2026 SUPPLEMENT
Crop Protection for Apples

This supplement contains additional crop protection information for apples as of May 15, 2026 to be used with the Ontario Crop Protection Hub (http:/ontario.ca/cropprotection). The following resources are for general information only. Use the information in the following tables to assist with choosing the best product for the pest complex present. Consider the life stage, history of the pest, weather and resistance management strategies, as well as the activity of each product to pests and beneficial insects.

The product label is a legal document and label instructions must be followed. The Ontario Ministry of Agriculture, Food & Agribusiness (OMAFA) does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

Labels for all registered products are available at the Pesticides Regulatory Directorate (PRD), formerly Pest Management Regulatory Agency (PMRA) website at http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.

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Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined below. Be sure sprayer is calibrated, the correct rate is applied, and spray coverage is complete. Know the active ingredient of a pesticide and the chemical group. The chemical group is indicated in the following tables in the column labelled "Group". Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Plant defence inducers (P) and biologicals with multiple modes of action (BM) are not known to be prone to resistance. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide Resistance Management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Tank-mix single site products with a multi-site protectant fungicide, where permitted.
- Where possible, do not use single site fungicides (e.g., Group 3, 7 and 11) when sporulating lesions of the target disease are present.

Insecticide Resistance Management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (e.g., codling moth, oriental fruit moth), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (e.g., mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some pesticides are toxic to bees and other pollinating insects. Use of pesticides on flowering crops requires careful management to avoid negative effects on pollinators. Insecticides should not be applied when tree fruit are in bloom. The Bee Act makes it an offence to do so in Ontario. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. Table 1.2 - *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators* provides more information on honeybee toxicity ratings.

The information in the following tables is provided as a guideline only. Read the product label and follow all safety precautions. Registered products are subject to review with the Pesticides Regulatory Directorate (PRD) and may change within the lifetime of this document. Consult the most recent label on the PRD website and/or product registrant for complete information.

1. GENERAL CROP PROTECTION

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Table 1.1 – Products Used on Apples

Use this table as a guide but refer to product label for specific information.
If no restricted entry period is stated on the label, assume it is 12 hours. When the re-entry for hand harvest exceeds the preharvest interval, follow the restricted entry interval.
The maximum applications is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.
Products listed as potentially organic may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec* organic listing or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
INSECTICIDES / MITICIDES							
Aceta 70 WP	33298	acetamiprid	4A	7 days	12 hours[2]/48 hours[4]/ 6 days[3]	4	—
Acramite 50 WS	27925	bifenazate	20D	7 days	12 hours	1	—
Agri-Mek SC	31607	abamectin	6	28 days	12 hours	1	—
Altacor	28981	chlorantraniliprole	28	5 days	12 hours	3 (max. 645 g/ha)	—
Altacor Max	34654	chlorantraniliprole	28	5 days	12 hours	3	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours[2]/48 hours[4]/ 6 days[3]	4	—
Beleaf 50 SG	29796	flonicamid	29	21 days	12 hours[2]/72 hours[3]	3 (max. 480 g/ha)	—
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	—	✓
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Confirm 240 F	24503	tebufenozide	18	14 days	12 hours	4	—
Cormoran	33353	acetamiprid + novaluron	4A+15	14 days	12 hours[2]/7 days[3]	max. 6.9 L/ha	—
Cyd-X	30120	*Cydia pomonella* granulovirus	31	0 days	12 hours	—	✓
Danitol	33817	fenpropathrin	3	16 days	24 hours[2]/7 days[4,12]/ 16 days[9]/23 days[3]	1	—
Decis 100 EC	33700	deltamethrin	3A	1 day	12 hours	3	—
Delegate	28778	spinetoram	5	7 days	12 hours	2[5]/3	—
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	—	✓
Entrust	30382	spinosad	5	7 days	when dry	3	✓

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
INSECTICIDES / MITICIDES (cont.)							
Envidor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—
GF-120 Fruit Fly Bait	28336	spinosad bait	5	—	when dry	10	✓
Harvanta 50 SL	32889	cyclaniliprole	28	7 days	12 hours	3 (max. 4.8 L/ha)	—
Imidan WP	29064	phosmet	1B	22 days	12 hours[2]/9 days[4,12]/ 22 days[9]/post-thinning	2	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	2 (max. 2 L/ha)	—
Isomate CM/OFM TT	29352	pheromone, oriental fruit moth and codling moth	NC	—	—	—	✓
Isomate DWB	30589	pheromone, dogwood borer	NC	—	—	—	—
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Kanemite 15 SC	28641	acequinocyl	20B	14 days	12 hours	2 (max. 4.1 L/ha)	—
Kopa	31433	potassium salts of fatty acids	UN	12 hours	12 hours	3[8]	✓
Madex HP	34116	*Cydia pomonella* granulovirus	31	—	4 hours	5 (per generation)	✓
Magister SC	34544	fenazaquin	21	10 days	12 hours[2]/24 hours[4,12]/ 17 days[9]	1	—
Malathion 85 E	8372	malathion	1B	3 days	12 hours[2]/48 hours[9]/ 72 hours[3]	2	—
Minecto Pro	33023	abamectin + cyantraniliprole	6+28	28 days	12 hours	1	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.83 L/ha	—
Nealta	31284	cyflumetofen	25	7 days	12 hours	2	—
Nexter SC	33433	pyridaben	21	25 days	24 hours	2	—
Perm-Up EC	28877	permethrin	3	7 days	12 hours	2[5]/1	—
Poleci 2.5 EC	32446	deltamethrin	3	1 day	12 hours	3	—
Pounce 384 EC	16688	permethrin	3	7 days	when dry	2[5]/1	—

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
INSECTICIDES / MITICIDES (cont.)							
Purespray Green Spray Oil 13 E	27666	mineral oil	UN	—	12 hours	2/8[10]	✓
Rimon 10 EC	28881	novaluron	15	14 days	12 hours	2[5]/4	—
Sefina	33265	afidopyropen	9D	7 days	12 hours	4 (max. 0.8 L/ha)	—
Shenzi 400 SC	34974	chlorantraniliprole	28	5 days	12 hours	3 (max. 563 mL/ha)	—
Ship 250 EC	32563	cypermethrin	3	7 days	12 hours	3	—
Sivanto Prime	31452	flupyradifurone	4D	14 days	12 hours	2 L/ha	—
Spiro SC	34247	spirodiclofen	23	7 days	12 hours	1	—
Success	26835	spinosad	5	7 days	when dry	3	—
Suffoil-X	33099	mineral oil	UN	—	12 hours	8	✓
Superior 70 Oil	9542 14981	mineral oil	UN	—	12 hours	1 (full rate)	✓
Surround WP	27469	kaolin	UN	0 days	12 hours	—	✓
Theme 480 SC	34379	thiacloprid	4A	30 days	12 hours	3 (max. 875 mL/ha)	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vayego 200 SC	33711	tetraniliprole	28	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	UN	0 days	12 hours	2/4[10]	✓
Virosoft CP 4	26533	*Cydia pomonella* granulovirus	31	—	4 hours	4[11]	✓
XenTari WG	31557	*Bacillus thuringiensis*	11	0 days	4 hours	—	✓

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
FUNGICIDES							
Aliette	27688	fosetyl al	P7	30 days	12 hours[2]/4 days[3]	3	—
Allegro 500 F	27517	fluazinam	29	28 days	24 hours	5	—
Aprovia	31981	benzovindiflupyr	7	30 days	12 hours	max. 2 L/ha	—
Aprovia Top	31526	difenoconazole + benzovindiflupyr	3+7	30 days	12 hours	max. 2.57 L/ha	—
Bio-Save 10 LP	29673	*Pseudomonas syringae*	BM	postharvest	—	1	—
Blossom Protect	30552	*Aureobasidium pullulans*	NC	0 days	when dry	5	✓
Buran	30601	garlic powder	NC	0 days	when dry	—	✓
Cevya	33405	mefentrifluconazole	3	0 days	12 hours	1.125 L/ha	—
Copper 53 W	9934	tri-basic copper sulphate	M	30 days	48 hours	3	✓
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	2	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	10	✓
Cyclone Plus	34762	citric and lactic acid	NC	0 days	4 hours (or when dry)	—	✓
Diplomat 5 SC	32918	polyoxin D zinc salt	19	0 days	when dry	max. 2.77 L/ha	✓
Dithane Rainshield	20553	mancozeb	M	77 days	12 hours[2]/35 days[3]	max. 24 kg/ha	—
Double Nickel LC	31887	*Bacillus amyloliquefaciens*	BM	0 days	when dry	—	✓
Downforce AG	34723	fluazinam	29	28 days	24 hours	5	—
EcoSwing	35206	*Swinglea glutinosa* extract	BM	0 day	4 hours (or when dry)	10	✓
Excalia	33819	inpyrfluxam	7	petal fall	12 hours	2 (max. 438 mL/ha)	—
Flint	30619	trifloxystrobin	11	14 days	12 hours[2]/4 days[3]	4 (max. 840 g/ha)	—
Flint Extra	34962	trifloxystrobin	11	14 days	12 hours[2]/4 days[3]	4	—
Follow WDG	34314	folpet	M	1 day	12 hours[2]/1 day[9]/ 6 days[3]	6	—
Folpan 80 WDG	27733	folpet	M	1 day	12 hours[2]/1 day[9]/ 6 days[3]	6	—

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
FUNGICIDES (cont.)							
Fontelis	30331	penthiopyrad	7	28 days	12 hours	4 (max. 4.5 L/ha)	—
Fullback 125 SC	31679	flutriafol	3	14 days	12 hours	max. 2.05 L/ha	—
Gatten	34297	flutianil	U13	14 days	12 hours	4	—
Inspire Super	30827	difenoconazole + cyprodinil	3+9	14 days	12 hours	4	—
Kasumin 2L	30591	kasugamycin	24	90 days	12 hours	4	—
Kenja 400 SC	31758	isofetamid	7	20 days	12 hours	6	—
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓
Lifegard WG	32526	*Bacillus mycoides*	P6	0 days	4 hours	—	✓
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	14 days	12 hours[2]/24 hours[3]	4 (max. 3.2 L/ha)	—
Maestro 80 WSP	33488	captan	M	7 days	High density[13]: 2 days[2]/6 days[12]/ 15 days[2,9]	10[13]	—
					Standard[14]: 2 days[2]/4 days[12]/ 19 days[9]/24 days[3]	2[14]	
Magister SC	34544	fenazaquin	39	10 days	12 hours[2]/24 hours[4,12]/ 17 days[9]	1	—
Manzate Max	33299	mancozeb	M	77 days	12 hours[2]/35 days[3]	max. 37.5 L/ha	—
Manzate Pro-stick	28217	mancozeb	M	77 days	12 hours[2]/35 days[3]	max. 24 kg/ha	—
Merivon	33951	fluxapyroxad + pyraclostrobin	7+11	5 days	12 hours[2]/5 days[9]/ 12 days[3]	4	—
Mertect SC	13975	thiabendazole	1	postharvest	—	—	—
Milstop	28095	potassium bicarbonate	NC	0 days	4 hours (or when dry)	10	✓
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	✓
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
FUNGICIDES (cont.)							
Migiwa 20 SC	35443	ipflufenoquin	52	7 days	12 hours	3 (max. 660 mL/ha)	—
Nova	22399	myclobutanil	3	14 days	12 hours[2,4]/5 days[9]/ 12 days[3]	6	—
Oxidate	32907	hydrogen peroxide + peroxyacetic acid	NC	0 days	4 hours	8	✓
Parasol Flowable	25901	copper hydroxide	M	2 days	48 hours	2	—
Penncozeb 75 DF Raincoat	30241	mancozeb	M	77 days	12 hours[2]/35 days[3]	max. 24 kg/ha	—
Phostrol	30449	mono- and dibasic sodium, potassium and ammonium phosphites	P7	0 days	12 hours	6	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	5 days	when dry[2]/5 days[9]/ 12 days[3]	4	—
Property 300SC	32534	pyriofenone	50	14 days	12 hours	1.464 L/ha	—
Purespray Green Oil 13 E	27666	mineral oil	NC	—	12 hours	2/8[10]	✓
Regalia Maxx	30199	*Reynoutria sachalinensis*	P5	0 days	when dry	—	✓
Regalia Rx	32350	*Reynoutria sachalinensis*	P5	0 days	when dry	—	✓
Ridomil Gold 480 SL	28474	metalaxyl-M and S	4	non-bearing only	12 hours	2	—
Scala SC	28011	pyrimethanil	9	14 days	12 hours[2]/24 hours[3]	4	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Senator 50 SC	32096	thiophanate-methyl	1	7 days	12 hours[2]/7 days[9]	2 (max. 0.875 L/ha)	—
Serifel	30054	*Bacillus amyloliquefaciens*	BM	0 days	4 hours (or when dry)	—	✓
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	4	—
Serenade OPTI	31666	*Bacillus subtilis*	BM	0 days	when dry	—	✓

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
FUNGICIDES (cont.)							
Streptomycin 17	10305	streptomycin sulphate	25	50 days	24 hours[2]/7 days[4]/ 14 days[3]	3	—
Suffoil-X	33099	mineral oil	NC	—	12 hours	8	✓
Supra Captan 80 WSP	33641	captan	M	7 days	High density[13]: 2 days[2]/6 days[12]/ 15 days[2,9]	10[13]	—
					Standard[14]: 2 days[2]/4 days[12]/ 19 days[9]/24 days[3]	2[14]	
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	2	—
Tibet 50 SC	34386	thiabendazole	1	postharvest	—	—	—
Vantana	35050	fluazinam	29	28 days	24 hours	5	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[10]	✓
PLANT GROWTH REGULATORS							
Accede SG	34861	1-aminocyclopropanecarboxylic acid	NC	—	12 hours	2 (max. 2.0 kg/ha)	—
Apogee	28042	prohexadione calcium	NC	45 days	12 hours	4 (max. 5.4 kg/ha)	—
Blush 2X	34224	prohydrojasmon	NC	7 days	when dry	2 (max. 7.6 L/ha)	—
Brevis 150 SC	35694	metamitron	NC	72 days	12 hours	2 (max. 4.48 L/ha)	—
Cilis Plus	29210	6-benzylaminopurine	NC	28 days	12 hours	max. 21.3 L/ha	—
Ethrel	11580	ethephon	NC	non-bearing only	12 hours[2]/ 2 days[15]/ 10 days[4,12]	—	—
Fruitone-L	31460	1-naphthaleneacetic acid	NC	5 days	when dry	2	—
Harvista 1.3 SC	32752	1-methylcyclopropene	NC	3 days	4 hours	max. 17.7 L/ha	—
Kudos 27.5 WDG	33010	prohexadione calcium	NC	45 days	12 hours	4 (max. 5.4 kg/ha)	—
Maintain 3.5L	33945	1-naphthaleneacetic acid	NC	5 days	12 hours	max 11.58 L/ha	—

Table 1.1 – Products Used on Apples

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
THINNERS / PLANT GROWTH REGULATORS (cont.)							
MaxCel	28851	6-benzyladenine	NC	28 days	12 hours	max. 22.5 L/ha	—
NovaGib 10 L	30403	gibberellins A_4A_7	NC	28 days	12 hours	5	—
Perlan	29187	6-benzylaminopurine + gibberellins A_4A_7	NC	28 days	12 hours	max. 2.4 L/ha	—
Promalin SL	16636	6-benzyladenine + gibberellins A_4A_7	NC	28 days	12 hours	4 (max. 2.3 L/ha)	—
ReTain	25609	aviglycine hydrochloride	NC	7 days	12 hours	—	—
Sevin XLR	27876	carbaryl	1A	75 days	Trellised[16]: 4 days[2]/14 days[3,9]	2 (max. 3.22 L/ha[16])	—
					Non-trellised[17]: 12 hours[2]/10 days[9]/ 17 days[3]	2 (max. 2.15 L/ha[17])	

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.
U/UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

[1] Apply no later than 14 days after petal fall. [2] General re-entry. [3] Hand thinning. [4] Contact and scouting activities. [5] Maximum trunk applications per year for borer. [6] Personal protective equipment required for certain activities. See label. [7] Pick-your-own harvest. [8] Maximum of 3 consecutive applications to ensure plant injury does not occur. Additional applications may be possible if previous experience with repeat applications of the product under the same conditions have not produced plant injury. [9] Hand harvest. Where restricted entry interval exceeds preharvest interval, use longer interval. [10] Maximum dormant applications per year / maximum summer applications per year. [11] Maximum of 2 applications per codling moth generation. [12] Pruning and training. [13] High density orchard, where maximum canopy width per tree is less than 2 m (1 m from trunk to row alley). [14] Non-high density/standard orchard, where maximum canopy width per tree is greater than 2 m (1 m from trunk to row alley). [15] Transplanting. [16] High density, trellised orchard. [17] Traditional low- to medium-density orchard.

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
INSECTICIDES											
Aceta 70 WP	MT	MT	ST	MT	NT	MT	MT	MT	MT	VT	moderate
Altacor/Altacor Max	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	short
Assail 70 WP	MT	MT	ST	MT	NT	MT	MT	MT	MT	VT	moderate
Beleaf 50 SG	NT	—	—	—	—	—	—	—	—	—	—
Bioprotec PLUS	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Closer	VT	VT	ST	ST	NT	MT	MT	MT	MT	VT	short to moderate
Confirm 240 F	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Cormoran	VT	MT	ST	MT	NT	MT	VT	MT	VT	VT	moderate
CYD-X	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Danitol	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	short
Decis 100 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	short
Delegate	VT	ST	MT	MT	ST	ST	ST	ST	ST	MT	moderate
Dipel 2X DF	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Entrust	VT	ST	ST	ST	NT	ST	NT	NT	NT	ST	short to moderate
Exirel	VT	MT	ST	ST	ST	ST	MT	ST	ST	MT	short
GF-120 Fruit Fly Bait	VT	NT	ST	ST	NT	NT	NT	NT	NT	ST	short to moderate
Harvanta 50 SL	VT	—	—	—	—	—	—	—	—	—	short
Imidan WP	VT	ST	NT	NT	NT	MT	MT	MT	MT	VT	moderate – long
Intrepid	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Madex HP	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
INSECTICIDES (cont.)											
Malathion 85 E	VT	ST	NT	NT	NT	ST	MT	ST	ST	MT	moderate
Minecto Pro	VT	MT	MT	MT	ST	ST	MT	ST	ST	MT	moderate
Movento 240 SC	VT3	ST	NT	NT	NT	ST	ST	ST	ST	—	short
Perm-Up EC	VT	VT	VT	VT	MT	ST	MT	MT	MT	VT	short
Poleci 2.5 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	short
Pounce 384 EC	VT	VT	VT	VT	MT	ST	MT	MT	MT	VT	short
Rimon 10 EC	MT[3]	MT	NT	NT	NT	—	VT	MT	VT	VT	—
Sefina	MT	—	—	—	—	—	—	—	—	—	—
Shenzi 400 SC	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	short
Ship 250 EC	VT	—	—	—	—	—	—	—	—	—	—
Sivanto Prime	MT	ST	NT	NT	NT	ST	—	—	—	—	short
Success	VT	ST	ST	ST	NT	ST	NT	NT	NT	ST	short to moderate
Surround WP	I[4]	MT	MT	MT	MT	MT	MT	—	ST	MT	long
Theme 480 SC	NT	MT	NT	NT	NT	ST	MT	MT	MT	VT	moderate
Up-Cyde 2.5 EC	VT	—	—	—	—	—	—	—	—	—	—
Vayego	VT	—	—	—	—	—	—	—	—	—	short
Virosoft CP 4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Xentari WG	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
MITICIDES											
Acramite 50 WS	MT	NT	MT	MT	MT	ST	NT	NT	NT	—	short

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
MITICIDES (cont.)											
Agri-Mek SC	VT	MT	MT	MT	ST	ST	ST	ST	ST	—	moderate
Envidor SC	MT	MT	NT	NT	NT	—	—	—	—	—	—
Kanemite 15 SC	NT	ST	ST	ST	ST	—	—	—	—	—	—
Kopa	NT	ST	MT	MT	ST	ST	ST	ST	ST	—	short
Magister	VT	NT	MT	MT	ST	—	NT	NT	NT	NT	long
Nealta	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	—
Nexter SC	VT	MT	VT	VT	MT	MT	MT	MT	MT	—	short
Purespray Green Spray Oil 13 E	NT	ST	MT	MT	ST	ST	ST	ST	ST	—	short
Spiro SC	MT	MT	NT	NT	NT	—	—	—	—	—	—
Suffoil-X	NT	ST	MT	MT	ST	ST	ST	ST	ST	—	short
Superior 70 Oil	NT	ST	MT	MT	ST	ST	ST	ST	ST	—	short
Vegol Crop Oil	NT	ST	MT	MT	ST	ST	ST	ST	ST	—	short
FUNGICIDES											
Aliette	NT	—	—	—	—	—	—	—	—	—	—
Allegro 500 F	NT	—	—	—	—	—	—	—	—	—	—
Aprovia / Aprovia Top	NT	—	—	—	—	—	—	—	—	—	—
Blossom Protect	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Buran	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Cevya	NT	ST	NT	NT	NT	—	—	—	—	—	—
Copper 53 W	NT	—	—	—	—	—	—	—	—	—	—

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
FUNGICIDES (cont.)											
Copper Spray	NT	—	—	—	—	—	—	—	—	—	—
Cueva	NT	—	—	—	—	—	—	—	—	—	—
Cyclone Plus	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Diplomat 5 SC	NT	—	—	—	—	—	—	—	—	—	—
Double Nickel LC	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Downforce AG	NT	—	—	—	—	—	—	—	—	—	—
Ecoswing	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Excalia	NT	—	—	—	—	—	—	—	—	—	—
Flint / Flint Extra	ST	ST	NT	NT	NT	—	—	—	—	—	—
Follow WDG	NT	—	—	—	—	—	—	—	—	—	—
Folpan 80 WDG	NT	—	—	—	—	—	—	—	—	—	—
Fontelis	NT	—	—	—	—	—	—	—	—	—	—
Fullback 125 SC	MT	ST	NT	NT	NT	—	—	—	—	—	—
Gatten	ST	—	—	—	—	—	—	—	—	—	—
Inspire Super	NT	ST	NT	NT	NT	—	—	—	—	—	—
Kasumin 2L	NT	—	—	—	—	—	—	—	—	—	—
Kenja 400 SC	NT	—	—	—	—	—	—	—	—	—	—
Kumulus DF	ST	MT	ST	ST	ST	—	—	—	—	—	short
Lifegard WG	MT	—	—	—	—	—	—	—	—	—	—
Luna Tranquility	NT	—	—	—	—	—	—	—	—	—	—

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
FUNGICIDES (cont.)											
Maestro 80 WSP	ST	ST	ST	ST	ST	ST	—	—	—	—	—
Magister	VT	NT	MT	MT	ST	—	NT	NT	NT	NT	long
Manzate Max / Pro-Stick	ST	ST	MT	MT	ST	—	—	—	—	—	—
Merivon	NT	ST	NT	NT	NT	—	—	—	—	—	—
Milstop	NT	—	—	—	—	—	—	—	—	—	—
Microscopic Sulphur WP	ST	MT	ST	ST	ST	—	—	—	—	—	short
Microthiol Disperss	ST	MT	ST	ST	ST	—	—	—	—	—	short
Migiwa 20 SC	NT	—	—	—	—	—	—	—	—	—	—
Nova	NT	ST	NT	NT	NT	—	—	—	—	—	—
Oxidate	MT[3]	—	—	—	—	—	—	—	—	—	—
Parasol Flowable	NT	—	—	—	—	—	—	—	—	—	—
Penncozeb 75 DF Raincoat	ST	ST	MT	MT	ST	—	—	—	—	—	—
Phostrol	NT	—	—	—	—	—	—	—	—	—	—
Pristine WG	NT	ST	NT	NT	NT	—	—	—	—	—	—
Property 300 SC	NT	—	—	—	—	—	—	—	—	—	—
Regalia Maxx / Rx	NT	—	—	—	—	—	—	—	—	—	—
Ridomil Gold 480 SL	NT	—	—	—	—	—	—	—	—	—	—
Scala SC	NT	—	—	—	—	—	—	—	—	—	—
Senator 50 SC	NT	—	—	—	—	—	—	—	—	—	—
Sercadis	NT	—	—	—	—	—	—	—	—	—	—

Table 1.2 – Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees[1]	Stethorus (spider mite destroyer)	Predatory mites			Aphidoletes (aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids	Duration of impact to beneficial insects[2]
			Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali						
FUNGICIDES (cont.)											
Serenade OPTI	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	none
Streptomycin 17	NT	—	—	—	—	—	—	—	—	—	—
Supra Captan 80 WSP	ST	ST	ST	ST	ST	ST	—	—	—	—	—
Syllit 400 FL	MT	—	ST	ST	—	ST	—	—	—	—	—
Vantana	NT	—	—	—	—	—	—	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

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

[2] Duration: Short = hours to days. Moderate = days to 2 weeks. Long = many weeks or months.

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

[4] White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from various northeastern extension publications.

2. DISEASE MANAGEMENT

Table of Contents

Table 2.1 – Apple Crop Protection: Disease

Use this table as a guide but refer to product label for specific information. Products are listed in the crop protection tables by chemical group and are in alphabetical order within each group. The order does not reflect efficacy. For information on preharvest and restricted entry intervals, maximum applications, and organic status, see Table 1.1 – *Products Used on Apples*. For honeybee toxicity and impact to common beneficial insects, see Table 1.2 – *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*. For efficacy ratings, see Table 2.2 – *Activity of Fungicides on Apple Diseases.*

Group	Product Name	Common Name	Rate	Product Specific Comments
BITTER ROT				
General Comments: - Apply fungicides preventatively to susceptible cultivars, such as Empire, Ambrosia, Honeycrisp and Golden Delicious, in orchards with a history of infections. - Warm, wet weather during fruit maturity favours disease development. Fruit infection can develop rapidly near harvest. - Where possible, for resistance management of multiple diseases, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.				
7+11	Merivon	fluxapyroxad + pyraclostrobin	300–400 mL/ha	- Do not tank-mix or make sequential applications with Exirel. - Do not use with crop oil concentrate (COC), methylated seed oil (MSO) adjuvants or emulsifiable concentrates (EC). - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved fruit scab control, tank-mix with a compatible protectant fungicide if used after bloom.
7+11	Pristine WG	boscalid + pyraclostrobin	1–1.2 kg/ha	- Do not tank-mix or make sequential applications with Exirel. - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved fruit scab control, tank-mix with a compatible protectant fungicide if used after bloom.
19	Diplomat 5 SC	polyoxin D zinc salt	463–926 mL/ha	- **SUPPRESSION ONLY**
29	Allegro 500 F	fluazinam	0.75–1 L/ha	- May provide mite suppression. - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.75–1 L/ha	
M4	Maestro 80 WSP	captan	3 kg/ha	- Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel. - When restricted entry interval exceeds preharvest interval, follow restricted entry interval.
M4	Supra Captan 80 WSP	captan	3 kg/ha	
P5	Regalia Maxx	*Reynoutria sachalinensis* extract	5–10 L/ha	- **SUPPRESSION ONLY** - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Do not exceed 0.5% v/v (ie., 5 L in 1000 L water/ha) during bloom.
P5	Regalia Rx	*Reynoutria sachalinensis* extract	5–10 L/ha	

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
BLACK ROT / FROG-EYE LEAF SPOT				
General Comments: - Leaf infections (frog-eye leaf spot) can begin in spring; fruit rot risk increases through summer, particularly during wet weather. - Overwinters in dead wood, cankers, and mummified fruit. Sanitation is critical for management. - Apply fungicides preventatively to susceptible blocks, or those cultivars which frequently hold fruit mummies (eg., Gala, Empire, Honeycrisp, Cortland, Northern Spy) in orchards with a history of black rot infections. - Where possible, for resistance management of multiple diseases, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.				
3	Ceyva	mefentrifluconazole	250–375 mL/ha	- **SUPPRESSION ONLY** - Other Group 3 fungicides are known to be weak on fruit scab; however, research has shown Cevya may have some efficacy.
7+11	Merivon	fluxapyroxad + pyraclostrobin	300–400 mL/ha	- Do not tank-mix or make sequential applications with Exirel. - Do not use with crop oil concentrate (COC), methylated seed oil (MSO) adjuvants or emulsifiable concentrates (EC). - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved fruit scab control, tank-mix with a compatible protectant fungicide if used after bloom.
7+11	Pristine WG	boscalid + pyraclostrobin	1–1.2 kg/ha	- Do not tank-mix or make sequential applications with Exirel. - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved fruit scab control, tank-mix with a compatible protectant fungicide if used after bloom.
29	Allegro 500 F	fluazinam	1 L/ha	- **SUPPRESSION ONLY** - May provide mite suppression. - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	1 L/ha	
29	Vantana	fluazinam	1 L/ha	
M4	Follow WDG	folpet	3–3.75 kg/ha	- May cause russeting to Delicious and other sensitive cultivars when used pink to 30 days after petal fall. - Do not use within 14 days of oil.
M4	Folpan 80 WDG	folpet	3–3.75 kg/ha	
M4	Maestro 80 WSP	captan	3 kg/ha	- Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel. - When restricted entry interval exceeds preharvest interval, follow restricted entry interval.
M4	Supra Captan 80 WSP	captan	3 kg/ha	
NC	OxiDate	hydrogen peroxide + peroxyacetic acid	1% v/v (i.e., 1 L in 100 L water/ha)	- **PARTIAL SUPPRESSION ONLY** - Apply at first signs of infection or when conditions favour disease development. Reapply every 5-7 days, as needed. - For increased coverage, use with a registered non-ionic surfactant. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
BLISTER SPOT				
General Comments: - Apply preventatively to Mutsu/Crispin, Jonagold, Golden Delicious and other susceptible cultivars. - Warm, humid or wet conditions during the spring and early summer favour a build up of bacterial populations and subsequent infections of leaf veins and fruit. Mutsu are most susceptible beginning two weeks after petal fall lasting for about six weeks (late July). - Symptoms often do not appear until mid to late July after which time the bacteria can no longer infect the fruit.				
M1	Copper 53 W	tri-basic copper sulphate	1 kg/ha per 1,000 L water	- Apply up to 3 sprays beginning 10 days after petal fall (calyx). - To reduce the risk of phytotoxicity, use 6 kg of hydrated lime per 1 kg of Copper 53 W per 1,000 L of water. Do not tank-mix lime mixture with other insecticides and fungicides. See label for more information.
P7	Aliette WDG	fosetyl al	2 kg/ha	- Begin applications at petal fall (calyx) with 1-2 subsequent sprays at 7-day intervals. - Do not tank-mix with copper, adjuvants/surfactants that enhance penetration, or foliar fertilizers.
FIRE BLIGHT				
General Comments: - Use disease forecasting models (e.g., Maryblyt, Cougar Blight) to time fire blight sprays. See Ontario CropIPM for more information. Ontario Fire Blight Prediction Maps are also available on ONfruit.ca to aid in decision-making. - Otherwise, apply sprays if temperatures over 18°C are accompanied by high humidity (over 69%), heavy dews or rainfall. - For ***dormant canker*** management, spray when overwintering cankers begin to ooze as tree breaks dormancy. Apply up to ¼-inch green. - For ***blossom blight*** management, spray susceptible cultivars beginning at first bloom, unless specified in product specific comments and continue until petal fall including rat-tail bloom. - For ***shoot blight*** management, maintain protective sprays during conditions of rapid growth or following a trauma event such as hail, strong wind or heavy rain. Prune out infected shoots where possible and apply preventative spray immediately after. - See Table 2.5 – *Disease Susceptibility Ratings of Common Apple Cultivars* and Table 2.6 – *Insect and Disease Susceptibility Ratings of Common Apple Rootstocks* for more information on cultivar and rootstock susceptibility to fire blight.				
24	Kasumin 2L	kasugamycin	5 L in 1,000 L water/ha	- **BLOOM APPLICATION** - Do not apply after petal fall. - This product is effective against streptomycin-resistant fire blight populations. - Does not provide protection of any blossoms that open after application. Monitor bloom closely during conditions conducive to infection to determine if reapplication is required. - Rotate with another chemical group after 2-3 days if warm, wet conditions (above 18°C) are forecast. - If using lower water volumes, refer to water volume chart on label for rate recommendations.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FIRE BLIGHT (cont.)				
25	Streptomycin 17	streptomycin	600 g/1,000 L water	- **BLOOM AND SUMMER APPLICATION** - Apply at bloom or following a trauma event. Preharvest interval restrictions need to be considered prior to a late summer application. - Does not provide protection of any blossoms that open after application. Monitor bloom closely during conditions conducive to infection to determine if reapplication is required. - Rotate with another chemical group after 2-3 days if warm, wet conditions (above 18°C) are forecast. - May provide some curative or kick-back activity if applied within 24 hours following an infection event. - Apply within 24 hours of a trauma event such as hail, strong wind or heavy rain to control shoot blight, especially if blossom blight has occurred or fire blight is active in the region. - Degrades rapidly in UV.
BM2	Double Nickel LC	*Bacillus amyloliquefaciens* strain D-747	5–7.5 L/ha	- **SUPPRESSION ONLY** - **BLOOM AND SUMMER APPLICATION** - Apply at 1-5% bloom and reapply every 3-7 days if conditions favour disease development. - Can be mixed with copper fungicide to improve control.
BM2	Serifel	*Bacillus amyloliquifaciens* strain MBI 600	0.56 kg/ha	- **PARTIAL SUPPRESSION ONLY** - **BLOOM AND SUMMER APPLICATION** - Apply at 1-5% bloom and reapply every 2-7 days if conditions favour disease development. - Use only under low to moderate disease pressure. Under high disease pressure, follow with Streptomycin or Kasumin 2-3 days later. - Do not tank-mix or apply within 7 days of mancozeb.
BM2	Serenade OPTI	*Bacillus subtilis* strain QST 713	1.1–1.7 kg/ha	- **SUPPRESSION ONLY** - **BLOOM AND SUMMER APPLICATION** - Apply at 1-5% bloom and reapply as needed if conditions favour disease development. - Under high disease pressure, follow with Streptomycin or Kasumin 2-3 days later.
M1	Copper Spray	copper oxychloride	3.2 kg/ha	- **DORMANT TO BUD SWELL APPLICATION** - Apply up to ¼-inch green. - This spray does not eliminate the need for blossom blight management. This product is a contact fungicide only and does not have activity on the fire blight pathogen within the plant tissue. - Thorough coverage of limbs and trunk is essential for good control. - Phytotoxicity may occur with some copper formulations if applied at a later growth stage. Read label for more information.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FIRE BLIGHT (cont.)				
M1	Copper 53 W	tri-basic copper sulphate	1 kg/ha per 1,000 L water/ha	- **DORMANT TO BUD SWELL APPLICATION** - Apply up to ¼-inch green. - This spray does not eliminate the need for blossom blight management. This product is a contact fungicide only and does not have activity on the fire blight pathogen within the plant tissue. - Thorough coverage of limbs and trunk is essential for good control. - Phytotoxicity may occur with some copper formulations if applied at a later growth stage. Read label for more information.
M1	Cueva	copper octanoate	1% v/v in 470–940 L water/ha	- **DORMANT, BLOOM AND SUMMER APPLCATIONS** - For dormant canker management, apply up to ¼-inch green. - Dormant spray does not eliminate the need for blossom blight management. This product is a contact fungicide only and does not have activity on the fire blight pathogen within the plant tissue. - For blossom blight management, apply when conditions are conducive to infection. - For shoot blight management, apply within 24 hours of a trauma event such as hail, strong wind or heavy rain, especially if blossom blight has occurred or fire blight is active in the region. - May cause russeting of light-skinned cultivars. Use a 0.5–0.8% solution if fruit is present. If concerned about sensitivity of fruit, test first on a small area.
M1	Parasol Flowable	copper hydroxide	4.7 L/ha	- **DORMANT TO BUD SWELL APPLICATION** - Apply up to ¼-inch green. - This spray does not eliminate the need for blossom blight management. This product is a contact fungicide only and does not have activity on the fire blight pathogen within the plant tissue. - Thorough coverage of limbs and trunk is essential for good control. - Phytotoxicity may occur with some copper formulations if applied at a later growth stage. Read label for more information.
NC	Blossom Protect	*Aureobasidium pullulans*	3 kg Buffer Protect NT + 0.75 kg Blossom Protect in 500 L water/ha	- **BLOOM APPLICATION** - If a forecast system is available, apply 1–2 days before an infection date. Repeat after 2 days and up to 5 times if infection continues. - If no forecast system is available, apply at 10, 40, 70 and 90% open blossoms. - For every 1 m of tree height, dilute 3 kg Buffer Protect NT in 500 L/ha water and add 0.75 kg Blossom Protect to dilution. - This product is sensitive to fungicides and may have reduced efficacy if tank-mixed or applied within 2 days of certain products. See label for further details. - Russeting may occur on sensitive cultivars. Do not apply more than 2 times on Golden Delicious, Idared and Jonagold or to control rat-tail blossom.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FIRE BLIGHT (cont.)				
NC	Cyclone Plus	citric and lactic acid	1.4% v/v (i.e., 14 L in 1,000L water/ha)	- **BLOOM AND SUMMER APPLICATION** - Apply at 1-5% bloom and reapply as needed if conditions favour disease development.
NC	Buran	garlic powder	1.4% v/v (i.e., 7–11 L in 500–800 L water/ha)	- **SUPPRESSION ONLY (at blossom blight stage)** - **BLOOM AND SUMMER APPLICATION** - Use of a non-ionic surfactant at a rate of 0.1% could help improve coverage. - Do not apply if rain is forecast within 48 hours. - Do not tank-mix with streptomycin.
NC	OxiDate	hydrogen peroxide + peroxyacetic acid	1% v/v (i.e., 1 L in 100 L water/ha)	- **PARTIAL SUPPRESSION ONLY** - **BLOOM AND SUMMER APPLICATION** - Does not have activity on infected blossoms or shoots, but rather helps prevent spread of bacteria to other susceptible tissue. - Apply at first signs of infection or when conditions favour disease development. Reapply every 5-7 days as needed. - For increased coverage, use with a registered non-ionic surfactant. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
P5	Regalia Maxx	*Reynoutria sachalinensis* extract	5–10 L/ha	- **SUPPRESSION ONLY** - **BLOOM AND SUMMER APPLICATION** - Begin applications at pink and continue through critical infection periods into summer. - Does not have activity on infected blossoms or shoots, but rather helps prevent spread of bacteria to other susceptible tissue. - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Initial inducement of plant defence response occurs soon after application, but 3-5 days are required to attain maximum level of protection. - Do not exceed 0.5% v/v (ie., 5 L in 1000 L water/ha) during bloom.
P5	Regalia Rx	*Reynoutria sachalinensis* extract	5–10 L/ha	

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FIRE BLIGHT (cont.)				
P6	LifeGard WG	*Bacillus mycoides* isolate J	70–333 g/ha	- **SUPPRESSION ONLY** - **PINK AND/OR POST-BLOOM APPLICATION** - Do not apply during bloom. This product is toxic to bees. - Apply 0.33 g / 1L water. See label for suggested volumes. - Does not have activity on infected blossoms or shoots, but rather helps prevent spread of bacteria to other susceptible tissue. - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Initial inducement of plant defence response occurs soon after application, but 3–5 days are required to attain maximum level of protection. - Do not tank-mix with antibiotics (e.g., Streptomycin, Kasumin). - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
NC	Apogee	prohexadione calcium	450 g/1,000 L water	- **PINK TO KING BLOOM PETAL FALL APPLCATION** - Reduces vegetative growth, making trees less susceptible to fire blight shoot infection. Has no impact on blossom blight or fire blight bacteria but can slow spread to shoot should blossom infection occur. - Apply when terminal shoots are 2.5–5.5 cm long. Must be applied at least 10 days before occurrence of conditions favourable to shoot infection. Accurate timing is critical. Reapply 14–21 days later. - Uptake can be enhanced with the addition of 0.05% v/v non-ionic surfactant. - In plantings with low vigour, a reduction in shoot growth caused by the high rate for fire blight suppression may be undesirable. - Do not tank-mix with calcium. - Severe cracking can occur on Empire and Stayman cultivars and decrease in yield in Cortland.
NC	Kudos 27.5 WDG	prohexadione calcium	450 g/1,000 L water	
FLY SPECK / SOOTY BLOTCH				
General Comments: - Begin fungicide coverage at petal fall (calyx) if fly speck and sooty blotch were a problem in the past. In orchards that have not had a problem with fly speck and sooty blotch in the past, fruit can become infected typically 4–6 weeks after petal fall. - Warm, wet weather during fruit maturity favours disease development. - While infection occurs shortly after petal fall, symptoms do not appear until mid- to late summer. - Late season infections can occur in orchards where summer rains have removed fungicide residues. Reapply fungicides in August or September if more than 5 cm of rain have occurred since the last fungicide was applied. - Scab resistance and powdery mildew sensitivity to some Group 3 and 11 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. - Where possible, for resistance management of multiple diseases, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.				
3	Cevya	mefentrifluconazole	250–375 mL/ha	- Unlike other Group 3 fungicides, Cevya may have some efficacy on fruit scab.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FLY SPECK / SOOTY BLOTCH (cont.)				
3+7	Aprovia Top	difenoconazole + benzovindiflupyr	643 mL/ha	- Weak on fruit scab and should be tank-mixed with a compatible post-bloom protectant fungicide effective against scab.
3+9	Inspire Super	difenoconazole + cyprodinil	836 mL/ha	- Weak on fruit scab and should be tank-mixed with a compatible post-bloom protectant fungicide effective against scab.
7+11	Merivon	fluxapyroxad + pyraclostrobin	300–400 mL/ha	- Do not tank-mix or make sequential applications with Exirel. - Do not use with crop oil concentrate (COC), methylated seed oil (MSO) adjuvants or emulsifiable concentrates (EC). - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible post-bloom protectant fungicide effective against scab.
7+11	Pristine WG	boscalid + pyraclostrobin	600–800 g/ha	- Do not tank-mix or make sequential applications with Exirel. - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible post-bloom protectant fungicide effective against scab.
11	Flint	trifloxystrobin	140–175 g/ha	- Do not tank-mix or make sequential applications with Exirel. - Weak on fruit scab. Tank-mix with a compatible post-bloom protectant fungicide effective against scab.
11	Flint Extra	trifloxystrobin	145–180 g/ha	
19	Diplomat 5 SC	polyoxin D zinc salt	463–926 mL/ha	- **SUPPRESSION ONLY**
29	Allegro 500 F	fluazinam	0.5–1 L/ha	- May provide mite suppression. - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.5–1 L/ha	
29	Vantana	fluazinam	0.75–1 L/ha	
M4	Follow WDG	folpet	3–3.75 kg/ha	- May cause russeting to Delicious and other sensitive cultivars when used pink to 30 days after petal fall. - Do not use within 14 days of oil.
M4	Folpan 80 WDG	folpet	3–3.75 kg/ha	
M4	Maestro 80 WSP	captan	3 kg/ha	- Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel. - When restricted entry interval exceeds preharvest interval, follow restricted entry interval.
M4	Supra Captan 80 WSP	captan	3 kg/ha	
NC	OxiDate	hydrogen peroxide + peroxyacetic acid	1% v/v (i.e., 1 L in 100 L water/ha)	- **SUPPRESSION ONLY** - For increased coverage, use with a registered non-ionic surfactant. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
FLY SPECK / SOOTY BLOTCH (cont.)				
P5	Regalia Maxx	*Reynoutria sachalinensis* extract	5–10 L/ha	- **SUPPRESSION ONLY** - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Do not exceed 0.5% v/v (ie., 5 L in 1000 L water/ha) during bloom.
P5	Regalia Rx	*Reynoutria sachalinensis* extract	5–10 L/ha	
P6	LifeGard WG	*Bacillus mycoides* isolate J	70–333 g/ha	- **SUPPRESSION ONLY** - Do not apply during bloom. This product is toxic to bees. - Apply 0.33 g / 1L water. See label for suggested volumes. - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Initial inducement of plant defence response occurs soon after application, but 3–5 days are required to attain maximum level of protection. - Do not tank-mix with antibiotics (e.g., Streptomycin, Kasumin). - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
P7	Phostrol	mono- and dibasic sodium, potassium and ammonium phosphites	4.4 L/ha	- No product specific comments.
PHYTOPHTHORA CROWN & ROOT ROT				
General Comments: - Watch for symptoms during wet periods and in stressed trees. Infection risk increases in poorly drained soils or low areas during prolonged soil saturation. - See Table 2.6 – *Insect and Disease Susceptibility Ratings of Common Apple Rootstocks* for more information on Phytophthora-resistant rootstocks.				
4	Ridomil Gold 480 SL	metalaxyl-M and S	1 mL/tree	- **NON-BEARING APPLICATION** - Apply in 5 L of water per tree, using handgun to drench trunk and soil surrounding tree. - Apply before new growth begins and again in early fall. - Do not apply as a foliar spray.
P7	Aliette WDG	fosetyl al	3–5 kg/ha	- **BEARING APPLICATION** - Apply as a foliar spray. - Apply from tight cluster to pink and again 6 weeks later. - Do not use a drench treatment on bearing trees. - Do not tank-mix with copper, adjuvants/surfactants that enhance penetration or foliar fertilizers.
P7	Aliette WDG	fosetyl al	5–10 g/tree	- **NON-BEARING APPLICATION** - Apply in 5 L of water per tree, using handgun to drench trunk and soil surrounding tree. - Apply in spring after bud break and again in early fall.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
POWDERY MILDEW				
General Comments: - Infections begin from overwintering buds, especially during warm, humid conditions. Free water is not required for infection. - Begin application at green tip to half-inch green and continue to first summer spray. Additional sprays may be needed on susceptible cultivars or if disease pressure is severe. - See Table 2.5 – *Disease Susceptibility Ratings of Common Apple Cultivars* for more information on cultivar susceptibility. - Infection will continue until susceptible growing tissue is no longer present, or terminal bud set. Infected shoots and buds have reduced vigour and are more susceptible to cold injury. - Scab resistance and powdery mildew sensitivity to some Group 3 and 11 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. - Where possible, for resistance management of multiple diseases, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.				
1	Senator 50 SC	thiophanate-methyl	250 mL/1,000 L water	- Historically, Benlate-resistant forms of apple scab have been present in Ontario. Senator belongs to the same chemical group as Benlate. Use caution if Benlate was used in your orchard in the past.
3	Ceyva	mefentrifluconazole	250–375 mL/ha	- **SUPPRESSION ONLY** - Other Group 3 fungicides are known to be weak on fruit scab; however, research has shown Cevya may have some efficacy.
3	Fullback 125 SC	flutriafol	585–877 mL/ha	- Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3	Nova	myclobutanil	340 g/ha	- Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3+7	Aprovia Top	difenoconazole + benzovindiflupyr	643 mL/ha	- Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3+9	Inspire Super	difenoconazole + cyprodinil	836 mL/ha	- **SUPPRESSION ONLY** - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
7	Aprovia	benzovindiflupyr	500 /ha	- No product specific comments.
7	Excalia	inpyrfluxam	146–219 mL/ha	- Use with an organosilicone adjuvant (e.g., Xiameter) at a rate of 32–62 mL/100 L water. - Do not use after petal fall (calyx).
7	Fontelis	Penthiopyrad	1–1.5 L/ha	- Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
POWDERY MILDEW (cont.)				
7	Sercadis	fluxapyroxad	167–333 mL/ha	- Use with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). - Do not use after full bloom.
7+9	Luna Tranquility	fluopyram + pyrimethanil	600 /ha	- No product specific comments.
7+11	Merivon	fluxapyroxad + pyraclostrobin	300–400 mL/ha	- Do not tank-mix or make sequential applications with Exirel. - Do not use with crop oil concentrate (COC), methylated seed oil (MSO) adjuvants or emulsifiable concentrates (EC). - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible protectant fungicide if used after bloom.
7+11	Pristine WG	boscalid + pyraclostrobin	1–1.2 kg/ha	- Do not tank-mix or make sequential applications with Exirel. - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible protectant fungicide if used after bloom.
11	Flint	trifloxystrobin	140–210 g/ha	- Do not tank-mix or make sequential applications with Exirel. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
11	Flint Extra	trifloxystrobin	145–215 mL/ha	
19	Diplomat 5 SC	polyoxin D zinc salt	259–926 mL/ha	- **SUPPRESSION ONLY**
39	Magister SC	fenazaquin	1.75–2.63 L/ha	- This product also provides control of mites. See Table 3.6 – *Activity of Miticides Registered on Apple in Ontario* for more information on targeted life stages, preferred timing and comments on knock-down for registered miticides. - This product is toxic to bees. Avoid application during bloom or when bees are active. See label for specific bee toxicity statements.
50	Property 300 SC	pyriofenone	300–366 mL/ha	- Activity can be improved with the addition of a non-ionic surfactant at the rates specified on the surfactant label or at 0.25-0.5% if no rate is specified on the surfactant label. - Do not apply to Macoun, SnowSweet, or Baldwin cultivars.
52	Migiwa 20 SC	ipflufenoquin	165–220 mL/ha	- **SUPPRESSION ONLY (at low rate)** - May be used with a non-ionic surfactant at a rate of 0.125% - 0.5% v/v (1.25 - 5 L in 1,000 L water) to improve control under high pressure.
BM2	Serenade OPTI	*Bacillus subtilis* strain QST 713	1.7–3.3 kg/ha	- **SUPPRESSION ONLY** - Use in conjunction with other cultural or chemical controls.
M2	Kumulus DF	sulphur	22.5 kg/ha	- May cause an increase in red mite and scale populations at this rate. - Do not use within 14 days of Purespray Green Spray Oil or SuffOil-X and 30 days of Vegol Crop Oil or Superior Oil. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
POWDERY MILDEW (cont.)				
M2	Microscopic Sulphur WP	sulphur	6.5 kg/1,000 L water	- May cause an increase in red mite and scale populations if applying at a rate more than 1,000L water. - Do not use within 14 days of Purespray Green Spray Oil or SuffOil-X and 30 days of Vegol Crop Oil or Superior Oil. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
M2	Microthiol Disperss	sulphur	22.5 kg/ha	- May cause an increase in red mite and scale populations at this rate. - Do not use within 14 days of Purespray Green Spray Oil or SuffOil-X and 30 days of Vegol Crop Oil or Superior Oil. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
NC	Purespray Green Spray Oil 13E	mineral oil	10 L/1,000 L water	- **SUPPRESSION ONLY** - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow, Perm-Up, Pounce or sulphur.
NC	SuffOil-X	mineral oil	13 L/1,000 L water	- **SUPPRESSION ONLY** - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use in combination with or immediately before or after spraying Sevin or sulphur or within 14 days of Supra Captan, Maestro, Folpan, or Follow. - If concerned about tree sensitivity, test first on a small area.
NC	Vegol Crop Oil	canola oil	2% v/v	- **SUPPRESSION ONLY** - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
POWDERY MILDEW (cont.)				
NC	Buran	garlic extract	1.2–1.8% v/v (i.e., 9L in 500–800L water/ha)	- Begin applications preventatively when conditions are conducive to disease development. Reapply every 7–10 days if needed. - Control can be achieved under low to moderate disease pressure with addition of a non-ionic surfactant at a rate of 0.1% v/v. - Do not apply if rain is forecast within 48 hours.
NC	OxiDate	hydrogen peroxide + peroxyacetic acid	1% v/v (i.e., 1 L in 100 L water/ha)	- **SUPPRESSION ONLY** - For increased coverage, use with a registered non-ionic surfactant. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
NC	MilStop	potassium bicarbonate	2.8–5.6 kg/ha	- Begin applications at first sign of disease. Reapply every 7–10 days if needed.
P5	Regalia Maxx	*Reynoutria sachalinensis* extract	5–10 L/ha	- **SUPPRESSION ONLY** - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Do not exceed 0.5% v/v (ie., 5 L in 1000 L water/ha) during bloom.
P5	Regalia Rx	*Reynoutria sachalinensis* extract	5–10 L/ha	
P6	LifeGard WG	*Bacillus mycoides* isolate J	70–333 g/ha	- **SUPPRESSION ONLY** - Do not apply during bloom. This product is toxic to bees. - Apply 0.33 g / 1L water. See label for suggested volumes. - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Initial inducement of plant defence response occurs soon after application, but 3–5 days are required to attain maximum level of protection. - Do not tank-mix with antibiotics (e.g., Streptomycin, Kasumin). - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
U13	Gatten	flutianil	440–590 mL/ha	- No product specific comments.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
RUST				
General Comments: - If the alternate cedar host, like Eastern red cedar or juniper, is nearby, include in sprays up to and including first summer sprays during wet periods. - Young leaves and fruit are most susceptible; risk declines as tissue matures. - See Table 2.5 – *Disease Susceptibility Ratings of Common Apple Cultivars* for more information on cultivar susceptibility. - Scab resistance to some Group 3 and 11 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. - Where possible, for resistance management of multiple diseases, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.				
3	Fullback 125 SC	flutriafol	585–877 mL/ha	- Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3	Nova	myclobutanil	340 g/ha	
3+7	Aprovia Top	difenoconazole + benzovindiflupyr	643 mL/ha	
3+9	Inspire Super	difenoconazole + cyprodinil	836 mL/ha	
7	Fontelis	penthiopyrad	1–1.5 L/ha	- Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
11	Flint	trifloxystrobin	140–210 g/ha	- Do not tank-mix or make sequential applications with Exirel. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
11	Flint Extra	trifloxystrobin	145–215 g/ha	
29	Allegro 500 F	fluazinam	0.75–1 L/ha	- Will provide suppression of Quince rust if used at higher rate. - May provide mite suppression. - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.75–1 L/ha	
29	Vantana	fluazinam	0.75–1 L/ha	
M3	Dithane Rainshield	mancozeb	2–6 kg/ha	- No product specific comments.
M3	Manzate Max	mancozeb	7.8–9.38 L/ha	
M3	Manzate Pro-Stick	mancozeb	6 kg/ha	
M3	Penncozeb 75DF Raincoat	mancozeb	6 kg/ha	

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
SCAB				
General Comments: - Apply fungicides before spore release as soon as green tissue is present and keep growing leaves covered if conditions are conducive to disease development. - See Table 2.3 – *Characteristics of Apple Scab Fungicides* for more information on pre- and post-infection activity, retention and redistribution of apple scab fungicides. - Rainfall is needed for spore release and leaves/fruit must be wet for infection to occur. The length of the wetting period required for infection varies with temperature. See Table 2.4 – *Relationship of Temperature and Leaf Wetness to Apple Scab Infection* and Ontario Crop IPM for information on infection periods. - For resistance management, tank-mix products from Groups 1, 3, 7, 9, 11 and U12 with a ½ to full rate compatible protectant apple scab fungicide from a different group (e.g., Group M or BM). See label for more information on suggested tank-mix partners. - Resistance to some Group 3, 11 and U12 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. - Where possible, for resistance management, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season. - Do not use fungicide groups that have high resistance risk (e.g., Group 1, 3, 7, 9, 11 and U12) if active scab lesions are present in the orchard. - See Table 2.5 – *Disease Susceptibility Ratings of Common Apple Cultivars* for more information on cultivar susceptibility.				
1	Senator 50 SC	thiophanate-methyl	250 mL/1,000 L water	- Historically, Benlate-resistant forms of apple scab have been present in Ontario. Senator belongs to the same chemical group as Benlate. Use caution if Benlate was used in your orchard in the past. - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
3	Cevya	mefentrifluconazole	250–375 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Other Group 3 fungicides are known to be weak on fruit scab; however, research has shown Cevya may have some efficacy.
3	Fullback 125 SC	flutriafol	950 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3	Nova	myclobutanil	340 g/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3+7	Aprovia Top	difenoconazole + benzovindiflupyr	386–643 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
3+9	Inspire Super	difenoconazole + cyprodinil	560–836 mL/ha	- Group 9 fungicides provide effective scab control in cooler weather compared to other groups and may be a good option in cool, wet springs. - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
SCAB (cont.)				
7	Aprovia	benzovindiflupyr	300–500 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
7	Excalia	inpyrfluxam	146–219 mL/ha	- Do not use after petal fall (calyx). - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
7	Fontelis	penthiopyrad	1–1.5 L/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
7	Kenja 400 SC	isofetamid	913 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
7	Sercadis	fluxapyroxad	333 mL/ha	- Do not use after full bloom. - Use with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
7+9	Luna Tranquility	fluopyram + pyrimethanil	800 mL/ha	- Group 9 fungicides provide effective scab control in cooler weather compared to other groups and may be a good option in cool, wet springs. - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
7+11	Merivon	fluxapyroxad + pyraclostrobin	300–400 mL/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Do not tank-mix or make sequential applications with Exirel. - Do not use with crop oil concentrate (COC), methylated seed oil (MSO) adjuvants or emulsifiable concentrates (EC). - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible protectant fungicide if used after bloom.
7+11	Pristine WG	boscalid + pyraclostrobin	1–1.2 kg/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Do not tank-mix or make sequential applications with Exirel. - The Group 11 fungicide in this tank-mix is weak on fruit scab. For improved control, tank-mix with a compatible protectant fungicide if used after bloom.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
SCAB (cont.)				
9	Scala SC	pyrimethanil	1 L/ha	- Do not use after bloom. - Group 9 fungicides provide effective scab control in cooler weather compared to other groups and may be a good option in cool, wet springs. - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - This product is not effective against other diseases such as powdery mildew, rust or rots.
11	Flint	trifloxystrobin	140–175 g/ha	- For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster. - Do not tank-mix or make sequential applications with Exirel. - Weak on fruit scab. Tank-mix with a compatible protectant fungicide if used after bloom.
11	Flint Extra	trifloxystrobin	145–180 g/ha	
29	Allegro 500 F	fluazinam	0.5–1 L/ha	- May provide mite suppression. - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.5–1 L/ha	
29	Vantana	fluazinam	0.75–1 L/ha	
52	Migiwa 20 SC	ipflufenoquin	165–220 mL/ha	- May be used with a non-ionic surfactant at a rate of 0.125% - 0.5% v/v (1.25 - 5 L in 1,000 L water) to improve control under high pressure. - For effective uptake, expanding leaf surface is required. Effectiveness may be reduced before tight cluster.
BM1	EcoSwing	*Swinglea glutinosa* extract	1.75–2.35 L/ha	- **SUPPRESSION ONLY** - Use in conjunction with other cultural or chemical controls.
BM2	Serenade OPTI	*Bacillus subtilis* strain QST 713	1.7–3.3 kg/ha	- **SUPPRESSION ONLY** - Use in conjunction with other cultural or chemical controls.
M1	Cueva	copper octanoate	1% v/v in 470–940 L water/ha	- May cause russeting of light-skinned cultivars. Use a 0.5–0.8% solution if fruit is present. If concerned about sensitivity of fruit, test first on a small area.
M2	Kumulus DF	sulphur	12–15 kg/ha	- May cause an increase in red mite and scale populations at a high rate. - Do not use within 14 days of Purespray Green Spray Oil or SuffOil-X and 30 days of Vegol Crop Oil or Superior Oil. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
M2	Microscopic Sulphur WP	sulphur	6.5 kg/1,000 L water	
M2	Microthiol Disperss	sulphur	12–15 kg/ha	

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
SCAB (cont.)				
M3	Dithane Rainshield	mancozeb	2–6 kg/ha	- No product specific comments.
M3	Manzate Max	mancozeb	7.8–9.38 L/ha	
M3	Manzate Pro-Stick	mancozeb	6 kg/ha	
M3	Penncozeb 75DF Raincoat	mancozeb	6 kg/ha	
M4	Follow WDG	folpet	3–3.75 kg/ha	- May cause russeting to Delicious and other sensitive cultivars when used pink to 30 days after petal fall. - Do not use within 14 days of oil.
M4	Folpan 80 WDG	folpet	3–3.75 kg/ha	
M4	Maestro 80 WSP	captan	3 kg/ha	- Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel. - When restricted entry interval exceeds preharvest interval, follow restricted entry interval.
M4	Supra Captan 80 WSP	captan	3 kg/ha	
NC	Buran	garlic powder	1.8% v/v (i.e., 9L in 500L water/ha)	- **SUPPRESSION ONLY** - This product should only be used as a post-infection treatment, but before 350 degree-hours (base 0ºC) after beginning of infection. Apply after rainfall or when conditions are conducive to disease development. - Do not use more than 18 L/ha per application. - Do not apply if rain is forecast within 48 hours.
NC	OxiDate	hydrogen peroxide + peroxyacetic acid	1% v/v (i.e., 1L in 100L water/ha)	- **PARTIAL SUPPRESSION ONLY** - For increased coverage, use with a registered non-ionic surfactant. - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.
P6	LifeGard WG	*Bacillus mycoides* isolate J	70–333 g/ha	- **SUPPRESSION ONLY** - Do not use during bloom. This product is toxic to bees. - Apply 0.33 g / 1L water. See label for suggested volumes. - This product works by activating the tree's defense mechanism and is most effective when it is applied before infection occurs or when added to a rotation where disease control has been maintained by an effective fungicide program. - Initial inducement of plant defence response occurs soon after application, but 3–5 days are required to attain maximum level of protection. - Do not tank-mix with antibiotics (e.g., Streptomycin, Kasumin). - Do not apply when temperatures are high (above 30°C), prior to rain and to heat- or drought-stressed trees.

Table 2.1 – Apple Crop Protection: Disease

Group	Product Name	Common Name	Rate	Product Specific Comments
SCAB (cont.)				
U12	Syllit 400 FL	dodine	1.75 L/ha	- Do not use after tight cluster. - Resistance is present in some Ontario orchards. Check the status of resistance to U12 fungicides in your orchard before using it.

Table 2.2 – Activity of Fungicides on Apple Diseases

Use fungicides only for the disease listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product or by the presence of resistant populations.

Group	Fungicide	Apple scab	Powdery mildew	Fire blight	Rust	Black rot	Bitter rot	Sooty blotch	Fly speck	Type of Activity
M	Copper 53 W[1]	(2)	(1)	2–3	(1)	(1)	(1)	(1)	(1)	Contact
M	Copper Spray[1]	(2)	(1)	2	(1)	(1)	(1)	(1)	(1)	Contact
M	Cueva	2	(1–2)	2	(1)	(1)	(1)	(1)	(1)	Contact
M	Dithane Rainshield	3	0	0	3–4	(3)	(3)	(2–3)	(2–3)	Contact
M	Follow WDG	2–3	0	0	0	2	(2–3)	2	2	Contact
M	Folpan 80 WDG	2–3	0	0	0	2	(2–3)	2	2	Contact
M	Kumulus DF	2	2–3	—	(1)	(1)	(2)	(1–2)	(1–2)	Contact
M	Maestro 80 WSP	3–4	0	0	0	3–4	3–4	2–3	2–3	Contact
M	Manzate Max	3	0	0	3–4	(3)	(3)	(2–3)	(2–3)	Contact
M	Manzate Pro-Stick	3	0	0	3–4	(3)	(3)	(2–3)	(2–3)	Contact
M	Microscopic Sulphur WP	2	2–3	—	(1)	(1)	(2)	(1–2)	(1–2)	Contact
M	Microthiol Disperss	2	2–3	—	(1)	(1)	(2)	(1–2)	(1–2)	Contact
M	Parasol Flowable[1]	(2)	(1)	2	(1)	(1)	(1)	(1)	(1)	Contact
M	Penncozeb 75 DF Raincoat	3	0	0	3–4	(3)	(3)	(2–3)	(2–3)	Contact
M	Supra Captan 80 WSP	3–4	0	0	0	3–4	3–4	2–3	2–3	Contact
1	Senator 50 SC[2]	3	3	0	0	(3)	(1)	(4)	(4)	Locally systemic
3	Cevya[2]	3–4	2–3	0	—	2	—	3	3	Locally systemic
3	Fullback 125 SC[2]	3–4	4	0	4	0	0	0	0	Locally systemic
3	Nova[2]	3–4	4	0	4	0	0	0	0	Locally systemic
3+7	Aprovia Top[2]	4	3	0	3	—	(2-3)	3	3	Locally systemic
3+9	Inspire Super[2]	4	3	0	4	(1)	(1)	3–4	3–4	Locally systemic
7	Aprovia[2]	4	3	0	—	—	(2-3)	—	—	Locally systemic

Table 2.2 – Activity of Fungicides on Apple Diseases

Group	Fungicide	Apple scab	Powdery mildew	Fire blight	Rust	Black rot	Bitter rot	Sooty blotch	Fly speck	Type of Activity
7	Excalia[2]	4	3	0	—	—	—	—	—	Locally systemic
7	Fontelis[2]	4	2–3	0	3	—	—	—	—	Locally systemic
7	Kenja 400 SC[2]	4	—	0	—	—	—	—	—	Locally systemic
7	Sercadis[2]	4	3	0	(2)	(2)	(2)	(2–3)	(2–3)	Locally systemic
7+9	Luna Tranquility[2]	4	3–4	0	(1)	(2)	(2)	(2)	(2)	locally systemic
7+11	Merivon[2]	3–4	3–4	0	—	3–4	3–4	4	4	Locally systemic
7+11	Pristine WG[2]	3–4	3–4	0	(2–3)	3–4	3–4	4	4	Locally systemic
9	Scala SC[2]	2–3	—	0	0	0	0	0	0	Locally systemic
11	Flint[2]	4	4	0	2	(3)	(3)	4	3	Locally systemic
11	Flint Extra[2]	4	4	0	2	(3)	(3)	4	3	Locally systemic
19	Diplomat 5 SC	2	2	—	—	(2)	2	2–3	2–3	Systemic
24	Kasumin 2L[2]	0	0	3	0	0	0	0	0	Locally systemic
25	Streptomycin 17[2]	0	0	4	0	0	0	0	0	Locally systemic
29	Allegro 500 F	2–3	0	0	—	1–2	3	3	3	Locally systemic
29	Downforce AG	2–3	0	0	—	1–2	3	3	3	Locally systemic
29	Vantana	2–3	0	0	—	1–2	3	3	3	Locally systemic
39	Magister SC	0	3–4	0	0	0	0	0	0	Locally systemic
50	Property 300SC	0	3–4	0	0	0	0	0	0	Locally systemic
52	Migiwa 20 SC	4	3–4	0	—	—	—	—	—	Locally systemic
BM	Blossom Protect	—	—	2–3	—	—	—	—	—	Contact
BM	EcoSwing	1–2	—	—	—	—	—	—	—	Locally systemic
BM	Double Nickel LC	(1–2)	(1–2)	2	—	—	—	—	—	Contact
BM	Serenade OPTI	1–2	1–2	2	(2)	(2)	(2)	(2)	(2)	Contact
BM	Serifel	—	—	2	—	—	—	—	—	Contact

Table 2.2 – Activity of Fungicides on Apple Diseases

Group	Fungicide	Apple scab	Powdery mildew	Fire blight	Rust	Black rot	Bitter rot	Sooty blotch	Fly speck	Type of Activity
NC	Buran	2–3	3	2–3	—	—	—	—	—	Contact
NC	Cyclone Plus	—	—	2	—	(1–2)	(1–2)	—	—	Contact
NC	Milstop	0	2–3	0	0	0	0	0	0	Contact
NC	Oxidate	1–2	2	1–2	(1)	1–2	(1)	1–2	1–2	Contact
NC	Purespray Green Spray Oil 13 E	0	1–2	0	0	0	0	0	0	Contact
NC	Suffoil-X	0	1–2	0	0	0	0	0	0	Contact
NC	Vegol Crop Oil	0	1–2	0	0	0	0	0	0	Contact
P5	Regalia Maxx / Rx	1–2	1–2	1–2	(2)	2	1–2	1–2	1–2	Locally systemic
P6	Lifegard WG	2	2	2	—	—	—	2	2	Locally systemic
P7	Phostrol	—	—	—	—	—	—	2	2	Systemic
U12	Syllit 400 FL[2]	3–4	(1)	0	(2)	0	0	(1)	(1)	Locally systemic
U13	Gatten	0	4	0	0	0	0	0	0	Locally systemeic

0 = No control. 1 = Poor control. 2 = Fair control. 3 = Good control, some limitations. 4 = Excellent control, few if any limitations.
— = Not registered for this disease, or activity on this disease is unavailable.
( ) = Not registered on pest. May provide efficacy when applied for another pest listed on product label.
BM = Biologicals with multiple modes of action. M = Multi-site fungicide. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.
U = Mode of action has not been determined.
[1] May be phytotoxic and cause russeting if used after early season. See label for more information.
[2] Rankings assume no resistance in the pathogen population in an orchard.
Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.
Source: Various northeastern extension publications, scientific journal articles, Plant Disease Management Reports (APS) and Ontario field trials.

Table 2.3 – Characteristics of Apple Scab Fungicides

Product	Protectant Activity (pre-infection)	Post-Infection Activity (hours)[1]	Post-Symptom Activity	Retention (50 mm rain)	Redistribution (12 mm rain)
Allegro	G–VG	N	N	—	—
Downforce	G–VG	N	N	—	—
Vantana	G–VG	N	N	—	—
Buran	N	30–90	VG	N	—
Cevya	VG	72[3]	G	—	—
Copper 53 W	G	—	—	G	G
Copper Spray	G	—	—	G	G
Cueva	G	—	—	G	G
Dithane Rainshield	VG	18–24	N	E[2]	V–VG
Flint/Flint Extra	VG	48–72[3]	G	E	G
Follow WDG	G–VG	—	N	VG	G
Folpan 80 WDG	G–VG	—	N	VG	G
Fontelis	E	48	—	E	F–G
Fullback 125 SC	VG	48–72[3]	G	—	—
Inspire Super	VG	48[3]	E	VG	G
Kumulus DF	F	N	N	F–G	F–G
Luna Tranquility	E	48	—	E	F–G
Maestro 80 WSP	VG	18–24	N	VG	G
Manzate Max	VG	18–24	N	E[2]	G–VG
Manzate Pro-Stick	VG	18–24	N	E[2]	G–VG
Microscopic Sulphur WP	F	N	N	F–G	F–G
Microthiol Disperss	F	N	N	F–G	F-G
Migiwa 20 SC	VG	48	G–VG	—	—
Nova	F	72–96[3]	G–VG	F[2]	F[2]

Table 2.3 – Characteristics of Apple Scab Fungicides

Product	Protectant Activity (pre-infection)	Post-Infection Activity (hours)[1]	Post-Symptom Activity	Retention (50 mm rain)	Redistribution (12 mm rain)
Parasol Flowable	G	—	—	G	G
Penncozeb 75 DF Raincoat	VG	18–24	N	E[2]	G–VG
Scala SC	G	48–72	N	G	—
Senator 50 SC	F	18–24	VG	G	F
Sercadis	VG	48	F	E	G
Sharda Captan 48 SC	VG	18–24	N	VG	G
Supra Captan 80 WSP	VG	18–24	N	VG	G
Syllit 400 FL	VG	18–24	VG	VG	G

E = Excellent. VG = Very good. G = Good. F = Fair. N = None. — = Indicates no information is available.

[1] Maximum post-infection activity is calculated from the start of the infection period. Length of activity can be dependent on temperature (e.g., longer activity in cooler temperatures).
[2] Values are based on field observations.
[3] Post-Infection activity of sterol inhibitor (Group 3) and strobilurin (Group 11) fungicides may be reduced in orchards where scab populations have shifted towards resistance.

Data is adapted from various northeastern extension publications, scientific journal articles, and third-party efficacy trials provides by manufacturer. The post-infection activity of these fungicides may not be adequate to control primary scab in commercial orchards. Do not rely solely on post-infection activity. Some products and formulations have not been evaluated (e.g., Aprovia, Excalia, Kenja 400 SC, Merivon, Oxidate, Pristine WG, Regalia and Serenade OPTI). Contact the manufacturer for more information.

Table 2.4 – Relationship of Temperature and Leaf Wetness to Apple Scab Infection

Apple scab infections occur during wetting periods when leaf wetness stimulates the spores to germinate and penetrate plant tissue. The scab prediction table given here can be used to determine whether conditions have been sufficient for infection so that appropriate spray decisions can be made. Length of leaf wetness period is from the beginning of the wetting event until canopy is no longer wet, or relative humidity drops below 90%.

Average Temperature (°C)[1]	Minimum Number of Hours of Leaf Wetness Required - Primary (Ascospore) Infection[2]			Minimum Number of Hours of Leaf Wetness Required - Secondary (Conidia) Infection[2]	Lesion appearance (days)[3]
	Light	Moderate	Heavy		
1	40	69	93	37	—
2	34	69	93	33	—
3	30	52	65	30	—
4	27	42	57	26	—
5	21	34	50	23	—
6	18	27	44	20	17
7	15	23	37	17	17
8	13	21	34	15	17
9	12	17	27	13	17
10	11	16	26	10	16
11	9	14	22	9.5	15
12–13	8	12	20	9	14
14–15	7	11	19	9	12–13
15.5	6.5	10	17	9	10–11
16–24	6	9	16	7.0–9.0	9–10
24–25	6.5	9	16	9–11	—
25	8	11	18	11	—
25.5	10	14	23	13	—

[1] Add lowest and highest temperatures during wet period and divide sum by 2 to get average temperature.
[2] Calculate hours of wetting by either (1) beginning the count at the time leaves first become wet and ending the count when the relative humidity drops below 90%, or (2) adding consecutive wet periods (hours) if the leaves are again wetted within 8 hours from the time relative humidity dropped below 90%.
[3] Number of days required for lesions to appear after infection has been initiated.
Adapted from Stensvand, A., Gadoury, D. M., Amundsen, T., Semb, L., and Seem, R. C. 1997. Ascospore release and infection of apple leaves by conidia and ascospores of *Venturia inaequalis* at low temperatures. Phytopathology 87:1046-1053 and Carisse, O. 2006. Apple Scab: Improving Understanding for Better Management. Agriculture & Agri-Food Canada, Publication 10203E.

Table 2.5 – Disease Susceptibility Ratings of Common Apple Cultivars

Cultivar	Scab	Fire Blight	Powdery Mildew	Rusts[1]
Ambrosia	VS	S	R	S
Belmac	R	—	T	R
Braeburn	S	VS	S	S
Cameo	S	S	R	S
Cortland	VS	S	S	S
Crimson Crisp	VR	T	T	S
Delicious (Red)	S	R	T	VR
Delicious (Golden)	S	S	VS	S
Dayton	VR	R	T	T
Early McIntosh	S	R	T	R
Empire	VS	R	S	R
Enterprise	VR	R	S	R
Freedom	VR	VR	R	R
Fuji	S	VS	R	varied
Gala	VS	VS	S	varied
Ginger Gold	VS	VS	S	VS
GoldRush	VR	T	S	S
Gravenstein	S	S	VS	varied
Honeycrisp	T	R	S	S
Idared	S	VS	S	VS
Jerseymac	VS	S	S	VR
Jonagold	S	VS	S	R
Jonamac	S	S	S	R

Table 2.5 – Disease Susceptibility Ratings of Common Apple Cultivars

Cultivar	Scab	Fire Blight	Powdery Mildew	Rusts[1]
Jonathan	S	VS	VS	S
Liberty	VR	R	R	VR
Lodi	S	VS	R	S
Macoun	VS	S	T	R
McIntosh	VS	S	T	VR
Mutsu (Crispin)	VS	VS	S	S
Northern Spy	S	S	S	S
Novamac	VR	VR	VR	VR
Nova Spy	R	—	S	MR
Paulared	R	VS	T	R
Pink Lady	VS	VS	R	R
Pristine	VR	R	R	S
Silken	VS	VS	S	VS
Stayman	VS	S	VS	S
Wealthy	S	S	S	VS
Zestar!	S	S	R	S

VS = Very susceptible. S = Susceptible. T = Tolerant (moderately resistant under ideal conditions). R = Resistant. VR = Very resistant. — = Indicates information is not available.

[1] Rusts include cedar-apple rust and quince rust. Resistance in a cultivar may vary depending on type of rust.

Adapted from Beckerman, J. (2006). Disease Susceptibility of Common Apple Cultivars. Purdue Extension BP-132-W and Cline, J., Warner, J. Wilson, K. & Zandstra, J. (1998). Disease-Resistant Apple Cultivars. Ontario Ministry of Agriculture, Food & Rural Affairs, Factsheet 98-013.

Table 2.6 – Insect and Disease Susceptibility Ratings of Common Apple Rootstocks

Rootstock	Fire Blight	Phytophthora	Replant Disease Complex[1]	Woolly Apple Aphid[2]	Burr Knot Formation[3]
Budagovsky series					
B.9	S	T	—	S	medium
B.118	—	T	—	S	—
Malling series					
M.7	T	T	—	S	medium
M.9	S	T	—	S	high
M.26	S	S[4]	—	S	high
M.27	T	T	—	S	low
Malling-Merton series					
MM.106	S	S	—	T	low
MM.111	R	T	—	R	high
Geneva series					
G.11	R	T	T (partial)[5]	S	low
G.16	R	T	T (partial)[5]	S	low
G.30	VR	T	T	S	low
G.41	VR	T	T	R	low
G.202	VR	T	T	R	low
G.210	VR	T	T	R	low
G.213	VR	T	T	R	low
G.214	VR	T	T	R	low
G.222	VR	T	S	R	medium
G.814	VR	T	T	S	medium
G.890	VR	T	T	R	low
G.935	VR	T	T	S	low

Table 2.6 – Insect and Disease Susceptibility Ratings of Common Apple Rootstocks

Rootstock	Fire Blight	Phytophthora	Replant Disease Complex[1]	Woolly Apple Aphid[2]	Burr Knot Formation[3]
G.969	VR	T	T	R	low
Other					
Ottawa 3	S	T	—	S	low
Vineland series	R	—	—	—	low

S = Susceptible. T = Tolerant (moderately resistant under ideal conditions). R = Resistant. VR = Very resistant. — = Indicates information is not available.

[1] Replant disease complex consists of several pathogens (Cylindrocarpon, Pythium spp., Fusarium and Rhizoctonia), bacteria and parasitic nematodes [2] Does not effectively control high pressure from aerial colonies of woolly apple aphid. [3] Burr knots are common entry points for insect pests such as dogwood borer. [4] Though moderately resistant to Phytophthora, M.26 will not perform well on poorly-drained sites. [5] This rootstock is considered only moderately tolerant to replant disease and does not perform as well against this disease as other Geneva series rootstocks in moderate- to high-pressure conditions.

Adapted from 2020-2021 Penn State Tree Fruit Production Guide, Geneva Apple Rootstocks Comparison Chart v.4 (https://ctl.cornell.edu/wp-content/uploads/plants/GENEVA-Apple-Rootstocks-Comparison-Chart.pdf) and Wilson, K. (2000). Apple Rootstocks. Ontario Ministry of Agriculture, Food & Rural Affairs, Factsheet 00-007.

3. INSECT & MITE MANAGEMENT

Table of Contents

Table 3.1 – Apple Crop Protection: Insects

Use this table as a guide but refer to product label for specific information. Products are listed in the crop protection tables by chemical group and are in alphabetical order within each group. The order does not reflect efficacy. For information on preharvest and restricted entry intervals, maximum applications, and organic status, see Table 1.1 – *Products Used on Apples*. For honeybee toxicity and impact to common beneficial insects, see Table 1.2 – *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*. For efficacy ratings, see Table 3.3. *Activity of Insecticides and Miticides on Apple Pests*, Table 3.4 – *Activity of Prebloom Insecticides Against Orchard Insects,* and Table 3.5 – *Activity of Petal Fall Insecticides Against Orchard Insects*.

Group	Product Name	Common Name	Rate	Product Specific Comments
APPLE MAGGOT				
General Comments: - Adults typically emerge in summer and are active from late June through harvest, depending on weather. - Monitor traps along orchard borders near wooded areas or abandoned trees where pressure is often highest. - Apply 7 days after the first adult maggot is caught on a sticky board or immediately after first adult female maggot is caught on a red sphere.				
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application. - Can be applied as a border spray if population is not resident in the orchard.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product at this timing is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season. - Do not use this product as a border spray. Efficacy of this application method is unknown.
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	120–240 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - Do not use this product as a border spray. Efficacy of this application method is unknown.
4A	Assail 70 WP	acetamiprid	120–240 g/ha	
4A	Theme 480 SC	thiacloprid	440 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - Do not use this product as a border spray. Efficacy of this application method is unknown.
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - Do not use this product as a border spray. Efficacy of this application method is unknown. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
5	Delegate	spinetoram	420 g/ha	- **SUPPRESSION ONLY.** - Do not use this product as a border spray. Efficacy of this application method is unknown.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
APPLE MAGGOT (cont.)				
5	GF-120 Fruit Fly Bait	spinosad bait	1.5 L in 6 L water/ha	- **SUPPRESSION ONLY.** - Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. - Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4-6 mm directed to underside of leaves and inside the canopy.
28	Altacor	chlorantraniliprole	285 g/ha	- **SUPPRESSION ONLY.** - Do not use this product as a border spray. Efficacy of this application method is unknown.
28	Altacor Max	chlorantraniliprole	143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	188–250 mL/ha	
28	Exirel	cyantraniliprole	1–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions. - Do not use this product as a border spray. Efficacy of this application method is unknown.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- **SUPPRESSION ONLY.** - Do not use this product as a border spray. Efficacy of this application method is unknown.
28	Vayego 200 SC	tetraniliprole	300 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only. - Do not use this product as a border spray. Efficacy of this application method is unknown.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Begin applications well before first maggot flies are trapped in the orchard. - Use 50 kg/ha for the first 2 applications and continue at 7-14 day intervals using 25 kg/ha to maintain even coverage of fruit as long as flies continue to be captured. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
CODLING MOTH				
General Comments: - Place pheromone traps for monitoring in orchard by bloom. - There are 2-3 generations of codling moth per year, depending on region. - Use pheromone traps to time sprays. Apply insecticides between the specified degree-days (base 10°C) after first sustained moth catch (biofix) of first generation. For information on calculating degree days, see Degree-Day Modeling on the Ontario Crop Protection Hub. - With the exception of Imidan (assuming population is not resident in the orchard), do not use products as a border spray for this pest. Efficacy of this application method is unknown for other insecticide groups.				
1B	Malathion 85 E	malathion	1,220 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product at this timing is discouraged.*** - Resistance to other products within this group has been confirmed in Ontario. - For first generation, apply at 138 DDC. For second generation, apply at 667-694 DDC. - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application. - Resistance to Imidan has been confirmed in Ontario. - For first generation, apply at 138 DDC. For second generation, apply at 667-694 DDC.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product at this timing is discouraged.*** - For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC. - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	100–125 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	400–500 mL/ha	
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	120–240 g/ha	- For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC. - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	120–240 g/ha	
4A	Theme 480 SC	thiacloprid	440 mL/ha	- For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC. - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
CODLING MOTH (cont.)				
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC. - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
5	Delegate	spinetoram	420 g/ha	- For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC.
5	Entrust	spinosad	364 mL/ha	- **SUPPRESSION ONLY.** - For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC.
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - For first generation, apply at 83-111 DDC. For second generation, apply at 667-694 DDC. - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
11A	XenTari WG	*Bacillus thuringiensis* strain abts-1857	0.5–1.6 kg/ha	- Product must be consumed to be effective. Spray when and where pests are actively feeding. Death of insect may take several days. - For first generation, apply at 111-138 DDC. For second generation, apply at 639-667 DDC. - Acidify spray mix to below pH 7.0. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
15	Rimon 10 EC	novaluron	1.4 L/1,000 L water	- **FOR FIRST GENERATION ONLY.** - ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - This is a targeted spray with ovi-larvicidal activity which must be absorbed by eggs or ingested by larvae to interfere with regular insect growth or development. Applications must be applied prior to egg deposition or shortly thereafter. - Apply at 100 DDC, or about 7-10 days after first sustained adult catch. This timing often coincides with petal fall. - See label for additional information on rates and volumes. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
18	Intrepid	methoxyfenozide	1 L/ha	- Early season application is most effective. - This product must be ingested by larvae to interfere with regular insect growth or development. Applications must be applied prior to egg hatch. - For first generation, apply at 83-111 DDC. For second generation, apply at 611-639 DDC.
18	Confirm 240 F	tebufenozide	1 L/ha	

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
CODLING MOTH (cont.)				
28	Altacor	chlorantraniliprole	215 g/ha	- For first generation, apply at 83-111 DDC. For second generation, apply at 667-694 DDC.
28	Altacor Max	chlorantraniliprole	73–108 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–188 mL/ha	
28	Exirel	cyantraniliprole	500–750 mL/ha	- For first generation, apply at 83-111 DDC. For second generation, apply at 667-694 DDC. - Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- For first generation, apply at 83-111 DDC. For second generation, apply at 667-694 DDC.
28	Vayego 200 SC	tetraniliprole	225 mL/ha	- Apply post-bloom only. - For first generation, apply at 83-111 DDC. For second generation, apply at 667-694 DDC.
31	Cyd-X	*Cydia pomonella* granulovirus	250 mL/ha	- Virus must be ingested to be effective. After death, larvae will disintegrate and release new viral bodies which may infected other larvae. - For first generation, apply at 83-111 DDC. For second generation, apply at 611-639 DDC. - Control is best achieved when used in conjunction with other active ingredients or mating disruption. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
31	Virosoft CP 4	*Cydia pomonella* granulovirus	250 mL/ha	
31	Madex HP	*Cydia pomonella* granulovirus isolate V-22	50–100 mL/ha	
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - **FOR FIRST GENERATION ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
–	Isomate CM/OFM TT	pheromone	500 dispensers/ha	- Reduces mating of codling moth and oriental fruit moth. - Apply dispensers in early spring before first flight, no later than petal fall. Dispensers last up to 150 days for codling moth and up to 90 days for oriental fruit moth. - Most orchards will require insecticides for one or both codling moth generations. Insecticides for oriental fruit moth may be needed in late cultivars where high populations exist.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
DOGWOOD BORER				
General Comments: - In orchards with a history of borer problems, place pheromone traps mid-June to monitor adult flight. - Adult emergence can begin in early to mid-June, with flight continuing through August and September. Peak flight typically occurs during July. - Eggs are laid near burr knots, graft unions, and wounded bark. Young orchards on size-controlling rootstocks are at greater risk, especially where burr knots are present. - Direct the spray to the lower portion of the trunk, particularly the graft union and any pruning cuts.				
3A	Perm-Up EC	permethrin	22 mL/100 L water, plus 2 L oil	- Apply at egg hatch, or 7-14 days after peak flight of adult catch. - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Pounce 384 EC	permethrin	22 mL/100 L water, plus 2 L oil	
4A	Cormoran	acetamiprid + novaluron	1.5 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - Apply between egg laying and hatch, or peak flight and 7-14 days after peak flight of adult catch. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
5	Delegate	spinetoram	420 g/ha	- Apply at egg hatch, or 7-14 days after peak flight of adult catch.
15	Rimon	novaluron	1.4 L/1,000 L water	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - Apply at 25-75% egg laying, or peak flight. - See label for additional information on rates and volumes. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
28	Altacor	chlorantraniliprole	215–285 g/ha	- Apply at egg hatch, or 7-14 days after peak flight of adult catch.
28	Altacor Max	chlorantraniliprole	108–143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	188–250 mL/ha	
–	Isomate DWB	pheromone	250–375 dispensers/ha	- Reduces mating of dogwood borer. Supplemental control may be needed. - Apply dispensers prior to adult emergence in the spring (end of May). - Use higher rate for high pressure areas or initial year of treatment. - Double the rate, up to a maximum of 500 dispensers/ha around borders of orchard.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
EUROPEAN APPLE SAWFLY				
General Comments: - This invasive insect is currently known to be present in orchards in economically damaging population levels in Eastern Ontario, Georgian Bay region and moving westward through the Greater Toronto & Hamilton area. Management is needed where there has been a history of damage. - Use white sticky traps to monitor for sawfly adults. Hang traps in orchard between tight cluster and pink. Continue monitoring until 2 weeks after petal fall. - Apply a prebloom insecticide if monitoring indicates early activity. - If a prebloom insecticide has been applied, spray postbloom when 6 sawflies have been caught per trap. Where no prebloom insecticides have been applied, spray postbloom when 3 sawflies have been caught per trap. - ***Early petal fall is the most effective timing for controlling this pest. It is important not to delay this application.*** - Fruit damage typically occurs 2-3 weeks after petal fall, causing characteristics ribbon-like scarring on maturing fruit.				
4A	Aceta 70 WP	acetamiprid	120–240 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	120–240 g/ha	
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
5	Delegate	spinetoram	420 g/ha	- No product specific comments.
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
28	Altacor	chlorantraniliprole	215 g/ha	- No product specific comments.
28	Altacor Max	chlorantraniliprole	73–108 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–188 mL/ha	
28	Exirel	cyantraniliprole	0.5–1.0 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
EUROPEAN APPLE SAWFLY (cont.)				
28	Vayego 200 SC	tetraniliprole	225 mL/ha	- Apply post-bloom only.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed and waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
GREEN APPLE APHID				
General Comments: - A cool, wet spring favours aphid development and is unfavourable for the aphid's natural enemies. - Populations build slowly on apples in early spring (bloom, petal fall) and more rapidly as average daily temperatures increase. - Spray if 10% of terminals (e.g., 10 or more terminals in a 100-terminal sample) are infested. - Sprays can be delayed or avoided if predators are present on more than 20% of infested terminals.				
1B	Malathion 85 E	malathion	880 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
3A	Decis 100 EC	deltamethrin	100 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	80–120 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80–120 g/ha	
4A+15	Cormoran	acetamiprid + novaluron	0.7–1.05 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
4C	Closer	sulfoxaflor	100–200 mL/ha	- Where possible, rotate with products outside of Group 4.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
GREEN APPLE APHID (cont.)				
4D	Sivanto Prime	flupyradifurone	500–750 mL/ha	- Where possible, rotate with products outside of Group 4.
9D	Sefina	afidopyropen	0.2 L/ha	- No product specific comments.
23	Movento 240 SC	spirotetramat	365–435 mL/ha	- Apply post-bloom only. - Control may not be apparent for 2-3 weeks. - Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details. - Because of adjuvant addition, do not tank-mix with sulphur, Maestro, Supra Captan, Folpan or Follow.
28	Exirel	cyantraniliprole	0.75–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Vayego 200 SC	tetraniliprole	150 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only.
29	Beleaf 50 SG	flonicamid	120–160 g/ha	- Do not use with adjuvants.
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	SuffOil-X	mineral oil	13 L/1,000 L water	- **DETERS FEEDING ONLY** - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use in combination with or immediately before or after spraying Sevin or sulphur or within 14 days of Supra Captan, Maestro, Folpan, or Follow. - If concerned about tree sensitivity, test first on a small area.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
GREEN APPLE APHID (cont.)				
UN	Vegol Crop Oil	canola oil	2% v/v	- Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.
JAPANESE BEETLE				
General Comments: - This is a sporadic pest in Ontario that can cause economic damage, especially in young plantings of Honeycrisp. - Where trees are under stress (drought, heat, high crop load) and when skeletonization of leaves has become significant, special sprays may be required. - Adults emerge typically late June to early July and feed on foliage during hot, sunny weather. Populations are often highest along orchard edges near grassy areas, turf or wild grape.				
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product at this timing is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
4A+15	Cormoran	acetamiprid + novaluron	0.84–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
28	Altacor	chlorantraniliprole	285 g/ha	- **SUPPRESSION ONLY.**
28	Altacor Max	chlorantraniliprole	143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	250 mL/ha	
28	Exirel	cyantraniliprole	1.0–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
LEAFCURLING MIDGE				
General Comments: - This is a special spray for orchards where there is a history of damage or on young plantings. - Adult emergence begins tight cluster to pink with multiple generations possible through the season as long as there is actively growing leaves, including root suckers. - Early signs include tightly curled young leaves, purple to pink colouration, and distorted shoot growth on actively growing terminals. - Place pheromone traps in orchard at tight cluster and begin monitoring for orange eggs in the newest unfurled leaves. - Apply an insecticide shortly after upswing in pheromone trap catches or when eggs have been found. - If using degree days, apply insecticides between 5-50% adult emergence for the target generation using the specified degree-days (base 10°C) from March 1st (biofix). For first generation, apply at 76-132 DDC. For second generation, apply at 430-556 DDC. For third generation, apply at 942-1160 DDC. For information on calculating degree days, see Degree-Day Modeling on the Ontario Crop Protection Hub. - Generations begin to overlap as season progresses, making control more difficult.				
3A	Decis 100 EC	deltamethrin	100–125 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Poleci 2.5 EC	deltamethrin	400–500 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
5	Delegate	spinetoram	420 g/ha	- **SUPPRESSION ONLY.**
23	Movento 240 SC	spirotetramat	365–585 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only. - Effective against larva within leaf so can be applied at early onset of observed damage. - Control may not be apparent for 2-3 weeks. - Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details. - Because of adjuvant addition, do not tank-mix with sulphur, Maestro, Supra Captan, Folpan or Follow.
MULLEIN BUG				
General Comments: - Monitor susceptible cultivars such as Red Delicious, Spartan, Northern Spy, Empire, Cortland, Gala, Jonagold and Golden Delicious. - Nymphs typically begin to emerge at bloom. - Damage is not of concern once fruit is larger than dime- to quarter-sized. - Apply controls where 7–9 nymphs are caught per 25 tree taps. - Economic thresholds for mullein bug are based on pest density, but it is important to note that damage caused by this pest also is affected by availability of food such as pollen, nectar, plant nitrogen or animal prey. As a result, high populations of mullein bug may not cause significant fruit damage. - Several weeks after petal fall, nymphs become predaceous and begin feeding on prey such as European red mite and aphids. Nymphs with red bellies are an indication they have been feeding on mites and should be included in beneficial counts.				

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
MULLEIN BUG (cont.)				
3A	Decis 100 EC	deltamethrin	100 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
4A	Aceta 70 WP	acetamiprid	80–160 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80–160 g/ha	
4A	Theme 480 SC	thiacloprid	440 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
4C	Closer	sulfoxaflor	100–200 mL/ha	- Where possible, rotate with products outside of Group 4.
28	Vayego 200 SC	tetraniliprole	150 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only.
OBLIQUEBANDED LEAFROLLER				
General Comments: - Spray overwintering obliquebanded leafroller in orchards with historical pest problems or high pest pressure (1–2% of the terminals or buds have larvae or damage) from tight cluster to bloom. - Place pheromone traps in the orchard at petal fall to monitor emergence of summer-generation adults. - Accumulate degree days (base 6.1°C) at first sustained moth catch (biofix) and apply insecticides targeting summer-generation larvae. For information on calculating degree days, see Degree-Day Modeling on the Ontario Crop Protection Hub. - Apply at 240–280 DDC after first sustained moth catch (base 6.1°C), unless otherwise indicated.				
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
OBLIQUEBANDED LEAFROLLER (cont.)				
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	100 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
5	Delegate	spinetoram	420 g/ha	- No product specific comments.
5	Entrust	spinosad	364 mL/ha	
5	Success	spinosad	182 mL/ha	
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
11A	XenTari WG	*Bacillus thuringiensis* subsp. *aizawai*	0.5–1.6 kg/ha	- Product must be consumed to be effective. Spray when and where pests are actively feeding. Death of insect may take several days. - Acidify spray mix to below pH 7.0. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
11A	BioProtec PLUS	*Bacillus thuringiensis* subsp. *Kurstaki*	1.8–2.5 L/ha	
11A	Dipel 2X DF	*Bacillus thuringiensis* subsp. *kurstaki*	1.125–1.675 kg/ha	

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
OBLIQUEBANDED LEAFROLLER (cont.)				
18	Intrepid	methoxyfenozide	1 L/ha	- **SUPPRESSION ONLY OF SUMMER GENERATION.** - Apply at first egg hatch, or 110-170 DDC. - Cross-resistance to this group and pyrethroids (Group 3) may be possible in organophosphate (Group 1B)-resistant populations.
18	Confirm 240 F	tebufenozide	1 L/ha	
28	Altacor	chlorantraniliprole	145–285 g/ha	- No product specific comments.
28	Altacor Max	chlorantraniliprole	73–143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–250 mL/ha	
28	Exirel	cyantraniliprole	0.5–1.0 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- No product specific comments.
28	Vayego 200 SC	tetraniliprole	150 mL/ha	- Apply post-bloom only.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed and waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
ORIENTAL FRUIT MOTH				
General Comments: - First generation flight begins around tight cluster, with larvae targeting succulent shoots early in the season. Later generations feed directly on fruit. - Adjust spray timing based on monitoring. Apply insecticides 6–10 days after upswing in pheromone trap captures, which often coincides with petal fall. Later season, apply insecticides 3–6 days after upswing in trap captures. - Alternatively, accumulate degree-days (base 7.2°C) at first sustained moth catch of first generation (biofix) and apply insecticides at appropriate timing for each generation. For information on calculating degree days, see Degree-Day Modeling on the Ontario Crop Protection Hub. - Late season damage can continue until harvest. Monitor trap catch and continue controls as needed, especially on late maturing varieties.				

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
ORIENTAL FRUIT MOTH (cont.)				
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - For first generation, apply at 139-153 DDC. For second generation, apply at 750-778 DDC. For third generation, apply at 1305-1333 DDC (1st spray) and 1556-1611 DDC (2nd spray). - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	100–125 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	400–500 mL/ha	
4A	Aceta 70 WP	acetamiprid	120–240 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - For first generation, apply at 139-153 DDC. For second generation, apply at 750-778 DDC. For third generation, apply at 1305-1333 DDC (1st spray) and 1556-1611 DDC (2nd spray).
4A	Assail 70 WP	acetamiprid	120–240 g/ha	
4A	Theme 480 SC	thiacloprid	440 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season. - - For first generation, apply at 139-153 DDC. For second generation, apply at 750-778 DDC. For third generation, apply at 1305-1333 DDC (1st spray) and 1556-1611 DDC (2nd spray).
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks. - For first generation, apply at 139-153 DDC. For second generation, apply at 750-778 DDC. For third generation, apply at 1305-1333 DDC (1st spray) and 1556-1611 DDC (2nd spray).
5	Delegate	spinetoram	420 g/ha	- Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray).
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray). - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
ORIENTAL FRUIT MOTH (cont.)				
11A	XenTari WG	*Bacillus thuringiensis* subsp. *aizawai*	0.5–1.6 kg/ha	- Product must be consumed to be effective. Spray when and where pests are actively feeding. Death of insect may take several days. - Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray). - Acidify spray mix to below pH 7.0. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
15	Rimon 10 EC	*novaluron*	1.4 L/1,000 L water	- **USE IN EARLY GENERATION ONLY.** - ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - This is a targeted spray with ovi-larvicidal activity which must be absorbed by eggs or ingested by larvae to interfere with regular insect growth or development. Applications must be applied prior to egg deposition or shortly thereafter. - Apply at 111-139 DDC, or about 3-6 days after upswing in moth flight. - See label for additional information on rates and volumes. - This product is toxic to certain beneficial insects. Use may lead to mite outbreaks.
18	Intrepid	methoxyfenozide	1 L/ha	- Early season application is most effective. - This product must be ingested by larvae to interfere with regular insect growth or development. Applications must be applied prior to egg hatch. - For first generation, apply at 139-153 DDC. For second generation, apply at 750-778 DDC. For third generation, apply at 1305-1333 DDC (1st spray) and 1556-1611 DDC (2nd spray).
28	Altacor	chlorantraniliprole	215 g/ha	- Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray).
28	Altacor Max	chlorantraniliprole	73–108 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–188 mL/ha	
28	Exirel	cyantraniliprole	500–750 mL/ha	- Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray). - Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray).

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
ORIENTAL FRUIT MOTH (cont.)				
28	Vayego 200 SC	tetraniliprole	300 mL/ha	- Apply post-bloom only. - Apply at 194-208 DDC or earlier if using as an ovi-larvicide. For second generation, apply at 805-833 DDC. For third generation, apply at 1361-1389 DDC (1st spray) and 1611-1667 DDC (2nd spray).
31	Madex HP	*Cydia pomonella* granulovirus isolate V-22	50–100 mL/ha	- Virus must be ingested to be effective. After death, larvae will disintegrate and release new viral bodies which may infected other larvae. - For first generation, apply at 83-111 DDC. For second generation, apply at 611-639 DDC. - Control is best achieved when used in conjunction with other active ingredients or mating disruption. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
–	Isomate CM/OFM TT	pheromone	500 dispensers/ha	- Reduces mating of codling moth and oriental fruit moth. - Apply dispensers in late April before first flight. Dispensers last up to 150 days for codling moth and up to 90 days for oriental fruit moth. - Most orchards will require insecticides for one or both codling moth generations. Insecticides for oriental fruit moth may be needed in late cultivars where high populations exist.
–	Isomate OFM TT	pheromone	125–250 dispensers/ha	- Reduces mating of oriental fruit moth. - Apply dispensers in late April before first flight. Dispensers last for the entire season. - Use higher rate for high pressure areas or initial year of treatment. Supplemental control measures should be applied with high pest populations. - Most orchards will require insecticides for one or both codling moth generations. Insecticides for oriental fruit moth may be needed in late cultivars where high populations exist. - Outbreaks of other pests may occur when insecticides are not used for oriental fruit moth.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
PLUM CURCULIO				
General Comments: - Adult movement into the orchard begins in the spring following sustained warm weather (mean temperatures of 15.5ºC or higher) and light rain. This usually occurs around bloom and lasts for up to six weeks, with the greatest migration occurring within the period of up to 14 days after petal fall. - Fruit are most susceptible during the first few weeks after petal fall when females lay eggs in young fruitlets. Late summer feeding damage can also occur but is not as common. - Apply when monitoring indicates plum curculio is in the orchard or at first sign of feeding damage after bloom.				
1B	Malathion 85 E	malathion	1,220 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product at this timing is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application. - Can be applied as a border spray if population is not resident in the orchard and scouting reports do not indicate signs of interior damage.
3A	Perm-Up EC	permethrin	360–520 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Pounce 384 EC	permethrin	360–520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	120–240 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	120–240 g/ha	
4A	Theme 480 SC	thiacloprid	290–440 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A+15	Cormoran	acetamiprid + novaluron	1.05–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
5	Delegate	spinetoram	420 g/ha	- **SUPPRESSION ONLY.**
28	Exirel	cyantraniliprole	1–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- **SUPPRESSION ONLY.**
28	Vayego 200 SC	tetraniliprole	300 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
PLUM CURCULIO (cont.)				
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Make 2 initial applications at 50 kg/ha, 7 days apart, to establish a base layer. Continue at 7-14 day intervals, using reduced rate of 25 kg/ha to maintain even coverage of developing fruits. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
POTATO LEAFHOPPER				
General Comments: - Leafhopper do not overwinter in Ontario but are carried in by wind currents during spring and early summer storms. Adults are first noticed in orchards in early or mid June, generally just after the first cut of hay in the area. - It has been documented on other crops that potato leafhopper feeding can affect the rate of photosynthesis, yield and crop quality at fairly low populations, and before leaf symptoms occur. In apples, one or two nymphs per leaf cause leaf curling, or "hopperburn" if allowed to feed for a prolonged period of time (4-7 days). - Apply where monitoring indicates a potential problem, particularly on young trees or nursery stock.				
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
4A	Aceta 70 WP	acetamiprid	80 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80 g/ha	
4A	Theme 480 SC	thiacloprid	145 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A+15	Cormoran	acetamiprid + novaluron	700 mL/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
4D	Sivanto Prime	flupyradifurone	500–750 mL/ha	- Where possible, rotate with products outside of Group 4.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
POTATO LEAFHOPPER (cont.)				
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Make 2 initial applications at 50 kg/ha, 7 days apart, to establish a base layer. Continue at 7-14 day intervals, using reduced rate of 25 kg/ha to maintain even coverage of leaves. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
ROSY APPLE APHID				
General Comments: - Colonies establish early in spring around tight cluster to bloom and feed on unfolding leaves and fruit clusters. Feeding can cause severe leaf curling and misshapen fruit that persists through season. - Spray if 20% of clusters (e.g., 20 or more clusters in a 100-cluster sample) are infested. - Sprays can be delayed if predators are present on more than 20% of infested clusters. However, rosy apple aphid infestations can result in reduced fruit quality so monitoring of thresholds and damage is critical.				
1B	Malathion 85 E	malathion	610–880 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
3A	Decis 100 EC	deltamethrin	100 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	80–120 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80–120 g/ha	
4A+15	Cormoran	acetamiprid + novaluron	0.7–1.05 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
4C	Closer	sulfoxaflor	100–200 mL/ha	- Where possible, rotate with products outside of Group 4.
4D	Sivanto Prime	flupyradifurone	500–750 mL/ha	- Where possible, rotate with products outside of Group 4.
9D	Sefina	afidopyropen	0.2 L/ha	- No product specific comments.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
ROSY APPLE APHID (cont.)				
23	Movento 240 SC	spirotetramat	365–435 mL/ha	- Apply post-bloom only. - Control may not be apparent for 2-3 weeks. - Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details. - Because of adjuvant addition, do not tank-mix with sulphur, Maestro, Supra Captan, Folpan or Follow.
28	Exirel	cyantraniliprole	0.75–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Vayego 200 SC	tetraniliprole	150 mL/ha	- **SUPPRESSION ONLY.** - Apply post-bloom only.
29	Beleaf 50 SG	flonicamid	120–160 g/ha	- Do not use with adjuvants.
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	Purespray Green Spray Oil 13 E	mineral oil	10 L/1,000 L water	- **SUPPRESSION ONLY** - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow, Perm-Up, Pounce or sulphur.
UN	SuffOil-X	mineral oil	13 L/1,000 L water	- **DETERS FEEDING ONLY** - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use in combination with or immediately before or after spraying Sevin or sulphur or within 14 days of Supra Captan, Maestro, Folpan, or Follow. - If concerned about tree sensitivity, test first on a small area.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
ROSY APPLE APHID (cont.)				
UN	Vegol Crop Oil	canola oil	2% v/v	- Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.
SAN JOSE SCALE				
General Comments: - Monitor limbs and fruit for scale activity. Infestations can build unnoticed if not regularly scouted. - For dormant applications (indicated below), apply when buds begin to swell. Scale are passively respiring at this timing and have not formed a thick cuticle covering. Delaying this dormant application will reduce efficacy against this pest. - For summer applications, apply when the crawlers are active in orchards with a history of scale. In Ontario, first and second generation crawler activity typically begins mid- to late June and early August, respectively. Activity of both generations can last 4–6 weeks. - Degree-days (DDC) can be used to determine optimal spray timing. Crawler activity should begin at 278 DDC (base 10°C) for first generation and 806 DDC (base 10°C) for second generation after March 1 biofix. For information on calculating degree days, see Degree-Day Modeling on the Ontario Crop Protection Hub. - Thorough coverage of trunk and limbs is essential for good control.			
1B	Malathion 85 E	malathion	1,220 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application.
4C	Closer	sulfoxaflor	400 mL/ha	- Where possible, rotate with products outside of Group 4.
4D	Sivanto Prime	flupyradifurone	0.75–1 L/ha, plus 0.25% v/v oil	- Where possible, rotate with products outside of Group 4. - Oil may cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not apply when temperatures exceed 30ºC, to crops under moisture stress or just prior to rain.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
SAN JOSE SCALE (cont.)				
23	Movento 240 SC	spirotetramat	365–585 mL/ha	- Apply post-bloom only. - Control may not be apparent for 2-3 weeks. Apply just prior to predicted crawler emergence in blocks where scale was observed the previous year. Reapply, if necessary, after 14 days. - Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details. - Because of adjuvant addition, do not tank-mix with sulphur, Maestro, Supra Captan, Folpan or Follow.
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- Also registered for European fruit scale, lecanium scale and oystershell scale. - This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	Purespray Green Spray Oil 13 E	mineral oil	20 L/1,000 L water	- **DORMANT TO BUD SWELL APPLCATION.** - Also registered for European fruit scale, lecanium scale and oystershell scale. - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow, Perm-Up, Pounce or sulphur.
UN	Superior 70 Oil	mineral oil	20 L/1,000 L water	- **DORMANT TO BUD SWELL APPLCATION.** - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan or Follow, or within 30 days of sulphur.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
SAN JOSE SCALE (cont.)				
UN	Vegol Crop Oil	canola oil	20 L/1,000 L water (dormant) 2% v/v (summer)	- **DORMANT TO BUD SWELL APPLICATION and SUMMER APPLICATION** - Also registered for European fruit scale, lecanium scale and oystershell scale. - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.
SPOTTED TENTIFORM LEAFMINER				
General Comments: - Adult flight begins pre-bloom with several generations occurring through the season. Larvae mine leaves, reducing photosynthetic area and potentially stressing heavily infested trees. - For first generation tentiform leafminer (pre-bloom through to June), apply when there are 3 or more eggs per spur (prior to egg hatch) OR 1 or more sap-feeding miners per leaf (after egg hatch). - For second generation tentiform leafminer (mid to late June through July), apply where there are 2 sap-feeding miners per leaf (stressed trees) or 4 sap-feeding miners per leaf (healthy trees). - Control measures are not generally recommended for third generation (August/September) tentiform leafminer. - Insecticides do not provide sufficient control when tissue-feeding mines become predominant.				
1B	Imidan WP	phosmet	2.68 kg/ha	- All thinning activities must be completed prior to application.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - Apply at first sign of adult activity. Does not provide effective control of eggs or mining larvae. - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	125–188 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	500 mL/ha	
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	80 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80 g/ha	

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
SPOTTED TENTIFORM LEAFMINER (cont.)				
4A	Theme 480 SC	thiacloprid	145–290 mL/ha	- **Note rate change from first to second generation.** - To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A+15	Cormoran	acetamiprid + novaluron	700 mL/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
5	Delegate	spinetoram	210–420 g/ha	- No product specific comments.
6	Agri-Mek SC	abamectin	170 mL/ha	- Do not apply later than 6 weeks after petal fall. - Apply with 10 L of oil and a minimum of 1,000 L water/ha. - Apply at egg hatch or at first sign of sap-feeder stage. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur.
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
18	Intrepid	methoxyfenozide	500 mL/ha	- **USE FOR FIRST GENERATION ONLY.**
18	Confirm 240 F	tebufenozide	1 L/ha	- **USE FOR FIRST GENERATION ONLY.**
28	Altacor	chlorantraniliprole	215 g/ha	- No product specific comments.
28	Altacor Max	chlorantraniliprole	73–108 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–188 mL/ha	
28	Exirel	cyantraniliprole	500–750 mL/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
SPRING-FEEDING CATERPILLAR				
General Comments: - Species in this complex include, but are not limited to, leafrollers, eye spotted bud moth, green pug moth, gypsy moth and green fruitworm. Not all products are registered for all species. Refer to the label for registered pests. - Larvae become active early in spring from silver tip through bloom, feeding on buds, blossoms, and young foliage. - Damage is often patchy and more noticeable in orchard borders or blocks near wooded areas. - Apply if there are 12–15 larvae per 100 terminals.				
1B	Malathion 85 E	malathion	880–1,220 mL/ 1,000 L water	- No product specific comments
1B	Imidan WP	phosmet	2.68 kg/ha	- Pest activity may be too early for use of this product on established trees. All thinning activities must be completed prior to application.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	100 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
3A	Perm-Up EC	permethrin	520 mL/ha	
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	120 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	120 g/ha	
4A+15	Cormoran	acetamiprid + novaluron	0.84–1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - Certain species such as green fruitworm may require higher rate. See label for more details. - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
5	Delegate	spinetoram	210–420 g/ha	- No product specific comments.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
SPRING-FEEDING CATERPILLAR (cont.)				
5	Entrust	spinosad	364 mL/ha	- No product specific comments.
5	Success	spinosad	182 mL/ha	
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Applications later than 6 weeks after petal fall will not provide effective control of mites. - Apply with 0.25-1.0% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
11A	XenTari WG	*Bacillus thuringiensis* subsp. *aizawai*	0.5–1.6 kg/ha	- Product must be consumed to be effective. Spray when and where pests are actively feeding. Death of insect may take several days. - Acidify spray mix to below pH 7.0. - Product can be broken down by sunlight. Apply in the evening or on a cloudy day.
11A	BioProtec PLUS	*Bacillus thuringiensis* subsp. *Kurstaki*	1.8–2.5 L/ha	
11A	Dipel 2X DF	*Bacillus thuringiensis* subsp. *kurstaki*	1.125–1.675 kg/ha	
28	Altacor	chlorantraniliprole	145–285 g/ha	- No product specific comments.
28	Altacor Max	chlorantraniliprole	73–143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	125–250 mL/ha	
28	Exirel	cyantraniliprole	0.5–1.0 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.
28	Harvanta 50 SL	cyclaniliprole	1.2–1.6 L/ha	- No product specific comments.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
TARNISHED PLANT BUG				
General Comments: - Targeted sprays for plant bug are not economical unless there is a perennial problem in the orchard. - Overwintering adults become active on warm days in early spring and attack floral buds and immature fruit. Cool weather during bloom can prolong activity and increase risk of catfacing injury. - While damage to bearing orchards is minimal after June, nurseries and newly planted blocks are susceptible throughout the summer. - Monitor for signs of feeding activity such as ooze near or on the flower buds.				
3A	Perm-Up EC	permethrin	520 mL/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Pounce 384 EC	permethrin	520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
3A	Up-Cyde 2.5 EC	cypermethrin	400 mL/ha	
4A+15	Cormoran	acetamiprid + novaluron	1.26 L/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
4C	Closer	sulfoxaflor	400 mL/ha	- Where possible, rotate with products outside of Group 4.
29	Beleaf 50 SG	flonicamid	200 g/ha	- **SUPPRESSION ONLY.** - Do not use with adjuvants.
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Must be applied before pest is present. Begin applications at tight cluster. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
WHITE APPLE LEAFHOPPER				
General Comments: - Spray when 2–5 nymphs per leaf in a 100-leaf sample. Nymphs are active in mid-June and early August. - Best timing for control is after petal fall, if threshold is reached. - Heavy feeding can reduce tree vigour and create nuisance spotting on fruit from honeydew and cast skins. - Control of adults is very difficult.				

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
WHITE APPLE LEAFHOPPER (cont.)				
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
3A	Decis 100 EC	deltamethrin	100 mL/ha	
3A	Poleci 2.5 EC	deltamethrin	400 mL/ha	
3A	Perm-Up EC	permethrin	360–520 mL/ha	
3A	Pounce 384 EC	permethrin	360–520 mL/ha	
3A	Ship 250 EC	cypermethrin	400 mL/ha	
4A	Aceta 70 WP	acetamiprid	80 g/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A	Assail 70 WP	acetamiprid	80 g/ha	
4A	Theme 480 SC	thiacloprid	145 mL/ha	- To prevent mite outbreaks, limit use of Group 4A products to maximum of 2 applications per season.
4A+15	Cormoran	acetamiprid + novaluron	700 mL/ha	- ***Do not allow this product to drift onto grapes as leaf spotting may occur.*** - To prevent mite outbreaks, limit use of Group 4A products to a maximum of 2 applications per season.
4D	Sivanto Prime	flupyradifurone	500–750 mL/ha	- Where possible, rotate with products outside of Group 4.
28	Altacor	chlorantraniliprole	285 g/ha	- **SUPPRESSION ONLY.**
28	Altacor Max	chlorantraniliprole	143 g/ha	
28	Shenzi 400 SC	chlorantraniliprole	188–250 mL/ha	
28	Exirel	cyantraniliprole	0.75–1.5 L/ha	- Do not tank-mix or make sequential applications with Supra Captan, Maestro, Pristine, Merivon, Flint, or copper fungicides. See product label for other tank-mix restrictions.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
WHITE APPLE LEAFHOPPER (cont.)				
UN	Surround WP	kaolin	25–50 kg/ha	- **REDUCTION IN DAMAGE ONLY.** - Acts as a repellent, irritant or physical barrier to the pest. - Apply when adult activity is first detected by monitoring and continue every 7 days during egg laying period. - Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. - White film will remain on fruit if applied near harvest unless crop will be washed / waxed. - May delay sugar accumulation. - Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.
WOOLLY APPLE APHID				
General Comments: - This is a special spray for orchards with a history of high woolly apple aphid damage. See Table 2.6 – *Insect and Disease Susceptibility Ratings of Common Apple Rootstocks* for more information on woolly apple aphid-resistant rootstocks. - Adults overwinter on the roots and in protected sites on the tree (i.e., loose bark, pruning wounds, cankers). In the spring, young aphids crawl to new sites. - Monitor for cottony masses on shoots and water sprouts, particularly in vigorous orchards. - Spray if aphid colonies are close to fruit clusters or on young trees and nursery stock. - Early intervention is key for effective control before populations build mid- to late season. Efficacy of control reduces once colonies can be observed in the outer canopy. - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs.			
1B	Malathion 85 E	malathion	610 mL/ 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
4C	Closer	sulfoxaflor	400 mL/ha	- Where possible, rotate with products outside of Group 4.
23	Movento 240 SC	spirotetramat	365–435 mL/ha	- Apply post-bloom only. - Control may not be apparent for 2-3 weeks. - Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label for further details. - Because of adjuvant addition, do not tank-mix with sulphur, Maestro, Supra Captan, Folpan or Follow.
29	Beleaf 50 SG	flonicamid	120–160 g/ha	- High rate is needed for this pest. - Do not use with adjuvants.

Table 3.1 – Apple Crop Protection: Insects

Group	Product Name	Common Name	Rate	Product Specific Comments
WOOLLY APPLE APHID (cont.)				
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	SuffOil-X	mineral oil	13 L/1,000 L water	- **DETERS FEEDING ONLY** - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use in combination with or immediately before or after spraying Sevin or sulphur or within 14 days of Supra Captan, Maestro, Folpan, or Follow. - If concerned about tree sensitivity, test first on a small area.
UN	Vegol Crop Oil	canola oil	2% v/v	- May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.

Table 3.2 – Apple Crop Protection: Mites

Use this table as a guide but refer to product label for specific information. Products are listed in the crop protection tables by chemical group and are in alphabetical order within each group. The order does not reflect efficacy. For information on preharvest and restricted entry intervals, maximum applications, and organic status, see Table 1.1 – *Products Used on Apples*. For honeybee toxicity and impact to common beneficial insects, see Table 1.2 – *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*. For efficacy ratings, see Table 3.3 – *Activity of Insecticides and Miticides on Apple Pests.*

Group	Product Name	Common Name	Rate	Product Specific Comments
APPLE RUST MITE				
General Comments: - Monitor from pink throughout the summer. - Do not use miticides unless apple rust mite populations are greater than 200–500 mites per leaf. Low populations of apple rust mites provide valuable prey for predatory mites. - See Table 3.6 – *Activity of Miticides Registered on Apple in Ontario* for more information on targeted life stages, preferred timing and comments on knock-down for registered miticides. - Presence of beneficial insects should be considered before applying a spray. - Thorough spray coverage is essential for good control. - For resistance management, do not use any miticide more than once per season.				
21A	Magister SC	fenazaquin	1.75 L/ha	- No product specific comments.
21A	Nexter SC	pyridaben	500 mL/ha	- No product specific comments.
23	Envidor 240 SC	spirodiclofen	750 mL/ha	- Apply post-bloom only. - Control may not be apparent for 7-10 days.
23	Spiro SC	spirodiclofen	710 mL/ha	
29	Allegro 500 F	fluazinam	0.75–1.0 L/ha	- **SUPPRESSION ONLY.** - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.75–1.0 L/ha	
29	Vantana	fluazinam	0.75–1.0 L/ha	
UN	Vegol Crop Oil	canola oil	2% v/v	- May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
APPLE RUST MITE (cont.)				
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	Kumulus	sulphur	6 kg/ha	- Do not use within 14 days of Purespray Green Spray Oil or SuffOil-X and 30 days of Vegol Crop Oil or Superior Oil. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees.
UN	Microthiol Disperss	sulphur	6 kg/ha	
EUROPEAN RED MITE				
General Comments: - Eggs hatch around tight cluster to pink, with populations increasing rapidly during warm, dry conditions. - Trees can withstand greater mite activity as canopy gets more dense. Unless indicated in product comments below, early season, apply when there are 5-7 active mites per leaf. Apply when there are 7-10 active mites per leaf in June to mid-July or 10-15 active mites per leaf in July and August. - See Table 3.6 – *Activity of Miticides Registered on Apple in Ontario* for more information on targeted life stages, preferred timing and comments on knock-down for registered miticides. - Presence of beneficial insects should be considered before applying a spray. - Thorough spray coverage is essential for good control. - For resistance management, do not use any miticide more than once per season.				
1B	Malathion 85 E	malathion	610–1,220 mL / 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
1B	Imidan WP	phosmet	2.68 kg/ha	- **SUPPRESSION ONLY.** - All thinning activities must be completed prior to application.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
EUROPEAN RED MITE (cont.)				
6	Agri-Mek SC	abamectin	170 mL/ha	- Do not apply later than 6 weeks after petal fall. - Apply before a threshold of 5 mites per leaf is reached. - Apply with 10 L oil and a minimum of 1,000 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur.
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Do not apply later than 6 weeks after petal fall. - Apply before a threshold of 5 mites per leaf is reached. - Apply with 0.25-1% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.
20B	Kanemite 15 SC	acequinocyl	2.07 L/ha	- No product specific comments.
20D	Acramite 50 WS	bifenazate	851 g/ha (or 3.75 pouches/ha)	- No product specific comments.
21A	Magister SC	fenazaquin	1.75–2.34 L/ha	- No product specific comments.
21A	Nexter SC	pyridaben	500 mL/ha	- No product specific comments.
23	Envidor 240 SC	spirodiclofen	750 mL/ha	- Apply post-bloom only. - Control may not be apparent for 7-10 days.
23	Spiro SC	spirodiclofen	710 mL/ha	
25	Nealta	cyflumetofen	1 L/ha	- Apply as mite populations begin to build, before mite damage is observed. The use of a registered adjuvant may improved performance.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
EUROPEAN RED MITE (cont.)				
29	Allegro 500 F	fluazinam	0.75–1.0 L/ha	- **SUPPRESSION ONLY.** - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.75–1.0 L/ha	
29	Vantana	fluazinam	0.75–1.0 L/ha	
UN	Vegol Crop Oil	canola oil	20 L / 1,000 L water (dormant) 2% v/v (summer)	- For dormant application, apply dormant to green tip before overwintering eggs hatch. - For summer application, apply when mites first appear. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.
UN	Purespray Green Spray Oil 13 E	mineral oil	20 L / 1,000 L water (dormant) 10 L / 1,000 L water (summer)	- **SUPPRESSION ONLY.** - For dormant application, apply dormant to green tip before overwintering eggs hatch. - For summer application, apply when mites first appear. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow, Perm-Up, Pounce or sulphur.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
EUROPEAN RED MITE (cont.)				
UN	Superior 70 Oil	mineral oil	20 L / 1,000 L water	- Apply dormant to green tip before overwintering eggs hatch. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan or Follow or within 30 days of sulphur.
TWO-SPOTTED SPIDER MITE				
General Comments: - Populations typically build in hot, dry weather. Feeding causes leaf stippling and bronzing, with flare-ups often occurring in mid- to late summer. - Trees can withstand greater mite activity as canopy gets more dense. Unless indicated in product comments below, early season, apply when there are 5-7 active mites per leaf. Apply when there are 7-10 active mites per leaf in June to mid-July or 10-15 active mites per leaf in July and August. - See Table 3.6 – *Activity of Miticides Registered on Apple in Ontario* for more information on targeted life stages, preferred timing and comments on knock-down for registered miticides. - Presence of beneficial insects should be considered before applying a spray. - Thorough spray coverage is essential for good control. - For resistance management, do not use any miticide more than once per season.			
1B	Malathion 85 E	malathion	610–1,220 mL / 1,000 L water	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
3A	Danitol	fenpropathrin	0.78–1.55 L/ha	- ***To preserve beneficial insects, use of this product post-bloom is discouraged.*** - This product is highly toxic to beneficial insects. To preserve natural enemies and reduce potential for secondary pest outbreaks, do not make more than 1 application per season.
6	Agri-Mek SC	abamectin	170 mL/ha	- Do not apply later than 6 weeks after petal fall. - Apply before a threshold of 5 mites per leaf is reached. - Apply with 10 L oil and a minimum of 1,000 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur.
6+28	Minecto Pro	abamectin + cyantraniliprole	496 mL/ha	- Do not apply later than 6 weeks after petal fall. - Apply before a threshold of 5 mites per leaf is reached. - Apply with 0.25-1% oil (or 0.1-0.5% non-ionic surfactant) and a minimum of 450 L water/ha. - May cause russeting on Golden Delicious and other light-skinned cultivars. - Because of oil tank-mix, do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or sulphur. - Do not tank-mix or make sequential applications with Pristine, Merivon, Flint or copper fungicides. See product label for other tank-mix restrictions.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
TWO-SPOTTED SPIDER MITE (cont.)				
20B	Kanemite 15 SC	acequinocyl	2.07 L/ha	- No product specific comments.
20D	Acramite 50 WS	bifenazate	568 g/ha (or 2.5 pouches/ha)	- No product specific comments.
21A	Magister SC	fenazaquin	1.75–2.34 L/ha	- No product specific comments.
21A	Nexter SC	pyridaben	1 L/ha	- Only controls two-spotted spider mite nymphs.
23	Envidor 240 SC	spirodiclofen	750 mL/ha	- Apply post-bloom only. - Control may not be apparent for 7-10 days.
23	Spiro SC	spirodiclofen	710 mL/ha	
25	Nealta	cyflumetofen	1 L/ha	- Apply as mite populations begin to build, before mite damage is observed. The use of a registered adjuvant may improved performance.
29	Allegro 500 F	fluazinam	0.75–1.0 L/ha	- **SUPPRESSION ONLY.** - Do not make more than 3 sequential applications before rotating to another fungicide group. - Do not mix with oil.
29	Downforce AG	fluazinam	0.75–1.0 L/ha	
29	Vantana	fluazinam	0.75–1.0 L/ha	
UN	Vegol Crop Oil	canola oil	2% v/v	- Apply when mites first appear. - May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia if not applied properly. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro, Folpan, Follow or copper or within 30 days of sulphur. - Do not apply to wet foliage.

Table 3.2 – Apple Crop Protection: Mites

Group	Product Name	Common Name	Rate	Product Specific Comments
TWO-SPOTTED SPIDER MITE (cont.)				
UN	SuffOil-X	mineral oil	13 L / 1,000 L water	- **SUPPRESSION ONLY.** - Apply when mites first appear. - Do not apply when temperatures are high (over 30ºC), prior to rain or to heat- or moisture-stressed trees. - Do not use in combination with or immediately before or after spraying Sevin or sulphur or within 14 days of Supra Captan, Maestro, Folpan or Follow. - If concerned about tree sensitivity, test first on a small area.
UN	Kopa Insecticidal Soap	potassium salts of fatty acids	2% v/v in 700–1,000 L water/ha	- This product must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. - Begin applications when populations are low and reapply every 1-3 weeks, as needed. - Test a small area of each variety prior to spraying the whole block. - Applying soaps more than 3 times may cause plant injury. Application within 3 days of certain other pest control products may increase plant injury on sensitive plants – see label for details. - Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. - Manzate and Dithane are incompatible with Kopa.

Table 3.3 – Activity of Insecticides and Miticides on Apple Pests

Use products only for pests listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Insecticide	Apple maggot	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Potato leafhopper	San Jose scale	Spring-feeding caterpillar	Stink bug	Tarnished plant bug	White apple leafhopper	Aphids			Mites		
																		Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
1B	Imidan WP	3–4	3[R]	—	(3)	3	(1)	—	2[R]	(3)[R]	4	(1)	1	3	(1)	2	1	2	2	(1)	—	—	—
1B	Malathion 85 E	(2)	3	—	(3)	—	—	—	(1)	(3)	3	(1)	—	2	(2)	(1)	(1)	3	2	3	—	—	—
3A	Danitol	3	3	—	—	3	—	—	2[R]	3	(2)	3	(1)	3	—	—	3	(2)	(2)	—	—	—	—
3A	Decis 100 EC[1]	(3)	3	—	(3)	—	2	1	2[R]	3	(2)	(4)	(1)	3	—	(3)	4	3	3	(1)	0	0	0
3A	Perm-Up EC[1]	3	2	3	(3)	(3)	—	2	2[R]	(3)	2	(3)	(1)	3	(2)	4	3	(2-3)	(3)	(1)	0	0	0
3A	Poleci 2.5 EC[1]	(3)	3	—	(3)	—	2	1	2[R]	3	(2)	(4)	(1)	3	—	(3)	4	3	3	(1)	0	0	0
3A	Pounce 384 EC[1]	3	2	3	(3)	(3)	—	2	2[R]	(3)	2	(3)	(1)	3	(2)	4	3	(2-3)	(3)	(1)	0	0	0
3A	Ship 250 EC[1]	2	2	—	(3)	(3)	2	(1)	1[R]	(3)	3	—	(1)	3	—	3	1	(2)	(2)	—	0	0	0
3A	Up-Cyde 2.5 EC[1]	2	2	—	(3)	(3)	2	(1)	1[R]	(3)	3	—	(1)	3	—	3	1	(2)	(2)	—	0	0	0
4A	Aceta 70 WP[1]	3–4	3	—	3	(4)	(2)	3	(1)	4	3–4	4	(2)	3	(3)	(3)	4	4	4	(2)	0	0	0
4A	Assail 70 WP[1]	3–4	3	—	3	(4)	(2)	3	(1)	4	3–4	4	(2)	3	(3)	(3)	4	4	4	(2)	0	0	0
4A	Theme 480 SC[1]	3	3	—	(4)	(4)	(1–2)	3	(1)	4	4	4	(2)	—	(2)	(3)	4	(4)	(4)	(2)	0	0	0
4A+15	Cormoran	3–4	3	3	3	4	—	3	—	4	3–4	4	—	3	—	3	4	4	4	—	0	0	0
4C	Closer[1]	0	0	0	0	0	(3)	3	0	0	0	(4)	3	0	(2)	2–3	(4)	4	4	3–4	0	0	0

Table 3.3 – Activity of Insecticides and Miticides on Apple Pests

Group	Insecticide	Apple maggot	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Potato leafhopper	San Jose scale	Spring-feeding caterpillar	Stink bug	Tarnished plant bug	White apple leafhopper	Aphids			Mites		
																		Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
4D	Sivanto Prime	—	—	—	—	—	—	—	—	—	—	4	3	—	—	—	4	4	4	(1)	0	0	0
5	Delegate	2	4	3	3	—	2	—	4	4	2	—	—	4	(1)	—	—	0	0	—	0	0	0
5	Entrust	(2)	2	—	—	—	—	—	4	(1)	(1)	0	—	4	—	0	0	0	0	—	0	0	0
5	Success	(2)	(2)	—	—	—	—	—	4	(1)	(1)	0	—	4	—	0	0	0	0	—	0	0	0
6	Agri-Mek SC	0	0	0	0	0	—	0	0	0	0	3	—	0	(1)	0	3	—	—	—	(3)	4	3
6+28	Minecto Pro	(3)	4	—	3	—	(2)	0	4	4	(2)	(2)	—	4	—	(3)	(3)	(3)	(3)	—	(3)	4	3
9D	Sefina	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	4	—	—	—	—
11A	Bioprotec PLUS	0	(1-2)	—	—	0	—	0	3	(1)	0	0	0	3	0	0	0	0	0	0	0	0	0
11A	Dipel 2X DF	0	(1-2)	—	—	0	—	0	3	(1)	0	0	0	3	0	0	0	0	0	0	0	0	0
11A	Xentari WG	0	1-2	—	—	0	—	0	3	(1)	0	0	0	3	0	0	0	0	0	0	0	0	0
15	Rimon 10 EC	—	3	3	—	—	—	—	(3)	3	—	2	—	(4)	(1)	(3)	2	—	—	—	0	0	0
18	Confirm 240 F	0	3	—	—	—	—	0	3^R	(3)	0	0	0	3	(1)	0	0	0	0	—	0	0	0
18	Intrepid	0	3	—	—	—	—	0	3^R	3	0	0	0	3	(1)	0	0	0	0	—	0	0	0
20B	Kanemite 15 SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	4	4
20D	Acramite 50 WS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	4
21A	Magister SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
21A	Nexter SC	0	0	0	0	0	0	0	0	0	0	(3)	0	0	0	0	(3)	(1-2)	(1-2)	0	3	3	2
23	Envidor 240 SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
23	Movento 240 SC	0	0	0	0	0	3	0	0	0	0	—	4	0	0	0	—	4	3	4	0	0	0

Table 3.3 – Activity of Insecticides and Miticides on Apple Pests

Group	Insecticide	Apple maggot	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Potato leafhopper	San Jose scale	Spring-feeding caterpillar	Stink bug	Tarnished plant bug	White apple leafhopper	Aphids			Mites		
																		Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
23	Spiro SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4
25	Nealta	0	0	0	0	0	0	0	0	0	0	—	0	0	0	0	—	0	0	0	—	4	4
28	Altacor	2	4	3	4	2	—	—	4	4	(1)	—	(1)	4	(1)	(1)	2	(1)	(1)	—	0	0	0
28	Altacor Max	2	4	3	4	2	—	—	4	4	(1)	—	(1)	4	(1)	(1)	2	(1)	(1)	—	0	0	0
28	Exirel	3	4	—	3	3	(2)	0	4	4	2–3	(2)	—	4	—	(3)	3	3	3	—	0	0	0
28	Harvanta 50 SL	2	4	—	(3)	(2)	—	—	4	4	2	—	—	4	—	—	(2)	—	—	—	0	0	0
28	Shenzi 400 SC	2	4	3	4	2	—	—	4	4	(1)	—	(1)	4	(1)	(1)	2	(1)	(1)	—	0	0	0
28	Vayego 200 SC	2	4	—	3	—	—	2	4	4	2	—	—	(4)	—	—	—	2	2	—	0	0	0
29	Beleaf 50 SG	—	—	—	—	—	—	—	—	—	—	—	—	—	(1)	3	—	3	3	2	0	0	0
31	Cyd-X	0	4	0	0	0	0	0	—	(3)	0	0	0	—	0	0	0	0	0	0	0	0	0
31	Madex HP	0	4	0	0	0	0	0	—	4	0	0	0	—	0	0	0	0	0	0	0	0	0
31	Virosoft CP 4	0	4	0	0	0	0	0	—	(3)	0	0	0	—	0	0	0	0	0	0	0	0	0
UN	Kopa	0	(1-2)	0	0	0	—	0	(1)	0	0	(1)	2	(1)	—	0	(1)	3	2	—	2	2	2
UN	Purespray Green Spray Oil 13 E (dormant)	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	(2)	2	(1)	—	4	—
UN	Purespray Green Spray Oil 13 E (summer)	0	(1-2)	0	0	0	(2-3)	0	(1)	(1)	0	0	(3-4)	(1)	0	0	0	(2)	2	(1)	(2)	4	(2-3)
UN	Suffoil-X	—	(1)	—	—	—	(1)	—	—	(1)	—	—	(2)	—	—	—	—	1–2	1–2	(1)	(3)	(3)	3-4
UN	Superior 70 Oil (dormant)	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	(2)	2	(1)	—	4	—

Table 3.3 – Activity of Insecticides and Miticides on Apple Pests

Group	Insecticide	Apple maggot	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Potato leafhopper	San Jose scale	Spring-feeding caterpillar	Stink bug	Tarnished plant bug	White apple leafhopper	Aphids			Mites		
																		Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
UN	Surround WP	2	2	—	2	(1)	—	—	1	2	2	2	(2)	1	(2)	1	1	—	—	—	0	(2)	0
UN	Vegol Crop Oil (dormant / summer)	0	(1)	0	0	0	(2)	0	(1)	(1)	0	0	3–4	(1)	0	0	0	2	2	1	2	4	2-3

0 = Not Effective; 1 = Partial Suppression; 2 = Suppression; 3 = Control; 4 = Excellent Control
— = No data available
( ) = Not registered on pest
[1] May cause mite flare-ups
[R] Resistance has been detected in Ontario populations.
Source: Various northeastern extension publications, scientific journal articles, and Ontario field trials.

Table 3.4 – Activity of Prebloom Insecticides Against Orchard Insects

Use insecticides only for insects listed on the product label for the crop. Consult the label for more information. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Group	European apple sawfly	Green apple aphid	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Rosy apple aphid	Spring feeding caterpillar	Tarnished plant bug
Danitol	3A	—	(✓s)	—	—	✓s	(✓s)	✓	—
Decis 100 EC	3A	(✓)	✓	✓s	✓s	✓s	✓	✓	(✓)
Perm-Up EC	3A	(✓)	(✓)	—	✓s	✓s	(✓)	✓	✓
Poleci 2.5 EC	3A	(✓)	✓	✓s	✓s	✓s	✓	✓	(✓)
Pounce 384 EC	3A	(✓)	(✓)	—	✓s	✓s	(✓)	✓	✓
Ship 250 EC	3A	(✓)	(✓s)	✓s	(✓s)	✓s	(✓s)	✓	✓
Up-Cyde 2.5 EC	3A	(✓)	(✓s)	✓s	(✓s)	✓s	(✓s)	✓	✓
Aceta 70 WP	4A	✓	✓	(✓s)	✓	(✓s)	✓	✓	(✓)
Assail 70 WP	4A	✓	✓	(✓s)	✓	(✓s)	✓	✓	(✓)
Theme 480 SC	4A	(✓)	(✓)	(✓s)	✓	(✓s)	(✓)	(✓)	(✓)
Cormoran	4A+15	✓	✓	—	✓	—	✓	✓	✓
Closer	4C	X	✓	(✓)	✓	X	✓	X	✓
Sivanto Prime	4D	X	✓	—	—	X	✓	X	—
Delegate	5	✓	X	✓s	—	✓	X	✓	—
Entrust	5	—	X	—	—	✓	X	✓	X
Success	5	—	X	—	—	✓	X	✓	X
Minecto Pro	6+28	✓	(✓)	(✓s)	X	✓	(✓)	✓	(✓)
Sefina	9D	X	✓	—	X	X	✓	X	X
BioProtec PLUS	11A	—	X	—	X	✓	X	✓	X
Dipel 2X DF	11A	—	X	—	X	✓	X	✓	X
XenTari WG	11A	—	X	—	X	✓	X	✓	X
Confirm 240 F	18	—	X	—	X	✓	X	✓	X

Table 3.4 – Activity of Prebloom Insecticides Against Orchard Insects

Use insecticides only for insects listed on the product label for the crop. Consult the label for more information. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Group	European apple sawfly	Green apple aphid	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Rosy apple aphid	Spring feeding caterpillar	Tarnished plant bug
Intrepid	18	—	X	—	X	✓	X	✓	X
Nexter SC	21A	X	(✓s)	X	X	X	(✓s)	X	X
Altacor / Altacor Max	28	✓	(✓s)	—	—	✓	(✓s)	✓	(✓s)
Exirel	28	✓	✓	(✓s)	X	✓	✓	✓	(✓)
Harvanta 50 SL	28	(✓)	—	—	—	✓	—	✓	—
Shenzi 400 SC	28	✓	(✓s)	—	—	✓	(✓s)	✓	(✓s)
Vayego 200 SC	28	✓	✓s	—	✓s	✓	✓s	(✓)	—
Beleaf 50SG	29	—	✓	—	—	—	✓	—	✓
Kopa Insecticidal Soap	UN	—	✓	—	X	(✓s)	✓s	(✓s)	X
Purespray Green Spray Oil 13E	UN	—	(✓s)	(✓)	X	(✓s)	✓s	(✓s)	X
SuffOil-X	UN	—	✓s	(✓s)	—	—	✓s	—	—
Surround	UN	✓s	—	—	—	✓s	—	✓s	✓s
Vegol Crop Oil	UN	X	✓s	(✓s)	X	(✓s)	✓s	(✓s)	X

✓ = Has activity on the pest. s = Suppression. X = Product does not have activity at this timing. ( ) = Not registered on pest. May provide efficacy when applied for another pest listed on product label.
— = Information in not known.

Table 3.5 – Activity of Petal Fall Insecticides Against Orchard Insects

Use insecticides only for insects listed on the product label for the crop. Consult the label for more information. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Group	Codling moth (eggs)	European apple sawfly	Green apple aphid	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Rosy apple aphid	Delayed petal fall / first summer spray		
											Codling moth	San Jose scale	Woolly apple aphid
Aceta 70 WP	4A	—	✓	✓	(✓s)	✓	(✓s)	✓	✓	✓	✓	(✓)	(✓)
Assail 70 WP	4A	—	✓	✓	(✓s)	✓	(✓s)	✓	✓	✓	✓	(✓)	(✓)
Theme 480 SC	4A	—	(✓)	(✓)	(✓s)	✓	(✓s)	✓	✓	(✓)	✓	(✓)	(✓)
Cormoran	4A+15	—	✓	✓	—	✓	—	✓	✓	✓	✓	(✓)	(✓s)
Closer	4C	X	X	✓	(✓)	✓	X	X	X	✓	X	✓	✓
Sivanto Prime	4D	X	X	✓	—	—	X	X	X	✓	X	✓	(✓)
Delegate	5	—	✓	X	✓s	—	✓	✓	✓s	X	✓	—	—
Entrust	5	—	—	X	—	—	✓	(✓s)	(✓s)	X	✓s	—	X
Success	5	—	—	X	—	—	✓	(✓s)	(✓s)	X	(✓s)	—	X
Minecto Pro	6+28	—	✓	(✓)	(✓s)	X	✓	✓	(✓)	(✓)	✓	—	—
Sefina	9D	X	X	✓	—	X	X	X	X	✓	X	—	—
BioProtec PLUS	11A	X	—	X	—	X	✓	(✓s)	X	X	(✓s)	X	X
Dipel 2X DF	11A	X	—	X	—	X	✓	(✓s)	X	X	(✓s)	X	X
XenTari WG	11A	X	—	X	—	X	✓	✓s	X	X	✓s	X	X
Rimon 10 EC	15	✓	—	—	—	—	(✓)	✓	—	—	X	—	—
Confirm 240 F	18	X	—	X	—	X	✓	(✓)	X	X	✓	X	X
Intrepid	18	X	—	X	—	X	✓	✓	X	X	✓	X	X
Nexter SC	21A	X	X	(✓s)	X	X	X	X	X	(✓s)	X	X	X
Movento 240 SC	23	X	X	✓	✓	X	X	X	X	✓	X	✓	✓

Table 3.5 – Activity of Petal Fall Insecticides Against Orchard Insects

Use insecticides only for insects listed on the product label for the crop. Consult the label for more information. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Group	Codling moth (eggs)	European apple sawfly	Green apple aphid	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Plum curculio	Rosy apple aphid	Delayed petal fall / first summer spray		
											Codling moth	San Jose scale	Woolly apple aphid
Spiro SC	23	X	X	✓	✓	X	X	X	X	✓	X	✓	✓
Altacor / Altacor Max	28	—	✓	(✓s)	—	—	✓	✓	(✓s)	(✓s)	✓	(✓s)	—
Exirel	28	—	✓	✓	(✓s)	X	✓	✓	✓	✓	✓	—	X
Harvanta 50 SL	28	—	(✓)	—	—	—	✓	✓	(✓)	—	✓	—	X
Shenzi 400 SC	28	—	✓	(✓s)	—	—	✓	✓	(✓s)	(✓s)	✓	(✓s)	—
Vayego 200 SC	28	—	✓	✓s	—	✓s	✓	✓	✓s	✓s	✓	—	X
Beleaf 50SG	29	—	—	✓	—	—	—	—	—	✓	—	—	✓s
Cyd-X	31	X	X	X	X	X	—	(✓)	X	X	✓	X	X
Madex HP	31	X	X	X	X	X	—	✓	X	X	✓	X	X
Virosoft CP 4	31	X	X	X	X	X	—	(✓)	X	X	✓	X	X
Kopa Insecticidal Soap	UN	(✓s)	X	✓	—	X	(✓s)	(✓s)	X	✓s	(✓s)	✓s	✓s
Purespray Green Spray Oil 13E	UN	(✓s)	X	(✓s)	(✓)	X	(✓s)	(✓s)	X	✓s	(✓s)	(✓)	(✓)
SuffOil-X	UN	(✓s)	X	✓s	(✓s)	—	—	(✓s)	—	✓s	(✓s)	(✓s)	✓s
Surround	UN	—	✓s	(✓s)	—	—	✓s	✓s	✓s	(✓s)	✓s	(✓s)	(✓s)
Vegol Crop Oil	UN	(✓s)	X	✓s	(✓s)	X	(✓s)	(✓s)	X	✓s	(✓s)	(✓s)	✓s

✓ = Has activity on the pest. s = Suppression. X= Product does not have activity at this timing. ( ) = Not registered on pest. May provide efficacy when applied for another pest listed on product label.
— = Information is not known.

Table 3.6 – Activity of Miticides Registered on Apple in Ontario[1]

Product	Target Species	Life Stage(s) Affected	Preferred Timing	Comments on Knock-down
Acramite 50 WS	European red mite two-spotted spider mite	nymphs, adults	postbloom	rapid
Agri-Mek SC	European red mite two-spotted spider mite	nymphs	within 21 days of petal fall	rapid
Envidor 240 SC	European red mite two-spotted spider mite apple rust mite	eggs, nymphs, adult females	postbloom	slow
Kanemite 15 SC	European red mite two-spotted spider mite	all life stages	postbloom	rapid
Kopa	European red mite two-spotted spider mite apple rust mite	nymphs, adults	as mite population builds, before damage is observed	intermediate
Magister SC	European red mite two-spotted spider mite apple rust mite	all life stages	summer	rapid
Minecto Pro	European red mite two-spotted spider mite	nymphs	within 6 weeks of petal fall	rapid
Nealta	European red mite two-spotted spider mite	all life stages	as mite population builds, before damage is observed	intermediate[2]
Nexter	European red mite two-spotted spider mite apple rust mite	nymphs and adults of European red mite, apple rust mite nymphs of two-spotted spider mite no effect on eggs	summer	rapid
Purespray Green Spray Oil 13 E	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs
Suffoil-X	Two-spotted spider mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs
Superior 70 Oil	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs
Vegol Crop Oil	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs

[1] Use established thresholds to time applications. Miticides are most effective when applied alone, using recommended rates and water volumes. Apply each miticide once per season to delay the development of resistance.
[2] The knock-down may be enhanced by increased coverage using a registered adjuvant.

4. Plant Growth Regulators

For additional information on plant growth regulators and thinning, visit the Apple Pest Management Information section on the Ontario Crop Protection Hub and click on Plant Growth Regulators and Thinning of Tree Fruit.

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Calculating Parts per Million (ppm)

1 ppm = 1 g active ingredient per 1,000 L water

Precautions

Applying MaxCel or Cilis Plus in combination with the hormone thinner, NAA (naphthaleneacetic acid), either as a tank-mix or separate sprays during the same growing season may result in pygmy fruit in prone cultivars (i.e., Fuji, Red Delicious, Golden Delicious and Gala).

Bee Warning

When Sevin is used for fruit thinning, extensive bee kills can occur if weeds or legumes are blooming in the ground cover. To minimize bee kills, remove bees from the orchard prior to treatment. Do not spray when the wind will carry Sevin to adjacent weedy or crop areas in bloom. Advise local beekeepers of your spray activity.

Water Volume, Coverage & pH

Unless specified on the label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, or if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.

Plant growth regulator performance can be altered based on the amount of water used. Be sure to use sufficient water carrier volume to disperse or dissolve the product and create enough spray to contact all target surface(s). Consider environmental conditions, crop size, density and developmental stage for water volume amounts. Water pH can also alter product performance, measure water pH and allow for buffering capacity depending on the product label.

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Use this table as a guide but refer to product label for specific information. Products are listed in the crop protection tables by chemical group and are in alphabetical order within each group. The order does not reflect efficacy. For information on preharvest and restricted entry intervals, maximum applications, and organic status, see Table 1.1 – *Products Used on Apples*.

Product Name	Common Name	Rate	Product Specific Comments
FRUIT COLOUR			
General comments: - Apply during periods of slow drying conditions to maximize efficacy. - For more information, see Plant Growth Regulators on the Apple Pest Management Information page on the Ontario Crop Protection Hub.			
Blush 2X	prohydrojasmon	0.95–3.8 L/ha	- Applications should be made in no more than 935 L/ha of water. - Make 1–2 applications 7–28 days before anticipated harvest. If applying twice, make first application 21–28 days before harvest and reapply 7–10 days before harvest. - Begin application once red colour starts to develop. - Results may vary due to cultivar and environmental conditions. Avoid application during the hottest part of the day. - Do not apply to trees under stress. - A DA-meter can be utilized to time first application more efficaciously.
FRUIT SHAPE			
General comments: - Apply during periods of slow drying conditions to maximize efficacy. - Spray first application or only application between king bloom and early petal fall. - Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. - These products may increase the amount of thinning achieved with subsequent blossom thinning sprays.			
Perlan	6-benzylaminopurine + gibberellins A_4A_7	1.2–2.3 L/ha	- For use on Red Delicious only. - Apply between 40–80% king bloom and early petal fall. If a prolonged bloom occurs, apply 1.2 L/ha and reapply 5–7 days later.
Promalin SL	6-benzyladenine + gibberellins A_4A_7	0.6–2.3 L/ha	- Use on fruit that has a natural typiness like Red Delicious, Golden Delicious, Ambrosia and Gala to elongate fruit and develop more prominent calyx lobes. - Apply a single application of 1.2–2.3 L/ha between early king bloom and early petal fall of side blooms. Alternatively, if a prolonged bloom occurs, apply two applications of 0.6–1.2 L/ha between early king bloom to early petal fall of side blooms and 3–21 days later (or when the rest of the canopy is in bloom).
FRUIT SIZE			
Cilis Plus	6-benzylaminopurine	10–50 ppm (0.48–2.39 L/1,000 L water)	- Make 2–4 applications at 3–10 day intervals. May cause thinning in easy-to-thin cultivars. - Apply when temperatures are greater than 20°C during and after application.
MaxCel	6-benzyladenine	10–50 ppm (0.47–2.50 L/1,000 L water)	

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
FRUITLET THINNING			
General comments: - Apply during warm (18 - 29°C) and slow drying conditions to maximize absorption. - Avoid application when temperatures are above 30°C. - See Table 4.2 – *Weather Implications on Chemical Thinner Effectiveness* and Table 4.3 – *Factors That Promote and Suppress the Response to Chemical Thinners.* - For more information, see Table 4.4 – *Suggested Rates for Chemical Thinning of Mature Apple Trees,* and Plant Growth Regulators and Thinning of Tree Fruit on the Apple Pest Management Information page on the Ontario Crop Protection Hub.			
Accede SG	1-aminocyclopropanecarboxylic acid	500–1000 g/ha	- Apply between full bloom to king fruitlet size of 25 mm but most effective when king fruitlets are 15–20 mm in diameter. - Direct most of application in upper 2/3 of tree canopy. - Allow 7-10 days before making a second application. - Results are improved when application occurs at 18 °C or above, followed by 2-3 days of similar temperatures. - Use a non-ionic surfactant to improve absorption. - Do not apply if rain is expected within 8 hours. - Do not apply to trees under stress.
Brevis 150 SC	metamitron	1.12–2.24 L/ha	- Applications should be made between 500–1500 L/ha of water. - Apply between petal fall to king fruitlet size of 18 mm. - Allow 5-10 days before making a second application. - Use tree carbon balance model to adjust rates based on weather conditions. - Apply product alone. Avoid use on trees younger than 4 years old. - Do not apply when temperatures are lower than 10°C or above 29°C. - Do not use any adjuvants that increase droplet spreading or penetration, such as a non-ionic surfactant. - Do not apply to trees under stress. - Note the preharvest intervals for early maturing cultivars.
Cilis Plus	6-benzylaminopurine	50–200 ppm (2.4–9.5 L/1,000 L water)	- Application between 5 mm to king fruitlet size of 20 mm but most effective when king fruitlets are 5–10 mm in diameter. - Direct most of application in upper 2/3 of tree canopy. - Allow 7-10 days before making a second application. - Maximum of 2 applications per season for thinning. - Apply when temperatures are greater than 20°C during and after application. - Do not apply when temperatures are below 16°C.
Fruitone-L	1-naphthaleneacetic acid	1.2–9.7 ppm (39–312 mL/1,000 L water)	- Apply between petal fall (3–7 mm fruit size) and early fruit set (8–10 mm fruit size) but most effective when the king fruitlets are 5–10 mm. Applying too soon can cause excessive thinning of Empire. - Use a non-ionic surfactant to improve absorption. - Do not apply below 15.6°C or above 26.7°C.
Maintain 3.5L	1-naphthaleneacetic acid	1.2–10.0 ppm (37–313 mL/1,000 L water)	

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
FRUITLET THINNING (cont.)			
MaxCel	6-benzyladenine	75–200 ppm (3.8–10.0 L/1,000 L water)	- Apply when fruitlets are 5–15 mm in diameter. - Maximum 2 applications per season for thinning. - Apply when temperatures are greater than 20°C during and after application. - See Table 4.5 – *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR*.
Sevin XLR	carbaryl	0.5–2 L/1,000 L water	- Apply 7–12 days after petal fall (7 days if warm and 12 days if cool). Can be applied up to 21 days after petal fall if conditions are less than ideal. - There will be little to no increase in thinning effectiveness at concentrations higher than 2 L/1,000 L water. - Apply as a dilute spray under slow drying conditions between 21–24°C. - Chemical-resistant gloves are recommended when hand thinning following application. - Note the preharvest intervals for early maturing cultivars.
Sevin XLR + Cilis Plus	carbaryl + 6-benzylaminopurine	1–2 L/1,000 L water + 2.5–6.3 L/1,000 L water	- Use for difficult-to-thin cultivars or for situations where aggressive thinning is required to decrease crop load. - Note the preharvest intervals for early maturing cultivars. - See product comments for Sevin XLR and Cilis Plus. - See Table 4.5 – *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR.*
Sevin XLR + Maxcel	carbaryl + 6-benzyladenine	1–2 L/1,000 L water + 2.65–6.60 L/1,000 L water	- Use for difficult-to-thin cultivars or for situations where aggressive thinning is required to decrease crop load. - Note the preharvest intervals for early maturing cultivars. - See product comments for Sevin XLR and Maxcel. - See Table 4.5 – *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR*.
Sevin XLR + Fruitone-L	carbaryl + 1-naphthaleneacetic acid	1 L/1,000 L water + 5–10 ppm (156–312 mL/1,000 L water)	- Use for difficult-to-thin cultivars or for situations where aggressive thinning is required to decrease crop load. - Note the preharvest intervals for early maturing cultivars. - See product comments for Sevin XLR and Fruitone-L.
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Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
HARVEST MANAGEMENT			
General comments: - Delay maturing by reducing ethylene production. - For more information, see Plant Growth Regulators on the Apple Pest Management Information page on the Ontario Crop Protection Hub.			
Harvista 1.3 SC	1-methylcyclopropene	5.9–17.7 L/ha	- Harvest maturity can be delayed by 7–14 days and reduce preharvest drop, reduce fruit ethylene production, allow for additional time to develop colour and increase size, maintain fruit firmness, delay starch hydrolysis, delay onset or reduce incidence of watercore and enhance storage potential. - An in-line chemical injector system, designed for use with this product, is required for application. Apply 3–21 days before estimated harvest. - Ontario research has shown that applying as close as possible to the estimated harvest date has achieved better results. Use higher rate for fruit at a more advanced stage of maturity. - Use low rate for bicoloured apples to prevent delay in red colour development. - Use an organosilicone surfactant at a rate of 0.05% v/v. - Do not apply when temperatures are above 35°C. - Do not tank-mix or make sequential applications with copper.
ReTain	aviglycine hydrochloride	333 g/0.4 ha (1 pouch/0.4 ha)	- For single pick harvest, apply 3–4 weeks before the anticipated normal harvest date. This will delay harvest for up to 7–10 days. - For multiple pick harvest, apply 1–2 weeks before the anticipated normal harvest date of first pick. This will not delay the first pick but will control the maturation rate for later picks. - Reduces preharvest drop, helps to maintain fruit firmness, may reduce incidence and/or severity of watercore and stem bowl cracking and may enhance storage potential. - Use with an organosilicone surfactant at a rate of 0.05–0.1% v/v. - Avoid application when temperatures are above 30°C. - Do not tank-mix with sunburn protection products or apply a sun protectant product three days before or after application.

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
PREHARVEST DROP			
General comments: - Inhibits fruit abscission but fruit continues to mature. - Avoid application when temperatures are above 30°C. - Apply during warm (21 - 24°C) and slow drying conditions to maximize absorption. - For more information, see Plant Growth Regulators on the Apple Pest Management Information page on the Ontario Crop Protection Hub.			
Fruitone-L	1-naphthaleneacetic acid	5–20 ppm (156–625 mL/1,000 L water)	- Apply 10 ppm as soon as the first undamaged apples begin to drop or after the first spot pick. - Maximum 2 applications per season for preharvest drop. - Effective for 7–10 days. If needed, reapply 10 ppm 5–6 days later. - Higher concentration and number of applications increase the ripening effect. - Fruit will not keep well in long-term storage, especially McIntosh. - Fruit treated twice should be sold immediately.
Maintain 3.5L	1-naphthaleneacetic acid	5–20 ppm (156–627 mL/1,000 L water)	
RETURN BLOOM			
General comments: - Apply during warm (18 - 29°C) and slow drying conditions to maximize absorption. - Avoid application when temperatures are above 30°C.			
Ethrel	ethephon	2–4.25 L/1,000 L water	- Only to be used on non-bearing apple trees. - Closed mixing/loading systems are required. - For young trees just beginning to initiate flowers, apply 3–5 weeks after full bloom to avoid thinning and misshapen fruit. - Apply 1–2 weeks after bloom to non-bearing trees (determined by bearing trees in the area). - Use lower rate for spur type trees and higher rate for non-spur type trees. - Concentrate sprays can be used at rate of 7 L/500 L water for spur type trees or 14 L/500 L water for non-spur type trees. This rate may completely remove any fruit from trees, especially if applied 4 weeks after full bloom.
Fruitone-L	1-naphthaleneacetic acid	1.2–9.7 ppm (39–312 mL/1,000 L water)	- Apply between petal fall (3–7 mm fruit size) and early fruit set (8–10 mm fruit size) but most effective when the king fruitlets are 5–10 mm. - Applying too soon can cause excessive thinning of Empire. - Use a non-ionic surfactant to improve absorption. - Do not apply below 15.6°C or above 26.7°C.
Maintain 3.5L	1-naphthaleneacetic acid	1.2–10.0 ppm (37–313 mL/1,000 L water	
MaxCel	6-benzyladenine	75–200 ppm (3.8–10.0 L/1,000 L water)	- Apply when fruitlets are 5–15 mm in diameter. - Maximum 2 applications per season for thinning. - Apply when temperatures are greater than 20°C during and after application.

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
RUSSETING			
General comments: - Apply during periods of slow drying conditions to maximize efficacy. - During wet or humid periods, use higher rate and shorten intervals between applications, particularly on large trees and susceptible cultivars. - Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. - These products cannot reduce russeting caused by pest, herbicide drift or phytotoxicity.			
NovaGib 10 L	gibberellins A_4A_7	1.5–1.9 L/ha	- Apply at 7–10 day intervals, beginning at petal fall. - Do not apply in water volumes greater than 935 L/ha to reduce the risk of russet caused by spray water. - When applied in the same season as prohexadione calcium (Apogee or Kudos 27.5 WDG), there may be reductions in efficacy of NovaGib and/or prohexadione calcium. - Do not add any kind of wetting adjuvant or surfactant unless you are sure of its crop safety. - NovaGib may only reduce russeting caused by climatic factors during the first 30-40 days of development.
Promalin SL	6-benzyladenine + gibberellins A_4A_7	250–500 mL/ha	- Apply at 7–12 day intervals, beginning at full bloom to petal fall. - Promalin cannot reduce russeting cause by frost.
TREE GROWTH MODIFICATION			
General comments: - Stimulates lateral bud break and shoot growth (branching) on nursery stock and young trees of most apple cultivars. This effect provides a better tree framework for early cropping.			
MaxCel	6-benzyladenine	250–500 ppm (12.5–25 L/ 1,000 L water)	- Make first application after trees have reached a height at which lateral branching is desired. - Make 1-4 applications directly to targeted sites where shoot growth is desired throughout the season. Applications can be made each time the main leader adds 12 to 15 cm of new growth, or every 10-14 days. Deliver 2-4 mL spray solution to shoot tip of each tree, targeting the uppermost leaves that are still expanding. - Do not tank mix with streptomycin or apply streptomycin on the same day.
Promalin SL	6-benzyladenine + gibberellins A_4A_7	100–166 mL/500 mL latex paint	- Dormant to bud swell application. Also improves branch angle. - Mix with latex paint and apply directly to buds with a brush or sponge uniformly covering bark surface. - Apply to 1-year-old wood only. - Apply when terminal buds have started to swell, but before bud break as this may result in injury to tender side shoot tips. - Notching bark above the bud prior to treatment will greatly increase efficacy.
Promalin SL	6-benzyladenine + gibberellins A_4A_7	63–250 mL /10 L water	- Apply when new terminal growth is 2.5-8 cm long (from approximately king bloom to 1 week after petal fall).

Table 4.1 – Apple Crop Protection: Plant Growth Regulators

Product Name	Common Name	Rate	Product Specific Comments
VEGETATIVE GROWTH CONTROL			
General comments: - Apply during periods of slow drying conditions to maximize efficacy. - Do not use when temperatures are below freezing or above 30°C or if rain is forecast within 6 hours.			
Apogee	prohexadione calcium	270–450 g/1,000 L water	- Apply in late bloom or early petal fall when terminal and/or bourse shoots are 2.5–5 cm long. Accurate timing is critical. Reapply at 14–21 day intervals if needed. - Use higher rate for medium to high vigour trees. - Uptake can be enhanced with the addition of 0.05% v/v non-ionic surfactant. - Do not tank-mix with calcium. - Severe cracking can occur on Empire and Stayman cultivars and decrease in yield in Cortland. - May cause trees to retain more fruit. Consider a more aggressive thinning program if needed.
Kudos 27.5 WDG	prohexadione calcium	270–450 g/1,000 L water	

Table 4.2 – Weather Implications on Chemical Thinner Effectiveness

Weather Condition(s)	**Prediction**
Warm Conditions (greater than 18°C)	- All thinners perform more effectively
High Night Temperatures (greater than 18°C)	- Great stress - High demand and use of energy for night respiration - Greater drop
Very High Day-Time Temperatures (greater than 29°C)	- Great stress - High energy demand - Greater drop - Risk of excessive thinning
Very Cool Temperatures (less than 18°C)	- Reduced stress - Reduced energy demand - Greater set
Dark Cloudy Weather (at and/or after application ~3 days)	- Greater stress - Greater thinning response - Greater drop
High Relative Humidity (greater than 60%)	- Slower dry time - Greater thinning response
High Light	- Increased supply: harder to thin
Low Light	- Reduced supply: easier to thin
Low Temperatures	- Low demand: harder to thin
High Temperatures	- High demand: easy to thin
Low Light + Warm Temperatures	- Most efficacious thinning
Table adapted from Cornell University and Michigan State University	

Table 4.3 – Factors That Promote and Suppress the Response to Chemical Thinners

Factor	Cause	Effect on Chemical Thinner Response
Lower Light Conditions	Reduced sunlight lowers photosynthesis and decreases carbohydrate supply. Fruitlets with lower carbohydrate status are more susceptible to chemical thinners.	Promotes
Warm Temperatures	Warm temperatures increase tree metabolic activity and uptake, accelerating chemical thinner response.	Promotes
Higher Night Temperatures	An increase in respiration causes a reduction in carbohydrate availability, enhancing susceptibility to chemical thinners.	Promotes
Frost or Near-Freezing Temperatures	Cold conditions can damage flower parts and developing fruitlets, potentially affecting pollination and reducing seed development, increasing chemical thinner sensitivity.	Promotes
Heavy Bloom	More competition between flowers divides carbohydrate availability, enhancing susceptibility to chemical thinners.	Promotes
Light Bloom	Fewer fruitlets reduce competition for carbohydrates, strengthening fruit retention and reducing chemical thinner efficacy.	Suppresses
Poor Pollination	Reduced seed number lowers auxin, weakening fruitlet dominance and increasing susceptibility to chemical thinners.	Promotes
Fruitlets Set in Clusters (rather than singles)	Clusters compete for carbohydrates. Laterals become weaker compared to the kings and more sensitive to chemical thinners.	Promotes
Biennial-bearing Trees in an “Off” Year	Lower crop load results in higher carbohydrate levels within fruitlets, increasing retention and reducing chemical thinner efficacy.	Suppresses
Young Trees with Vigorous Upright Growth	Strong vegetative growth diverts carbohydrates away from fruitlets, increasing susceptibility to chemical thinners.	Promotes
Leaf Cuticles Formed Under Cooler Periods	Soft cuticles increase chemical absorption, enhancing chemical thinner efficacy.	Promotes
Comparable Lateral and King Fruitlet Size	Similar strength in fruitlets reduces dominance, decreasing selective thinning of laterals, reducing chemical thinner effectiveness.	Suppresses
Low Moisture	Water stress reduces photosynthesis and carbohydrate availability, increasing fruitlet susceptibility to chemical thinners.	Promotes
Weak Root Systems	Water and nutrients have limited uptake, reducing canopy growth and carbohydrate supply, increasing susceptibility to chemical thinners.	Promotes
Resources used to develop and adapt table include Cline 2021; Future Orchards, 2012; Perennia 2021; Robinson et al., n.d.; Williams and Edgerton 1981; Williams 1979.		

Table 4.4 – Suggested Rates for Chemical Thinning of Mature Apple Trees[1]

Cultivar	Sevin XLR (L/1,000 L water)[2]	Fruitone-L (NAA) (ppm)[3]	Sevin XLR (/1,000 L water) + Fruitone-L (NAA) (ppm)[2,3]	MaxCel or Cilis Plus (g BA/ha)[4]	Sevin XLR (L/1,000 L water) + MaxCel or Cilis Plus (g BA/ha)[2,3,4]
Ambrosia	1–1.5	—	—	50	—
Aurora Golden Gala™	1–1.5	—	—	75	1 + 50
Braeburn	—	1.2–7.3	—	—	—
Cameo	1	2.4–9.7	—	—	—
Cortland	—	1.2–7.3	1–2 + 2.5–5	—	—
Creston	0.5–1	—	—	—	—
Crispin/Mutsu	0.5–1.5	2.4–9.7	—	—	—
Empire	1–1.5	2.4–9.7	1 + 2.5–4	50–100	1 + 50
Fuji	—	3.6–9.7	1–1.5 + 10–12	100–150	1–2 + 50–75
Gala	—	2.4–9.7	1 + 5–10	75–100	1–2 + 50
Gingergold	1–1.5	2.4–9.7	1 + 2.5–5	75	1 + 50
Golden Delicious, Wealthy	1–2	3.6–9.7	1 + 5–10	75–100	1–2 + 50
Golden Supreme	1	2.4–9.7	—	—	—
Goldrush	—	—	1 + 10	—	—
Honeycrisp	1–1.5	2.4–9.7	1 + 2.5	—	—
Idared	—	1.2–7.3	—	50–75	—
Jerseymac	1–1.5	2.4–9.7	—	—	—
Jonagold	1–1.5	2.4–9.7	—	50–75	—
Jonamac	—	3.6–9.7	—	—	—
Lodi	—	3.6–9.7	1 + 10–15	—	—
Macoun	—	3.6–9.7	—	—	—
McIntosh, Early	—	3.6–9.7	1 + 5–105	50–75	—
McIntosh, Non-spur	1–2	1.2–7.3	—	50	—
McIntosh, Spur-type	—	1.2–7.3	1–2 + 2.5–5	50–75	1 + 50

Table 4.4 – Suggested Rates for Chemical Thinning of Mature Apple Trees[1]

Cultivar	Sevin XLR (L/1,000 L water)[2]	Fruitone-L (NAA) (ppm)[3]	Sevin XLR (/1,000 L water) + Fruitone-L (NAA) (ppm)[2,3]	MaxCel or Cilis Plus (g BA/ha)[4]	Sevin XLR (L/1,000 L water) + MaxCel or Cilis Plus (g BA/ha)[2,3,4]
Northern Spy	0.5–1.5	1.2–7.3	—	—	—
Paulared	1–1.5	3.6–9.7	1 + 10–15	75	1 + 50
Red Delicious	0.5–1.5	1.2–7.3	—	—	—
Red Delicious, Spur-type	—	1.2–7.3	1–2 + 5–10	—	—
Silken	1–1.5	—	—	—	—
Spartan, Russets	1–2	2.4–9.7	1 + 10–15	—	—

— = Treatment information not available.

[1] These rates are suggested for trees with a settled cropping history. Chemically thinning a first crop tree or immature trees is considered very risky.
[2] Sevin XLR is 43% active ingredient and contains 480 g or approximately 0.5 kg of carbaryl per litre. 1 L of Sevin XLR is roughly equivalent to 1 kg of Sevin 50 W.
[3] Sufficient water volumes must be used to thoroughly wet trees. For actual amount of NAA, refer to the label.
[4] Consult *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR* to determine the actual ppm benzyladenine (BA) being applied. Concentration of BA should be no less than 50 ppm to be effective.
[5] At petal fall
Table developed by John Cline, University of Guelph.

Table 4.5 – Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR

Desired response[1]	Concentration of 6-BA (ppm)[2]	Concentration of Carbaryl (ppm)[2]	Number of Applications	Amount of MaxCel or Cilis Plus		Amount of Sevin XLR (L/1,000 L water/ha)
				MaxCel (L/1,000 L water/ha)	Cilis Plus (L/1,000 L water/ha)	
Enhance size only[3,4]	10–50	—	2 to 4	0.5–2.65	0.5–2.5	—
Mild thinning and sizing	50–75	—	1 to 2	2.65–3.95	2.5–3.75	—
Moderate thinning and sizing	75–100	—	1 to 2	3.95–5.3	3.75–5.05	—
	50–75	500	1 to 2	2.65–3.95	2.5–3.75	1
Aggressive thinning and sizing	100–150	—	1 to 2	5.3–7.95	5.05–7.55	—
	75–100	500–1,000	1 to 2	3.95–5.3	3.75–5.05	1–2
Very aggressive thinning and sizing	150–200	—	1 to 2	7.95–10.65	7.55–10.1	—
	100–125	1,000	1 to 2	5.3–6.6	5.05–6.3	2

— = Information is not available.

[1] There are several factors that influence the chemical thinning outcome. Rates are generally chosen on the degree of cultivar sensitivity to chemical thinners.
[2] 1 ppm is equivalent to 1 mg/L.
[3] Mild thinning may occur under some conditions (weak trees, young trees, sensitive cultivars, and environmental conditions that favour the thinning response).
[4] While 6-BA has the potential to increase cell division and enhance fruit size beyond the thinning (crop load) effect alone, this is not observed in all years because the response can be affected by spray concentration, coverage, cultivar, tree health, time of application, tree stress, and environmental conditions during and following spray application.
Table developed by John Cline, University of Guelph.