

# HERBICIDES IN EASTERN CANADA FOR HORTICULTURE

## BY MODE OF ACTION

Herbicides should be used as part of an Integrated Weed Management (IWM) program. IWM uses all available weed control strategies, in the best possible way to manage weed populations, thereby optimizing economic returns to the grower. Such strategies include cultural, mechanical and chemical methods of weed control. Tank mixing herbicides with multiple modes of action as part of your IWM plan is one of the most effective ways to delay or prevent the development and spread of herbicide resistant weeds.

Site of Action	Level of Risk for Resistance Development	Chemical Family	Active Ingredient	Single-Mode Products	Resistant Weed Species by County			
1 ACCase inhibitors	High	Aryloxyphenoxypropionate (Fop)	fluzafop-p-butyl	Venture® L	1 resistant weed species in Ontario Large Crabgrass - Essex, Chatham-Kent 48 resistant weed species globally			
			quizalofop-p-ethyl	Assure® II, Yuma GL				
		Cyclohexanediones (Dim)	clethodim	Arrow®, Select®				
			sethoxydim	Poast® Ultra				
2 ALS/AHAS inhibitors	High	Imidazolinones	imazapyr	Arsenal®	9 resistant weed species in Ontario Canada fleabane - Brant, Chatham-Kent, Elgin, Essex, Haldimand, Halton, Hamilton, Huron, Lambton, Lennox and Addington, Middlesex, Niagara, Norfolk, Northumberland, Oxford, Peel, Perth, Peterborough, Stormont, Dundas & Glengarry, Waterloo, Wellington, York Common ragweed - Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Huron, Lambton, Middlesex, Niagra, Ottawa, Oxford, Perth, Prescott-Russell, Simcoe, Stormont, Dundas & Glengarry, Wellington Common waterhemp - Bruce, Essex, Lambton Eastern black nightshade - Bruce, Elgin, Huron, Middlesex, Ottawa, Oxford, Perth, Simcoe, Stormont, Dundas & Glengarry, Wellington Giant foxtail - Elgin, Essex, Lambton, Oxford Green foxtail - Huron, Kawartha Lakes, Lambton, Oxford, Perth, Wellington Lamb's-quarters - Chatham-Kent, Elgin, Essex, Lambton, Middlesex, Simcoe, Stormont, Dundas & Glengarry Redroot pigweed - Bruce, Chatham-Kent, Elgin, Essex, Haldimand, Hamilton, Huron, Lambton, Lennox and Addington, Middlesex, Oxford, Perth, Simcoe, Stormont, Dundas and Glengarry, Wellington Cocklebur - Lambton 150 resistant weed species globally			
				imazethapyr		Nu-Image®, Pursuit®, Phantom®		
		Sulfonylureas	chlorosulfuron	Telar®				
			halosulfuron	Permit®, Sandea®				
			ehametsulfuron-ethyl	Muster®				
			metsulfuron-ethyl	Escort®				
			nicosulfuron	Accent®, Ultim®				
			rimsulfuron	Elim™ SG, Prism® SG				
			thifensulfuron-methyl	Pinnacle® SG				
			triflurosulfuron-methyl	UpBeet®				
			foramsulfuron	Option® Liquid				
3 Mitosis inhibitors	Moderate	Dinitroanilines	trifluralin	Bonanza 480, Rival®, Treflan™ EC	0 resistant weed species in Ontario 1 resistant weed species globally			
			pendimethalin	Prow® H2O				
4 Synthetic auxins	Low	Benzoic Acids	dicamba	Banvel® II, Hawkeye™ Power, Oracle®, Vanquish®, VMD 480	1 resistant weed species in Ontario Wild carrot - Halton 34 resistant weed species globally			
			Pyridine carboxylic acids	clopyralid		Lontrel 7Z, Lontrel™ 360		
		Phenoxy carboxylic acids	2,4-D	2,4-D amine, 2,4-D ester				
			MCPA	MCPA				
			MCPA/MCPB	Agroflex®				
			MCPP (mecoprop)	Comptox®, Mecoprop				
5 Photosystem II inhibitors	Moderate-High	Triazines	simazine	Princep® Nine-T, Simadex®, Simazine 480	10 resistant weed species in Ontario Common ragweed - Bruce, Haldimand, Hamilton, Lennox and Addington, Niagara, Norfolk, Wellington Lamb's-quarters - All county's except for Muskoka and Toronto Redroot pigweed - Chatham-Kent, Simcoe, Stormont, Dundas and Glengarry, Waterloo Green pigweed - Elgin, Huron, Oxford, Simcoe, Wellington Common waterhemp - Essex, Lambton Witchgrass - Grey, Haldimand, Leeds and Grenville, Norfolk, Prescott-Russell, Wellington Wild mustard - Stormont, Dundas, & Glengarry Barnyard grass - Waterloo Yellow foxtail - York Common groundsel - York 73 resistant weed species globally			
			prometryne	Gesagard® 480SC				
			hexazinone	Pronone®, Velpar®				
			metribuzin	Lexone® 75DF, Sencor® 480F, Sencor® 500F, Sencor® 75DF, Sencor® Solupak,				
		Pyridazinones	pyrazon	Pyramin® FL				
			Uracils	terbacil		Sinbar®, Sinbar® WDG		
		6 Photosystem II inhibitors	Low	Benthiadiazoles		bentazon	Basagran®, Basagran® Forté	3 resistant weed species in Ontario Redroot pigweed - Chatham-Kent, Essex Smooth pigweed - Essex Green pigweed - Chatham-Kent, Essex 4 resistant weed species globally
				Benzonitriles		bromoxynil	Bromotrill®, Brolex®, Konil®, Pardon®	
7 Photosystem II inhibitors	Low-Moderate	Substituted ureas	diuron	Diurex® 80WDG, Karmex®	2 resistant weed species in Ontario Redroot pigweed - Chatham-Kent, Huron, Lambton, Middlesex, Simcoe, York Green pigweed - Lambton, Middlesex, Simcoe 28 resistant weed species globally			
			linuron	Lorox® L				
8 Fatty acid and lipid biosynthesis inhibitors	Moderate	Thiocarbamates	EPTC	Eptam®	0 in Ontario 10 Globally			
		Benzenesulfonamide	bensulide	Betasan®, Prefar®				
9 EPSP synthase inhibitor	Low	Glycine	glyphosate	Credit®, Factor® 540, Fortran® 540, Forza® Silvicultural herbicide, Glyfos®, Maverick™ III, Matrix Herbicide Solution, Mpower®, Polaris™, Renegade®, HC, Roundup Transorb® HC, Roundup Ultra2®, Roundup WeatherMAX®, Sharpshooter®, Sharpshooter Plus, Touchdown® Total, Traxton®, Vantage™ Forestry, Vantage™ Plus Max II, Vantage™ XRT, Vision® Silviculture, Vision® Max Silviculture	4 resistant weed species in Ontario Canada fleabane - Brant, Bruce, Chatham-Kent, Dufferin, Durham, Elgin, Haldimand, Halton, Hamilton, Hastings, Huron, Lambton, Lennox and Addington, Middlesex, Niagra, Norfolk, Northumberland, Ottawa, Oxford, Peel, Perth, Peterborough, Prince Edward, Stormont, Dundas and Glengarry, Waterloo, Wellington, York Common ragweed - Essex Giant ragweed - Chatham-Kent, Essex, Lambton, Lennox and Addington Common waterhemp - Essex, Waterloo 37 resistant weed species globally			
10 Glutamine synthetase inhibitors	Low	Phosphinic acid	glufosinate ammonium	Liberty® 150 SN, Ignite®	0 resistant weed species in Ontario 3 resistant weed species globally			
11 Carotenoid biosynthesis inhibitors	Low-Moderate	Triazole	amitrole	Amitrol 240	0 resistant weed species in Ontario 6 resistant weed species globally			
13 Carotenoid biosynthesis inhibitors	Low-Moderate	Isoxazolidinone	clomazone	Command 360 ME	0 resistant weed species in Ontario 4 resistant weed species globally			
14 PPO inhibitors	Low-Moderate	Aryl triazole	carfentrazone-ethyl	Aim EC	0 resistant weed species in Ontario 11 resistant weed species globally			
			Dicarboximide	flumioxazin		Broadstar®, Chateau®, SureGuard®,		
			Diphenylether	fomesafen		Reflex®		
				oxyfluorfen		Goal™ 2XL		
15 Mitosis inhibitors (Long-chain fatty acid inhibitors)	Low-Moderate	Amide	propyzamide	Kerb™ SC	0 resistant weed species in Ontario 5 resistant weed species globally			
			Chloroacetamides	dimethanamid-P		Frontier® Max, Frontier Max Plus®, Outlook®		
			Acetamide	napropamide		Devinol®DF-XT		
			Acetanilide	s-metolachlor/benoxacor		Dual II Magnum®		
16 Fatty acid and lipid biosynthesis inhibitors	Low-Moderate	Benzofurane	ethofumesate	Nortron®/Flowable	0 resistant weed species in Ontario 1 resistant weed species globally			
20 Cellulose inhibitors	Low-Moderate	Benzonitrile	dichlobenil	Casoron®G-4	0 resistant weed species in Ontario 3 resistant weed species globally			
22 Photosystem I inhibitors	Low-Moderate	Bipyridyliums	diquat	Reglone®	3 resistant weed species in Ontario Canada fleabane - Essex Eastern black nightshade - Chatham-Kent Field peppergrass - Essex 32 resistant weed species globally			
			paraquat	Gramoxone®				
27 HPPD inhibitors	Low-Moderate	Triketone	mesotrione	Callisto®	0 resistant weed species in Ontario 2 resistant weed species globally			
			Pyrazolone	topramezone		Armezon®, Impact®		