance control of certain broadleaf weeds, allowing for a lower rate of glyphosate to be used. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
flumioxazin/ pyroxasulfone (159.6 g/ha)	FIERCE (76%) + glyphosate (540 g/L)*	210 g/ha (85 g/acre) + 1.67–3.3 L/ha (0.67–1.34 L/acre)	• Apply PP or PRE but no longer than 3 days after planting. Applications made to soybeans that have begun to crack or are emerged will result in severe crop injury • The risk of crop injury is minimized when used on well drained soils and planted to a depth of 4 cm or more • When using no-till planters with coulters that incorporate the soil, weed control may be reduced, therefore applications should be done after planting, but within 3 days of planting. • Do not use FIERCE herbicide in soybeans in the same field that BOUNDARY, DUAL II MAGNUM or FRONTIER MAX will be used preemergee, or soybean injury may occur. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
fomesafen/glyphosate (1200 g/ha)	FLEXSTAR GT (67 g/L + 271 g/L)	3.5 L/ha (1.4 L/acre)	• Apply PP up to 7 days before planting and PRE. • **Do NOT** apply more than once per season and to any field in consecutive years. • Apply with Turbocharge at 0.25% v/v if weeds are emerged.
chlorimuron-ethyl (9 g ai/ha) + imazethapyr (75 g/ha) + glyphosate (900 g/ha)	FREESTYLE (sold as a co-pack): CLASSIC GRANDE (25 DF) + DUPONT IMAZETHAPYR (240 g/L) + glyphosate (540 g/L)*	 36 g/ha (14.4 g/acre) + 312 mL/ha (126 mL/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PP up to 14 days before planting • Some rotational restrictions apply (refer to CLASSIC and PURSUIT in Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
glyphosate (0.9 kg/ha) + chlorimuron-ethyl (9 g/ha)	GUARDIAN MAX (sold as co-pack): POLARIS MAX (540 g/L) + CLASSIC (25 DF)	 1.67 L/ha (0.67 L/acre) + 36 g/ha (14 g/acre)	• Apply as a PP burndown. • Some rotational restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • GUARDIAN MAX is a co-pack of POLARIS MAX + CLASSIC. • CLASSIC can only be applied once per growing season.

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer also to Chapter 6, Preplant & Postharvest Weed Control. (cont'd)			
saflufenacil (68 g/L)/ dimethenamid-P (600 g/L) (247 g/ha) + glyphosate (900 g/ha)	INTEGRITY (668 g/L) + glyphosate (540 g/L)* + MERGE	0.37 L/ha (0.15 L/acre) 1.67 L/ha (0.67 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE from 21 days prior to planting up to three days after planting. • **Do NOT** use rates higher than 0.15 L/acre, as crop injury may result. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
saflufenacil (17.8%) /imazethapyr (50.2%) (216 g/ha) + glyphosate (900–1,800 g/ha)	OPTILL (68%) + glyphosate (540 g/L)* + MERGE	147 g/ha (59 g/acre) + 1.67–1.3 L/ha (0.67–1.34 L/acre) + 1 L/ha (0.4 L/acre)	• Apply PP or PRE, from 21 days prior to planting up to three days after planting. • Provides early-season weed control. Refer to glyphosate label for recommended rate. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
pendimethalin (1,000 g/ha) + glyphosate (900 g/ha)	PROWL H2O (455 g/L) + glyphosate (540 g/L)*	2.2 L/ha (0.89 L/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PP. • Provides early-season weed control only. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
s-metolachlor (1.25 kg/ha) + metribuzin (0.420 kg/ha) + glyphosate (900 g/ha)	TIEDOWN (sold as a co-pack): UPI S-MET (960 g/L) + TRICOR (75%) + glyphosate (540 g/L)*	 1.3 L/ha (0.525 L/acre) + 0.56 kg/ha (0.225 kg/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PPI or PRE. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
flumioxazin (71.4–107.1 g/ha) + glyphosate (0.9 kg/ha)	VALTERA (51.1%) + glyphosate (540 g/L)*	140–210 g/ha (56–84 g/acre) + 1.67 L/ha (0.67 L/acre)	• Apply to coarse and medium textured soils. • Apply to soybeans prior to planting or within 3 days after planting but prior to soybean emergence. • Severe crop injury will result if applications are made to soybeans that have begun to crack through the soil surface or have emerged. • **Do NOT** within 100 metres of non-dormant pears. • **Do NOT** tank-mix with DUAL II MAGNUM, BOUNDARY or FRONTIER MAX. • Any tillage operation performed after application will reduce weed control. • Apply only **ONCE** per growing season. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	VALTERA EZ (480 g/L) + glyphosate (540 g/L)*	150 - 225 mL/ha (60- 90 mL/acre) + 1.67 L/ha (0.67 L/acre)	

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer also to Chapter 6, Preplant & Postharvest Weed Control. (cont'd)			
pyroxasulfone (125–246.5 g/ha)	ZIDUA SC (500 g/L) + glyphosate (540 g/L)*	250–493 mL/ha (100–197 mL/acre) + 1.67 L/ha (0.67 L/acre)	• Apply PP or PRE. For early season residual weed control, a postemergence application of glyphosate will likely be required. • Can also be tank-mixed with either ERAGON LQ and MERGE adjuvant or INTEGRITY + MERGE for the control of glyphosate resistant Canada fleabane. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
Postemergence Grass and Broadleaf Herbicides (no residual weed control) – "Roundup Ready" (Glyphosate Tolerant) Varieties Only			
glyphosate (0.9–1.8 kg/ha)	glyphosate (540 g/L)*	1.67–3.33 L/ha (0.67–1.34 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply between the first trifoliate leaf stage and the full flower stage of the soybeans. • Weeds are more easily controlled and weed competition avoided when applications are made when weeds are small, although weeds up to 25 cm tall will be controlled. • Sequential applications are desirable when there are perennial weeds emerging over a long period of time (i.e. sow-thistle, Canada thistle). • For best results, apply the second application 14 days after the first. • Apply when milkweed, perennial sow-thistle and Canada thistle are 15–60 cm. • Apply when nutsedge is 5–15 cm in height and at the high rate. • A second application may be made for later flushes emerging after the initial application. • Use 100–200 L/ha (40–80 L/acre) water. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	other glyphosate products	See Table 11–6.	
bentazon (320 g/L) (561.6 g/ha)/ acifluorfen (160 g/L) (280.8 g/ha)	HURRICANE (480 g/L) + glyphosate (360 g/L)*	1.755 L/ha (0.7 L/acre) + 2.5 L/ha (1–2 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply between the 1–2 triolfiate stage of soybean and to emerged weeds. • This tank-mix will control certain glyphosate resistant weeds (specifically: waterhemp and common ragweed) when applied at the six leaf stage of growth (<10 cm tall) or less.

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Tank-Mixes for Residual Weed Control – "Roundup Ready" (Glyphosate Tolerant) Varieties Only			
glyphosate (0.9–1.8 kg/ha) + imazepthapyr (0.038–0.05 kg/ha)	ASSIGNMENT (sold as a co-pack): RU WEATHERMAX (540 g/L) + PURSUIT (240 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 160–210 mL/ha (65–85 mL/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply up to the 3rd trifoliate stage of soybean. • Use **ONLY** once per season. • Other glyphosate products can be tank-mixed with PURSUIT or PHANTOM or NU-IMAGE to make up the same treatment. • Some rotational cropping restrictions apply (see PHANTOM or PURSUIT or NU-IMAGE label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops.
fomesafen/glyphosate (1200 g/ha)	FLEXSTAR GT	3.5 L/ha (1.4 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply between the 1–2 trifoliate stage of soybean. • Provides residual control of common ragweed and redroot pigweed. • If weeds are large or under stress then the addition of TURBOCHARGE at 0.25% v/v is required. • **Do NOT** apply to soybeans within 90 days of harvest.
glyphosate (0.45–0.9 kg/ha) + cloransulam-methyl (17.5 g/ha)	glyphosate (540 g/L)* + FIRSTRATE (84 WG)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 20.8 g/ha (8.5 g/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • The addition of FIRSTRATE will provide residual control of common ragweed, velvetleaf, cocklebur, jimsonweed and giant ragweed. • **Do NOT** apply to soybeans within 65 days of harvest. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
glyphosate (0.9–1.8 kg/ha) + imazethapyr (0.038–0.05 kg/ha)	glyphosate (540 g/L)* + PURSUIT (240 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 160–210 mL/ha (65–85 mL/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply up to the 3rd trifoliate stage of soybean. • Use only **ONCE** per season. • Some rotational cropping restrictions apply (see PURSUIT label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	glyphosate (540 g/L)* + PHANTOM (240 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 160–210 mL/ha (65–85 mL/acre)	
	glyphosate (540 g/L)* + NU-IMAGE (240 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 160–210 mL/ha (65–85 mL/acre)	

TABLE 11–7. Herbicide Treatment Rates for Glyphosate Tolerant ("Roundup Ready") Soybean (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Tank-Mixes for Residual Weed Control – "Roundup Ready" (Glyphosate Tolerant) Varieties Only (cont'd)			
glyphosate (0.9 kg/ha) + chlorimuron-ethyl (9 g/ha)	GUARDIAN MAX (sold as co-pack): POLARIS MAX (540 g/L) + CLASSIC (25 DF)	1.67 L/ha (0.67 L/acre) + 36 g/ha (14 g/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply up to the 3rd trifoliate stage of soybean. • Use **ONLY** once per season. • GUARDIAN is a co-pack of POLARIS + CLASSIC. • Some rotational cropping restrictions apply (see CLASSIC label and Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops).
Tank-Mixes to Address "Roundup Ready" Volunteer Corn in "Roundup Ready" (Glyphosate Tolerant) Soybean Varieties			
glyphosate (0.9–1.8 kg/ha) + quizalofop-p-ethyl (0.024 kg/ha)	glyphosate (540 g/L)* + ASSURE II (96 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 0.25 L/ha (0.1 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • The addition of ASSURE II is to control volunteer "Roundup Ready" corn. • Apply to volunteer corn up to 30 cm (12 in.) in height. • **Do NOT** apply to soybeans within 80 days of harvest. • SUREMIX may or may not be added to this tank-mix. If adding SUREMIX do so at a rate of 5 L/1,000 L water. • Volunteer "ENLIST" corn **WILL NOT** be controlled by this herbicide. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	glyphosate (540 g/L)* + CONTENDER (96 g/L)		
	glyphosate (540 g/L)* + YUMA GL (96 g/L)		
glyphosate (0.9–1.8 kg/ha) + clethodim (45 g/ha) + surfactant (0.5% v/v)	glyphosate (540 g/L)* + SELECT or STATUE or ANTLER (240 g/L) + AMIGO or CARRIER or X-ACT/ ADAMA ADJUVANT 80	1.67–3.33 L/ha (0.67–1.34 L/acre) + 190 mL/ha (75 mL/acre) + 5 L/1,000 L)	• For use ONLY with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply to volunteer corn at the 2–5 leaf stage. • SELECT, STATUE, ANTLER or ARROW ALL-IN will control all types of volunteer corn. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	glyphosate (540 g/L)* + ARROW ALL-IN (120 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 380 mL/ha (152 mL/acre)	
glyphosate (0.9–1.8 kg/ha) + fluazifop-p-butyl (0.075 kg/ha)	glyphosate (540 g/L)* + VENTURE (125 g/L)	1.67–3.33 L/ha (0.67–1.34 L/acre) + 0.6 L/ha (0.243 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • The addition of VENTURE is needed to control volunteer "Roundup Ready" corn. • Apply to volunteer corn at the 2–5 leaf stage. • Volunteer "ENLIST" corn **WILL NOT** be controlled by this herbicide. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
Preharvest – Refer to the Preharvest Treatments listed for Conventional (non GMO) Soybeans.			

Glufosinate Tolerant ("Liberty Link") Soybean

Weed Management Strategies for Glufosinate Tolerant Soybean

Strategies for weed management in glufosinate tolerant soybeans are similar to those outlined for glyphosate tolerant soybeans.

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 11–8. Soybean Herbicide Weed Control Ratings in Glufosinate Tolerant ("Liberty Link") Soybeans

LEGEND: Numbers (0–9) = weed control ratings Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor – = insufficient information available to make a rating
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

		Grasses								Annual Broadleaves												Perennials							
Trade Name	**Weed Stage**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtail, giant**	**foxtail, green**	**foxtail, yellow**	**witchgrass**	**proso millet**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**mustards**	**nightshades, annual**	**pigweeds**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**bindweed, field**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**	**Crop Tolerance**
Postemergence Grass and Broadleaf Herbicides and Tank-Mixes – "Liberty Link" (glufosinate tolerant) varieties only																													
LIBERTY[1]	emerged weeds	9	9	9	9	9	8	9	9	8	9	7	8	8	9	9	9	9	6	8	4	6	6	–	6	6	8	7	E[1]
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
LIBERTY[1] + BASAGRAN FORTÉ	emerged weeds	9	9	9	9	9	8	9	9	8	9	7	9	8	9	9	9	9	6	8	4	6	6	–	8	6	8	7	G[1]
LIBERTY[1] + FIRSTRATE	emerged weeds	9	9	9	9	9	8	9	9	8	9	9[R]	8	9	9	9	9	9	9[R]	8	4	6	6	–	6	6	8	7	E[1]
	residual weed control	0	0	0	0	0	0	0	0	–	9	9[R]	–	9[R]	–	2	9[R]	9[R]	9[R]	9	0	–	2	–	–	2	6	–	
LIBERTY[1] + HURRICANE	emerged weeds	9	9	9	9	9	8	9	9	8	9	7	8	8	9	9	9	9	6	8	8	6	6	–	6	6	8	7	G[1]
	residual weed control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
LIBERTY[1] + PURSUIT	emerged weeds	9	9	9	9	9	9	9	9	8	9	7	9	8	9	9	9	9	6	8	4	6	6	–	7	6	8	7	G[1]
	residual weed control	8	7	7	9[R]	9[R]	9	8	7	8	7[R]	2	9	8[R]	9	9[R]	9[R]	8[R]	6[R]	9	1	2	2	2	4	2	2	2	

[1] Use only on certified soybean seed designated as "Liberty-Link" Soybean.

TABLE 11–9. Herbicide Treatment Rates for Glufosinate Tolerant ("Liberty Link") Soybean

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer Table 11-5 for burndown and residual control herbicides, and refer also to Chapter 6, Preplant & Postharvest Weed Control.			
Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a "one pass" weed management program. Refer to Chapter 6, Preplant & Postharvest Weed Control for preplant application rates for glyphosate. It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (i.e., SENCOR, LOROX L) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
One Pass Strategies			
glufosinate ammonium (0.5 kg/ha)	LIBERTY 200 SN (200 g/L)	2.5 L/ha (1 L/acre)	· Use **ONLY** on soybean varieties that are tolerant to LIBERTY 200 SN. · LIBERTY 200 SN can be applied from the cotyledon to flowering stage of soybean. · LIBERTY 200 SN is a contact herbicide and has no residual activity. · Ammonium sulphate can be applied at 6 L/ha (2.4 L/acre) (liquid) or 3.3 kg/ha (1.3 kg/acre) (dry) for improved control of specific weeds. · **Do NOT** add oil or any other surfactants.
glufosinate ammonium (0.5 kg/ha) + bentazon (0.84 kg/ha)	LIBERTY 200 SN (200 g/L) + BASAGRAN FORTÉ (480 g/L)	2.5 L/ha (1 L/acre) + 1.75 L/ha (0.7 L/acre)	· Use **ONLY** on soybean varieties that are tolerant to LIBERTY 200 SN. · This tank-mix can be applied from the cotyledon to flowering stage of soybean. · This tank-mix consists of contact herbicides that have no residual activity. · Weeds should be targeted when small and actively growing (8 leaf stage or less).
glufosinate ammonium (0.5 kg/ha) + cloransulam-methyl (17.5 g/ha)	LIBERTY 200 SN (200 g/L) + FIRSTRATE (84 WG)	2.5 L/ha (1 L/acre) + 20.8 g/ha (8.5 g/acre)	· Use **ONLY** on soybean varieties that are tolerant to LIBERTY 200 SN. · This tank-mix can be applied from the cotyledon to flowering stage of soybean. · The addition of FIRSTRATE is for residual activity of labeled broadleaf weeds. · Weeds should be targeted when small and actively growing (6 leaf stage or less).
glufosinate ammonium (0.5 kg/ha) + imazethapyr (0.075 kg/ha)	LIBERTY 200 SN (200 g/L) + PURSUIT (240 g/L)	2.5 L/ha (1 L/acre) + 0.312 L/ha (0.126 L/acre)	· Use **ONLY** on soybean varieties that are tolerant to LIBERTY 200 SN. · This tank-mix can be applied from the cotyledon to flowering stage of soybean. · The addition of PURSUIT is for residual activity of labeled grass and broadleaf weeds. · Weeds should be targeted when small and actively growing (8 leaf stage or less).
Two Pass Strategies			
glufosinate ammonium (0.5 kg/ha) followed by glufosinate ammonium (0.4 kg/ha)	LIBERTY 200 SN (200 g/L) followed by LIBERTY 200 SN (200 g/L)	2.5 L/ha (1 L/acre) followed by 2 L/ha (0.8 L/acre)	· Use **ONLY** on soybean varieties that are tolerant to LIBERTY 200 SN. · LIBERTY 200 SN can be applied from the cotyledon to flowering stage of soybean. · Ideally, the first application is made between the uni-foliate and 2nd trifoliate stage of soybean, the second application is made between the 4th and 6th trifoliate stage of soybean.

Weed Control for Enlist Soybeans

Strategies for weed management in soybeans are similar to those outlined for glyphosate tolerant soybeans

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 11–10. Weed Control for Enlist Soybeans

LEGEND: Numbers (0–9) = weed control ratings Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor

	Grasses									Annual Broadleaves													Perennials							
Trade Name	barnyard grass	crabgrass, smooth	crabgrass, large	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada	Crop Tolerance
Postemergence Herbicides for Enlist Hybrids Only																														
ENLIST DUO	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	5	8	7	9	8	9	9	9	E

TABLE 11–11. Herbicide Treatment Rates for Enlist Soybeans

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Herbicides for Enlist Soybean Varieties Only			
2,4-D choline salt (194 g/L) glyphosate (204 g/L)	ENLIST DUO	2.9–4.3 L/ha (1.17–1.74 L/acre)	• Apply POST up to the full flowering stage (R2) • Make 1–2 applications with a minimum of 12 days between applications. • Two applications may be necessary for control of perennial weeds or late weed flushes that emerged after the initial application. • Apply as a coarse to extremely coarse spray (ASABE S-572 Standard). • Re-Entry interval is 48 hours after application. • Do not apply more than two post emergent applications per use season. • Do not apply more than 8.6 L/ha of ENLIST DUO per use season. • Read and follow the DAS Stewardship Program (http://www.traitstewardship.com) that accompanies the use of soybean seed containing the DAS-40278-9 gene.
2,4-D choline salt (194 g/L) glyphosate (204 g/L) + clethodim (45 g/ha)	ENLIST DUO + SELECT (240 g/L) + AMIGO	4.3 L/ha (11.74 L/acre) 190 mL/ha (75 mL/acre) + 5 L/1,000 L	• This tank-mix will control volunteer ENLIST corn in ENLIST soybean. • Apply when volunteer corn is in the 2–6 leaf stage. • STATUE or ARROW ALL-IN can be used in place of SELECT. Refer to the precatuionary notes for those herbicides in this chapter for more information around timing and application rates.

GLYPHOSATE AND DICAMBA TOLERANT ("ROUNDUP READY 2 XTEND™") SOYBEAN

Weed Management Strategies in Roundup Ready 2 Xtend Soybeans

Weed Management Strategies in Roundup Ready 2 Xtend Soybeans

The chosen herbicide program and timing of glyphosate + dicamba applications should be tailored to the target weed species and method of tillage in a given field. Always consider using additional herbicide modes of action or traditional residual herbicides as needed.

No-till/conservation tillage:

Use the high label rate of dicamba with glyphosate when applied pre-plant or preemergence. The high label rate of dicamba provides short term residual weed control of broadleaf weeds to assist in early weed removal.

Early weed removal and short term residual weed control with dicamba applied early at the high label rate provides the best chance to improve soybean yield compared to glyphosate only applications[1].

Conventional tillage:

Start clean with tillage and apply dicamba with glyphosate to small weeds (<10 cm or 4 inches), as the first in-crop herbicide application (emergence to 2nd trifoliate leaf stage).

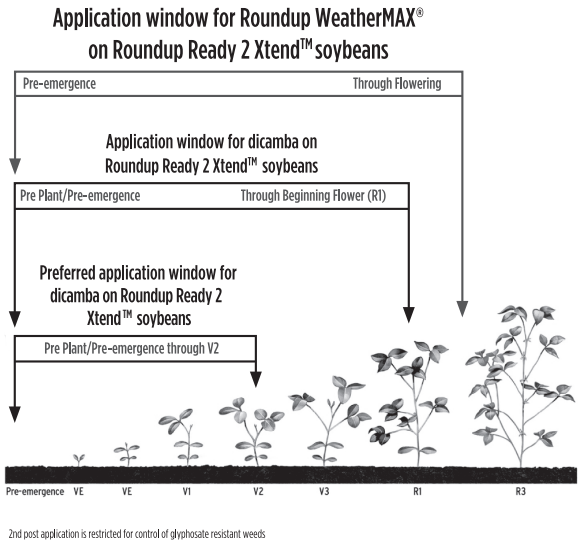
In fields with historically high weed pressure, a pre-emergence residual herbicide should be applied to minimize risk of yield loss due to early season weed competition.

Management of Glyphosate-Resistant Weeds

In Monsanto Canada and University of Guelph trials, dicamba has provided excellent control of giant ragweed, Canada fleabane and common ragweed[2].

Where glyphosate-resistant weeds exist, include an additional, effective mode of action in a tank mix or in sequential applications.

Window of Application



2nd post application is restricted for control of glyphosate resistant weeds

Application Requirements[3]

Choose nozzles that produce large droplets to minimize drift potential (examples below).

Droplet Sizes and Categories[1]

Category	Symbol	Colour Code	Approximate Volume Median Diameter (VMD) (microns)
Extremely Coarse	XC	White	429 - 622
Hypro Ultra Lo-Drift™ · AITT J60 TeeJet® · #8 MR Wilger · AI TeeJet® Air Induction (80°)			
Ultra-Coarse	UC	Black	> 622
Turbo TeeJet® Induction			

Use nozzles that produce Extremely Coarse to Ultra-Coarse droplets in the Roundup Ready® Xtend Crop System

[1]ASABE (American Society of Agricultural & Biological Engineers) Standard 572.1 http://www.teejet.com/media/408987/cat51-us_lores_all.pdf

- Apply when wind speed is between 3–15 km/h.
- Apply in minimum carrier volume of 100 L/ha (10 GPA).
- Select a ground speed below 25 km/h.
- Set boom to lowest effective height over the target.
- Do NOT apply during a temperature inversion.

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1 2008-2014 Bayer CropScience and University of Guelph field trials (n = 39).

2 giant ragweed (2010-2013) at 5 locations; Canada fleabane (2011-2013) at 6 locations; common ragweed (2013-2015) at 4 locations

3 Refer to dicamba herbicide label for more detailed application requirements.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.

GLYPHOSATE AND DICAMBA TOLERANT ("ROUNDUP READY 2 XTEND™") SOYBEAN

Weed Management Strategies in Roundup Ready 2 Xtend Soybeans

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavourable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Always refer to the product label for more information on registered weed species, product uses and precautions.

TABLE 11–12. Glyphosate and dicamba Tolerant ("Roundup Ready 2 Xtend") Soybean Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings
* sold as a co-pack under this trade name
Crop tolerance ratings: E = Excellent, G = Good, F = Fair, P = Poor
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.
– = insufficient information available to make a rating

Trade Name	Weed Stage	Annual Grasses									Annual Broadleaves													Perennials							Crop Tolerance
		barnyard grass	smooth crabgrass	large crabgrass	fall panicum	foxtail, giant	foxtail, green	foxtail, yellow	witchgrass	proso millet	buckwheat, wild	cocklebur	corn spurry	fleabane, Canada	lady's thumb	lamb's-quarters	mustards	nightshades, annual	pigweeds	ragweed, common	ragweed, giant	velvetleaf	waterhemp	bindweed, field	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada	
Soil Applied Broadleaf Herbicides for Dicamba Tolerant (Xtend) Varieties Only (Pre-plant or Preemergence timing only)																															
ENGENIA[2],FEXAPAN[2] or XTENDIMAX[2]	residual weed control	0	0	0	0	0	0	0	0	0	8	6	8	8	9	9	6	9	9	9	7	8	8	2	0	0	0	0	2	2	E[2]
Soil Applied Grass and Broadleaf Herbicides for Dicamba Tolerant (Xtend) Varieties Only (Pre-plant or Preemergence timing only)																															
TAVIUM[2]	residual weed control	9	9	9	8[2]	8	8	8	9	2	9	9	9	9	9	9	6	9	9	9	9[4]	9[4]	8	8[4]	0	0	8	9[4]	8[4]		E[2]
Postemergence Herbicides for Glyphosate and Dicamba Tolerant (Xtend) Varieties Only																															
ENGENIA[2],FEXAPAN[2] or XTENDIMAX[2]	emerged weed control	0	0	0	0	0	0	0	0	0	8	6	8	8	9	9	6	9	9	9	7	8	8	2	0	0	0	0	2	2	E[2]
glyphosate (540 g/L)[2,3]	emerged weed control	9	9	9	9	9	9	9	9	9	8	9	9	9[R]	8	9	9	9	9	9[R]	9[R]	9	8	7/8	5	8	8[1]	9	8	9	
One Pass Postemergence Tank-Mixes with Residual Weed Control for Glyphosate and Dicamba Tolerant (Xtend) Varieties Only																															
ENGENIA[2],FEXAPAN[2] or XTENDIMAX[2] + glyphosate[2,3]	emerged weed control	9	9	9	9	9	9	9	9	9	8	9	9	8	8	9	9	9	9	9	7	9	8	7/8	5	8	8[1]	9	8	9	E[2]
	residual weed control	0	0	0	0	0	0	0	0	0	8	6	8	8	9	9	6	9	9	9	7	8	8	2	0	0	0	0	2	2	
ROUNDUP XTEND[2]	emerged weed control	9	9	9	9	9	9	9	9	9	8	9	9	8	8	9	9	9	9	9	7	9	8	7/8	5	8	8[1]	9	8	9	E[2]
	residual weed control	0	0	0	0	0	0	0	0	0	8	6	8	8	9	9	6	9	9	9	7	8	8	2	0	0	0	0	2	2	

[1] A glyphosate rate of 1.8 kg/ha is required to achieve this level of control.

[2] Use only on certified soybean seed designated as "Roundup Ready 2 Xtend" Soybean.

[3] Numerous products exist. See Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.

[4] Weed must be emerged to achieve this level of control.

TABLE 11–13. Herbicide Treatment Rates for Roundup Ready 2 Xtend Soybeans

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Preplant Burndown Herbicides – Refer Table 11-5 for burndown and residual control herbicides, and refer also to Chapter 6, Preplant & Postharvest Weed Control.			
Non-selective herbicides such as glyphosate are used to control emerged weeds prior to no-till planting. Tank-mixing of a residual herbicide with glyphosate can be used to improve application efficiency with a “one pass” weed management program. Refer to Chapter 6, Preplant & Postharvest Weed Control for preplant application rates for glyphosate. It is also important to note that when targeting perennial weeds, the addition of a triazine-based herbicide (i.e., SENCOR, LOROX L) will reduce the level of activity achieved with glyphosate. Increasing the rate of glyphosate should overcome this antagonism.			
Soil Applied Broadleaf Herbicides for Dicamba Tolerant (Xtend) Varieties Only (Pre-plant or Preemergence timing only)			
dicamba (288–600 g/ha)	ENGENIA (600 g/L)	0.48–1 L/ha (0.19–0.4 L/acre)	• Can only be applied to dicamba/glyphosate tolerant soybean varieties (e.g., Roundup Ready 2 Xtend). Applications made to non “Xtend” soybean will result in complete plant death. • Apply POST up to the early flower stage of the crop (R1). • The highest rate can only be used once in a season. • **Do NOT** apply more than 3.36 L/ha of XtendiMax/FeXapan with VaporGrip Technology or 1.96 L/ha of Engenia in a single growing season. • Off-target drift mitigation (summary only: refer to the label for complete details): 1) Sprayer speed should be less than 25 km/hr. 2) Use nozzles that deliver an extremely coarse to ultra coarse droplets. 3) Boom height should be 50 cm or less above the crop canopy. 4) Do not spray during fog or a temperature inversion. 5) Spray when wind speeds are between 5 and 15 km/hr. 6) Spray when air temperatures are between 10 and 25˚C. 7) Avoid spraying during high humidity. 8) Do not add any acidifying agents or ammonium sulphate (AMS) to condition water prior to adding both products.
	FEXAPAN (350 g/L)	0.82–1.71 L/ha (0.33–0.68 L/acre)	
	XTENDIMAX (350 g/L)		
Soil Applied Grass and Broadleaf Herbicides for Dicamba Tolerant (Xtend) Varieties Only (Pre-plant or Preemergence timing only)			
dicamba (134 g/L) (563 g/ha)/ s-metolachlor (271 g/L) (1,125 g/ha)	TAVIUM (405 g/L)	4.15 L/ha (1.7 L/acre)	• Can only be applied to dicamba/glyphosate tolerant soybean varieties (e.g., Roundup Ready 2 Xtend). Applications made to non “Xtend” soybean will result in complete plant death. • Apply PP or PRE in a minimum of 100 L/ha (40 L/acre) and prior to weed emergence. • Apply in a tank-mixture with Roundup Weathermax or other glyphosate products formulated as a potassium salt (Table 11–6) if annual grasses, American and Eastern Black Nightshade or other perennial weeds are emerged at application. • Refer to off-target drift mitigation guidelines in the precautionary notes of dicmba in this section.

TABLE 11–13. Herbicide Treatment Rates for Roundup Ready 2 Xtend Soybeans (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Postemergence Herbicides for Glyphosate and Dicamba Tolerant (Xtend) Varieties Only			
dicamba (288–600 g/ha)	ENGENIA (600 g/L)	0.48–1 L/ha (0.19–0.4 L/acre)	• For use ONLY with certified soybean seed designated as "Roundup Ready 2 Xtend" soybeans. • Apply POST up to the early flower stage of the crop (R1). • The highest rate can only be used once in a season. • **Do NOT** apply more than 3.36 L/ha of XtendiMax/FeXapan with VaporGrip Technology or 1.96 L/ha of Engenia in a single growing season. • Off-target drift mitigation (summary only: refer to the label for complete details): 1) Sprayer speed should be less than 25 km/hr. 2) Use nozzles that deliver an extremely coarse to ultra coarse droplets. 3) Boom height should be 50 cm or less above the crop canopy. 4) Do not spray during fog or a temperature inversion. 5) Spray when wind speeds are between 5 and 15 km/hr. 6) Spray when air temperatures are between 10 and 25˚C. 7) Avoid spraying during high humidity. 8) Do not add any acidifying agents or ammonium sulphate (AMS) to condition water prior to adding both products.
	FEXAPAN (350 g/L)	0.82–1.71 L/ha (0.33–0.68 L/acre)	
	XTENDIMAX (350 g/L)		
glyphosate (0.9–1.8 kg/ha)	glyphosate (540 g/L)*	1.67–3.33 L/ha (0.67–1.34 L/acre)	• For use **ONLY** with pedigreed (certified) soybean seed designated as "Roundup Ready" soybeans. • Apply between the first trifoliate leaf stage and the full flower stage of the soybeans. • Weeds are more easily controlled and weed competition avoided when applications are made when weeds are small, although weeds up to 25 cm tall will be controlled. • Apply when milkweed, perennial sow-thistle and Canada thistle are 15–60 cm. • Apply when nutsedge is 5–15 cm in height and at the high rate. • A second application may be made for later flushes emerging after the initial application. • Use 100–200 L/ha (40–80 L/acre) water. * Numerous products exist, refer to Table 11–6. Glyphosate Products Rates, Manufacturer, Rainfast and Salt Type Labeled for Use on Glyphosate Tolerant "Roundup Ready" Soybean for a complete list of registered products.
	other glyphosate products	See Table 11–6.	
One Pass Postemergence Tank-Mixes with Residual Weed Control for Glyphosate and Dicamba Tolerant (Xtend) Varieties Only			
dicamba (288–600 g/ha) + glyphosate (900–2500 g/ha)	ENGENIA (600 g/L) + glyphosate (540 g/L)	0.48–1 L/ha (0.19–0.4 L/acre) + 1.67–4.67 L/ha (0.67–1.89 L/acre)	• Apply PP or PRE, for use ONLY with certified soybean seed designated as "Roundup Ready 2 Xtend" soybeans • The highest rate can only be used once in a season and is typically used at the PP or PRE timing to enhance burndown activity on glyphosate resistant weeds (e.g. Canada fleabane) and provide short term residual weed control. When the highest rate is applied PP or PRE, the lower rate should be used for POST timings. • **Do NOT** apply more than 3.36 L/ha of XtendiMax/FeXapan with VaporGrip Technology or 1.96 L/ha of Engenia in a single growing season. • Off-target drift mitigation (summary only: refer to the label for complete details): 1) Sprayer speed should be less than 25 km/hr. 2) Use nozzles that deliver an extremely coarse to ultra coarse droplets. 3) Boom height should be 50 cm or less above the crop canopy. 4) Do not spray during fog or a temperature inversion. 5) Spray when wind speeds are between 5 and 15 km/hr. 6) Spray when air temperatures are between 10 and 25˚C. 7) Avoid spraying during high humidity. 8) Do not add any acidifying agents or ammonium sulphate (AMS) to condition water prior to adding both products.
	FEXAPAN (350 g/L) + glyphosate (540 g/L)	0.82–1.71 L/ha (0.33–0.68 L/acre) + 1.67–4.67 L/ha (0.67–1.89 L/acre)	
	XTENDIMAX (350 g/L) + glyphosate (540 g/L)		

TABLE 11–13. Herbicide Treatment Rates for Roundup Ready 2 Xtend Soybeans (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
One Pass Postemergence Tank-Mixes with Residual Weed Control for Glyphosate and Dicamba Tolerant (Xtend) Varieties Only (Cont'd)			
dicamba (120 g/L) (300–600 g/ha) + glyphosate (240 g/L) (600–1,200 g/ha)	ROUNDUP XTEND	2.5–5 L/ha (1–2 L/acre)	• Can only be applied to dicamba/glyphosate tolerant soybean varieties (e.g., Roundup Ready 2 Xtend). Applications made to non "Xtend" soybean will result in complete plant death. • Apply to weeds less than 10 cm tall with a minimum spray volume of 100 L/ha (40 L/acre or 10 U.S. gal/acre). • The highest rate can only be used once in a season and is typically used at the PP or PRE timing. When the highest rate is applied PP or PRE, the lower rate should be used for POST timings. • Do NOT apply more than 10 L/ha (4 L/acre) of Roundup Xtend in a single growing season. • Off-target drift mitigation (summary only: refer to the label for complete details): 1) Sprayer speed should be less than 25 km/hr. 2) Use nozzles that deliver an extremely coarse to ultra coarse droplets. 3) Boom height should be 50 cm or less above the crop canopy. 4) Do not spray during fog or a temperature inversion. 5) Spray when wind speeds are between 5 and 15 km/hr. 6) Spray when air temperatures are between 10 and 25˚C. 7) Avoid spraying during high humidity. 8) Do not add any acidifying agents or ammonium sulphate (AMS) to condition water prior to adding Roundup Xtend.

12. OTHER FIELD CROPS

NOTES: Weed control ratings are given as 0–9 where 0 indicates no control and 9 indicates 90%–100% control under ideal conditions. Ratings are subjective values based on best available information and give general comparisons based on use as described in this guide. Under unfavorable conditions (e.g., too dry, too wet, too cold, or poor application) the herbicides may not be as effective as indicated. Ratings may vary with weed and crop stage and with the timing and rates of the product(s) being used. Please see product label for more information on registered weed species, product uses and precautions.

TABLE 12–1. Canola, Flax, Hemp, Millet, Mustard, Peanut, Sorghum, Sunflower Herbicide Weed Control Ratings

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

Trade Name	WSSA Group(s)	Crop							Annual Grasses									Annual Broadleaves													Perennials						
		canola	flax	hemp	mustard	peanuts	sorghum and millet	sunflowers	barnyard grass	crabgrass	fall panicum	foxtails	witchgrass	proso millet	wild oats	vol. corn	vol. cereals	buckwheat, wild	cocklebur	fleabane, Canada	lady's thumb	lamb's-quarters	wild mustard	nightshade, annual	pigweed	ragweed, common	ragweed, giant	velvetleaf	waterhemp	field bindweed	horsetail	milkweed	nutsedge	quackgrass	sow-thistle	thistle, Canada
Soil Applied Grass Herbicides																																				
EPTAM	8	x	✓	x	x	x	x	✓	9	9	9	9	9	7	8	–	–	4	2	0	7	7	5	7	7	5	3	5	–	–	–	–	8	5	–	–
DUAL II MAGNUM	15	x	x	x	x	✓	x	x	9	9	9	9	9	4	4	0	4	2	2	0	2	7	2	8	8	4	3	2	7	0	0	0	8	0	0	0
FRONTIER MAX	15	x	x	x	x	✓	x	x	9	9	9	9	9	4	4	0	4	2	2	0	2	7	2	8	8	4	3	2	7	0	0	0	8	0	0	0
TREFLAN, BONANZA, RIVAL or TRIFLUREX	3	✓	x	x	✓	x	x	✓	9	9	9	9	9	7	8	–	–	5	2	0	2	8	2	2	8	2	2	2	–	2	2	2	2	2	2	2
Soil Applied Broadleaf Herbicides																																				
AUTHORITY 480	14	x	✓	x	x	x	x	✓	–	–	–	–	–	–	–	–	–	9	–	–	–	9	–	9	9	4	–	–	6	–	–	–	–	–	–	–
CALLISTO	27	x	✓	x	x	x	✓	x	2	4	0	2	2	2	–	0	0	8	8	8	9	9	9	9	9	7	7	9	–	2	0	0	0	0	0	0
Soil Applied Grass and Broadleaf Herbicides																																				
EDGE	3	x	x	✓	x	x	x	x	8	8	8	8	8	–	6	–	6	8	–	–	–	8	–	–	8	–	–	–	–	–	–	–	–	–	–	–

[1] Use only on crops planted with certified canola seed designated as "Roundup Ready" canola. See Table 4–3. Glyphosate Products, Registered Uses and Rates Needed for a complete list of registered products.
[2] Use only on crops planted with certified canola seed designated as "Liberty Link" canola.
[3] Use only on crops planted with certified canola seed designated as "Pursuit Tolerant" canola products.
[4] Various formulations available, see Table 4–1, Herbicides Used in Ontario. See label for specific uses and rates.

TABLE 12–1. Canola, Flax, Millet, Mustard, Peanut, Sorghum, Sunflower Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

		Crop							Annual Grasses									Annual Broadleaves													Perennials						
Trade Name	**WSSA Group(s)**	**canola**	**flax**	**hemp**	**mustard**	**peanuts**	**sorghum and millet**	**sunflowers**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtails**	**witchgrass**	**proso millet**	**wild oats**	**vol. corn**	**vol. cereals**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**wild mustard**	**nightshades, annual**	**pigweed**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**field bindweed**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**
Postemergence Grass Herbicides																																				
ASSURE II, CONTENDER or YUMA GL	1	✓	✓	✓	x	x	x	x	9	8	9	9	9	9	–	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
DUAL II MAGNUM	1	x	x	x	x	x	✓	x	7	7	–	7	–	–	–	0	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
POAST ULTRA	1	✓	✓	x	✓	x	x	✓	9	8	9	9	9	9	8	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0
SELECT, STATUE, ANTLER or ARROW ALL-IN	1	✓	✓	x	x	x	x	✓	9	8	9	9	9	9	–	–	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
VENTURE L	1	✓	x	x	x	✓	x	✓	9	8	9	8	9	8	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0
Postemergence Broadleaf Herbicides																																				
BASAGRAN	6	x	✓	x	x	x	✓	x	0	0	0	0	0	0	0	0	0	7	9	5	9	7	9	7	7	8	6	9	1	6	2	2	8	0	6	7
BUCTRIL M, BADGE, LOGIC M or MEXTROL	4,6	x	✓	x	x	x	x	x	0	0	0	0	0	0	0	0	0	9	8	6	9	9	9	9	9	9	7	9	6	7	7	0	0	0	7	7
LONTREL XC	4	✓	x	x	x	x	x	x	0	0	0	0	0	0	0	0	0	8	–	9	3	5	0	–	5	8	9	–	9	3	–	–	0	0	8	8
MCPA	4	x	✓	x	x	x	x	x	0	0	0	0	0	0	0	0	0	2	7	7	0	9	9	–	9	9	9	7	6	7	7	0	0	0	7	7
MUSTER	2	✓	x	x	x	x	x	x	0	0	0	0	0	0	0	–	0	2	0	–	0	2	9	2	8	2	1	0	–	0	0	0	0	0	0	0
PARDNER, BROMAX, BROMOTRIL, BROTEX or KORIL	6	x	x	x	x	x	✓	x	0	0	0	0	0	0	0	0	0	9	7	–	9	9	8	9	8^R	9	–	9	–	7	0	0	0	0	7	7
PEAK + DICAMBA	2	x	x	x	x	x	✓	x	0	0	0	0	0	0	0	0	0	–	9	6	9	9	9	9	9	9	7	9	5	–	–	–	–	–	7	7

[1] Use only on crops planted with certified canola seed designated as "Roundup Ready" canola. See Table 4–3. Glyphosate Products, Registered Uses and Rates Needed for a complete list of registered products.
[2] Use only on crops planted with certified canola seed designated as "Liberty Link" canola.
[3] Use only on crops planted with certified canola seed designated as "Pursuit Tolerant" canola products.
[4] Various formulations available, see Table 4–1, Herbicides Used in Ontario. See label for specific uses and rates.

TABLE 12–1. Canola, Flax, Millet, Mustard, Peanut, Sorghum, Sunflower Herbicide Weed Control Ratings (cont'd)

LEGEND: Numbers (0–9) = weed control ratings – = insufficient information available to make a rating ✓ = can be used on this crop x = not indicated for use on this crop
R = populations resistant to this herbicide exist in Ontario and won't be adequately controlled if present.

		Crop							Annual Grasses									Annual Broadleaves												Perennials						
Trade Name	**WSSA Group(s)**	**canola**	**flax**	**hemp**	**mustard**	**peanuts**	**sorghum and millet**	**sunflowers**	**barnyard grass**	**crabgrass**	**fall panicum**	**foxtails**	**witchgrass**	**proso millet**	**wild oats**	**vol. corn**	**vol. cereals**	**buckwheat, wild**	**cocklebur**	**fleabane, Canada**	**lady's thumb**	**lamb's-quarters**	**wild mustard**	**nightshades, annual**	**pigweed**	**ragweed, common**	**ragweed, giant**	**velvetleaf**	**waterhemp**	**field bindweed**	**horsetail**	**milkweed**	**nutsedge**	**quackgrass**	**sow-thistle**	**thistle, Canada**
Postemergence Grass and Broadleaf Herbicides – For Use With Herbicide Tolerant Canola Varieties																																			
glyphosate[1]	9	✓[1]	x	x	x	x	x	x	9	9	9	9	9	9	9	9	9	8	9	9[R]	8	9	9	9	9	9[R]	8[R]	9	9[R]	7/8	5	8	8	9	8	9
LIBERTY[2]	10	✓[2]	x	x	x	x	x	x	9	9	9	9	9	9	8	–	–	8	9	7	8	9	9	9	9	9	–	8	5	6	6	–	6	6	8	7
PURSUIT, PHANTOM or NU-IMAGE[3]	2	✓[3]	x	x	x	x	x	x	8	7	7	9	8	7	8	–	–	8	7	2	9	9	9	9	9	8	6	9	2	2	2	2	4	5	2	2
Postemergence Tank-Mixes																																			
POAST ULTRA + BUCTRIL M[4]	1 +4,6	x	✓	x	x	x	x	x	9	8	9	9	9	9	8	8	7	9	8	6	9	9	9	9	8	9	7	9	6	7	7	–	–	6	7	7
POAST ULTRA + LONTREL	1+4	✓	x	x	x	x	x	x	9	8	9	9	9	9	8	8	7	8	–	9	3	5	0	–	5	8	9	–	9	3	–	–	0	6	8	8
POAST ULTRA + MCPA[4]	1+4	x	✓	x	x	x	x	x	9	8	9	9	9	9	8	8	7	2	7	7	0	9	9	–	9	9	9	7	6	7	8	0	0	6	7	7
POAST ULTRA + MUSTER	1+2	✓	x	x	x	x	x	x	9	8	9	9	9	9	8	8	7	2	0	–	0	2	9	2	8	2	–	0	–	0	0	0	0	6	0	0
SELECT (clethodim)[4] + BUCTRIL M[4]	1 +4,6	x	✓	x	x	x	x	x	9	8	9	9	9	9	–	–	–	9	8	6	9	9	9	9	8	9	7	9	6	7	7	–	–	7	7	7
VENTURE + LONTREL	1+4	✓	x	x	x	x	x	x	9	8	9	8	9	8	9	9	9	8	–	9	3	5	0	–	5	8	9	–	9	3	–	–	0	9	8	8
VENTURE + MUSTER	1+4	✓	x	x	x	x	x	x	9	8	9	8	9	8	9	9	9	2	0	–	0	2	9	2	8	2	–	0	–	0	0	0	0	9	0	0

[1] Use only on crops planted with certified canola seed designated as "Roundup Ready" canola. See Table 4–3. Glyphosate Products, Registered Uses and Rates Needed for a complete list of registered products.
[2] Use only on crops planted with certified canola seed designated as "Liberty Link" canola.
[3] Use only on crops planted with certified canola seed designated as "Pursuit Tolerant" canola products.
[4] Various formulations available, see Table 4–1, Herbicides Used in Ontario. See label for specific uses and rates.

Herbicide Treatments include:

- Preplant (PP) – Also see Chapter 6 *Preplant & Postharvest Weed Control,* for details of products, rates and remarks.
- Preplant Incorporated (PPI) – Two incorporations at right angles operating at a depth of 10 cm using a double disk (7–10 km/h) or vibrating shank S-tine cultivator (10–13 km/h) are required unless otherwise stated. Cultivation-type equipment used for herbicide incorporation is known to spread perennial weeds to previously uninfested areas. Ensure machines are clean and/or treat fields with perennial weeds last.
- Preemergence (PRE) – Rainfall of 15–20 mm within 10 days after application is necessary to activate preemergence treatments. Shallow cultivation, rotary hoeing or harrowing will control weed escapes and improves herbicide activity in the absence of rainfall.
- Postemergence (POST) – Leaf stage of the weeds is critical for good weed control. Smaller weeds are usually more sensitive to herbicide injury. Apply according to leaf stages specified on the pesticide label. Crop stage is important to optimize crop safety. Adjuvants will frequently improve the weed control when used as directed. Weather or other conditions may influence the optimum rate of adjuvant, see the product label for more details. Always use appropriate drift management technology.

TABLE 12–2. Herbicide Treatment Rates for Field Crops

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
CANOLA – WINTER AND SPRING PLANTED			
Canola – Soil Applied Grass Herbicides			
trifluralin (0.6–1.147 kg/ha)	TREFLAN EC (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI. • Strongly absorbed to soil particles, negligible leaching.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.4–0.76 L/acre)	
	BONANZA 480 (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	1.46–2.78 L/ha (0.58–1.1 L/acre)	
Canola – Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.072 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.375–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	• Apply to annual grasses and volunteer cereals in the 2 leaf to tillering stage and to quackgrass in the 2–6 leaf stage of growth. • Canola is tolerant at all growth stages. • **Do NOT** apply to canola within 64 days of harvest.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + XA OIL CONCENTRATE		
sethoxydim (0.15–0.2 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• Apply at 1–6 leaf stages of annual grasses. • Canola is tolerant at all growth stages.
sethoxydim (0.5 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• Use this rate for quackgrass control. • Thorough preplant tillage will provide more uniform quackgrass emergence. • Apply to quackgrass in the 1–3 leaf stage of growth.

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Canola – Postemergence Grass Herbicides (Cont'd)			
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000 L	• Canola is tolerant at all growth stages. • Apply to annual grasses and volunteer cereals in the 2–6 leaf stage of growth. • Suppression of quackgrass when applied at the higher dose. • Preharvest Interval (PHI) is 60 days. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT or STATUE.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-p-butyl (0.100 kg/ha)	VENTURE L (125 g/L)	0.8 L/ha (0.32 L/acre)	• For the control of volunteer cereals. • Apply at the 2–5 leaf stage of volunteer cereals.
fluazifop-p-butyl (0.125–0.175 kg/ha)	VENTURE L (125 g/L)	1.0–1.4 L/ha (0.4–0.57 L/acre)	• Apply to annual grasses in the 2–5 leaf stage of growth and 3–5 leaf stage of quackgrass. • Use the 1.4 L/ha (0.57 L/acre) rate for a mixed stand of annual grasses and quackgrass. • **Do NOT** apply VENTURE to canola later than the 5 leaf stage of crop growth.
Canola – Postemergence Broadleaf Herbicides			
clopyralid (0.15–0.2 kg/ha)	LONTREL XC (600 g/L)	0.25–0.33 L/ha (100-132 mL/acre)	• Use **only** on the following cultivars: CYCLONE, EBONY, JEWEL, 46A65 and HYOLA 401. • Apply one postemergence application per season at the 2–6 leaf stage of canola. • Apply to Canada thistle at the rosette to pre-bud stage.
ethametsulfuron-methyl (11 g/ha) + surfactant (0.2% v/v)	MUSTER (75 DF) + AGRAL 90	15 g/ha (6 g/acre) + 2 L/1,000 L	• **Do NOT** apply MUSTER to Polish varieties of canola as crop injury may result. • Apply when the wild mustard in the cotyledon to 6 leaf stages, before the crop begins to bolt. • **Do NOT** apply to winter planted canola. • **Do NOT** plant to any crop except winter wheat in the year of treatment. • **Do NOT** feed or graze treated crop within 60 days of application.
Canola – Postemergence Grass and Broadleaf Herbicides			
sethoxydim (0.15–0.2 kg/ha) + clopyralid (0.15–0.2 kg/ha) + surfactant/solvent (0.75–1 L/ha)	POAST ULTRA (450 g/L) + LONTREL XC (600 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 0.25–0.33 L/ha (100-132 mL/acre + 0.75–1 L/ha (0.3–0.4 L/acre)	• Apply when canola is between the 2–6 leaf stages. • LONTREL is used on the following cultivars **only**: CYCLONE, EBONY, JEWEL, 46A65 and HYOLA 401. • Add half the amount of water to tank, add the required amount of POAST ULTRA, and then add the required amount of LONTREL. Add MERGE last along with remaining amount of water to fill the tank.
sethoxydim (0.15–0.2 kg/ha) + ethametsulfuron-methyl (11 g/ha) + surfactant/solvent (0.75–1 L/ha)	POAST ULTRA (450 g/L) + MUSTER (75 DF) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 15 g/ha (6 g/acre) + 0.75–1 L/ha (0.3–0.4 L/acre)	• **Do NOT** apply to winter planted canola. • Apply when canola is between the 2 leaf stage and bolting. • Add MUSTER to the tank first and agitate. Once MUSTER is in suspension add the required amount of POAST ULTRA, followed by the correct amount of MERGE.

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Canola – Postemergence Grass and Broadleaf Herbicides (Cont'd)			
sethoxydim (0.15–0.2 kg/ha) + ethametsulfuron-methyl (11 g/ha) + clopyralid (0.15 kg/ha) + surfactant/solvent (0.75–1 L/ha)	POAST ULTRA (450 g/L) + MUSTER (75 DF) + LONTREL XC (600 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 15 g/ha (6 g/acre) + 0.25 L/ha (100 mL/acre) + 0.75–1 L/ha (0.3–0.4 L/acre)	• **Do NOT** apply to winter planted canola. • Apply when canola is between the 2 leaf stage and bolting. • Add MUSTER to the tank first and agitate. Once MUSTER is in suspension add the required amount of POAST ULTRA, followed by the correct amount of MERGE.
fluazifop-p-butyl 0.125–0.175 kg/ha + clopyralid (0.15–0.2 kg/ha)	VENTURE L (125 g/L) + LONTREL XC (600 g/L)	1.0–1.4 L/ha (0.4–0.57 L/acre) + 0.25–0.33 L/ha (100-132 mL/acre	• **Do NOT** apply VENTURE to canola later than the 5 leaf stage of crop growth. • LONTREL is to be used **ONLY** on the following cultivars: CYCLONE, EBONY, JEWEL, 46A65 and HYOLA 401. • Add VENTURE to the tank first and agitate before adding LONTREL L.
fluazifop-p-butyl (0.125–0.175 kg/ha) + ethametsulfuron-methyl (11 g/ha)	VENTURE L (125 g/L) + MUSTER (75 DF)	1.0–1.4 L/ha (0.4–0.57 L/acre) + 15 g/ha (6 g/acre)	• **Do NOT** apply to winter planted canola. • **Do NOT** apply VENTURE to canola later than the 5 leaf stage of crop growth. • **Do NOT** apply MUSTER tank-mix to Polish varieties of canola as crop injury may result. • Add MUSTER to the tank-mix first and agitate before adding VENTURE.
Canola – Postemergence Grass and Broadleaf Herbicides (for use with herbicide tolerant varieties only)			
glyphosate (0.297–0.45 kg/ha)	glyphosate (360 g/L)*	0.825–1.25 L/ha (0.33–0.5 L/acre)	• For use only with pedigreed (certified) canola seed designated as "Roundup Ready" canola. • Apply up to the 6 leaf stage of the canola. A second application may be made for later flushes emerging after the initial application and for improved results on perennial weeds. • The higher rate should be used when weeds are larger, when weed pressure is high and for perennial weeds. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)*	0.62–0.94 L/ha (0.25–0.38 L/acre)	
	glyphosate (540 g/L)*	0.55–0.83 L/ha (0.22–0.33 L/acre)	
glufosinate ammonium (0.50 kg/ha)	LIBERTY 200 SN (200 g/L)	2.5 L/ha (1 L/acre)	• LIBERTY 200 SN can be applied from the cotyledon to the early bolting stage of canola. • For use only with canola seed designated as "Liberty Link" canola. • Ammonium sulphate can be applied at 6 L/ha (2.4 L/acre) (liquid) or 3.3 kg/ha (1.3 kg/acre) (dry) for improved control of specific weeds. • **Do NOT** add oil or any other surfactants.
imazethapyr (0.075 kg/ha) + non ionic surfactant (0.25% v/v) + liquid fertilizer (2 L/ha)	PURSUIT (240 g/L) + non-ionic surfactant + liquid fertilizer 10-34-0, 28-0-0 or 32-0-0	0.312 L/ha (0.125 L/acre) + 2.5 L/1,000 L + 2 L/ha (0.8 L/acre)	• For use on imazethapyr tolerant (CLEARFIELD) canola only. • Apply early postemergence when the crop has at least one fully expanded leaf and before the weeds reach the 2 true leaf stage. • PURSUIT will provide residual weed control from soil activity. • Some rotational cropping restrictions apply, see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops, page 74.

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Canola – Postemergence Grass and Broadleaf Herbicides (for use with herbicide tolerant varieties only) (Cont'd)			
glyphosate (0.45 kg/ha) + clopyralid (0.10 kg/ha)	glyphosate (360 g/L)* + LONTREL XC (600 g/L)	1.25 L/ha (0.5 L/acre) + 167 mL/ha (67 mL/acre)	• For use only with certified canola seed designated as "Roundup Ready" canola. • Provides season long top growth control of Canada thistle and control of wild buckwheat. • Apply when canola is in the 2–6 leaf stage. • Apply in 100 L/ha (40 L/acre) of water. • For more information on weed controlled and rates, refer to the LONTREL and appropriate glyphosate product labels. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)* + LONTREL XC (600 g/L)	0.94 L/ha (0.38 L/acre) + 0.28 L/ha (0.11 L/acre)	
	glyphosate (540 g/L)* + LONTREL XC (600 g/L)	0.83 L/ha (0.33 L/acre) + 0.28 L/ha (0.11 L/acre)	
Canola – Preharvest			
glyphosate (0.9 kg/ha)	glyphosate (360 g/L)*	2.5 L/ha (1 L/acre)	• Apply in 50–100 L/ha (20–40 L/acre) water when the crop is less than 30% grain moisture, when pods are green to yellow and seeds are yellow to brown and 7–14 days prior to harvest and use ground application only. • **Do NOT** apply to seed crops. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)*	1.875 L/ha (0.75 L/acre)	
	glyphosate (540 g/L)*	1.67 L/ha (0.67 L/acre)	
Canola – Harvest-Aid			
saflufenacil (25.2–49.7 g/ha) + adjuvant	ERAGON LQ (342 g/L) + MERGE	73–146 mL/ha (29.5–59 mL/acre) + 1 L/ha (0.4 L/acre)	• Apply when 60–75% of seeds have changed colour • Apply in 200 L/ha (80 L/acre) of water. • Preharvest interval (PHI) is 3 days.
saflufenacil (25.2–49.7 g/ha) + glyphosate (900 g/ha) + adjuvant	ERAGON LQ (342 g/L) + glyphosate (360 g/L) MERGE	73–146 mL/ha (29.5–59 mL/acre) + 2.5 L/ha (1 L/acre) + 1 L/ha (0.4 L/acre)	• Apply when 60–75% of seeds have changed colour • Apply in 200 L/ha (80 L/acre) of water. • **Do NOT** apply to crops grown for seed. • Preharvest interval (PHI) is 3 days.
diquat (0.3–0.408 kg/ha) + surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25–1.7 L/ha (0.5–0.68 L/acre) + 1 L/1,000	• Apply when crop is 80%–90% seed turn (green to brown) stage. • Harvest no later than 14 days after herbicide application to avoid pod shatter. • Use higher rate for heavy canopy. • Use minimum of 225 L/ha spray volume. • **Drift** will injure adjacent crops or plants.
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY (240 g/L) + AGRAL 90		

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
FLAX			
Preplant (PP) – See Chapter 6 *Preplant & Postharvest Weed Control*, for details of products, rates and remarks.			
Flax – Soil Applied Broadleaf Herbicides			
sulfentrazone (105–140 g/ha)	AUTHORITY (480 g/L)	219–292 mL/ha (88–117 mL/acre)	· Apply PP or PRE but no later than 3 days after planting. · Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). · **Do NOT** apply to flax grown on coarse-textured (sandy) soils. · **Do NOT** apply to soils with organic matter greater than 6%. · **Do NOT** apply to soils with a pH greater than 7.8. · The highest use rate should be used when applied to soils with a pH of less than 7 and with organic matter greater than 3% but less than 6%.
mesotrione (140 g/ha)	CALLISTO (480 g/L)	0.3 L/ha (0.12 L/acre)	· Apply PRE. · If flax is emerged at time of application, severe injury will occur. · **Do NOT** graze treated immature crops or cut for forage or hay.
Flax – Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.072 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.375–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	· Apply to emerged annual grasses and volunteer cereals in the 2 leaf to tillering stage and to quackgrass in the 2–6 leaf stage of growth. · Use the 0.375 L/ha (0.15 L/acre) rate for control of volunteer corn, volunteer cereals and green foxtail. · The 0.5 L/ha (0.2 L/acre) rate provides suppression of quackgrass and will also control barnyard grass. · Use the 0.75 L/ha (0.3 L/acre) rate for control of quackgrass. · **Do NOT** apply to flax within 82 days of harvest.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + XA OIL CONCENTRATE		
sethoxydim (0.15–0.2 kg/ha) + oil concentrate (2 L/ha) or surfactant/solvent	POAST ULTRA (450 g/L) + ASSIST	0.32–0.47 L/ha (0.13–0.19 L/acre) + 2 L/ha (0.8 L/acre)	· **Do NOT** use on low-linolenic varieties. · Treat the 1–6 leaf stage of annual grass. · For annual grasses and volunteer cereals. · Use the higher rate when volunteer cereals are present. · Use MERGE for conditions or weeds requiring medium to high rates of POAST ULTRA. · Flax is tolerant at any stage of growth. · Apply using 110–200 L/ha of water (44–80 L/acre).
	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre)	
sethoxydim (0.5 kg/ha) + surfactant/solvent (1–2 L/ha)	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	· **Do NOT** use on low-linolenic varieties. · For quackgrass control. Thorough preplant tillage will ensure more uniform quackgrass emergence. · Apply using 100–200 L/ha of water (40–80 L/acre).

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Flax – Postemergence Grass Herbicides (cont'd)			
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000 L	• Apply when the annual grasses and volunteer cereals are in the 2–6 leaf stages. • Apply to quackgrass in the 2–5 leaf stages. Use the higher rate for control of quackgrass. • Flax is tolerant at any growth stage. • Preharvest Interval (PHI) is 60 days. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT or STATUE.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-p-butyl (0.075 kg/ha)	VENTURE L (125 g/L)	0.6 L/ha (0.24 L/acre)	• Apply at 2–4 leaf stage of annual grasses.
fluazifop-p-butyl (0.25 kg/ha)	VENTURE L (125 g/L)	2 L/ha 0.8 L/acre	• Apply at 3–5 leaf stage of quackgrass.
Flax – Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha) + oil concentrate (2 L/ha)	BASAGRAN (480 g/L) + ASSIST	1.75–2.25 L/ha (0.7–0.9 L/acre) + 2 L/ha (0.8 L/acre)	• Apply when flax is 5 cm or higher and weeds are small and actively growing. • Top growth of nutsedge and Canada thistle is controlled and field bindweed may be suppressed. Two applications of 1.75 L/ha (0.7 L/acre) (0.84 kg active/ha), 10 days apart may be required. • A new flush of weeds may emerge after the first flush has been controlled. • Cool weather or drought may reduce control. • Reduce oil concentrate to 1 L/ha (0.4 L/acre) under abnormally hot and humid weather conditions or temporary crop injury may occur.
bromoxynil/mcpa (0.56 kg/ha)	BUCTRIL M ((1:1) 560 g/L)	1 L/ha (0.4 L/acre)	• Apply when the flax is 5–10 cm high before weeds have developed beyond the 4 leaf stage. • **Do NOT** use if the daytime temperature is over 29°C.
	BADGE ((1:1) 450 g/L)	1.25 L/ha (0.5 L/acre)	
	LOGIC M ((1:1) 450 g/L)		
	MEXTROL ((1:1) 450 g/L)		
MCPA (0.5 kg/ha)	MCPA AMINE (500 g/L)*	1 L/ha (0.4 L/acre)	• Flax may be treated when 5 cm tall to bud stage. • Best weed control is obtained if the application is made when the weeds are small (approx. 5 cm tall).

* See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Flax – Postemergence Tank-mixes			
sethoxydim (0.15–0.2 kg/ha) + bromoxynil/ mcpa (0.56 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + BUCTRIL M ((1:1) 560 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre) + 1 L/ha (0.4 L/acre)	• Apply when flax is 5–10 cm high before weeds have developed beyond the 4 leaf stage. • **Do NOT** use if the daytime temperature is over 29°C. • Apply using 100–200 L/ha of water (40–80 L/acre).
	POAST ULTRA (450 g/L) + BADGE ((1:1) 450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1.25 L/ha (0.5 L/acre) + 1 L/ha (0.4 L/acre)	
	POAST ULTRA (450 g/L) + LOGIC M ((1:1) 450 g/L) + MERGE		
	POAST ULTRA (450 g/L) + MEXTROL ((1:1) 450 g/L) + MERGE		
sethoxydim (0.15–0.2 kg/ha) + MCPA (0.42–0.55 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + MCPA AMINE (500 g/L)* + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 0.84–1.1 L/ha (0.34–0.44 L/acre) + 1 L/ha (0.4 L/acre)	• Flax may be treated when 5 cm tall to bud stage. • Best weed control is obtained if the application is made when the weeds are small (approximately 5 cm tall). • Apply using 100–200 L/ha of water (40–80 L/acre). * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
clethodim (0.045 kg/ha) + bromoxynil/mcpa (0.56 kg/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + BUCTRIL M ((1:1) 560 g/L) + AMIGO	0.19 L/ha (0.076 L/acre) + 1 L/ha (0.4 L/acre) + 5 L/1,000 L	• Apply when flax is 5–10 cm high and weeds are in the seedling stage for best results. • **Do NOT** use if daytime temperature is over 25°C.
	SELECT (240 g/L) + BADGE ((1:1) 450 g/L) + AMIGO	0.19 L/ha (0.076 L/acre) + 1.25 L/ha (0.5 L/acre) + 5 L/1,000 L	
	SELECT (240 g/L) + LOGIC M ((1:1) 450 g/L) + AMIGO		
	SELECT (240 g/L) + MEXTROL ((1:1) 450 g/L) + AMIGO		

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Flax – Preharvest			
glyphosate (0.9 kg/ha)	glyphosate (360 g/L)*	2.5 L/ha (1 L/acre)	• Apply in 50–100 L/ha (20–40 L/acre) water when the crop is less than 30% grain moisture, when the majority of bolls are brown (75%–80%) and 7–14 days prior to harvest. • **Do NOT** apply to seed crops. * See Table 4–1. Herbicides Used in Ontario, for formulations available. See label for specific uses and rates.
	glyphosate (480 g/L)*	1.875 L/ha (0.75 L/acre)	
	glyphosate (540 g/L)*	1.67 L/ha (0.67 L/acre)	
diquat (0.3–0.408 kg/ha) + non-ionic surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25–1.7 L/ha (0.5–0.68 L/acre) + 1 L/1,000 L	• Apply when the crop is at 75% boll turn stage. • **Do NOT** apply to immature crop. • This application reduces dry down time and eliminates the need for swathing.
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY (240 g/L) + AGRAL 90		
INDUSTRIAL HEMP GROWN FOR FIBRE PRODUCTION			
Site Preparation Before Planting – See Chapter 6 Preplant & Postharvest Weed Control.			
Industrial Hemp – Soil applied Grass and Broadleaf Herbicides			
ethafluralin (0.85-1.1 kg/ha)	EDGE (5%)	Medium soils: 17 kg/ha (6.8 kg.acre) Heavy soils: 22 kg/ha (8.8 kg/acre)	• Apply prior to weed emergence and at least 10 days prior to seeding.. Emerged weeds should be destroyed by cultivation or via a burn- down with glyphosate. • Do not apply to soils with less than 2% organic matter or greater than 15% organic matter. • Apply to a soil surface free of large clods and incorporate in the same operation if possible. The first incorporation must be done within 24 hours of application. • Incorporate into the soil in two different directions. An even uniform layer of Edge Granular Herbicide treated soil is required to obtain optimum control of germinating weed seeds. Use a tandem disc, discer or field (vibra-shank type) cultivator set to work 8 to 10 cm deep for the first incorporation. The second incorporation should be a discing or cultivation in a cross direction also at 8 to 10 cm deep. Operate disc implements at 7 to 10 km/hr and cultivators at 10 to 13 km/hr. Failure to operate implements at recommended speeds and depths may result in erratic weed control due to poor distribution of herbicide in the soil. • NOTE: For more effective weed control, it is recommended that the second incorporation be delayed at least 3 days following the first incorporation. This allows time for greater release of the herbicide onto soil particles and assures more uniform distribution. • Since not all hemp varieties have been tested for tolerance to Edge, first use of this herbicide should be limited to a small area of each variety to confirm tolerance prior to adoption as a general field practice. Consult your seed supplier for information on the tolerance of specific varieties of hemp to Edge Herbicide.
	EDGE MICOACTIV (10%)	Medium soils: 8.5 kg/ha (2.72 kg.acre) Heavy soils: 11 kg/ha (4.4 kg/acre)	

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Industrial Hemp – Postemergence Grass Herbicides			
quizalofop-p-ethyl (0.036–0.07 kg/ha) + oil concentrate (0.5% v/v)	ASSURE II (96 g/L) + SURE-MIX	0.38–0.75 L/ha (0.15–0.3 L/acre) + 5 L/1,000 L	• Make one application per year. Apply to emerged annual grasses and volunteer cereals when the crop is at the 2–6 crop leaf stage (6–25 cm in height). • Use the 0.38 L/ha (0.15 L/acre) rate of ASSURE II for control of volunteer corn, volunteer cereals and green foxtail. • The 0.5 L/ha (0.2 L/acre) rate of ASSURE II will suppress quackgrass and also control barnyard grass. • Use the 0.75 L/ha (0.3 L/acre) rate of ASSURE II for control of quackgrass. • Use a minimum of 100 litres of water/ha with a spray pressure of 210–275 kPa.
	CONTENDER (96 g/L) + CONTENDER MSO		
	YUMA GL (96 g/L) + XA OIL CONCENTRATE		
MUSTARD			
Preplant (PP) – See See Chapter 6 Preplant & Postharvest Weed Control, for details of products, rates and remarks.			
Mustard – Soil Applied Grass and Broadleaf Herbicides			
trifluralin (0.6–1.147 kg/ha)	TREFLAN EC (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI. • Strongly absorbed to soil particles, negligible leaching. • **Do NOT** use on sandy soils. • Can be applied immediately prior to, or up to 3 weeks before planting.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.4–0.76 L/acre)	
	BONANZA 400 (400 g/L)	1.5–2.75 L/ha (0.6–1.1 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	1.46–2.78 L/ha (0.58–1.1 L/acre)	
Mustard – Postemergence Grass Herbicides			
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000 L	• Apply when the annual grasses and volunteer cereals are in the 2–6 leaf stages. • Apply to quackgrass in the 2–5 leaf stages. Use the higher rate for control of quackgrass. • Preharvest Interval (PHI) is 60 days. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT or STATUE.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380–760 mL/ha (152–304 mL/acre)	
sethoxydim (0.15–0.2 kg/ha) + oil concentrate (2 L/ha)	POAST ULTRA (450 g/L) + ASSIST	0.32–0.47 L/ha (0.13–0.19 L/acre) + 2 L/ha (0.8 L/acre)	• Treat the 1–6 leaf stage of annual grass. • For annual grasses and volunteer cereals. • Use the higher rate when volunteer cereals are present. • Use MERGE for conditions or weeds requiring medium to high rates of POAST ULTRA. • Apply using 110–200 L/ha of water (44–80 L/acre).
sethoxydim (0.15–0.2 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre)	
sethoxydim (0.5 kg/ha) + surfactant/solvent	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• For quackgrass control. Thorough preplant tillage will ensure more uniform quackgrass emergence. • Apply using 100–200 L/ha of water (40–80 L/acre).

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Mustard – Preharvest			
diquat (0.3–0.408 kg/ha) + surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25–1.7 L/ha (0.5–0.68 L/acre) + 1 L/1,000 L	· Apply when crop is 60%–75% seed turn (green to brown) stage. · Harvest no later than 14 days after herbicide application to avoid pod shatter. · Use higher rate for heavy canopy. · Use minimum of 225 L/ha spray volume. · Drift will injure adjacent crops or plants.
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY (240 g/L) + AGRAL 90		
PEANUTS			
Preplant (PP) – See See Chapter 6 Preplant & Postharvest Weed Control, for details of products, rates and remarks.			
Peanuts – Preemergence Grass Herbicides			
dimethenamid (544–619 g/ha)	FRONTIER MAX (720 g/L)	756–860 mL/ha (302–344 mL/acre)	· Apply PPI. · Peanuts should be seeded at least 4 cm deep or crop injury may occur. · **Do NOT** apply within 80 days of harvest.
s-metolachlor/benoxacor (1,050–1,418 g/ha)	DUAL II MAGNUM (915 g/L)	1.15–1.55 L/ha (0.46–0.62 L/acre)	· Use the higher rate of DUAL II MAGNUM for heavier weed infestations. · For optimum yellow nutsedge control, apply DUAL II MAGNUM as a pre-plant incorporated application. · **Do NOT** graze of feed peanut forage or fodder to livestock for 30 days following application. · **Do NOT** harvest crop within 90 days of application. · Application of DUAL II MAGNUM may result in injury to the peanut crop which may include stand loss, delayed maturity and loss of yield.
Peanuts – Postemergence Broadleaf Herbicides			
bentazon (1.08 kg/ha) + oil concentrate (2 L/ha)	BASAGRAN (480 g/L) + ASSIST	2.25 L/ha (0.9 L/acre) + 2 L/ha (0.8 L/acre)	· Apply when peanuts are in the unifoliate to 4th trifoliate leaf stage and when weeds are small and actively growing. · Many annual broadleaf weeds including velvetleaf (15 cm/up to 6 leaf), smartweed (20 cm/up to 10 leaf) and cocklebur (30 cm/up to 10 leaf) are controlled. · Top growth of Canada thistle and yellow nutsedge is controlled and field bindweed may be suppressed but 2 applications of BASAGRAN at 1.75 L/ha (0.7 L/acre) 10 days apart may be required. · A new flush of weeds may emerge after the first flush has been controlled. · Temporary crop injury may occur under abnormally cool or hot, humid conditions. Reduce rate of oil concentrate to 1 L/ha (0.4 L/acre) when those conditions occur. Cool weather or drought may delay or reduce control.
Peanuts – Postemergence Grass Herbicides			
fluazifop-p-butyl (0.100 kg/ha)	VENTURE L (125 g/L)	0.8 L/ha (0.32 L/acre)	· For the control of volunteer cereals. · Apply at the 2–5 leaf stage of volunteer cereals. · Pre Harvest Interval – 40 days · ONLY one application per season

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Peanuts – Postemergence Grass Herbicides (cont'd)			
fluazifop-p-butyl (0.125–0.175 kg/ha)	VENTURE L (125 g/L)	1.0–1.4 L/ha (0.4–0.57 L/acre)	• Apply to annual grasses in the 2–5 leaf stage of growth and 3–5 leaf stage of quackgrass. • Use the 1.4 L/ha (0.57 L/acre) rate for a mixed stand of annual grasses and quackgrass. • Pre Harvest Interval – 40 days • ONLY one application per season
SORGHUM AND MILLET (GRAIN)			
Preplant (PP) – See See See Chapter 6 Preplant & Postharvest Weed Control, page 91, for details of products, rates and remarks.			
Sorghum and Millet (Grain) – Soil Applied Broadleaf Herbicides			
mesotrione (140 g/ha)	CALLISTO (480 g/L)	0.3 L/ha (0.12 L/acre)	• Apply 7–14 days prior to sorghum and pearl millet planting. • Application to emerged sorghum or pearl millet can result in severe crop injury. • Apply up to the 2-leaf stage of weeds. • **Do NOT** apply to pearl millet or sorghum grown in coarse textured soils or to sudangrass, or sorghum-sudangrass hybrids.
Sorghum and Millet (Grain) – Postemergence Broadleaf Herbicides			
bentazon (0.84–1.08 kg/ha)	BASAGRAN FORTÉ (480 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	• Apply when the crop is at the 3–6 leaf stage. • Annual weeds should be targeted at the 4–6 leaf stage. • A new flush of weeds may emerge after the first flush has been controlled. • Cool weather or drought may reduce control. • Reduce oil concentrate to 1 L/ha (0.4 L/acre) under abnormally hot and humid weather conditions or temporary crop injury may occur. • **Do NOT** apply within 100 days of harvest.
bromoxynil (0.28 kg/ha)	PARDNER (280 g/L)	1 L/ha (0.4 L/acre)	• Apply when the crop is at or beyond the 4 leaf stage and less than 20 cm in height. • One application per year. • **Do NOT** apply within 100 days of harvest.
	BROMOXYNIL (240 g/L)*	1.2 L/ha (0.48 L/acre)	
	BROMOXYNIL (480 g/L)*	0.6 L/ha (0.24 L/acre)	
prosulfuron (10 g/ha) + non-ionic surfactant (0.2% v/v)	PEAK (75 WG) + AGRAL 90	13.3 g/ha (5.3 g/acre) + 2 L/1,000 L	• Apply when the crop is between 3–5 leaf stage. • Best results when applied to actively growing weeds in the 1–6 leaf stage. • **Do NOT** apply by air. • Make **ONLY** one application per year.
Sorghum and Millet (Grain) – Postemergence Grass Herbicides			
s-metolachlor/benoxacor (572 g/ha)	DUAL II MAGNUM (915 g/L)	625 mL/ha (253 mL/acre)	• Apply after crop emergence but before weed emergence (typically the 1–3 leaf stage of sorghum). A stale seedbed will minimize the amount of weeds emerged at time of application. • For use in pearl millet that is intended for **ANIMAL FEED ONLY**. **Do NOT** apply to grain millet that is intended for **HUMAN CONSUMPTION**. • **Do NOT** harvest pearl millet for forage within 45 days of application. • **Do NOT** harvest pearl millet for grain within 130 days of application. • Application of DUAL II MAGNUM will result in injury to the pearl millet crop which may include stand loss, delayed maturity and loss of yield. • Millet should be seeded at least 2.5 cm deep or crop injury may result.

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
SUNFLOWERS			
• Cultural control of weeds in sunflowers can be used successfully, but only if weeds are also controlled in other crops in the rotation. There are several tillage options in the sunflower crop. • Preplant tillage can control 1 or 2 flushes of early germinating weeds. Plant sunflowers immediately after the last tillage operation. • A rotary hoe set to cultivate shallow can be effective in removing annual weeds that are just emerging. It is not very useful for controlling well-rooted seedlings. • Spring tooth harrows can be used to control small weeds when sunflowers are in the 4–6 leaf stages. There will be some damage to sunflowers and larger weeds will not be well controlled. • One or 2 cultivations with a row crop cultivator are the most common form of cultural control. Sunflowers have to be big enough to withstand burial. Lateral roots on sunflowers are shallow, so avoid cultivating too deep or too close to plants.			
Sunflowers – Soil Applied Grass Herbicides			
EPTC (3.4 kg/ha)	EPTAM (800 g/L)	4.25 L/ha (1.7 L/acre)	• Apply PPI. • **Do NOT** use on light sandy soils with less than 3% organic matter.
trifluralin (0.6–1.155 kg/ha)	TREFLAN EC (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	• Apply PPI.
	RIVAL (500 g/L)	1.2–2.3 L/ha (0.48–0.92 L/acre)	
	BONANZA 480 (480 g/L)	1.25–2.4 L/ha (0.5–0.96 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	1.46–2.78 L/ha (0.58–1.1 L/acre)	
Sunflower – Soil Applied Broadleaf Herbicides			
sulfentrazone (105–140 g/ha)	AUTHORITY (480 g/L)	219–292 mL/ha (88–117 mL/acre)	• Apply PP or PRE but no later than 3 days after planting. • Some rotational cropping restrictions apply (see Table 4–4. Herbicide Crop Rotation and Soil pH Restrictions: Field Crops). • **Do NOT** apply to flax grown on coarse-textured (sandy) soils. • **Do NOT** apply to soils with organic matter greater than 6%. • **Do NOT** apply to soils with a pH greater than 7.8. • The highest use rate should be used when applied to soils with a pH of less than 7 and with organic matter greater than 3% but less than 6%.
Sunflowers – Postemergence Grass Herbicides			
sethoxydim (0.15–0.2 kg/ha) + oil concentrate (2 L/ha)	POAST ULTRA (450 g/L) + ASSIST	0.32–0.47 L/ha (0.13–0.19 L/acre) + 2 L/ha (0.8 L/acre)	• Treat the 1–6 leaf stage of annual grass. • For annual grasses and volunteer cereals. • Use the higher rate when volunteer cereals are present. • Use MERGE for conditions or weeds requiring medium to high rates of POAST ULTRA. • Apply using 110–200 L/ha of water (44–80 L/acre).
sethoxydim (0.15–0.2 kg/ha) + surfactant/solvent (1 L/ha)	POAST ULTRA (450 g/L) + MERGE	0.32–0.47 L/ha (0.13–0.19 L/acre) + 1 L/ha (0.4 L/acre)	
sethoxydim (0.5 kg/ha) + surfactant/solvent	POAST ULTRA (450 g/L) + MERGE	1.1 L/ha (0.45 L/acre) + 1–2 L/ha (0.4–0.8 L/acre)	• For quackgrass control. Thorough preplant tillage will ensure more uniform quackgrass emergence. • Apply using 100–200 L/ha of water (40–80 L/acre).

TABLE 12–2. Herbicide Treatment Rates for Field Crops (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 4, Herbicides Used in Ontario and Chapter 5, Notes on Adjuvants.
Sunflowers – Postemergence Grass Herbicides (cont'd)			
clethodim (45-90 g/ha) + surfactant (0.5% v/v)	SELECT (240 g/L) + AMIGO	188--375 mL/ha (75-150 mL/acre) + 5 L/1,000 L	• Apply when the annual grasses and volunteer cereals are in the 2–6 leaf stages. • Apply to quackgrass in the 2–5 leaf stages. Use the higher rate for control of quackgrass. • Allow 72 days between application and harvest. • ARROW ALL-IN has an adjuvant included in its formulation, therefore does not require the addition of an adjuvant that is required when using SELECT or STATUE.
	STATUE (240 g/L) + CARRIER		
	ANTLER (240 g/L) + X-ACT or ADAMA ADJUVANT 80		
	ARROW ALL-IN (120 g/L)	380-760 mL/ha (152-304 mL/acre)	
fluazifop-p-butyl (0.075 kg/ha)	VENTURE L (125 g/L)	0.6 kg/ha (0.24 L/acre)	• This rate is for control of volunteer corn only. • Apply at 2–5 leaf stage of the volunteer corn.
fluazifop-p-butyl (0.125–0.18 kg/ha)	VENTURE L (125 g/L)	1.0–1.4 L/ha (0.4–0.57 L/acre)	• Apply at 2–4 leaf stage of annual grasses and at 3–5 leaf stage quackgrass.
Sunflowers – Harvest-Aid			
diquat (0.3 kg/ha) + surfactant (0.1% v/v)	REGLONE DESICCANT (240 g/L) + AGRAL 90	1.25 L/ha (0.5 L/acre) + 1 L/1,000 L	• REGLONE may be used to reduce the period of time from maturity to harvest, to speed up harvesting, and decrease seed moisture at harvest. • Spray when seeds reach maturity (20–50% seed moisture). • Combine 15–20 days after spraying. • Beware of drift to adjacent crops or plants. • See Chapter 4, Herbicides Used in Ontario, for comments on aerial application.
	BOLSTER DESICCANT (240 g/L) + AGRAL 90		
	ARMORY (240 g/L) + AGRAL 90		
TOBACCO			
Tobacco – Post Transplant Herbicides			
Apply in 150–300 L/ha (60–120 L/acre) water.			
napropamide (1.125–2.25 kg/ha)	DEVRINOL DF (50 DF)	2.25–4.5 kg/ha (0.9–1.8 kg/acre)	• Apply immediately following transplanting in a 25–30 cm band over the transplants. • Use lower rates on lighter soils. • For best results, lightly incorporate or apply irrigation if rainfall does not occur within 2 days of application. • After harvest, soil should be worked at right angles to the rows to prevent injury to succeeding crops. Small grains may be seeded in the fall to prevent soil erosion. These grains may be stunted but not otherwise affected.
	DEVRINOL DF-XT (50 DF-XT)		
fluazifop-p-butyl (0.075–0.125 kg/ha)	VENTURE L (125 g/L)	0.6–1 L/ha (0.24–0.4 L/acre)	• May be applied up to 45 days to harvest.

13. APPENDICES

APPENDIX A. Contributors to Pub 75A Guide to Weed Control, 2020-2021

Members of the Ontario Weed Committee

Ontario Ministry of Agriculture, Food and Rural Affairs
M. Cowbrough (Chair, Editor of Pub 75A)
K. Obeid (Treasurer)

Ontario Pesticides Advisory Committee
A. Hamill, Harrow

University of Guelph
Plant Agriculture
F. Tardif, Guelph
D. Robinson, Ridgetown
P. Sikkema, Ridgetown

Agriculture and Agri-Food Canada
R. Nurse, Harrow
E. Page, Harrow

Contributing Members

J. Ashigh
M. Bakker
C. Budd
N. Cain
D. Campbell
T. Cholette
J. Ferguson
J. Ferrier
L. Freitag
T. Frey
M Griffiths
A. Hayward
H. Leigh
P. Lynch
C. Murphy
P. Pentland

Contributing Members (cont'd)

D. Petker
A. Pfeffer
G. Quesnel
A. Scott

Farm and Commodity Group Members

Innovative Farmers Association of Ontario
D. Gowan

Grain Farmers of Ontario
M. Vermey

APPENDIX B. Weed Control Glossary

Acid Equivalent (abbreviation – a.e.) (2,4-D, glyphosate) – the active part of the acid herbicide being used – usually indicated in grams/L on the label.

Active Ingredient – the chemical in a formulated product that is responsible for the herbicide effects.

Adjuvant – an ingredient added to a herbicide formulation or spray mixture to aid or modify the action of the herbicide, or the physical characteristics of the mixture.

Amine – acid or anionic herbicides can be formulated as ammonium salts or amines. 2,4-D amines are relatively non-volatile under most climatic conditions.

Annual Plant – completes its life cycle within a one-year period. Summer annuals complete their life cycle between spring and fall. Winter annuals germinate in fall, overwinter and then flower and complete their life cycle the following spring or summer.

Band Treatment – a herbicide applied as a narrow strip over the crop row, usually followed by inter-row cultivation.

Biennial Plant – completes its life cycle within a two-year period. Germinates in the spring, overwinters, flowers the following spring or summer and dies back the following fall.

Carrier – the diluent or material added to a herbicide product to facilitate its even distribution over the target area. The carrier is often water but it may also be granular products, oil or other solvents.

Compatible – compounds or formulations that can be mixed and applied together without undesirably altering their separate effects or the physical properties of the mixture.

Contact Chemicals – chemicals that kill only the parts of the plant on which they are sprayed. Movement within the plant is minimal.

Cotyledons – the seed leaves. Often visible when large seeds are opened. These are the first leaves visible in the germinated seedling. Broad-leaved crops or weeds have two cotyledons (dicots). Grasses (monocots) have one.

Directed Treatment – a treatment directed onto the weeds or soil in such a manner as to avoid contact with the crop.

Dormant – a resting stage similar to the condition of a plant during the winter.

Emergence – the time at which the seedling first appears above the ground.

Escape – a plant in a treated area that has been missed or survived the treatment.

Ester – some acid herbicides are reacted with alcohols to produce ester formulations. Ester formulations of 2,4-D and related herbicides can vaporize under hot conditions after treatment and cause unwanted damage by moving away from the treated area.

Formulation – means the same as Product – an active ingredient processed with other materials or formulants to make it easier to apply and/or more effective. Herbicides are rarely sold as pure active ingredients (2,4-D acid), they are sold as formulated mixtures (i.e., 2,4-D amine, sodium salt or ester with added emulsifiers, adjuvants, carriers, etc.).

GMO – a genetically modified organism (GMO) is an organism whose genetic material has been altered using genetic engineering techniques as opposed to traditional breeding methods.

GPS – global positioning system (GPS) is a space based global navigation satellite system that provides location and time information. It's primary application in pest management has been for accurate navigation of equipment so as to minimize the overlaps of pesticide applications.

Half-Life – the time required for 50% of a herbicide to be degraded or inactivated in soil or water.

Herbicide – a chemical that is toxic to plants.
Herbicide Tolerant Crops (abbreviation – HTCs) – New varieties of crops that have been developed by classical breeding or transgenic techniques to be tolerant to specific herbicides.

Hormone-Type Herbicide – includes 2,4-D, 2,4-DB, mecoprop MCPA, MCPB, dichlorprop, dicamba and triclopyr, picloram. At extremely low concentrations, these chemicals can stimulate and/or disrupt the growth of broadleaved plants.

Non-Selective Herbicide – a chemical used in such a manner that all exposed vegetation is damaged.

Perennial Plant – lives for more than 2 years.

Product – the contents of a herbicide container as marketed. In addition to the active ingredient, it may also contain other solvents, surfactants or carriers that are referred to as inert ingredients or formulants.

Program – application of one or more herbicides at two different stages of crop and/or weed growth. The second herbicide application is used to provide control of the weeds either escaping the original herbicide treatment or that are problems at different periods in the growth of the crop.

Resistant Weeds (Herbicide Resistant Weeds) – the inherited ability of some weeds in the population of a particular weed species to survive a herbicide application to which most of the original population was susceptible.

Selective Herbicide – a chemical used in such a manner that it will kill weeds on a growing crop without damaging the crop.

Sodium Salt – some acid or anionic herbicides can be formulated as sodium salts (e.g., 2,4,-D).

Soil Sterilant – a soil active herbicide that is applied at a sufficiently high rate to prevent all plant growth for at least one season.

Surfactant – a chemical added to the herbicide formulation or to the spray solution to improve the dispersing, spreading, sticking or wetting properties of the spray mixture.

Susceptible – a crop that may be damaged or a weed that may be readily controlled by the label rate of herbicide.

Tank-Mix – two chemicals that are packaged separately and mixed in the sprayer tank.

Translocated Herbicide – a chemical herbicide that moves within the plant.

APPENDIX C. Ontario Ministry of Agriculture, Food and Rural Affairs Crop Advisory Staff List

Denise Beaton
Crop Protection Program Lead
denise.beaton@ontario.ca

Jim Chaput
Minor Use Coordinator
jim.chaput@ontario.ca

Mike Cowbrough
Weed Management Field Crops Program Lead
Tel: 519-824-4120 ext. 52580
Fax: 519-763-8933
mike.cowbrough@ontario.ca

Kristen Obeid
Weed Management Program Lead – Horticulture
kristen.obeid@ontario.ca

A complete list of Ontario Ministry of Agriculture, Food and Rural Affairs advisory staff is available at ontario.ca/crops.

Agricultural Information Contact Centre
Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.
1 Stone Road West, Guelph, ON N1G 4Y2 · Tel: 519-826-4047 · Toll-free: 1-877-424-1300 · Fax: 519-826-7610 · E-mail: ag.info.omafra@ontario.ca

APPENDIX D. Ontario Ministry of Environment, Conservation and Parks (MECP) – Regional Offices Contact Information

Please contact the Ministry's local District or Area office. The local District Office contact information can be found from www.infogo.gov.on.ca
After business hours, please contact the Pollution Hotline at 1-866-MOE-TIPS (1-866-663-8477).

REGION County	Address	Telephone/Fax
Central Region Toronto, Halton, Peel, York, Durham, Muskoka, Simcoe	5775 Yonge Street, 8th Floor Toronto, ON M2M 4J1	Tel: 416-326-6700 Toll Free: 1-800-810-8048 Fax: 416-325-6345
West-Central Region Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant	Ontario Government Building 119 King Street West, 12th Floor Hamilton, ON L8P 4Y7	Tel: 905-521-7640 Toll Free: 1-800-668-4557 Fax: 905-521-7820
Eastern Region Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/Dundas & Glengarry, Haliburton, Peterborough, Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark, District of Nipissing (Twp of South Algonquin)	1259 Gardiners Road, Unit 3 PO Box 22032 Kingston, ON K7M 8S5	Tel: 613-549-4000 Toll Free: 1-800-267-0974 Fax: 613-548-6908
Southwestern Region Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth	733 Exeter Road London, ON N6E 1L3	Tel: 519-873-5000 Toll Free: 1-800-265-7672 Fax: 519-873-5020
Northern Region (East) Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie	199 Larch Street, Suite 1201 Sudbury, ON P3E 5P9	Tel: 705-564-3237 Toll Free: 1-800-890-8516 Fax: 705-564-4180
Northern Region (West) Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie, Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay	435 James Street South, Suite 331 Thunder Bay, ON P7E 6S7	Tel: 807-475-1205 Toll Free: 1-800-875-7772 Fax: 807-475-1745
Standards Development Branch	Pesticides Section 40 St. Clair Avenue West, 7th Floor Toronto, ON M4V 1M2	Tel: 416-327-5519 Fax: 416-327-2936
Approvals Branch	Pesticides Licensing 2 St. Clair Avenue West, 12A Floor Toronto, ON M4V 1L5	Tel: 416-314-8001 Toll Free: 1-800-461-6290 Fax: 416-314-8452

AGRICULTURE & AGRI-FOOD CANADA RESEARCH CENTRES

www.agr.gc.ca/index_e.php

Eastern Cereals and Oilseeds Research Centre
960 Carling Avenue
Ottawa, ON K1A 0C6
Tel: 613-759-1952

Greenhouse and Processing Crops Centre
2585 County Road 20
Harrow, ON N0R 1G0
Tel: 519-738-2251

Guelph Food Research Centre
93 Stone Road West
Guelph, Ontario N1G 5C9
Tel.: 519-829-2400
Fax: 519-829-2602

Southern Crop Protection and Food Research Centre
1391 Sandford Street
London, ON N5V 4T3
Tel: 519-457-1470

CANADIAN FOOD INSPECTION AGENCY REGIONAL OFFICES (PLANT PROTECTION)

www.inspection.gc.ca/english/toce.shtml

Belleville
345 College Street East
Belleville, ON K8N 5S7
Tel: 613-969-3333

Brantford
625 Park Road North, Suite 6
Brantford, N3T 5P9
Tel: 519-753-3478

Guelph
174 Stone Road West
Guelph, ON N1G 4T1
Tel: 519-837-9400

Hamilton
709 Main Street West, Suite 101
Hamilton, ON L8S 1A2
Tel: 905-572-2201

London
19-100 Commissioners Road East
London, ON N5Z 4R3
Tel: 519-691-1300

Ottawa District
38 Auriga Drive, Unit 8
Nepean, ON K2E 8A5
Tel: 613-274-7374 ext. 221

Toronto
1124 Finch Avenue West, Unit 2
Toronto, ON M3J 2E2
Tel: 416-665-5055

UNIVERSITY OF GUELPH

Weed Science Laboratory

Herbicide Resistant Weed Testing
Crop Science Building, 50 Stone Road East
Guelph, ON N1G 2W1
Tel: 519-824-4120 Ext. 58372
Contact: psmith@uoguelph.ca
www.uoguelph.ca

Ridgetown Campus
Ridgetown, ON N0P 2C0
Tel: 519-674-1500
www.ridgetownc.uoguelph.ca

Department of Plant Agriculture

www.plant.uoguelph.ca

Department of Plant Agriculture, Guelph
50 Stone Road West, Guelph, ON N1G 2W1
Tel: 519-824-4120 ext. 56083 or 52693

Department of Plant Agriculture, Simcoe
1283 Blueline Road, Box 587
Simcoe, ON N3Y 4N5
Tel: 519-426-7127

Department of Plant Agriculture, Vineland
Box 7000, 4890 Victoria Avenue North
Vineland Station, ON L0R 2E0
Tel: 905-562-4141

Lab Services Division
95 Stone Road West
Guelph, ON N1H 8J7
www.guelphlabservices.com

Trace Organic and Pesticide Contaminants
Tel: 519-823-1268

Pest Diagnostic Clinic
Tel: 519-767-6256

APPENDIX F. Herbicide Companies and Agents

Name	Phone	Website
ADAMA AGRICULTURAL SOLUTIONS CANADA LTD.	1-855-264-6262	www.adama.com/canada
ADJUVANTS PLUS INC.	1-877-512-4659	www.adjuvantsplus.com
AGRI STAR CANADA ULC	1-800-247-8013	www.albaughllc.ca
BASF CANADA INC.	1-877-371-2273	www.agsolutions.ca
BAYER CROPSCIENCE INC.	1-888-283-6847	www.bayercropscience.ca
CORTEVA AGRISCIENCE	1-800-667-3852	www.corteva.ca
FMC CANADA	1-833-362-7722	www.fmccrop.ca
GOWAN COMPANY	1-800-883-1844	www.gowanco.com
INTERPROVINCIAL COOPERATIVE LIMITED	1-800-328-4678	www.ipco.ca
LOVELAND PRODUCTS INC.	1-970-685-3300	www.lovelandproducts.ca
NORAC CONCEPTS INC.	1-519-821-3633	www.noracconcepts.com
NUFARM AGRICULTURE INC.	1-800-868-5444	www.nufarm.ca
SYNGENTA CROP PROTECTION CANADA INC.	1-800-459-2422	www.syngenta.ca
UPL CANADA	1-800-438-6071	www.upi-usa.com/canada/
VALENT CANADA INC.	1-519-767-9262	www.valent.ca
WINFIELD UNITED CANADA, ULC	1-888-975-4769	www.winfieldunited.ca

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Ontario Poison Centre: Toronto 1-800-268-9017

PREVENT ACCIDENTS

- **Read the label.** Follow all the precautions the label recommends. Read the First Aid section of the label BEFORE you begin to handle any pesticide.
- **Make sure that someone knows** what pesticides you are working with and where you are.
- **Keep a file of labels and product Safety Data Sheets (SDS) for the pesticides you use.** Make sure everyone knows where to find this in case of an emergency.
- **Post emergency numbers near all telephones.**
- **Keep clean water, paper towels, extra gloves and clean coveralls close by** in case you spill pesticide on yourself.

If someone has been working with pesticides and you see any possible symptoms of pesticide poisoning or injury, take emergency action immediately.

IF AN ACCIDENT OR POISONING HAPPENS

- protect yourself from injury first.
- Stop the exposure to the pesticide. Move the victim away from the contaminated area.
- Check the four basic facts — identify the pesticide, the quantity, the route of entry and time of exposure.
- Call an ambulance or the Ontario Poison Centre.
- Start first aid. This is not a substitute for professional medical help.
- **Provide the label, SDS sheet, container or a clear photo of the container to emergency personnel** at the scene — or take it with you to the hospital. Do not transport pesticide containers in the passenger compartment of the vehicle.

FIRST AID

If a pesticide comes in contact with skin:

- remove all contaminated clothing; wash skin thoroughly with lots of soap and warm water.
- dry skin well and cover with clean clothing or other clean material.

If pesticide comes in contact with eyes:

- hold eyelids open; wash the eyes with clean running water for 15 minutes or more.

If pesticide was inhaled:

- move the victim to fresh air and loosen tight clothing.
- give artificial respiration if the victim is not breathing.

Do not breathe in the exhaled air from the victim — you could also be poisoned.

If a pesticide was swallowed:

- call the Ontario Poison Centre IMMEDIATELY.

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- online at ontario.ca/publications
- by phone through the ServiceOntario Contact Centre, Monday to Friday, 8:30 a.m. to 5:00 p.m. ET
  - 416-326-5300
  - 1-800-668-9938, toll-free across Canada
  - 1-800-268-7095 TTY, toll-free across Ontario

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Agricultural Information Contact Centre
1-877-424-1300
1-855-696-2811 (TTY)
email: ag.info.omafra@ontario.ca
ontario.ca/omafra

For a major spill, a theft or a fire involving a pesticide:

Call the Ontario Ministry of the Environment, Conservation and Parks **Spills Action Centre** at **1-800-268-6060** (24 hr a day, 7 days a week).
Notify your municipality.

ontario.ca/crops