11. Information on Pesticides

Efficacy Ratings for Pesticides

The value of all insecticides, miticides and fungicides is evaluated by the Pest Management Regulatory Agency (PMRA) prior to registration, which includes an assessment of efficacy. Wording on the product label such as control, suppression or partial suppression is used to describe the level of pest management provided by these products. The definitions of "control" and "suppression" for insecticides have a somewhat different meaning than the same terms applied to fungicides, as shown in Table 11–1. *Pesticide Efficacy Ratings* on this page.

For direct pests that cause damage to the fruit, it is important to choose products that provide control rather than suppression. However, if the pest is an indirect pest, and does not affect fruit directly, products labelled for suppression may be useful. Together with natural enemies or biological control, products used for suppression might be enough to prevent significant crop damage. Products labelled for suppression may also play a role in resistance management. By alternating with products from different families, the risk of pest resistance to important products can be reduced.

Price and intended markets play a big part of the decision to use products for suppression. Sometimes there are no other options for organic pest management. However, when using a new product for pest suppression, try to leave an untreated check and evaluate the benefits of using these products compared to the cost of application.

Table 11–1. Pesticide Efficacy Ratings

Pesticide	Efficacy term	Defined as
Insecticide Miticide	Control	• The product, when applied in accordance with the label directions, consistently reduces pest numbers or pest damage to a commercially acceptable level.
	Suppression	• The product, when applied in accordance with the label directions, does not reduce pest populations or damage to a level typically required to achieve commercially acceptable control. Under such situations, the level of performance offered by the product should still have value in a pest management program.
Fungicide	Control	• A consistent level of disease management, as defined by commercial standards and expectations in the market, when compared to untreated control plots. In general, disease control ratings would be between 80%–100%.
	Suppression	• A consistent level of disease management that is less than full control, as defined by commercial standards and expectations in the market, when compared to untreated control plots. In general, disease control ratings would be between 60%–100%. • Suppression is defined as consistent disease reduction to a level that is not optimal but is still of commercial benefit.
	Partial suppression	• A level of disease management that is less than suppression, as defined by the commercial standards and expectations in the market. This label claim will generally only be considered for non-conventional fungicides. In general, disease control ratings would be less than 40%.

Source: Pest Management Regulatory Agency (PMRA), January 2014.

Relative Acute Toxicity of Pesticides

Acute toxicity is the toxic response that results from a single exposure to a pesticide. The symbols and words on the front panel of a pesticide label give you information about the acute toxicity. Pesticides and plant growth regulators listed here are grouped according to the relative acute toxicity and warning symbol on the label. This list does not provide information on chronic toxicity, which is the toxic response that results from repeated exposures to small doses of a pesticide over a longer time period. Other warnings about specific hazards, such as corrosiveness and skin or eye irritations, are not included in this list, but can be found on the product label.

Danger Poison Symbol*

High acute toxicity

- Agri-Mek SC
- Calypso 480 SC
- Capture 240 EC
- Chloropicrin 100
- Decis 5 EC
- Diazinon 500 E
- Diazinon 50 WSP
- Enfuse M 510
- Imidan 70-WP Instapak
- Lannate Toss-N-Go
- Lime Sulphur
- Lorsban 50 W
- Matador 120 EC
- Perm-Up EC
- Pic Plus Fumigant
- Pyrinex 480 EC
- Silencer 120 EC
- Superior 70 Oil
- Superior 70 Oil E
- Thionex 50 W WSP
- Up-Cyde 2.5 EC
- Vydate L
- Warhawk 480 EC

Warning Poison Symbol*

Moderate acute toxicity

- Aprovia
- Assail 70 WP
- Bartlett Waxed Mouse Bait
- Bumper 418 EC
- Busan 1020
- Busan 1180
- Busan 1236
- Copper 53 W
- Copper Spray
- Cygon 480–AG
- Dithane Rainshield
- Echo 90 DF
- Folpan 80 WDG
- Fruitone L
- Guardsman Copper Oxychloride 50
- Lagon 480 E
- Malathion 85 E
- Manzate Pro-Stick
- Nexter
- Priwen
- Ramik Brown
- Ridomil Gold 480 SL
- Sevin XLR
- Tanos 50 DF
- Thiram 75 WP
- Zampro

* See label for other important warnings including corrosiveness, skin and eye irritations and chronic toxicity.

Caution Poison Symbol*

Low acute toxicity

- Admire 240 Flowable
- Alias 240 SC
- Aliette
- Allegro 500 F
- Apollo SC
- Bravo ZN
- Cantus WDG
- Elevate 50 WDG
- Envidor 240 SC
- Equal 65 WP
- Jade
- Kocide 2000
- Mako
- Malathion 25 W
- Microscopic Sulphur WP
- Microthiol Disperss
- Nova
- Oberon Flowable
- Orthene 75% SP
- Pounce 384 EC
- Presidio
- Proline 480 SC
- Quash
- Quilt
- ReTain
- Rovral WDG
- Scala SC
- Skoot
- Sovran
- Syllit 400 FL
- Tilt 250 E
- Vapam HL

No Poison Symbol*

Lower acute toxicity

- Acramite 50 WS
- Acrobat 50 WP
- Actara 25 WG
- Actinovate SP
- Altacor
- Ambush 500 EC
- Apogee
- Beleaf 50 SG
- Bioprotec CAF
- Bio-Save 10 LP
- Bloomtime Biological FD
- Blossom Protect
- Botector
- Buran
- Cabrio EG
- Cilis Plus
- Closer
- Clutch 50 WDG
- Concept
- Confine Extra
- Confirm 240 F
- Cueva
- Cyd-X
- Delegate
- Dipel 2X DF
- Double Nickel 55
- Entrust
- Ethrel
- Exirel
- Falgro Tablet
- Ferbam 76 WDG
- Flint
- Fontelis
- Foray 48 BA
- Fracture
- Fullback 125 SC
- Funginex DC
- Gavel 75 DF
- GF-120 Fruit Fly Bait
- Granuflo T
- Indar
- Inspire Super
- Intrepid
- Isomate-CM/OFM TT
- Isomate-DWB
- Isomate-GBM Plus
- Isomate OFM TT
- Isomate-PTB Dual
- Kanemite 15 SC
- Kasumin 2 L
- Kenja 400 SC
- Kumulus DF
- Luna Tranquility
- Maestro 80 DF
- MaxCel
- Mertect SC
- Mettle 125 ME
- MilStop
- Movento 240 SC
- MustGrow
- Nealta
- Opal
- Penncozeb 75 DF Raincoat
- Perlan
- Phostrol
- Polyram DF
- Pristine WG
- Promalin SL
- Purespray Green Spray Oil 13 E
- Pyganic EC 1.4 II
- Quadris Flowable
- Quintec
- Rampart
- Regalia Maxx
- Revus
- Ridomil Gold MZ 68 WG
- Rimon 10 EC
- Scholar 230 SC
- Semios OFM Plus
- Senator 70 WP
- Sercadis
- Serenade OPTI
- Sirocco
- Sluggo Professional
- Streptomycin 17
- Success
- Supra Captan 80 WDG
- Surround WP
- Switch 62.5 WG
- Timorex Gold
- Tivano
- TwinGuard
- Virosoft CP 4
- Vivando SC

Bee Poisoning

Honeybees, native bee species 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 postbloom). 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 PM 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 AM. 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, see PMRA's Pollinator Protection and Responsible Use of Treated Seed Best Management Practices at www.hc-sc.gc.ca/cps-spc/pubs/pest/_fact-fiche/pollinator-protection-pollinisateurs/treated_seed-semences_traitees-eng.php.

- 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.

- Beekeepers should remove honeybee colonies as soon as pollination is complete in the crop and before any insecticides are applied postbloom. 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 hrs 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.

- 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. See Table 11–2. *Relative Toxicity of Pesticides to Honeybees*, page 312.

- Always read the most current label for guidance.

- Before applying a pesticide or planting with insecticide-treated seed, advise local beekeepers so they can move colonies out of the danger area, if this is an option.

For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 11–2. Relative Toxicity of Pesticides to Honeybees

Group I:
Pesticides highly toxic to bees

Severe losses may be expected if the following materials are used when bees are present at treatment time or within a few days thereafter.

Trade or Brand Name	Common Name/ Active Ingredient
Actara 25 WG	thiamethoxam
Admire 240 Flowable	imidacloprid
Agri-Mek SC	abamectin
Alias 240 SC	imidacloprid
Ambush 500 EC	permethrin
Capture 240 EC	bifenthrin
Closer	sulfoxaflor
Clutch 50 WDG	clothianidin
Concept	imidacloprid + deltamethrin
Cygon 480-AG	dimethoate
Decis 5 EC	deltamethrin
Delegate	spinetoram
Diazinon 500 E	diazinon
Diazinon 50 WSP	diazinon
Entrust 80 W	spinosad
Entrust	spinosad
Exirel	cyantraniliprole
GF-120 Fruit Fly Bait	spinosad
Imidan 70-WP Instapak	phosmet
Lagon 480 E	dimethoate
Lannate Toss-N- Go	methomyl
Lorsban 50 W	chlorpyrifos
Mako	cypermethrin
Malathion 25 W	malathion
Malathion 85 E	malathion
Matador 120 EC	lambda-cyhalothrin
Movento 240 SC**	spirotetramat
MustGrow*	oriental mustard seed meal
Nexter	pyridaben
Orthene 75% SP	acephate
Perm-Up EC	permethrin
Pounce 384 EC	permethrin
Pyganic EC 1.4 II	pyrethrins
Pyrinex 480 EC	chlorpyrifos
Sevin XLR	carbaryl
Silencer 120 EC	lambda-cyhalothrin
Success	spinosad
Up-Cyde 2.5 EC	cypermethrin
Vydate L	oxamyl

* The active ingredient in MustGrow is considered highly toxic to bees although risk is low due to minimal exposure.
**May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Group I:
Pesticides highly toxic to bees (cont'd)

Severe losses may be expected if the following materials are used when bees are present at treatment time or within a few days thereafter.

Trade or Brand Name	Common Name/ Active Ingredient
Warhawk 480 EC	chlorpyrifos

* The active ingredient in MustGrow is considered highly toxic to bees although risk is low due to minimal exposure.
**May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Group II:
Pesticides moderately toxic to bees

These can be used around bees if dosage, timing, and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

Trade or Brand Name	Common Name/ Active Ingredient
Acramite 50 WS	bifenazate
Assail 70 WP	acetamiprid
Copper 53 W	tri-basic copper sulphate
Envidor 240 SC	spirodiclofen
Fullback 125 SC	flutriafol
Maestro 80 DF	captan
Priwen	spiroxamine
Quintec	quinoxyfen
Rimon 10 EC**	novaluron
Supra Captan 80 WDG	captan
Thionex 50 W WSP	endosulfan
TwinGuard	sulfoxaflor + spinetoram

**May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Group III:
Pesticides relatively non-toxic to bees

Trade or Brand Name	Common Name/ Active Ingredient
Acrobat 50 WP	dimethomorph
Actinovate SP	*Stretomyces lydicus*
Aliette	fosetyl al
Allegro 500 F	fluazinam
Altacor	chlorantraniliprole
Apogee	prohexadione calcium
Apollo SC	clofentezine
Aprovia	benzovindiflupyr
Beleaf 50 SG	flonicamid
Bioprotec CAF	*Bacillus thuringiensis* var. *kurstaki*
Bloomtime Biological FD	*Pantoea agglomerans*
Blossom Protect	*Aureobasidium pullulans*
Botector	*Aureobasidium pullulans*

Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 11–2. Relative Toxicity of Pesticides to Honeybees (cont'd)

Group III:
Pesticides relatively non-toxic to bees (cont'd)

Trade or Brand Name	Common Name/ Active Ingredient
Bravo ZN	chlorothalonil
Bumper 418 EC	propiconazole
Buran	garlic powder
Cabrio EG	pyraclostrobin
Calypso 480 SC	thiacloprid
Cantus WDG	boscalid
Confine Extra	mono- and di-potassium salts of phosphorous acid
Confirm 240 F	tebufenozide
Copper Spray	copper oxychloride
Cueva	copper octonoate
Cyd-X	*Cydia pomonella* granulovirus
Dipel 2X DF	*Bacillus thuringiensis* var. *kurstaki*
Dithane Rainshield	mancozeb
Double Nickel 55	*Bacillus amyloliquefaciens*
Echo 90 DF	chlorothalonil
Elevate 50 WDG	fenhexamid
Equal 65 WP	dodine
Ferbam 76 WDG	ferbam
Flint	trifloxystrobin
Folpan 80 WDG	folpet
Fontelis	penthiopyrad
Foray 48 BA	*Bacillus thuringiensis* var. *kurstaki*
Fracture	blad polypeptide
Fruitone L	1-naphthaleneacetic acid
Funginex DC	triforine
Gavel 75 DF	zoxamide + mancozeb
Granuflo T	thiram
Guardsman Copper Oxychloride 50	copper oxychloride
Indar	fenbuconazole
Inspire Super	difenoconazole + cyprodinil
Intrepid	methoxyfenozide
Jade	propiconazole
Kanemite 15 SC	acequinocyl
Kasumin 2 L	kasugamycin
Kenja 400 SC	isofetamid
Kocide 2000	copper hydroxide
Kumulus DF	sulphur
Lime Sulphur	sulphur
Luna Tranquility	fluopyram + pyrimethanil
Manzate Pro-Stick	mancozeb
MaxCel	6-benzyladenine
Mettle 125 ME	tetraconazole

Group III:
Pesticides relatively non-toxic to bees (cont'd)

Trade or Brand Name	Common Name/ Active Ingredient
Microscopic Sulphur WP	sulphur
Microscopic Wettable Sulphur	sulphur
Microthiol Disperss	sulphur
MilStop	potassium bicarbonate
Nealta	cyflumetofen
Nova	myclobutanil
Oberon Flowable	spiromesifen
Opal	potassium salts of fatty acids
Penncozeb 75 DF Raincoat	mancozeb
Phostrol	mono- and di-basic sodium, potassium and ammonium phosphites
Polyram DF	metiram
Presidio	fluopicolide
Pristine WG	boscalid + pyraclostrobin
Proline 480 SC	prothioconazole
Quadris Flowable	azoxystrobin
Quash	metconazole
Quilt	azoxystrobin + propiconazole
Rampart	mono- and di-potassium salts of phosphorous acid
Regalia Maxx	*Reynoutria sachalinensis* extract
Revus	mandipropamid
Ridomil Gold 480 SL	metalaxyl-m and s-isomer
Ridomil Gold MZ 68 WG	metalaxyl-m and s-isomer + mancozeb
Rovral WDG	iprodione
Scala SC	pyrimethanil
Scholar 230 SC	fludioxonil
Senator 70 WP	thiophanate-methyl
Sercadis	fluxapyroxad
Serenade OPTI	*Bacillus subtilis*
Sirocco	potassium bicarbonate
Sovran	kresoxim-methyl
Switch 62.5 WG	cyprodinil + fludioxonil
Syllit 400 FL	dodine
Tanos 50 DF	famoxadone + cymoxanil
Thiram 75 WP	thiram
Timorex Gold	tea tree oil
Tivano	citric acid + lactic acid
Tilt 250 E	propiconazole
Virosoft CP 4	*Cydia pomonella* granulovirus
Vivando SC	metrafenone
Zampro	dimethomorph + ametoctradin

Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Handling and Mixing Pesticides

Formulations

Dry pesticide formulations include:

- **Wettable powders**—active ingredients added to a wetting and dispersion agent, such as talc mixed with water. They will not dissolve, but form a suspension that requires constant agitation. Unless the label states otherwise, premix wettable powders with water and add the slurry to the spray tank.
- **Granules**—a mix of dry, large free-flowing particles, usually with a low concentration of active ingredient. They are ready to be added directly to water.
- **Soluble powders**—dry materials, similar to granules, but dissolve in water.

Liquid pesticide formulations mix in water to form a solution. Some pesticides may be oil-based, such as emulsifiable concentrates, and form an opaque (milky) emulsion that requires agitation.

Soluble packaging

Water-soluble packaging is used for dry flowable and wettable powder formulations. In most cases, the water-soluble packaging material is PVA (polyvinyl alcohol), which dissolves completely when added to the tank water according to instructions. Read labels carefully.

- Keep soluble pouches dry until added to the spray tank.
- Do not handle pouches with wet hands or wet gloves.
- Do not remove pouches from the outer package until just before use.
- Always reseal the outer package to protect the remaining pouches from moisture.

Mixing soluble pouches

Consult product labels for specific mixing instructions for each product.

1. Half-fill the spray tank with water and have the agitator running. Add pouches directly to the tank (not into the basket).
2. Most pouches dissolve completely within 5 minutes, depending on water temperature and agitation.
3. As the tank continues to fill, add any other compatible pesticides.

Do not add:

- A pesticide that is incompatible with the PVA packaging material, such as oils (e.g., Superior Oil) and emulsifiable concentrate formulations containing mineral or vegetable oil.
- Any material containing boron, chelated micronutrients or water-soluble fertilizers. Rinse spray tank carefully after applying these nutrients.

Compatibility of spray materials

Users of commercial-class pest control products for crop protection or vegetation management are permitted to apply unlabelled tank mixes as long as:

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

For information on compatibility of spray materials, always check the product label. Physical incompatibility can result in a physical change in the solution. Components of the combined product may plug nozzles or become solidified or gummy in the tank. Chemical incompatibility can result in a chemical change in the solution. This can lead to reduced efficacy, or can cause plant injury when sprayed on the crop.

Generally, compatibility:

- varies with the formulation of the products. For example, two products may be compatible as wettable powder formulations, but the same active ingredient may be incompatible as emulsifiable concentrate formulations.
- refers to two-way mixtures. Adding a third product to a tank-mix, even if all are compatible with each other in two-way combinations, may result in incompatibility.

- may depend on the solvents and emulsifiers the manufacturer uses. Emulsifiable concentrates are more likely to cause compatibility problems than wettable powders.

Specifically:

- Add Captan or Maestro first when mixing with emulsifiable concentrate formulations of pyrethroids. Apply immediately with constant agitation.

- Do not mix pesticides with lime sulphur or streptomycin.

- Do not use oil sprays within 14 days of Captan or Maestro, including the oil used with Agri-Mek.

For more information on compatibility, contact the product manufacturer or distributor.

Jar test for pesticide compatibility

Always check the product labels for information on compatibility of spray materials. "Compatibility" refers to the physical and/or chemical compatibility of two or more products in a solution. If you are concerned, you should perform a jar test.

Always wear personal protective equipment (PPE) when performing a jar test. Do so in a safe and ventilated area, away from sources of ignition.

1. Measure 500 ml of water into a 1 litre glass jar. This should be the same water you would use to fill a spray tank.

2. Add ingredients according to Table 11–3. *Tank-Mix Order for Pesticide Compatibility Test,* on this page, stirring after each addition.

3. Let the solution stand in a ventilated area for 15 minutes and observe the results. If the mixture is giving off heat, these ingredients are not compatible. If gel or scum forms or solids settle to the bottom (except for the wettable powders) then the mixture is likely not compatible.

4. If no signs of physical incompatibility appear, test the mixture using a spray bottle on a small area where it is to be applied. Look for phytotoxic indications, such as plant damage, and monitor efficacy (this will be hard to do unless you fill the sprayer and try it on a few plants).

Tank water

Water quality can affect pesticide performance. The four variables are:

- pH (acidity & alkalinity)
- dissolved minerals (water hardness or softness)
- suspended particles (dirty water)
- temperature

pH

If the pH of your spray water is higher than 7.5, it is alkaline enough to affect some pesticides. The ideal carrier pH for pesticides is slightly acidic (pH 4.0–6.0). Alkaline water can break down certain insecticides during mixing, and inactivate some fungicides if left too long in the tank. Time is a factor: a pH of 3.5–6.0 is typically acceptable for spraying and short-term storage (approximately 12 hrs) of most spray solutions in the tank. A pH of 6.1–7.0 is acceptable if the pesticide is sprayed immediately. A pH of 7.1 or greater requires a buffer or acidifier. The three methods for measuring pH are a probe and meter (the most accurate method), litmus paper or a field kit (e.g., www.preiser.com, www.hoskin.ca).

Table 11–3. Tank-mix Order for Pesticide Compatibility Test

Order	Ingredient	Quantity for 500 ml or 500 g of product labeled for 1,000 L of final spray volume
1	Compatibility agents	5 ml (1 teaspoon)
2	Water-soluble packets, wettable powders and dry flowables	15 g (1 tablespoon)
3	Liquid drift retardants	5 ml (1 teaspoon)
4	Liquid concentrates, micro-emulsions and suspension concentrates	5 ml (1 teaspoon)
5	Emulsifiable concentrates	5 ml (1 teaspoon)
6	Water-soluble concentrates or solutions	5 ml (1 teaspoon)
7	Remaining adjuvants and surfactants	5 ml (1 teaspoon)

Dissolved Minerals

This is usually an issue with herbicides (e.g., salt-formulated), which can be affected by certain minerals dissolved in water. Test for dissolved minerals using Total Water Hardness test kits (e.g., www.H2OKits.com). They are packaged as individual test strips. The foil packets are small enough to fit in your pocket and are ideal when testing in the field.

Suspended Particles

Certain products (usually herbicides) can be negatively affected by suspended silt and organic matter. Water turbidity can be measured using a Secchi disk (more appropriate for waterways), a turbidimeter (expensive), or an inexpensive turbidity test (e.g., www.lamotte.com).

Tempeature

Water temperature affects pesticide solubility. Colder temperatures slow emulsification and dissolution. Avoid tank-mixing with water that is less than 10°C or greater than 27°C. Extreme temperatures may also affect product efficacy:

- With water dispersible granules, permit a little extra time for dissolution in cold water.
- If an oil-based product is added before a granular in cold water, agglomerates could form, plugging up the sprayer parts like screens and nozzles.
- Water-based products tend to thicken in cold water.
- Warmer temperatures can cause "oiling" where emulsifications become less stable and increase the amount of residue on sprayer parts. Generally, it is best to apply oil-based products as soon as possible while using high agitation.

In summary, commercial products are available to reduce pH, soften hard water and clear dirty water. Be sure to follow the pesticide label and the water treatment product label, exactly.

Agitation

Agricultural products are formulated to be as emulsifiable as possible, but many do not mix well in water. They contain elements that do not dissolve (e.g., wettable powders), or they may be petroleum distillates (e.g., emulsifiable concentrates). Other products are heavier than water and form precipitates (e.g., fertilizers and powdered metals like copper). Consequently, good agitation is very important.

Effective agitation requires water to "sweep" the bottom of the tank so that any precipitated material is picked up and re-mixed. Turbulence is often not enough. If there is too little agitation, the pesticide will be applied unevenly and not always at the required rate. If there is too much agitation, the pesticide may foam (which can be controlled using anti-foamers) or cause an invert emulsion (a gel). There are two common types of airblast sprayer agitation: mechanical and hydraulic.

Mechanical agitation

Mechanical agitation is produced by paddles that are attached to a shaft mounted near the bottom of the spray tank. While relatively effective, this system cannot always sweep the very bottom of the tank and some material precipitates are out of reach. Inadequate agitation can lead to frequently plugged nozzles and screens and "sludge" left at the bottom of the tank after spraying.

Hydraulic agitation

Hydraulic agitation is accomplished by returning a portion of the pump output to the tank. Cylindrical and oval tanks are the ideal configuration for the sparging (i.e., rinsing) type of hydraulic return agitation system. This system consists of a tube located longitudinally along the wall of the tank, with volume booster nozzles aimed at the centreline so they sweep across the bottom. Volume booster nozzles take a small amount of water pumped into their venturi chamber and create a vacuum that draws three to four times that volume from the surrounding water and expels it out the end. For hydraulic agitation to be effective, the agitator nozzle(s) should be fed by a dedicated line from the pressure side of the pump (not the pressure regulator). They should have a valve to throttle the flow or completely shut it off to prevent foaming.

Filling the tank

Pesticide labels usually provide directions for mixing different materials, including the sequence for mixing. The order in which you add each product to the tank, or inductor, is critical.

As formulations become more complicated, it is increasingly important to read the mixing instructions on the label. If the label does not specify, consider consulting one of the many free tank-mix apps that are available for smart phones. If that option is not available, use the W.A.L.E.S. method:

In a half-full tank with agitator running, add:

1. **W**ettable powders and flowables, including dissolvable packages

Fill tank to ¾ full and:

2. **A**gitate

Then, add:

3. **L**iquid and soluble products

4. **E**mulsifiable concentrates

5. **S**urfactants

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

Clean the tank and sprayer with a detergent or solvent immediately after use, then flush thoroughly with clean water. To prevent oil build-up, empty the tank completely before refilling.

Spray 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.

For more information on pesticide handling and operator safety, consult the Ontario Pesticide Education Program (OPEP) Grower Pesticide Safety course (www.opep.ca/index.cfm/learning-resources/farmers-learn-by-chapter).

Using non-ionic surfactants and crop oils to improve pesticide efficacy in fruit crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader stickers, crop oils, anti-foaming agents, buffering agents, etc.

Some pesticide labels recommend the addition of non-ionic surfactants to the tank mix for the pesticide to work correctly. A few product labels suggest the addition of crop oils to improve uptake. However, unless the product label specifies an adjuvant be added to the tank mix, growers do not need to use them.

A label might specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label.

Examples of adjuvants used for fruit crops are listed in Table 11-4. *Adjuvants Used in Ontario*, on this page.

Non-ionic surfactants do not have a charge in solution and are the most commonly used surfactants for the horticulture industry. Non-ionic surfactants are used to enhance pesticide penetration into a waxy cuticle. When used properly, do they not harm plants, remain stable, and do a good job of breaking water surface tension. However, application rate is critical. When applied at excessive rates, plant injury may result.

Crop oils solubilize the waxy cuticle layer on a leaf surface to increase spray penetration through the leaf cuticle. Oils are refined mineral oils (petroleum based) or seed oils.

Rates: Rates for adjuvants may be listed as the amount (in litres) added to 1,000 L (L/1,000 L) of spray solution, or as a % solution, volume (adjuvant) /volume (spray solution).

If you wish to convert to % volume/ volume (v/v) use the following conversion: 10 L/1,000 L = 1% v/v

Precautions: Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. For example, do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulfur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Problems could also occur around some formulations of copper, or specific products, such as Group 11 products. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants see www.sprayers101 or OMAFRA Publication 75, Guide to Weed Control, Chapter 5, *Notes on Adjuvants* .

Table 11–4. Adjuvants Used in Ontario

Trade names	Registration number	Adjuvant type	Ontario classification	Registrant or Distributor Code *
Agral 90	11809	Non-ionic surfactant	3	NOR
Agral 90	24725	Non-ionic surfactant	3	SYN
LI700	23026	Non-ionic penetrating surfactant, pH adjuster, deposition aid	4	LOI
XIAMETER OFX-0309	23078	Silicone surfactant	4	NOR

* See Table 11–9. *Pest Control Product Companies*, page 331 for registrant or distributor information.

Pesticides Used on Fruit Crops in Ontario

See Table 11–5. *Pesticides Used on Fruit Crops in Ontario by Active Ingredient*, on this page, Table 11–6. *Pesticides Used on Fruit Crops in Ontario,* page 321, and Table 11–7. *Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario*, page 330.

Crop Group numbers are used to indicate registrations on the majority of crops included within a crop group as listed in Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337. In some cases, a Crop Group indicated in Tables 11–6 may omit a few of the less common crops within that group. Growers of low acreage, specialty fruit should always check product labels to ensure the product is registered on their crop.

Table 11–5. Pesticides Used on Fruit Crops in Ontario by Active Ingredient

Common Name/ Active Ingredient	TRADE or BRAND Name*
abamectin	AGRI-MEK SC
acephate	ORTHENE 75% SP
acequinocyl	KANEMITE 15 SC
acetamiprid	ASSAIL 70 WP
ametoctradin + dimethomorph	ZAMPRO
Aureobasidium pullulans	BLOSSOM PROTECT, BOTECTOR
aviglycine hydrochloride	RETAIN
azoxystrobin	QUADRIS FLOWABLE, QUILT
Bacillus amyloliquefaciens	DOUBLE NICKEL 55
Bacillus subtilis	SERENADE OPTI
Bacillus thuringiensis var. *kurstaki*	BIOPROTEC CAF, DIPEL 2X DF, FORAY 48 BA
6-benzyladenine	MAXCEL, PROMALIN SL
6-benzylaminopurine	CILIS PLUS, PERLAN
benzovindiflupyr	APROVIA
BLAD polypeptide	FRACTURE
bifenthrin	CAPTURE 240 EC
bifenazate	ACRAMITE 50 WS
boscalid	CANTUS WDG
boscalid + pyraclostrobin	PRISTINE WG
calcium polysulphide	LIME SULPHUR
captan	MAESTRO 80 DF, SUPRA CAPTAN 80 WDG
carbaryl	SEVIN XLR
chlorantraniliprole	ALTACOR
chloropicrin	CHLOROPICRIN 100, PIC PLUS FUMIGANT
chlorothalonil	BRAVO ZN, ECHO 90 DF
chlorpyrifos	LORSBAN 50 W, PYRINEX 480 EC, WARHAWK 480 EC
citric acid + lactic acid	TIVANO
clofentezine	APOLLO SC
clothianidin	CLUTCH 50 WDG
copper hydroxide	KOCIDE 2000
copper octanoate	CUEVA
copper oxychloride	COPPER SPRAY, GUARDSMAN COPPER OXYCHLORIDE 50
copper sulphate, tri-basic	COPPER 53 W
cyantraniliprole	EXIREL
Cydia pomonella granulovirus	CYD-X, VIROSOFT CP4
cyflumetofen	NEALTA
cymoxanil + famoxadone	TANOS 50 DF
cypermethrin	MAKO, UP-CYDE 2.5 EC
cyprodinil + difenoconazole	INSPIRE SUPER
cyprodinil + fludioxonil	SWITCH 62.5 WG
deltamethrin	DECIS 5 EC
deltamethrin + imidacloprid	CONCEPT
diazinon	DIAZINON 50 WSP, DIAZINON 500 E
difenoconazole + cyprodinil	INSPIRE SUPER
dimethoate	CYGON 480-AG, LAGON 480 E
dimethomorph	ACROBAT 50 WP
dimethomorph + ametoctradin	ZAMPRO
diphacinone	RAMIK BROWN
dodine	EQUAL 65 WP, SYLLIT 400 FL
endosulfan	THIONEX 50 W WSP
ethephon	ETHREL
famoxadone + cymoxanil	TANOS 50 DF
fenbuconazole	INDAR
fenhexamid	ELEVATE 50 WDG
ferbam	FERBAM 76 WDG
ferric phosphate	SLUGGO PROFESSIONAL
flonicamid	BELEAF 50 SG
fluazinam	ALLEGRO 500 F
fludioxonil	SCHOLAR 230 SC
fludioxonil + cyprodinil	SWITCH 62.5 WG
fluopicolide	PRESIDIO
flutriafol	FULLBACK 125 SC
fluopyram + pyrimethanil	LUNA TRANQUILITY
fluxapyroxad	SERCADIS
folpet	FOLPAN 80 WDG
fosetyl al	ALIETTE
garlic powder	BURAN
gibberellic acid	FALGRO TABLET
imidacloprid	ADMIRE 240 FLOWABLE, ALIAS 240 SC

* Mention of a TRADE or BRAND name does not constitute a guarantee or warranty of the product by the Ontario Crop Protection Committee or the Ontario Ministry of Agriculture, Food and Rural Affairs.

Table 11–5. Pesticides Used on Fruit Crops in Ontario by Active Ingredient (cont'd)

Common Name/ Active Ingredient	TRADE or BRAND Name*
imidacloprid + deltamethrin	CONCEPT
iprodione	ROVRAL WDG
isofetamid	KENJA 400 SC
kaolin	SURROUND WP
kasugamycin	KASUMIN 2L
kresoxim-methyl	SOVRAN
lactic acid + citric acid	TIVANO
lambda-cyhalothrin	SILENCER 120 EC, MATADOR 120 EC
malathion	MALATHION 25 W, MALATHION 85 E
mancozeb	MANZATE PRO-STICK, DITHANE DG, PENNCOZEB 75 DF RAINCOAT
mancozeb + metalaxyl	RIDOMIL GOLD MZ 68 WG
mancozeb + zoxamide	GAVEL 75 DF
mandipropamid	REVUS
metalaxyl-m and s-isomer	RIDOMIL GOLD 480 SL
metalaxyl-m and s-isomer + mancozeb	RIDOMIL GOLD MZ 68 WG
metam potassium	BUSAN 1180
metam sodium	VAPAM HL, BUSAN 1020, BUSAN 1236, ENFUSE M510
metconazole	QUASH
methomyl	LANNATE TOSS-N-GO
methoxyfenozide	INTREPID
metiram	POLYRAM DF
metrafenone	VIVANDO SC
mineral oil	PURESPRAY GREEN SPRAY OIL 13 E, SUPERIOR 70 OIL, SUPERIOR 70 OIL E
myclobutanil	NOVA
1-naphthaleneacetic acid	FRUITONE L
novaluron	RIMON 10 EC
oriental mustard seed meal	MUSTGROW
oxamyl	VYDATE L
Pantoea agglomerans	BLOOMTIME BIOLOGICAL FD
penthiopyrad	FONTELIS
permethrin	AMBUSH 500 EC, PERM-UP EC, POUNCE 384 EC
pheromone	ISOMATE-CM/OFM TT, ISOMATE-DWB, ISOMATE-GBM PLUS, ISOMATE-PTB DUAL, ISOMATE OFM TT, SEMIOS OFM PLUS
phosmet	IMIDAN 70-WP INSTAPAK
phosphites, ammonium, potassium, mono- and di-basic sodium	PHOSTROL
phosphorous acid, mono- and di-potassium salts of phosphorous acid	CONFINE EXTRA, RAMPART
potassium bicarbonate	MILSTOP, SIROCCO
potassium salts of fatty acids	OPAL
prohexadione calcium	APOGEE
propiconazole	BUMPER 418 EC, JADE, TILT 250 E, QUILT
prothioconazole	PROLINE 480 SC
Pseudomonas syringae	BIO-SAVE 10 LP
pyraclostrobin	CABRIO EG
pyraclostrobin + boscalid	PRISTINE WG
pyrethrins	PYGANIC EC 1.4 II
pyridaben	NEXTER
pyrimethanil	SCALA SC
pyrimethanil + fluopyram	LUNA TRANQUILITY
quinoxyfen	QUINTEC
Reynoutria sachalinensis extract	REGALIA MAXX
spinetoram	DELEGATE
spinetoram + sulfoxaflor	TWINGUARD
spinosad	ENTRUST, GF-120 FRUIT FLY BAIT, SUCCESS
spirodiclofen	ENVIDOR 240 SC
spiromesifen	OBERON FLOWABLE
spirotetramat	MOVENTO 240 SC
spiroxamine	PRIWEN
Streptomyces lydicus	ACTINOVATE SP
streptomycin sulfate	STREPTOMYCIN 17
sulfoxaflor	CLOSER
sulfoxaflor + spinetoram	TWINGUARD
sulphur	KUMULUS DF, LIME SULPHUR, MICROSCOPIC SULPHUR WP, MICROSCOPIC WETTABLE SULPHUR, MICROTHIOL DISPERSS
tea tree oil	TIMOREX GOLD
tebufenozide	CONFIRM 240 F
tetraconizole	METTLE 125 ME
thiabendazole	MERTECT SC
thiacloprid	CALYPSO 480 SC
thiamethoxam	ACTARA 25 WG
thiophanate methyl	SENATOR 70 WP
thiram	GRANUFLO T, SKOOT, THIRAM 75 WP
trifloxystrobin	FLINT
triforine	FUNGINEX DC
zinc phosphide	BARTLETT WAXED MOUSE BAIT
zoxamide + mancozeb	GAVEL 75 DF

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Table 11–6. Pesticides Used on Fruit Crops in Ontario

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
27925	ACRAMITE 50 WS	bifenazate	a	CG 12, CG 13-07A, CG 14, apple, grape	WSP	50%	4	MCD
27700	ACROBAT 50 WP	dimethomorph	f	grape	D	50%	3	BAZ
28408	ACTARA 25 WG	thiamethoxam	i	CG 13-07A, CG 13-07B, CG 13-07G, apple, cherry, pear	D	25%	3	SYZ
28672	ACTINOVATE SP	*Streptomyces lydicus* strain WYEC108	f	blueberry, grape, strawberry	D	0.037%	4	PRI, NBL
24094	ADMIRE 240 Flowable	imidacloprid	i	CG 11, CG 12, CG 13A, CG 13B, CG 13-07F, CG 13-07G, CG 14, saskatoon berry	L	240 g/L	4	BCZ
31607	AGRI-MEK SC	abamectin	a,i	CG 13-07A, apple, grape, pear, strawberry	L	84 g/L	3	SYZ
28475	ALIAS 240 SC	imidacloprid	i	CG 13A, apple, blueberry, cherry, peach, saskatoon berry, strawberry	L	240 g/L	4	AMA, UAG
27688	ALIETTE	fosetyl al	f	apple, blackberry, blueberry, grape, raspberry, strawberry	D	80%	3	BCZ
27517	ALLEGRO 500 F	fluazinam	f	CG 13B, apple	L	40%	3	ISK, SYZ
28981	ALTACOR	chlorantraniliprole	i	CG 11, CG 12, CG 13-07A, CG 13-07B, CG 13-07G, CG 14, grape	D	35%	2	DUQ
14882	AMBUSH 500 EC	permethrin	i	apple, grape, peach, pear, plum	EC	500 g/L	4	AMV, ENG
28042	APOGEE	prohexadione calcium	pgr	apple, cherry, strawberry	D	27.5%	4	BAZ
21035	APOLLO SC	clofentezine	a	apple, peach, pear, raspberry, strawberry	L	500 g/L	3	AMA, KAM
31981	APROVIA	benzovindiflupyr	f	CG 13-07F, apple, blueberry, pear	EC	100 g/L	NC	SYZ
27128	ASSAIL 70 WP	acetamiprid	i	CG 11, CG 12, CG 13-07A, CG 13-07B, grape, strawberry	D	70%	4	ENG, NPS
8024	BARTLETT WAXED MOUSE BAIT	zinc phosphide	r	orchards	P	2%	3	BAT
29796	BELEAF 50 SG	flonicamid	i	CG 11-09, CG 12-09, CG 13-07G	D	50%	4	FMC, ISK, UAG
26854	BIOPROTEC CAF	*Bacillus thuringiensis* var. *kurstaki*	i	CG-13-07, apple, apricot, cherry, grape, hazelnut, peach, pear, pecan, plum, sweet chestnut, walnut	L	8.12%	3	AFG
29673	BIO-SAVE 10 LP	*Pseudomonas syringae* strain ESC-10	f	apple, cherry, pear	D	9×10^{10} CFU/g	4	JET

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[1] a = acaracide, miticide. b = bactericide. ba = bacterial antagonist. cp = crop protectant. f = fungicide. h = herbicide. i = insecticide. n = nematicide. md = mating disrupter. pgr = plant growth regulator. r = rodenticide. s = slug bait. tr = taste repellent.

[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

[3] AE = aerosol. D = dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = dispenser units. EC = emulsifiable concentrate. L = liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = particulate/pellet. WSP = water-soluble packets.

[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
28436	BLOOMTIME BIOLOGICAL FD	*Pantoea agglomerans* strain E325	ba	CG 13A, apple, pear, saskatoon berry	D	1 x 10^{10} CFU/g	4	NUA, VER
30552	BLOSSOM PROTECT	*Aureobasidium pullulans* strains DSM 14940 and DSM 14941	b	CG 11-09	D	5 x 10^{9} CFU/g	3	BFG, UAG
31248	BOTECTOR	*Aureobasidium pullulans* strains DSM 14940 and DSM 14941	f	grape	D	5 x 10^{9} CFU/g	3	BFG, UAG
28900	BRAVO ZN	chlorothalonil	f	blueberry, cherry, hazelnut, peach, strawberry	L	500 g/L	3	SYZ
28017	BUMPER 418 EC	propiconazole	f	CG 13A, apricot, blueberry, cherry, peach, plum, saskatoon berry, strawberry	EC	418 g/L	3	AMA, UAG
30601	BURAN	garlic powder	f	apple, grape, pear	L	15%	NC	AFG
19421	BUSAN 1020	metam sodium	f,h,n,	fruit crops (before planting)	L	33%	4	BUL
25124	BUSAN 1180	metam potassium	f,h,n,	fruit crops (before planting)	L	54%	3	BUL
25103	BUSAN 1236	metam sodium	f,h,n,	fruit crops (before planting)	L	42%	4	BUL
27323	CABRIO EG	pyraclostrobin	f	CG 12, blueberry, strawberry	D	20%	4	BAZ
28429	CALYPSO 480 SC	thiacloprid	i	CG 11	L	480 g/L	3	BCZ
30141	CANTUS WDG	boscalid	f	CG 12, CG 13, grape, strawberry	D	70%	2	BAZ
31396	CAPTURE 240 EC	bifenthrin	i	raspberry	L	240 g/L	3	FMC
25863	CHLOROPICRIN 100	chloropicrin	f,n	raspberry, strawberry (before planting)	L	99%	2	DAS, HND
30826	CLOSER	sulfoxaflor	i	CG 11-09, CG 12-09, CG 14, grape	L	240 g/L	3	DWE
29382	CLUTCH 50 WDG	clothianidin	i	CG 11, CG 12, grape, strawberry	D	50%	2	VAJ
29611	CONCEPT	imidacloprid + deltamethrin	i	blueberry	L	75 g/L + 10 g/L	3	BCZ
30648	CONFINE EXTRA	mono- and di-potassium salts of phosphorous acid	f	blueberry, grape, strawberry	L	53%	4	ACO
24503	CONFIRM 240 F	tebufenozide	i	13-07B, apple, pear	L	240 g/L	3	GOW, NPS, UAG
9934	COPPER 53 W	basic copper sulphate	b,f	apple, currant, gooseberry, grape, peach, pear, raspberry, strawberry, tart cherry	D	53.4%	3	LVP, UAG
19146	COPPER SPRAY	copper oxychloride	f	apple, blueberry, hazelnut, grape, peach, raspberry, tart cherry, walnut	D	50%	4	LVP, UAG

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[1] a = acaracide, miticide. b = bactericide. ba = bacterial antagonist. cp = crop protectant. f = fungicide. h = herbicide. i = insecticide. n = nematicide. md = mating disrupter. pgr = plant growth regulator. r = rodenticide. s = slug bait. tr = taste repellent.

[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

[3] AE = aerosol. D = dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = dispenser units. EC = emulsifiable concentrate. L = liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = particulate/pellet. WSP = water-soluble packets.

[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
31825	CUEVA	copper octanoate	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, plum, strawberry, raspberry, walnut	L	1.8%	4	ENG
30120	CYD-X	*Cydia pomonella* granulovirus	i	apple	L	0.06%	3	CIT
25651	CYGON 480-AG	dimethoate	i	blueberry, cherry, hazelnut, peach (non-bearing), pear, strawberry	EC	480 g/L	3	FMC
22478	DECIS 5 EC	deltamethrin	i	apple, blueberry, peach, pear, strawberry	EC	50 g/L	3	BCZ
28778	DELEGATE	spinetoram	i	CG 11, CG 12, CG 13-07A, CG 13-07B, CG 13-07G, CG 14, grape	D	25%	3	DWE
29976	DIAZINON 50 WSP	diazinon	i	CG 13A, apple, cherry, currant, gooseberry, pear, strawberry	WSP	50%	3	LVP, UAG
11889	DIAZINON 500 E	diazinon	i	CG 13A, apple, cherry, currant, gooseberry, pear, strawberry	EC	500 g/L	3	LVP, UAG
26508	DIPEL 2X DF	*Bacillus thuringiensis* var. *kurstaki*	i	CG 13-07, apple, apricot, cherry, grape, hazelnut, pecan, pear, plum, sweet chestnut, walnut	D	57%	4	VAA, VAJ
20553	DITHANE RAINSHIELD	mancozeb	f	apple, grape	D	75%	4	DWE
31888	DOUBLE NICKEL 55	*Bacillus amyloliquefaciens* strain D-747	b, f	apple, grape, pear, strawberry	D	5×10^{10} spores/g	3	CIT
29356	ECHO 90 DF	chlorothalonil	f	blueberry, peach, strawberry, tart cherry	L	90%	4	UAG
25900	ELEVATE 50 WDG	fenhexamid	f	CG 13A, CG 13B, cherry, grape, peach, strawberry	D	50%	3	AVV, UAG
29142	ENFUSE M 510	metam sodium	f, h,n	fruit crops (before planting)	L	42%	4	ENG, TAO
30382	ENTRUST	spinosad	i	CG 11, CG 12, CG 13-07A, CG 13-07B, CG 13-07G, grape	L	240 g/L	4	DWE
28051	ENVIDOR 240 SC	spirodiclofen	a	CG 11, CG 12, CG 14, blueberry, grape	L	240 g/L	4	BCZ
15608	EQUAL 65 WP	dodine	f	apple, cherry, pear	D	65%	4	NRA
30895	EXIREL	cyantraniliprole	i	CG 11-09, CG 12-09, CG 13-07B, CG 13-07H, CG 14-11	L	100 g/L	3	DUQ

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[1] a = acaracide, miticide. b = bactericide. ba = bacterial antagonist. cp = crop protectant. f = fungicide. h = herbicide. i = insecticide. n = nematicide. md = mating disrupter. pgr = plant growth regulator. r = rodenticide. s = slug bait. tr = taste repellent.

[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

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[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
20136	FERBAM 76 WDG	ferbam	f	apple, apricot, blackberry, blueberry, cherry, currant, grape, peach, pear, plum, raspberry	D	76%	4	LVP, UAG
30619	FLINT	trifloxystrobin	f	CG 11, CG 12, hazelnut, grape, strawberry	D	50%	4	BCZ
27733	FOLPAN 80 WDG	folpet	f	apple, grape, strawberry	D	80%	4	AMA, UAG
30331	FONTELIS	penthiopyrad	f	CG 11, CG 12, CG 13-07G, hazelnut, sweet chestnut, walnut	L	200 g/L	4	DUQ
24978	FORAY 48 BA	*Bacillus thuringiensis* var. *kurstaki*	i	apple, blueberry, pear, raspberry	L	10 BIU/kg	4	VAA, VAJ
31782	FRACTURE	BLAD polypeptide	f	CG 12, grape, strawberry	L	20%	4	FMC
31679	FULLBACK 125 SC	flutriafol	f	apple, grape, strawberry	L	125.08 g/L	2	FMC
27686	FUNGINEX DC	triforine	f	apple (non-bearing), blueberry, cherry, peach, plum, saskatoon berry	EC	190 g/L	3	ENG
26842	GAVEL 75 DF	zoxamide + mancozeb	f	grape	D	8.3% + 66.7%	4	GOW, UAG
28336	GF-120 FRUIT FLY BAIT	spinosad	i	apple, blueberry, cherry, walnut	L	0.02%	4	DWE
30548	GRANUFLO-T	thiram	f	apple, peach, plum, strawberry	D	75%	3	ENG, TAO
13245	GUARDSMAN COPPER OXYCHLORIDE 50	copper oxychloride	f	apricot, blueberry, cherry, grape, hazelnut, peach, pear, raspberry	D	50%	3	VAR
29064	IMIDAN 70-WP INSTAPAK	phosmet	i	apple, blueberry, grape, peach, pear, plum, tart cherry	WSP	70%	3	GOW, UAG
27294	INDAR	fenbuconazole	f	CG 12, blueberry	WSP	75%	2	DWE
30827	INSPIRE SUPER	difenoconazole + cyprodinil	f	apple, pear	L	86 g/L + 249 g/L	2	SYZ
27786	INTREPID	methoxyfenozide	i	CG 11-09, CG 12-09, CG 13-07A, CG 13-07B, CG 14-11, grape	L	240 g/L	3	DWE
29352	ISOMATE-CM/OFM TT	pheromone, oriental fruit moth and codling moth	md	CG 11, CG 12, walnut	DIS	91.7%	4	PBC
30589	ISOMATE-DWB	pheromone, dogwood borer	md	CG 11, CG 12-09, blueberry, hazelnut, pecan, sweet chestnut, walnut	DIS	87.1%	4	PBC
27525	ISOMATE-GBM PLUS	pheromone, grape berry moth	md	grape	DIS	91.1%	4	PBC

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

[3] AE = aerosol. D = dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = dispenser units. EC = emulsifiable concentrate. L = liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = particulate/pellet. WSP = water-soluble packets.

[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
31419	ISOMATE OFM TT	pheromone, oriental fruit moth	md	CG 11, CG 12	DIS	95.2%	4	PBC
30042	ISOMATE-PTB DUAL	pheromone, peachtree borer and lesser peachtree borer	md	CG 12-09	DIS	87.9%	4	PBC
24030	JADE	propiconazole	f	CG 13-A, apricot, blueberry, cherry, peach, plum, saskatoon berry, strawberry	EC	250 g/L	3	ENG
28641	KANEMITE 15 SC	acequinocyl	a	CG 13-07A, CG 14-11, apple, pear	L	15.8%	3	AVV, UAG
30591	KASUMIN 2 L	kasugamycin	b	CG 11-09, walnut	L	2.0%	3	AVV, UAG
31758	KENJA 400 SC	isofetamid	f	CG 13-07G, grape	L	400 g/L	3	ISK, ENG
27348	KOCIDE 2000	copper hydroxide	b,f	grape	D	53.8%	3	DUQ
18836	KUMULUS DF	sulphur	a,f	apple, cherry, grape, peach, pear, plum, saskatoon berry	D	80%	4	BAZ
9382	LAGON 480 E	dimethoate	i	blueberry, cherry, hazelnut, peach, pear, strawberry	EC	480 g/L	3	LVP, UAG
10868	LANNATE TOSS-N-GO	methomyl	i	apple	WSP	90%	2	DUQ
16465	LIME SULPHUR	calcium polysulphide	a,f,i	apple, blackberry, blueberry, cherry, gooseberry, grape, peach, pear, plum, raspberry, strawberry	L	30%	4	LVP, UAG
20944	LORSBAN 50 W	chlorpyrifos	i	peach, strawberry	WSP	50%	3	DWE
30510	LUNA TRANQUILITY	fluopyram + pyrimethanil	f	apple, grape (wine)	L	125 g/L + 375 g/L	2	BCZ
26408	MAESTRO 80 DF	captan	f	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	D	80%	3	AVV
30316	MAKO	cypermethrin	i	apple, grape, peach, pear, strawberry	EC	407 g/L	4	ENG
14656	MALATHION 25 W	malathion	i	apple, apricot, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	D	25%	4	LVP, UAG
8372	MALATHION 85 E	malathion	i	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	EC	85%	3	LVP, UAG
28217	MANZATE PRO-STICK	mancozeb	f	apple, grape	D	75%	3	UPI

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

[3] AE = aerosol. D = dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = dispenser units. EC = emulsifiable concentrate. L = liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = particulate/pellet. WSP = water-soluble packets.

[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
24984	MATADOR 120 EC	lambda-cyhalothrin	i	apple, cherry, peach, pear, plum, strawberry	EC	120 g/L	2	SYZ
13975	MERTECT SC	thiabendazole	f	apple, pear	L	500 g/L	4	SYZ
30673	METTLE 125 ME	tetraconazole	f	gooseberry, grape, strawberry	L	125 g/L	2	AVV
14653	MICROSCOPIC SULPHUR	sulphur	f	apple, cherry, currant, gooseberry, grape, peach, pear, plum, sea buckthorn	D	92%	4	LVP, UAG
873	MICROSCOPIC WETTABLE SULPHUR	sulphur	f	apple, cherry, grape, peach, pear, plum	D	92%	4	BAT
29487	MICROTHIOL DISPERSS	sulphur	a,f	apple, cherry, grape, peach, pear, plum, saskatoon berry	D	80%	4	UAG, UPI
28095	MILSTOP	potassium bicarbonate	f	apricot, grape, peach, plum	D	85%	4	BWI
28953	MOVENTO 240 SC	spirotetramat	i	CG 11-09, CG 12, CG 13-07B, CG 13-07F, CG 13-07H, CG 14	L	240 g/L	4	BCZ
30263	MUSTGROW	oriental mustard seed meal	f,n	CG 11-09, CG 12-09, CG 13-07A, CG 14-11, strawberry	P	100%	3	MQT
31284	NEALTA	cyflumetofen	a	CG 11-09, grape, strawberry	L	200 g/L	3	BAZ
25135	NEXTER	pyridaben	a,i	apple, cherry, grape, peach, pear, raspberry, strawberry	WSP	75%	3	GOW, UAG
22399	NOVA	myclobutanil	f	CG 13-07A, CG 13-07B, apple, cherry, grape, peach, pear, saskatoon berry, strawberry	WSP	40%	3	DWE, UAG
28905	OBERON FLOWABLE	spiromesifen	a,i	strawberry	L	240 g/L	3	BCZ
28146	OPAL	potassium salts of fatty acids	a,i	apple, apricot, blueberry, cherry, grape, hazelnut, peach, pear, pecan, plum, raspberry, strawberry, sweet chestnut, walnut	L	47%	4	OMD
14225	ORTHENE 75% SP	acephate	i	saskatoon berry	D	75%	3	AVV, UAG
30241	PENNCOZEB 75 DF RAINCOAT	mancozeb	f	apple, grape	D	75%	3	UAG, UPI
28877	PERM-UP EC	permethrin	i	apple, grape, peach, pear, plum	EC	384 g/L	3	UPI
30449	PHOSTROL	mono- and di-basic sodium, potassium and ammonium phosphites	f	CG 11-09, grape, raspberry, strawberry	L	53.6	4	ENG
28715	PIC PLUS FUMIGANT	chloropicrin	f,n	strawberry, raspberry	L	85.1%	2	DAS, TRI
20087	POLYRAM DF	metiram	f	apple, grape	D	80%	4	BAZ
16688	POUNCE 384 EC	permethrin	i	apple, grape, peach, pear, plum	EC	384 g/L	4	FMC, UAG
30051	PRESIDIO	fluopicolide	f	grape	L	39.5%	2	VAJ

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

[3] AE = aerosol. D = dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = dispenser units. EC = emulsifiable concentrate. L = liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = particulate/pellet. WSP = water-soluble packets.

[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
27985	PRISTINE WG	boscalid + pyraclostrobin	f	CG 11, CG 12, CG 13, grape, saskatoon berry, strawberry	D	25.2% + 12.8%	2	BAZ
31959	PRIWEN	spiroxamine	f	grape (wine)	EC	500 g/L	NC	BCZ
28359	PROLINE 480 SC	prothioconazole	f	CG 13-07B	L	480 g/L	3	BCZ
27666	PURESPRAY GREEN SPRAY OIL 13 E	mineral oil	f,i	CG 13-07, apple, apricot, cherry, chestnut, hazelnut, peach, pear, plum	L	99%	4	PCU
30164	PYGANIC EC 1.4 II	pyrethrins	i	blueberry, grape, raspberry	EC	1.4%	4	MGK
23705	PYRINEX 480 EC	chlorpyrifos	i	hazelnut, strawberry	EC	480 g/L	3	AMA, UAG
26153	QUADRIS FLOWABLE	azoxystrobin	f	hazelnut, strawberry	L	250 g/L	3	SYZ
30402	QUASH	metconazole	f	blueberry, currants, elderberry, sea buckthorn	WSP	50%	3	VAJ
28328	QUILT	azoxystrobin + propiconazole	f	blueberry	L	75 g/L + 125 g/L	3	SYZ
29755	QUINTEC	quinoxyfen	f	CG 12, grape, strawberry	D	250 g/L	3	DWE
11670	RAMIK BROWN	diphacinone	r	orchards	P	0.005%	4	HOK, UAG
30654	RAMPART	mono- and di-potassium salts of phosphorous acid	f	blackberry, grape	L	53%	4	LVP, UAG
30199	REGALIA MAXX	*Reynoutria sachalinensis* extract	f	apple, blueberry, grape, strawberry	L	20%	3	ENG, MQO
29074	REVUS	mandipropamid	f	grape	L	250 g/L	3	SYZ
28474	RIDOMIL GOLD 480 SL	metalaxyl-m and s-isomer	f	non-bearing apple, blueberry, raspberry, strawberry	L	480 g/L	3	SYZ
28893	RIDOMIL GOLD MZ 68 WG	metalaxyl-m and s-isomer + mancozeb	f	grape	D	4% + 64%	3	SYZ
28881	RIMON 10 EC	novaluron	i	CG 12, CG 13-07B, apple, strawberry	EC	10%	2	MCD, UAG
24709	ROVRAL WDG	iprodione	f	apricot, cherry, grape, peach, plum, raspberry, strawberry	D	500 g/kg	3	FMC, UAG
28011	SCALA SC	pyrimethanil	f	CG 11, blueberry, gooseberry, grape, raspberry, strawberry	L	400 g/L	3	BCZ
29528	SCHOLAR 230 SC	fludioxonil	f	CG 11, CG 12, strawberry	L	230 g/L	4	SYZ
31718	SEMIOS OFM PLUS	pheromone, oriental fruit moth	md	apple, apricot, peach, pear, plum	AE	11.7%	3	SMS
25343	SENATOR 70 WP	thiophanate-methyl	f	apple, blueberry, cherry, peach, pear, plum, raspberry, strawberry	D	70%	4	ENG, NPS

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

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[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
31697	SERCADIS	fluxapyroxad	f	CG 11, CG 12, CG 13A, CG 13B, CG 13-07G, grape	L	300 g/L	2	BAZ
28549	SERENADE OPTI	*Bacillus subtilis* strain QST 713	f	CG 11, CG 12, CG 13A, CG 13-07B, grape, strawberry	D	1.31 x 10^{10} CFU/g	3	BCZ
27876	SEVIN XLR	carbaryl	i	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	L	466 g/L	3	TKI
29052	SILENCER 120 EC	lambda-cyhalothrin	i	apple, cherry, peach, pear, plum, strawberry	EC	120 g/L	2	AMA, UAG
31091	SIROCCO	potassium bicarbonate	f	apricot, grape, peach, plum	D	85%	4	AFG
13258	SKOOT	thiram	tr	apple, cherry, plum, saskatoon berry, walnut	L	120 g/L	4	PRI
30025	SLUGGO PROFESSIONAL	ferric phosphate	s	fruit crops	P	0.28%	4	ENG
26257	SOVRAN	kresoxim-methyl	f	apple, pear, grape	D	50%	4	BAZ
10305	STREPTOMYCIN 17	streptomycin sulphate	b,f	apple, pear	D	25.2%	4	LVP, UAG
26835	SUCCESS	spinosad	i	CG 11, CG 12, CG 13-07A, CG 13-07B, CG 13-07G, grape	L	480 g/L	4	DWE
9542	SUPERIOR 70 OIL E	mineral oil	a,i	apple, apricot, blueberry, peach, pear, plum, saskatoon berry, tart cherry	EC	99%	4	BAT
14981	SUPERIOR 70 OIL	mineral oil	a,i	apple, apricot, blueberry, peach, pear, plum, tart cherry	EC	99%	4	LVP, UAG
24613	SUPRA CAPTAN 80 WDG	captan	f	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	D	80%	3	LVP, UAG
27469	SURROUND WP	kaolin	cp,i	CG 12-09, apple, grape, hazelnut, pear, pecan, raspberry, strawberry, sweet chestnut, walnut	D	95%	4	BAT, TKI
28189	SWITCH 62.5 WG	cyprodinil + fludioxonil	f	CG 13-07A, CG 13-07B, CG 13-07F, CG 13-07G	D	37.5% + 25%	3	SYZ
28351	SYLLIT 400 FL	dodine	f	apple, pear	L	402 g/L	4	CIB, ENG, NRA
27435	TANOS 50 DF	famoxadone + cymoxanil	f	CG 13-07A	D	25% + 25%	3	DUQ
29990	THIONEX 50 W WSP	endosulfan	i	apricot, cherry, peach, plum, strawberry	WSP	50%	2	LVP, UAG

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

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[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–6. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration No.	TRADE or BRAND Name*	Common Name/ Active Ingredient	Use[1]	Crop or Crop Group (CG) Registrations[2]	Formulation[3]	Guaranteed Active	Ont. Class[4]	Registrant/ Distributor Code[5]
27556	THIRAM 75 WP	thiram	f	apple, peach, plum, strawberry	D	75%	3	MCD
19346	TILT 250 E	propiconazole	f	CG 13A, apricot, blueberry, cherry, peach, plum, saskatoon berry, strawberry	EC	250 g/L	3	SYZ
30910	TIMOREX GOLD	tea tree oil	f	blueberry, grape, raspberry, strawberry	EC	23.8%	3	BIM, ENG
30468	TIVANO	citric acid + lactic acid	b,f	grape, strawberry	L	10.73 g/L + 21.37 g/L	4	AFG
31442	TWINGUARD	sulfoxaflor + spinetoram	i	CG 11-09, CG 12-09	D	20% + 20%	3	DWE
28795	UP-CYDE 2.5 EC	cypermethrin	i	apple, grape, peach, pear, plum, strawberry	EC	250 g/L	3	UAG, UPI
29128	VAPAM HL	metam sodium	f,h,n	fruit crops (before planting)	L	42%	4	AMV, UAG
26533	VIROSOFT CP 4	*Cydia pomonella* granulovirus	i	apple	L	4×10^{13} OBs/L	4	BPT
29765	VIVANDO SC	metrafenone	f	CG 11-09, CG 12-09A, CG 12-09B, grape	L	300 g/L	2	BAZ
17995	VYDATE L	oxamyl	i,n	apple (non-bearing), raspberry	L	240 g/L	2	DUQ
29984	WARHAWK 480 EC	chlorpyrifos	i	hazelnut, strawberry	EC	480 g/L	3	LVP, UAG
30321	ZAMPRO	dimethomorph + ametoctradin	f	grape	L	225 g/L + 300 g/L	3	BAZ

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[2] See Appendix C: *Crop Groupings for Pesticide Registrations in Canada*, page 337 for full listing of crops within each crop group (CG).

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[4] See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[5] See Table 11–9. *Pest Control Product Companies*, page 331, for registrant or distributor information.

Table 11–7. Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario

Registration No.	TRADE or BRAND Name*	Common Name or Active Ingredient	Use[1]	Guaranteed Active	Formulation[2]	Ont. Class[3]	Registrant/ Distributor Code[4]
28042	APOGEE	prohexadione calcium	PGR	27.5%	D	4	BAZ
29210	CILIS PLUS	6-benzylaminopurine	PGR, TH	2.0%	L	4	BAT, FAL
11580	ETHREL	ethephon	PGR	240 g/L	L	4	BCZ
27653	FALGRO TABLET	gibberellic acid	PGR	1.0 g/tablet	tablet	4	NRA
31460	FRUITONE L	1-napthaleneacetic acid	PGR	3.1%	L	4	AMV, UAG
28851	MAXCEL	6-benzyladenine	PGR, TH	1.9%	L	4	VAA, VAJ
29187	PERLAN	6-benzylaminopurine, gibberellins $A_4 + A_7$	PGR	1.8% BA 1.8% GA	L	4	BAT, FAL
16636	PROMALIN SL	benzyladenine gibberellins $A_4 + A_7$	PGR	1.8% BA 1.8% GA	EC	4	VAA, VAJ
25609	RETAIN	aviglycine hydrochloride	PGR	15%	D	3	VAA, VAJ
27469	SURROUND WP	kaolin	CP	95%	D	4	BAT, TKI

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[1] PGR = plant growth regulator. TH = thinner. CP = crop protectant.

[2] D = dry formulation (including wettable granule, wettable powder). EC = emulsifiable concentrate. L = liquid formulation (including solution).

[3] Farmers must be certified to buy and use pesticides in Class 2 and 3. See Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331.

[4] See Table 11–9. *Pest Control Product Companies*, page 331 or registrant or distributor information.

Pesticide Classification in Ontario

Under the *Pesticides Act* and Regulation 63/09, the Ontario Ministry of the Environment and Climate Change classifies federally registered pesticides into one of 12 classes. Each class has defined education, licensing and/or permit requirements and restrictions on its use and sale in Ontario. Pesticides are classified on the basis of their toxicity, environmental or health hazard, persistence, concentration, how they are used and their container size. The classification of each product in the publication can be found in Table 11–6. *Pesticides Used on Fruit Crops in Ontario*, page 321 and Table 11–7. *Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario*, on page 330.

Class 2 and 3 pesticides are the most hazardous. Table 11–8. *Pesticide Classification Schedules in Ontario: Classes 2, 3 and 4*, page 331, describes the hazard criteria for the classes of pesticides used in this publication. Regulation 63/09 of the *Pesticides Act* makes it mandatory for farmers to be certified to buy and use Class 2 or 3 pesticides on their farms. Pesticide storage requirements also vary by class. Detailed descriptions of each classification can be found at: www.ontario.ca/pesticides.

A farmer can become certified by attending a one-day Grower Pesticide Safety Course and passing the certification examination. To become a certified farmer, visit the Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

Table 11–8. Pesticide Classification Schedules In Ontario: Classes 2, 3 and 4

Provincial Class	Federal Class	Hazard Description	Hazard Criteria
2	Restricted or Commercial	Very Hazardous	Meets at least one of these criteria: • fumigant gas • acute oral LD_{50} less than or equal to 50 mg/kg • acute dermal LD_{50} less than or equal to 100 mg/kg • soil half-life greater than or equal to 6 months
3	Restricted or Commercial	Moderately Hazardous	Meets at least one of these criteria: • acute oral LD_{50} greater than 50 and less than or equal to 500 mg/kg • acute dermal LD_{50} greater than 100 and less than or equal to 1,000 mg/kg • soil half-life greater than 1 month and less than 6 months
4	Restricted or Commercial	Less or Least Hazardous	Meets all of these criteria: • acute oral LD_{50} greater than 500 mg/kg • acute dermal LD_{50} greater than 1,000 mg/kg • soil half-life less than or equal to 1 month

Source: Pesticide Classification Guideline for Ontario (2009).

Pest Control Product Companies

See Table 11–9. *Pest Control Product Companies*, on this page, for pest control product registrant or distributor contact information. The 3-letter codes represent the codes listed in Table 11–6. *Pesticides Used on Fruit Crops in Ontario,* page 321 and Table 11–7. *Thinners and Growth Regulators Used on Fruit Crops in Ontario,* page 330. For Canadian labels, contact the registrant/distributor or search the PMRA website at: www.pmra-arla.gc.ca/english/main/search-e.html.

Table 11–9. Pest Control Product Companies

Code	Registrant or Distributor	Website	Contact Number
ACO	Agronomy Company of Canada	www.agromartgroup.com	519-461-9057
AFG	AEF Global Inc.	www.aefglobal.com	1-866-622-3222
AMA	Adama Agricultural Solutions Canada Ltd.	www.adama.com/canada	1-855-264-6262
AMV	AMVAC Chemical Corporation	www.amvac-chemical.com	1-888-462-6822
AVV	Arysta LifeScience Corporation	www.arystalifescience.ca	1-866-761-9397
BAT	Bartlett, N.M. Inc.	www.bartlett.ca	1-800-263-1287
BAZ	BASF Canada Inc.	www.agsolutions.ca	1-877-371-2273
BCZ	Bayer CropScience Inc.	www.bayercropscience.ca	1-888-283-6847
BFG	bio-ferm GmbH	www.bio-ferm.com	+43-2272-660-89-60
BPT	BioTepp Inc.	www.biotepp.com	418-659-4446
BUL	Buckman Laboratories of Canada Ltd.	www.buckman.com	450-424-4404
BWI	BioWorks, Inc.	www.bioworksinc.com	1-800-877-9443
CAU	Cheminova Canada Inc.	www.cheminova.ca	1-888-316-6260
CIB	Chimac-Agriphar S.A.	—	—Refer to NRA number below
CIT	Certis USA	www.certisusa.com (U.S. website)	1-800-250-5024
DAS	Douglas Agricultural Services, Inc.	—	519-427-8195
DUQ	E.I. du Pont Canada Company	www.dupont.ca	1-800-931-3456
DWE	Dow AgroSciences Canada	www.dowagro.ca	1-800-667-3852
ENG	Engage Agro Corporation	www.engageagro.com	1-866-613-3336
FAL	Fine Americas, Inc.	www.fine-americas.com	1-888-474-3463
FMC	FMC Corporation	www.fmc.com	1-800-321-1362
GOW	Gowan Company	www.gowanco.com	1-800-883-1844

— = No information is available.

Table 11–9. Pest Control Product Companies (cont'd)

Code	Registrant or Distributor	Website	Contact Number
HOK	Hacco, Inc.	www.hacco.com (U.S. website)	920-326-2461
ISK	ISK Biosciences Corporation	www.iskbc.com (U.S. website)	1-877-706-4640
JET	Jet Harvest Solutions	www.jetharvest.com	1-877-866-5773
KAM	Kam's Growers Supply	www.kams.ca	1-877-821-1684
LVP	Loveland Products Canada Inc.	www.lovelandproducts.com (U.S. website)	1-800-328-4678
MCD	MacDermid Agricultural Solutions Canada Co.	www.macdermid.com	519-822-3790
MGK	McLaughlin Gormley King Co.	www.mgk.com	1-800-645-6466
MQO	Marrone Bio Innovations, Inc.	www.marronebioinnovations.com	1-877-664-4476
MQT	MPT Mustard Products & Technologies, Inc.	www.mptmustardproducts.com	306-668-2652
NBL	Novozymes BioAg Ltd.	www.bioag.novozymes.com	1-888-744-5662
NPS	Nippon Soda Co., Ltd.	www.nissoamerica.com	212-490-0350
NRA	Norac Concepts	www.noracconcepts.com	519-821-3633
NUA	Nufarm Ltd.	www.nufarm.ca	1-800-868-5444
OMD	Omex Agriculture Inc.	www.omexcanada.com	204-477-4052
PBC	Pacific Biocontrol Corporation	www.pacificbiocontrol.com (U.S. website)	1-800-999-8805
PCU	Petro-Canada Lubricants	www.purespraygreen.com	1-866-335-3369
PRI	Plant Products Inc.	www.plantproducts.com	1-800-387-2449
SMS	Semiosbio Technologies Inc.	www.semios.com	604-229-2044
SYZ	Syngenta Canada Inc.	www.syngenta.ca	1-877-964-3682
TAO	Taminco Inc.	www.taminco.com	1-888-826-4680
TKI	Tessenderlo Kerley, Inc.	www.tkinet.com	1-800-669-0559
TRI	TriEst Ag Group, Inc.	www.triestag.com	252-758-4263
UAG	United Agri Products Canada Inc.	www.uap.ca	1-800-265-4624
UPI	United Phosphorus, Inc.	www.upi-usa.com (U.S. website)	1-800-438-6071
VAA	Valent Biosciences Corporation	www.valentbiosciences.com	1-847-968-4700
VAJ	Valent Canada, Inc.	www.valent.ca	519-767-9262
VAR	Univar Canada Ltd.	www.univarcanada.com	1-800-265-7671
VER	Verdesian Life Sciences	www.vlsci.com	1-800-350-4789

— = No information is available.