

7. 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 7–1. Herbicide Weed Control Ratings for Grassy Weeds in Cereal Crops

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																									
FIERCE, FIERCE EZ	14, 15	x	x	✓	x	x	✓	x	x	9	–	7	6	8	9	8	–	7	9	9	9	–	0	7	G
FOCUS	15, 14	x	x	✓	x	x	✓	x	x	9	–	7	6	8	9	8	–	7	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	7	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 3–1. *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 7-2. Herbicide Weed Control Ratings for Cereals

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	hempenettle	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	-	9	9	9	-	-	-	-	9	-	9	9	9	9	9	9	9	7/8	9	9	9	8	-	-	-	-	8	-	7	8	9	-	F	
FIERCE, FIERCE EZ	14, 15	x	x	✓	x	x	✓	x	x	-	-	7	6	7	7	-	7	-	-	9	6	6	9	9	8	5	7	7	7	-	9	-	-	-	7	-	-	-	-	-	-	-	G
FOCUS	15, 14	x	x	✓	x	x	✓	x	x	-	7	-	-	-	8	-	-	-	7	-	7	9	9	7	-	-	7	6	-	7	-	-	-	-	-	-	-	-	-	-	-	-	G
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	
VALTERA EZ	14	x	x	✓	x	x	✓	x	x	-	-	6	5	-	7	6	-	7	-	-	9	6	6	9	9	7	3	7	7	7	-	8	-	-	-	7	-	-	-	-	-	-	G
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	9	7	9	8	9	9	9	8	-	9	7	1	7	6	-	2	5	7	7	F
BARRICADE M ²	2,2 + 4 + 4	✓	✓	✓	x	x	✓	x	x	8 ³	9	9	8 ³	7	7	6	9	9	9	9	9	9	9	9	9	9	9	9	9	8	7	6	7	7	7	6	-	6	8	7	8	G	
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	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 or BROMOXYNIL MCPA 225-225	6,4	✓	✓	✓	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	

¹ Various formulations are available, see Table 3-1. *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 7-2. 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	hemnettle	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	
Postemergence Broadleaf Herbicides (cont'd)																																											
ENFORCER M	6,4	✓	✓	✓	✓	x	✓	x	x	-	9	9	9	8	8	9	-	9	9	9	9	-	9	-	7	7	7	9	9	9	-	-	-	-	-	-	-	-	7	7	8	E	
ENLIST 1	4	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	
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	-	-	6	7	5	E	
INFINITY FX	27,6,4	x	✓	✓	x	x	✓	x	x	7	9	9	-	-	9	9	-	9	9	9	9	-	9	-	9	9	7	9	9	-	-	9	-	-	-	7	-	-	8	8	-	E	
LONTREL XC or PYRALID	4	x	✓	✓	x	x	✓	x	x	3	8	0	5	8	2	-	-	9	-	5	2	-	2	2	2	8	9	-	-	-	2	-	-	-	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
PARDNER or BROMOTRIL or BROTEX or KORIL or BROMAX or BROMOXYNIL 240	6	✓	✓	✓	x	✓	✓ ⁴	x	x	-	8	7	8	-	2	-	2	-	2	8	9	-	7	9	7	8	-	8	8	9	-	-	5	-	-	-	-	0	6	5	-	E	
PIXXARO	4 + 4	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	2,2 + 4	✓	✓	✓	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	

¹ Various formulations are available, see Table 3-1. *Herbicides Used in Ontario.*

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TABLE 7-2. Herbicide Weed Control Ratings for Cereals (cont'd)

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Postemergence Broadleaf Herbicides (cont'd)																																												
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	-	9	-	-	-	8	-	-	8	-	6	-	8	-	8	-	-	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	G		
Postemergence Broadleaf Herbicide Tank-Mixes																																												
BUCTRIL M ¹ + MCPA ¹	6,4 + 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	9	5	6	7	1	7	6	-	7	7	8	5	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 or PYRALID + 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	9	9	9	9	9	9	8	-	-	7	-	7	6	-	2	9	9	9	F		
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	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	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 3-1. *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.

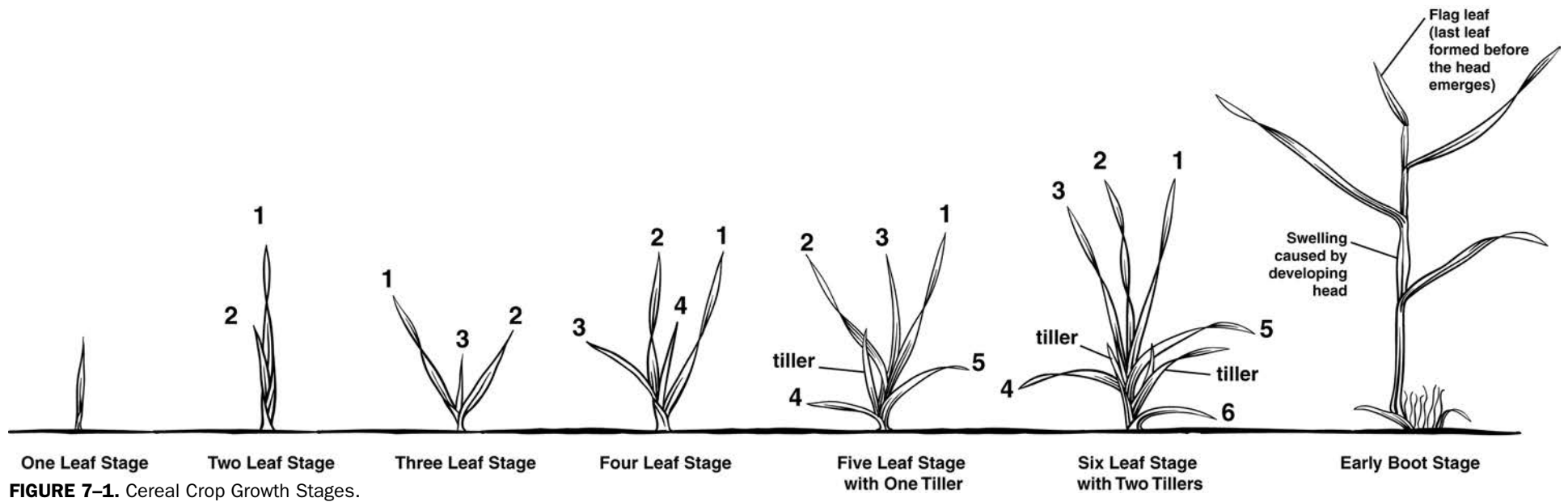


FIGURE 7-1. Cereal Crop Growth Stages.

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 7-1. *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 5 *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 7–3. Herbicide Treatment Rates for Cereals

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, 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)	<ul style="list-style-type: none"> • 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. <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i> for a complete list of available products.</p>
pyroxasulfone (90g/ha)	FIERCE EZ (363 g/L)	440 mL/ha (178ml/acre)	<ul style="list-style-type: none"> • Apply at least 7 days PP to wheat planted at least 1 inch (2.5 cm) deep • Apply to no-till fields only • Crop injury may occur in poorly drained soils or in applications made under cold/wet conditions. Flooding will result in crop injury
Flumioxazin (70g/ha)	FIERCE (76% WG)	210 g/ha (85 g/acre)	
pyroxasulfone (125–150 g/ha) carfentrazone-ethyl (14.8–17.8 g/ha)	FOCUS (447 g/L: 53 g/L)	280–336 mL/ha (112–134 mL/acre) + 2.1–3.1 L/ha (0.84–1.24 L/acre)	<ul style="list-style-type: none"> • Apply PP and PRE in both spring and winter wheat. Wheat must be planted a minimum of 2.5 cm deep. • The lower rate should be used on soils with less than 3% organic matter, while the higher rate can be used on soils with greater than 3% organic matter. • Crop injury may occur, but final grain yield should not be negatively impacted. • Sensitive wheat varieties exist, consult the seed company for more information. • Do NOT graze or feed livestock with grain, green chop or straw until 42 days after application.
Flumioxazin (71g/ha)	VALTERA EZ (479.2 g/L)	149 mL/ha (60 mL/acre)	<ul style="list-style-type: none"> • Apply at least 7 days PP to wheat planted at least 1 inch (2.5 cm) deep • Apply to no-till fields only • Crop injury may occur in poorly drained soils or in applications made under cold/wet conditions. Flooding will result in crop injury
trifluralin (0.383–0.546 kg/ha)	TREFLAN (480 g/L)	0.8–1.14 L/ha (0.32–0.46 L/acre)	<ul style="list-style-type: none"> • 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 (0.32–0.46 L/acre)	
	TRIFLUREX 40 EC (412 g/L)	0.93-1.33 L/ha (0.37-0.53 L/acre)	

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
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) + 5 L/1,000 L (5 L/1,000 L)	<ul style="list-style-type: none"> • 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.
Pinoxaden (60 g/ha)	AXIAL (50 g/L)	1200 mL/ha (500 mL/acre)	<ul style="list-style-type: none"> • 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 applying to a cereal crop that has been stressed by frost.
fenoxaprop-p-ethyl/ safener (92.4 g/L)	BENGAL (120 g/L) VIGIL (120 g/L)	0.77 L/ha (0.31 L/acre)	<ul style="list-style-type: none"> • For use ONLY on spring wheat. • Use for control of wild oats and other grassy weeds. • Apply at the 1–6 leaves on the main stem plus 3 tiller 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)	<ul style="list-style-type: none"> • For use ONLY on spring wheat and spring barley. • Use for control of wild oats and other grassy weeds. • Apply at the 1–6 leaves on the main stem plus 3 tiller 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.

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence Grass Herbicides (cont'd)			
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	<ul style="list-style-type: none"> • 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.
thiencarbazone-methyl (5 g/ha)	VARRO (10 g/L)	0.5 L/ha (0.2 L/acre)	<ul style="list-style-type: none"> • 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 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)	<ul style="list-style-type: none"> • 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. <p>For Winter Cereals:</p> <ul style="list-style-type: none"> • Do NOT apply to seedling winter cereals in the fall. • Apply from early tillering to just before the flag leaf stage of growth. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i> for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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. <p>For Winter Cereals:</p> <ul style="list-style-type: none"> • Do NOT apply to seedling winter cereals in the fall. • Apply from early tillering to just before the flag leaf stage of growth. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i> for a complete list of available products.</p>

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
thifensulfuron-methyl/ tribenuron-methyl (15 g/ha) + fluroxypyr (70 g/ha) + MCPA (282 g/ha) + non ionic surfactant (0.2% v/v)	BARRICADE M (sold as a co-pack): BARRICADE SG (50%) + PERIMETER II (333 g/L) + MCPA ESTER (600 g/L) + non ionic surfactant	1 case treats 40 acres 30 g/ha (12.15 g/acre) + 210 mL/ha (85 mL/acre) + 470 mL/ha (190 mL/acre) + 2 L/1,000 L (2 L/1,000 L)	<ul style="list-style-type: none"> For winter wheat, apply in the spring from the 3 leaf stage to the early flag leaf stage of the crop. For spring wheat, spring barley and oats, apply when the crop is between 3 leaf stage to initiation of stem elongation. Do NOT use on winter barley, fall rye and cereals underseeded with forage crops. Do NOT harvest within 60 days of application.
bromoxynil/MCPA (0.56 kg/ha)	BUCTRIL M (560 g/L) BADGE (450 g/L) MEXTROL (450 g/L) LOGIC M (450 g/L) BROMOXYNIL MCPA 225-225 (450 g/L)	1 L/ha (0.4 L/acre) 1.25 L/ha (0.5 L/acre)	<ul style="list-style-type: none"> 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. <p>Underseeded Red Clover (Winter Wheat Only):</p> <ul style="list-style-type: none"> 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 trifoliolate 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.
2,4-DB (1.1–1.4 kg/ha)	EMBUTOX (625 g/L) CALIBER 625 (625 g/L) COBUTOX 625 (625 g/L)	1.75–2.25 L/ha (0.7–0.9 L/acre)	<ul style="list-style-type: none"> 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 trifoliolate 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.
fluroxypyr/bromoxynil/ MCPA (600 g/ha)	ENFORCER M (480 g/L)	1.25 L/ha (0.5 L/acre)	<ul style="list-style-type: none"> 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.
2,4-D choline (500–817 g/ha)	ENLIST 1 (454 g/L)*	1.1–1.8 L/ha (0.44–0.72 L/acre)	<ul style="list-style-type: none"> Do NOT use on oats or cereals underseeded with legumes. Use the lower rate when weeds are in the seedling stage (2-4 Leaf) and the higher rate for harder to control species. Applying at higher water volumes (100 – 200 L/ha) may reduce the risk of crop injury. Apply when spring cereals are in the 3 leaf to early flag leaf stage of growth. <p>For Winter Cereals:</p> <ul style="list-style-type: none"> Do NOT apply to seedling winter cereals in the fall. Apply from early tillering to just before the flag leaf stage of growth.

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
dichlorprop/2,4-D (740 g/ha)	ESTAPROP XT (610 g/L)	1.2 L/ha (0.48 L/acre)	<ul style="list-style-type: none"> • 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. <p>For Winter Wheat:</p> <ul style="list-style-type: none"> • 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)		
dichlorprop/2,4-D (1.017 kg/ha)	TURBOPROP (582 g/L)	1.75 L/ha (0.7 L/acre)	<ul style="list-style-type: none"> • 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. <p>For Winter Wheat:</p> <ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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, Canada fleabane, giant ragweed and spreading atriplex. • 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)	<ul style="list-style-type: none"> • 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 Canada 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)	<ul style="list-style-type: none"> • 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.
	PYRALID (300 g/L)	504–672 mL/ha (200-270 mL/acre)	

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
MCPA (0.35–0.85 kg/ha)	MCPA AMINE (500 g/L)*	0.7–1.7 L/ha (0.28–0.68 L/acre)	<ul style="list-style-type: none"> • 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. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
MCPA (0.29–0.525 kg/ha)	MCPA ESTER (500 g/L)*	0.58–1.05 L/ha (0.232–0.42 L/acre)	<ul style="list-style-type: none"> • 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. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
MCPA (0.3–0.45 kg/ha)	MCPA SODIUM 300 (300 g/L)*	1–1.5 L/ha (0.4–0.6 L/acre)	<ul style="list-style-type: none"> • 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. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
bromoxynil (288 – 336 g/ha)	PARDNER (280 g/L)	1–1.2 L/ha (0.4–0.48 L/acre)	<ul style="list-style-type: none"> • 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)		

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence Broadleaf Herbicides (cont'd)			
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)	<ul style="list-style-type: none"> 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.
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)	<ul style="list-style-type: none"> 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 60 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, 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)	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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	<ul style="list-style-type: none"> • 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 injury may occur. • Do NOT harvest within 60 days of application. <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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	<ul style="list-style-type: none"> • Do NOT use on oats, winter barley, fall rye or cereals underseeded with legumes. • Apply postemergence and prior to flag leaf emergence. • 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 injury may occur. • Do NOT harvest within 60 days of application.

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, Notes on Adjuvants.
Postemergence 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)	<ul style="list-style-type: none"> • 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 injury may occur. • Do NOT harvest within 60 days of application. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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 injury may occur. • Do NOT harvest within 60 days of application. • Do NOT apply if rain is expected within 4 hours after application. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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 injury may 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)	<ul style="list-style-type: none"> • 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 injury may occur. • Do NOT harvest within 60 days of application. <hr/> <p>* Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)]	<ul style="list-style-type: none"> • 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 injury may occur. • Do NOT harvest within 60 days of application.

TABLE 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, 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)	<ul style="list-style-type: none"> • 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. <p>* Numerous products exist, refer to Table 3-1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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. <p>* Numerous products exist, refer to Table 3-1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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.
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)	<ul style="list-style-type: none"> • Do NOT harvest within 60 days of application. <p>* Numerous products exist, refer to Table 3-1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.</p>
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)	<ul style="list-style-type: none"> • 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.
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)	<ul style="list-style-type: none"> • Numerous products exist, refer to Table 3-1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.
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	<ul style="list-style-type: none"> • 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 7-3. Herbicide Treatment Rates for Cereals (cont'd)

ACTIVE INGREDIENT (rate)	TRADE NAME (Concentration)	PRODUCT RATE	PRECAUTIONS For more information, see Chapter 3, Herbicides Used in Ontario and Chapter 4, 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)	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	<ul style="list-style-type: none"> • 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.
+ non ionic surfactant (0.2% v/v)	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	<ul style="list-style-type: none"> * Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.
	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)	<ul style="list-style-type: none"> • 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	
Safinlufenacil (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)	<ul style="list-style-type: none"> • 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.
Safinlufenacil (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)	<ul style="list-style-type: none"> • 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.
glyphosate (0.9 kg/ha)	glyphosate (360 g/L)*	2.5 L/ha (1 L/acre)	<ul style="list-style-type: none"> • 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.
	glyphosate (480 g/L)*	1.88 L/ha (0.75 L/acre)	
	glyphosate (540 g/L)*	1.67 L/ha (0.67 L/acre)	<ul style="list-style-type: none"> * Numerous products exist, refer to Table 3–1. <i>Herbicides Used in Ontario</i>, for a complete list of available products.

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 7–4.

TABLE 7–4. 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: <http://mccc.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 3–3 and 3–4 of this guide may identify any known negative effects from herbicide carryover.

