

### WALNUT CALENDAR

**In this section:**

- Read the product label and follow all safety precautions. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–2. *Activity of Insecticides and Miticides on Walnut Pests*, page 381, for efficacy ratings.
- Where a product in the calendar is followed by a “\*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

**Resistance Management**

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. 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.

**Insecticide resistance management**

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafroller, codling 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 overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

**Spray Water Volumes**

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, 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.

**Bee Toxicity**

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.

### Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and droplet size. For more information, see the Buffer Zone Calculator at [www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php](http://www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php). Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

### Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Leafrollers	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Leafrollers are generally not a problem on walnut and will not often require control.</li> <li>If needed, apply when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
	Entrust *	364 mL/ha	when dry	14 days	Reapply in 7–10 days if needed.	

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Leafrollers (cont'd)	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity—repeat applications may be required. Use diluted spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.
	18	Intrepid	750 mL/ha	12 hours	14 days	For overwintering generations of obliquebanded leafroller, apply when larvae become active in the spring.
	28	Altacor	145–285 g/ha	12 hours	10 days	For overwintering generations of obliquebanded leafroller, apply when larvae become active in the spring. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Reduction in damage only.</b> Apply at first egg hatch. Make a second application 10 days later. Repeat at 7–14-day intervals as subsequent generations emerge. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.	
Codling moth	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Codling moth is a sporadic problem in commercial walnuts. Control may not be required.</li> <li>If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Apply at first egg hatch, before larvae penetrate nuts. Reapply in 14 days if needed.
		Entrust *	364 mL/ha	when dry	14 days	<b>Suppression only.</b> Apply at first egg hatch, before larvae penetrate nuts. Reapply in 7–10 days if needed.
28	Altacor	145–215 g/ha	12 hours	10 days	Apply before first egg hatch. Reapply 10–14 days later if needed. Under high pest pressure, use high rate. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.	
	Exirel	500–750 mL/ha	12 hours	5 days		

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Codling moth (cont'd)	NC	Isomate-CM/OFM TT *	750 dispensers/ha	—	—	Reduces mating of codling moth and oriental fruit moth. Place dispensers in upper third of canopy, before first codling moth flight in the spring. Dispensers last up to 150 days for codling moth and up to 90 days for oriental fruit moth. If populations of codling are very high, additional control measures may be required. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Aphids	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects.</li> <li>If control is required, apply in early stages of aphid infestation for best results.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season. Do not apply when bees are active.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with products outside of Group 4. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not apply to wet foliage. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Avoid application during bloom.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Scale	<b>General Comments:</b> <ul style="list-style-type: none"> <li>Monitor scaffold branches and apply when crawlers are active.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4C	Closer	200–400 mL/ha	12 hours	7 days	<b>San Jose scale only.</b> Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	<b>Soft brown scale only.</b> Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (sulphur products are not currently registered on tree nuts).
Vegol Crop Oil *		2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.	
Spider mites	<b>General Comments:</b> <ul style="list-style-type: none"> <li>Two-spotted spider mite and European red mite are rarely an economically significant problem on commercial walnut in Ontario.</li> <li>If required, apply when mites are active on foliage. Thorough spray coverage is essential for good control.</li> </ul>					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, make only 1 application per season.
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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Spider mites (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet O3–079, <i>Mating Disruption for Management of Insect Pests</i> .

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Walnut blight	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>Walnut blight is predominantly a problem of Persian (English) walnuts.</li> <li>Apply preventative sprays to protect developing buds and nuts in spring or during periods of prolonged leaf wetness. Repeat, as needed, at 7–10-day intervals.</li> <li>Note that in other growing regions, resistance of the walnut blight pathogen to copper has become a problem. Use copper only when necessary and rotate with products from other groups,</li> <li>Thorough coverage is essential to protect susceptible green tissue.</li> </ul>					
	M	Copper Spray *	4 kg/1,000 L water	48 hours	40 days	Apply at first pistillate or late May and repeat monthly if needed. Apply in a high-volume spray to ensure thorough coverage. Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, this product cannot be mixed with insecticide wettable powders.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause leaf spots during excessive moisture and cold. If concerned about sensitivity of plants, apply first to small areas. Do not use in combination with or closely following Vegol or Exirel. See product labels for details.
	24	Kasumin 2L	5 L/ha	12 hours	100 days	Apply when conditions favour disease development.
<b>First pistillate flower</b>						
<b>INSECTICIDES MAY BE TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Aphids	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects.</li> <li>If control is required, apply in early stages of aphid infestation for best results.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in <b>Prebloom</b> .
Scale	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in <b>Prebloom</b> .
Butternut curculio	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Reduction in damage only.</b> Apply when visual inspection shows adult feeding and egg-laying scars on new flower shoots. Repeat at 7-day intervals as needed to keep nuts covered throughout egg-laying period. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Walnut blight	Use one of the products listed for Walnut blight at <b>Prebloom</b> .					
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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Leafroller	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Leafrollers are generally not a problem on walnut and will not often require control.</li> <li>If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Apply at first egg hatch.
		Entrust *	364 mL/ha	when dry	14 days	
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	See comments for these products under Leafrollers in <b>Prebloom</b> .
	18	Intrepid	750 mL/ha	12 hours	14 days	Apply at first egg hatch. Reapply 10–14 days later if needed
	28	Altacor	145–285 g/ha	12 hours	10 days	Apply at first egg hatch. Reapply 10 days later if needed. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
Exirel		0.5–1.0 L/ha	12 hours	5 days		
NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Reduction in damage only.</b> See comments for this product under Leafrollers in <b>Prebloom</b> .	
Codling moth	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Codling moth is a sporadic problem in commercial walnuts. Control may not always be required.</li> <li>If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Apply at first egg hatch, before larvae penetrate nuts. Reapply in 14 days if needed.
		Entrust *	364 mL/ha	when dry	14 days	
	18	Intrepid	1.0 L/ha	12 hours	14 days	<b>Suppression only.</b> Apply at first egg hatch and repeat in 10–14 days if needed.
	28	Altacor	145–215 g/ha	12 hours	10 days	Apply at first egg hatch. Use high rate under high pressure. Reapply 10–14 days later if needed. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	5 days	

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Aphids	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects.</li> <li>If control is required, apply in early stages of aphid infestation for best results.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	<b>Use postbloom only.</b> Maximum 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in <b>Prebloom</b> .
Vegol Crop Oil *		2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Aphids in <b>Prebloom</b> .	
Scale	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Monitor scaffold branches and apply when crawlers are active.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4C	Closer	200–400 mL/ha	12 hours	7 days	<b>San Jose scale only.</b> Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects.
23	Movento 240 SC	585 mL/ha	12 hours	7 days	<b>Control of San Jose scale and suppression of Lecanium scale. Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur.	

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Scale (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	<b>Soft brown scale only.</b> See comments for these products under Scale in <b>Prebloom.</b>
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Scale in <b>Prebloom.</b>
Spider mites	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Two-spotted spider mite and European red mite are rarely an economically significant problem on commercial walnut in Ontario.</li> <li>If required, apply when mites are active on foliage. Thorough spray coverage is essential for good control.</li> </ul>					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Spider mites in <b>Prebloom.</b>
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Spider mites in <b>Prebloom.</b>
UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.	
Leafhopper	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Leafhoppers are a sporadic problem on walnuts.</li> <li>Control may be required with heavy infestations, particularly on young trees. Monitor for leafhopper activity beginning in late spring.</li> </ul>					
4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	<b>Suppression only. Use postbloom only.</b>	
Butternut curculio	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Butternut curculio is an economically significant pest of black and English (Persian) walnut.</li> <li>Begin monitoring for curculio activity in early spring, when shoot growth begins.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Apply when visual inspection shows adult feeding or egg-laying scars in new flower shoots. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	<b>Suppression only.</b> Apply at first sign of feeding damage after bloom. Reapply 14 days later depending on pest pressure.
NC	Surround WP *	50 kg/ha	12 hours	1 day	See comments for this product under Butternut Curculio in <b>First Pistillate Flower.</b>	
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Husk maggot	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>Husk maggot will attack husks of English and black walnut but are a more significant problem on English (Persian) walnut.</li> <li>Use sticky traps to monitor for adult flies prior to egg laying typically August to mid-September.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Apply when sticky traps show adult activity. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	<b>Suppression only.</b> Apply 7–10 days after first fly is caught on sticky traps. Reapply 14 days later depending on pest pressure.
		GF-120 Fruit Fly Bait *	1.5 L/6 L water	when dry	0 days	Under high pest pressure, this product may provide suppression only. Apply when first fly is caught on sticky traps. Reapply every 7 days or sooner if rain washes off residue. 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.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Reduction in damage only.</b> Apply when sticky traps show adult activity. Repeat at 7-day intervals as needed to maintain good coverage. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Walnut blight	If necessary, use one of the products listed for Walnut blight at <b>Prebloom</b> . See Table 6–1. <i>Products Used on Tree Nuts</i> , page 378, for preharvest intervals. Walnut blight controls should predominantly be targeted at protecting developing buds and nuts in the spring. Last Copper Spray application should be no later than husk split.					
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease development and repeat in 7–14 days if needed. Will also provide control of brown rot ( <i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

## PECAN AND SWEET CHESTNUT CALENDAR

### In this section:

- Read the product label and follow all safety precautions. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–3. *Activity of Insecticides and Miticides on Chestnut and Pecan Pests*, page 382, for efficacy ratings.
- Where a product in the calendar is followed by a “\*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

**Resistance Management**

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. 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.

**Insecticide resistance management**

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafrollers), 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 overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

**Spray Water Volumes**

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, 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.

**Bee Toxicity**

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.

### Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and droplet size. For more information, see the Buffer Zone Calculator at [www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php](http://www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php). Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

### Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Leafrollers	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>• Leafrollers are generally not a problem on chestnut or pecan and will not often require control.</li> <li>• If needed, apply when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed.</li> <li>• Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	<b>Chestnut only.</b> This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity and repeat applications may be required. Use dilute spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Leafrollers (cont'd)	18	Intrepid	750 mL/ha	12 hours	14 days	Apply when larvae become active in the spring.
	28	Altacor	145–285 g/ha	12 hours	10 days	Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
Aphids	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects.</li> <li>• Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results.</li> <li>• Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	<b>Chestnut only.</b> This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).	
	Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.	

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.



Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Leafhoppers	<b>General Comments:</b> <ul style="list-style-type: none"> <li>Leafhopper damage to chestnut leaves and shoots can be significant in some years, particularly on younger trees.</li> <li>Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage.</li> </ul>					
	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Sweet chestnut only. Reduction in damage only.</b> Begin applications at initial infestation, as determined by monitoring. Repeat at 7–14-day intervals as needed. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Scale	<b>General Comments:</b> <ul style="list-style-type: none"> <li>Scale is rarely a problem in chestnuts or pecans.</li> <li>Monitor scaffold branches and apply when crawlers are active.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4C	Closer	200–400 mL/ha	12 hours	7 days	<b>San Jose scale only.</b> Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
Vegol Crop Oil *		2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.	

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Prebloom</b>						
Mites	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>• Both two-spotted spider mite and European red mite will feed on chestnut. However, plants can tolerate some damage without significantly affecting yield or crop health.</li> <li>• Control may not always be required, particularly when populations of predatory mites are high. If required, apply when mites are active on foliage.</li> </ul>					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	<b>Chestnut only. Suppression only.</b> Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using sulphur (note: no sulphur products are currently registered on tree nuts). See label for compatibility with other products.
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high-pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet O3–079, <i>Mating Disruption for Management of Insect Pests</i> .

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>First pistillate flower</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Butternut curculio	<b>General Comments:</b> • Butternut curculio is not a common pest of pecan.					
	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Pecan only. Reduction in damage only.</b> Apply when visual inspection shows adult feeding and egg-laying scars on new flower shoots. Repeat at 7 day intervals as needed to keep nuts covered during egg laying period. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Aphids	<b>General Comments:</b> • Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. • Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in <b>Prebloom</b> .
Leafhoppers	Use one of the products listed for Leafhoppers at <b>Prebloom</b> . Leafhopper feeding can do significant damage to chestnut leaves and shoots, particularly on younger trees. Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage.					
Scale	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in <b>Prebloom</b> . Scale is rarely a problem in chestnuts or pecans.
<b>Summer sprays</b>						
Leafroller	Use one of the products listed for Leafrollers at <b>Prebloom</b> . Leafrollers are generally not a problem on chestnut or pecan and will not often require control.					
Aphids	<b>General Comments:</b> • Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. • Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	<b>Chestnut only.</b> This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	<b>Use postbloom only.</b> Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Aphids (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in <b>Prebloom.</b>
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Aphids in <b>Prebloom.</b>
Scale	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Scale is rarely a problem in chestnuts or pecans.</li> <li>• Monitor scaffold branches and apply when crawlers are active.</li> <li>• Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4C	Closer	200–400 mL/ha	12 hours	7 days	<b>San Jose scale only.</b>
	23	Movento 240 SC	585 mL/ha	12 hours	7 days	<b>For control of San Jose scale, and suppression of Lecanium scale. Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in <b>Prebloom.</b>
Vegol Crop Oil *		2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Scale in <b>Prebloom.</b>	
Spider mites	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Both two-spotted spider mite and European red mite will feed on chestnut. However, plants can tolerate some damage without significantly affecting yield or crop health.</li> <li>• Control may not always be required, particularly when populations of predatory mites are high. If required, apply when mites are active on foliage.</li> </ul>					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season
23	Envidor 240 SC	750 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.	

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer sprays</b>						
Spider mites (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Spider mites in <b>Prebloom</b> .
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	<b>Chestnut only. Suppression only.</b> See comments for this product under Mites in <b>Prebloom</b> .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments for this product under Spider mites in <b>Prebloom</b> .
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Leafhoppers	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Leafhopper damage to chestnut leaves and shoots can be significant in some years, particularly on younger trees.</li> <li>Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	<b>Suppression only. Use postbloom only.</b>
	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Chestnut only. Reduction in damage only.</b> See comments for this product under Leafhoppers in <b>Prebloom</b> .
Butternut curculio	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>Butternut curculio is rarely a problem in pecan and chestnut in Ontario.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	5	Delegate	420 g/ha	12 hours	14 days	<b>Suppression only.</b> Apply at first sign of feeding damage after bloom. Reapply 14 days later depending on pest pressure.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	<b>Pecan only. Reduction in damage only.</b> Begin applications at initial infestation, as determined by monitoring. Repeat at 7–14-day intervals as needed. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	<b>Chestnut only.</b> Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease. Will also provide control of brown rot ( <i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.

— = Information not applicable or not specified on product label. \* = Potentially organic. Check with certifying body.



## FILBERT/HAZELNUT CALENDAR

### In this section:

- Read the product label and follow all safety precautions. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–4. *Activity of Insecticides and Miticides on Hazelnut Pests*, page 383, and Table 6–5. *Activity of Fungicides on Eastern Filbert Blight*, page 384, for efficacy ratings.
- Where a product in the calendar is followed by a “\*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

**Resistance Management**

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. 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.

**Insecticide resistance management**

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafrollers), 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 overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

**Spray Water Volumes**

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, 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.

**Bee Toxicity**

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.



### Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and droplet size. For more information, see the Buffer Zone Calculator at [www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php](http://www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php). Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

### Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Bud break (up to 1/4-inch vegetative growth)</b>						
Eastern filbert blight	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Eastern filbert blight is the most significant disease of hazelnuts in Ontario.</li> <li>• Apply protective fungicides preventatively to protect new growth starting at bud break and continuing for approximately 8 weeks. Rotate between different fungicide groups.</li> </ul>					
	M	Bravo ZN	6.72 L/ha	48 hours <sup>1</sup> / 72 hours <sup>2</sup> / 11 days <sup>3</sup> / 20 days <sup>4</sup>	120 days	Apply from bud break to shoot elongation. Do not tank-mix with oils, other pesticides, surfactants or fertilizers. Do not apply within 1 week of oil. Use caution when using in a spray program with Purespray Green Spray Oil. See label for details.
	Copper Spray * or Guardsman Copper Oxychloride *	3–9 kg/ha	48 hours	2 days	Apply beginning at bud swell, when tissue is susceptible to infection. Use 3 kg/ha on small trees and up to 9 kg/ha on large trees. Apply in a high-volume spray to ensure thorough coverage.	
	Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, these products cannot be mixed with insecticide wettable powders.	

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Bud break (up to ¼-inch vegetative growth)</b>						
Eastern filbert blight (cont'd)	3	Quash	245 g/ha	12 hours	25 days	<b>Suppression only.</b> For resistance management, rotate between different fungicide groups. Do not make alternate row applications.
	11	Flint	140–280 g/ha	12 hours	60 days	Apply at bud break and continue as needed on a 14-day interval. Use 140 g/ha on small trees or up to 280 g/ha on larger trees. Avoid drift, especially onto Concord grapes. For resistance management, rotate between different fungicide groups. Do not use in combination with or closely following Exirel. See labels for details.
		Quadris Flowable	900 mL/ha	12 hours	45 days	Apply beginning at bud swell, when tissue is susceptible to infection. Highly phytotoxic to certain apple varieties. Use dedicated sprayer and avoid spray drift. For resistance management, rotate between different fungicide groups. Do not use in combination with or closely following Exirel. See labels for details.
<b>Early spring (&gt; ¼-inch vegetative growth)</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Eastern filbert blight	Use one of the products listed for Eastern filbert blight at <b>Bud break</b> . Some products have limited numbers of applications per year. See Table 6–1. <i>Products Used on Tree Nuts</i> , page 378.					
Leafrollers	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>• Obliquebanded leafrollers feed predominantly on leaves but can also feed between the husk and the nut. Examine undersides of husks for larvae from late spring through July.</li> <li>• Apply insecticide when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed.</li> <li>• Pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.</li> <li>• Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity and repeat applications may be required. Use dilute spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.
	18	Intrepid	750 mL/ha	12 hours	14 days	For overwintering generation of obliquebanded leafroller, apply when larvae become active in the spring.

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Early spring (&gt; ¼-inch vegetative growth)</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Leafrollers (cont'd)	28	Altacor	145–285 g/ha	12 hours	10 days	For overwintering generation of obliquebanded leafroller, apply when larvae become active in the spring. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper, Quadris, Flint), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
	NC	Surround WP *	50 kg/ha	12 hours	1 day	
Aphids	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Aphid populations on hazelnut are often kept in check by natural parasitism and predation and control will not be required.</li> <li>• Where control is required, apply in early stages of aphid infestation for best results.</li> <li>• Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	1	Cygon 480-AG or Lagon 480 E	5 L/ha	5 days <sup>1</sup> /21 days <sup>5</sup> / 34 days <sup>6</sup>	45 days	Avoid application during bloom. Apply primarily on younger trees when aphids appear. Toxic to certain beneficial insects. Use caution when using in a spray program with Purespray Green Spray Oil. See label for details.
		Warhawk 480 EC	4.2–4.8 L/ha	48 hours <sup>1</sup> /4 days <sup>4</sup>	14 days	<b>Filbert aphid only.</b> Use in 100 L/ha. This product is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4	Admire 240 Flowable	230 mL/ha	24 hours	7 days	Use postbloom only. Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects
23	Movento 240 SC	365 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).	

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Early spring (&gt; ¼-inch vegetative growth)</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Aphids (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
Spider mites	<p><b>General Comments:</b></p> <ul style="list-style-type: none"> <li>• Foliar mites on hazelnuts, such as spider and rust mites, are usually controlled by natural predators. Populations may increase to damaging levels on water-stressed trees or where insecticides applied for other pests have reduced levels of beneficial insects.</li> <li>• Where control of foliar mites is required, treat in late spring or early summer if populations become high and leaf bronzing appears.</li> <li>• There are no miticides currently registered for bud mite, the main yield-limiting mite pest of hazelnut.</li> </ul>					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	<b>Use postbloom only.</b> Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Early spring (&gt; ¼-inch vegetative growth)</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Spider mites (cont'd)	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	<b>Suppression only.</b> Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Use caution when using in a spray program with Cygon, Lagon or Bravo. See label for details. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using sulphur (note: no sulphur products are currently registered on tree nuts). See label for compatibility with other products.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Scale	<b>General Comments:</b> <ul style="list-style-type: none"> <li>Scale insects on hazelnut are often kept in check by natural predation. However, in some orchards populations can increase to damaging levels.</li> <li>Monitor scaffold branches for adult scale. Spray when crawlers are active which is typically mid to late summer for Lecanium scale.</li> <li>Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.</li> </ul>					
	4C	Closer	200–400 mL/ha	12 hours	7 days	<b>San Jose scale only.</b> Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects
	23	Movento 240 SC	585 mL/ha	12 hours	7 days	<b>Control of San Jose scale and suppression of Lecanium scale. Use postbloom only.</b> Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: no sulphur products are currently registered on tree nuts).

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Early spring (&gt; ¼-inch vegetative growth)</b>						
<b>INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.</b>						
Scale (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
Leafhopper	<b>General Comments:</b> <ul style="list-style-type: none"> <li>In Ontario hazelnuts, leafhoppers are generally only economically damaging on young trees.</li> <li>Monitor crops for presence of leafhoppers beginning in mid-late spring. If control is required, apply early in infestation for best results.</li> </ul>					
	4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	<b>Suppression only.</b> Toxic to bees. Apply only after bloom and do not apply to flowering weeds and cover crops if bees are active in the treatment area. Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high-pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
<b>Summer</b>						
Aphids	Use one of the products listed for Aphids at <b>Early spring (&gt; ¼-inch vegetative growth)</b> .					
Leafhopper	Use one of the products listed for Leafhoppers at <b>Early spring (&gt; ¼-inch vegetative growth)</b> .					
Leafroller	Use one of the products listed for Leafrollers at <b>Early spring (&gt; ¼-inch vegetative growth)</b> .					
<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
<b>Summer</b>						
Spider mites	Use one of the products listed for Mites at <b>Early spring (&gt; ¼-inch vegetative growth)</b> .					
Scale	Use one of the products listed for Scale at <b>Early spring (&gt; ¼-inch vegetative growth)</b> .					
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease development. Will also provide control of brown rot ( <i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.
Bacterial blight	<b>General Comments:</b>					
	<ul style="list-style-type: none"> <li>• Young hazelnut trees less than 10 years old are particularly susceptible to bacterial blight.</li> <li>• Apply 1 to 2 sprays after harvest but before fall rains. For severe infections or heavy rains, a 3rd application can be made when ¾ of the leaves have dropped.</li> </ul>					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	3–9 kg/ha	48 hours	2 days	Apply the first spray in late August or early September before the start of the fall rains and nut drop. Repeat after harvest at leaf fall and in early spring just before leaf bud break. Use 3 kg/ha on small trees, and up to 9 kg/ha on large trees in proportionately more water. Apply in a high-volume spray to ensure thorough coverage. Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, these products cannot be mixed with insecticide wettable powders.
	Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	May cause leaf spots during excessive moisture and cold. If concerned about sensitivity of plants, apply first to small areas. Do not use in combination with or closely following Vegol or Exirel. See product labels for details.	

<sup>1</sup> General re-entry. <sup>2</sup> Orchard maintenance. <sup>3</sup> Transplanting. <sup>4</sup> Scouting activities. <sup>5</sup> Hand harvest. <sup>6</sup> Hand thinning. — = Information not applicable or not specified on product label.

\* = Potentially organic. Check with certifying body.



**Table 6–1. Products Used on Tree Nuts**

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum number** of applications is the labelled maximum number 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 publication Bulletin D'Information No. 6, 2 juin 2017* 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	Registered Nut Crops <sup>1</sup>
<b>Products for insect control or suppression</b>								
Acramite 50 WS	27925	bifenazate	UN	14 days	12 hours	1	—	W, P, C, H
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	2	—	W, P, C, H
Altacor	28981	chlorantraniliprole	28	10 days	12 hours	3 (max. 645 g/ha)	—	W, P, C, H
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	W, P, C, H
Closer	30826	sulfoxafloer	4C	7 days	12 hours	2	—	W, P, C, H
Cygon 480-AG	25651	dimethoate	1B	45 days	5 days <sup>2</sup> /21 days <sup>3</sup> / 34 days <sup>4</sup>	1	—	H
Delegate	28778	spinetoram	5	14 days	12 hours	3	—	W, P, C, H
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	W, P, C, H
Entrust	30382	spinosad	5	14 days	when dry	3	✓	W
Envidor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—	W, P, C, H
Exirel	30895	cyantraniliprole	28	5 days	12 hours	4	—	W, P, C, H
GF-120 Fruit Fly Bait	28336	spinosad bait	5	0 days	when dry	10	✓	W
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	max. 2 L/ha	—	W, P, C, H
Isomate-CM/OFM TT	29352	pheremone, oriental fruit moth and codling moth	NC	—	—	—	✓	W
Isomate DWB	30589	pheremone, dogwood borer	NC	—	—	—	—	W, P, C, H
Kanemite 15 SC	28641	acequinocyl	20B	14 days	12 hours	2	—	W, P, C, H

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

<sup>1</sup> Indicates which nut crops product is registered on W = walnut, P = pecan, C = chestnut, H = hazelnut. <sup>2</sup> General re-entry. <sup>3</sup> Hand harvest or laying irrigation pipe. <sup>4</sup> Hand thinning.

<sup>5</sup> 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. <sup>6</sup> Maximum 6 applications per year with no more than 2 dormant applications. <sup>7</sup> Scouting activities. <sup>8</sup> Orchard maintenance. <sup>9</sup> Transplanting.

<sup>10</sup> Preharvest interval is 2 days for hazelnut or 40 days for walnut. <sup>11</sup> Maximum 3 applications per year for hazelnut or 4 applications per year for walnut.



**Table 6–1.** Products Used on Tree Nuts (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Registered Nut Crops <sup>1</sup>
<b>Products for insect control or suppression</b>								
Kopa	31433	potassium salts of fatty acids	NC	0 days	12 hours	3 <sup>5</sup>	✓	W, P, C, H
Lagon 480 E	9382	dimethoate	1B	45 days	5 days <sup>2</sup> /21 days <sup>3</sup> / 34 days <sup>4</sup>	1	—	H
Matador 120 EC	24984	lambda-cyhalothrin	3	14 days	24 hours	max. 390 mL/ha	—	W, C, H
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.58 L/ha	—	W, P, C, H
Opal	28146	potassium salts of fatty acids	NC	0 days	12 hours	3 <sup>5</sup>	✓	W, P, C, H
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓	C, H
Sivanto Prime	31452	flupyradifurone	4D	7 days	12 hours	max. 2 L/ha	—	W, P, C, H
Surround WP	27469	kaolin	NC	1 day	12 hours	—	✓	W, P, C, H
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 <sup>6</sup>	✓	W, P, C, H
Warhawk 480 EC	29984	chlorpyrifos	1B	14 days	48 hours <sup>2</sup> /4 days <sup>7</sup>	3	—	H
<b>Products for disease control or suppression</b>								
Bravo ZN	28900	chlorothalonil	M	120 days	48 hours <sup>2</sup> /3 days <sup>8</sup> / 11 days <sup>9</sup> /20 days <sup>7</sup>	3	—	H
Copper Spray	19146	copper oxychloride	M	2 days/40 days <sup>10</sup>	48 hours	3/4 <sup>11</sup>	✓	W, H
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—	W, H
Flint	30619	trifloxystrobin	11	60 days	12 hours	4	—	H
Fontelis	30331	penthiopyrad	7	14 days	12 hours	max. 4.5 L/ha	—	W, C, H
Guardsman Copper Oxychloride 50	13245	copper oxychloride	M	2 days	48 hours	3	✓	H
Kasumin 2L	30591	kasugamycin	24	100 days	12 hours	4	—	W
Quadris Flowable	26153	azoxystrobin	11	45 days	12 hours	4	—	H
Quash	30402	metconazole	3	25 days	12 hours	4 (max. 980 g/ha)	—	H

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

<sup>1</sup> Indicates which nut crops product is registered on W = walnut, P = pecan, C = chestnut, H = hazelnut. <sup>2</sup> General re-entry. <sup>3</sup> Hand harvest or laying irrigation pipe. <sup>4</sup> Hand thinning.

<sup>5</sup> 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. <sup>6</sup> Maximum 6 applications per year with no more than 2 dormant applications. <sup>7</sup> Scouting activities. <sup>8</sup> Orchard maintenance. <sup>9</sup> Transplanting.

<sup>10</sup> Preharvest interval is 2 days for hazelnut or 40 days for walnut. <sup>11</sup> Maximum 3 applications per year for hazelnut or 4 applications per year for walnut.

## Notes on Tree Nut Insects and Diseases

Use the information in the following notes to assist with choosing the best product for the pest complex present. Consider the life stage present and resistance management strategies, as well as the activity of each product to pests and beneficial insects.

### In this section:

- Table 6–2.** *Activity of Insecticides and Miticides on Walnut Pests, page 381.*
- Table 6–3.** *Activity of Insecticides and Miticides on Chestnut and Pecan Pests, page 382.*
- Table 6–4.** *Activity of Insecticides and Miticides on Hazelnut Pests, page 383.*
- Table 6–5.** *Activity of Fungicides on Eastern Filbert Blight, page 384.*
- Table 6–6.** *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators, page 384.*

Information in Tables 6–2 to 6–4 is based partly on information from other tree fruit in Ontario and the northeastern United States. Impact on these insects in tree nuts is expected to be similar to that of apples. However, differences in production systems, timing of applications and other factors may change efficacy of these products.

**Table 6–2.** Activity of Insecticides and Miticides on Walnut 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.

Insecticide	Husk maggot <sup>1</sup>	Codling moth	Dogwood borer	Japanese beetle	Leafrollers	Potato leafhopper	Butternut curculio <sup>2</sup>	Scale	Spring-feeding caterpillar	Aphids	Mites	
											European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	0	0	0	✓ *	✓ *
Admire 240 Flowable	✓s	—	—	✓s	—	✓ *	—	✓s	—	✓ *	0	0
Altacor	✓s	✓ *	✓	✓s	✓ *	—	✓s	✓s	✓	✓s	0	0
Bioprotec CAF	0	✓s	—	—	✓ *	0	0	—	✓	0	0	0
Closer	—	—	—	—	—	✓	—	✓ *	—	✓ *	0	0
Delegate	✓s *	✓ *	✓	—	✓ *	—	✓s *	—	✓	0	0	0
Dipel 2X DF	0	✓s	—	—	✓ *	0	0	—	✓	0	0	0
Entrust	✓s	✓s *	—	—	✓ *	0	✓s	—	✓	0	0	0
Envidor 240 SC	0	0	0	0	0	0	0	0	0	0	✓ *	✓ *
Exirel	✓	✓ *	—	✓	✓ *	✓s	✓	—	✓	—	0	0
GF-120 Fruit Fly Bait	✓ *	—	—	—	—	—	—	—	—	—	—	—
Intrepid	0	✓ *	—	—	✓ * R	0	0	0	✓	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	0	0	0	—	✓	✓ *
Matador 120 EC	✓ *	✓ *	—	✓	✓s * R	✓	✓s *	✓s	✓	✓ *	0	0
Movento 240 SC	—	—	—	—	—	—	—	✓ *	—	✓ *	0	0
Sivanto Prime	—	—	—	—	—	✓	—	✓	—	✓ *	0	0
Surround WP	✓s *	✓s	—	✓s	✓s *	✓s	✓s *	✓s	✓s	✓s	✓s	0
Vegol Crop Oil	—	—	—	—	—	—	—	✓s *	—	✓s *	✓	✓s *

\* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective. — = Information is unavailable. s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

<sup>1</sup> Efficacy based on apple maggot in Ontario apples. Impact on the closely related walnut husk fly should be similar but may vary between the two cropping systems.

<sup>2</sup> Efficacy based on plum curculio in Ontario apples. Impact on the closely related butternut curculio should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or walnut calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit, Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

**Table 6–3.** Activity of Insecticides and Miticides on Chestnut and Pecan 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. Some of the products listed below are registered on only pecan or only chestnut. See Chestnut and Pecan Calendar for details.

Insecticide	Japanese beetle	Leafrollers	Potato leafhopper	Weevils <sup>1</sup>	Scale	Spring-feeding caterpillar	Aphids	Mites	
								European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	✓ *	✓ *
Admire 240 Flowable	✓s	—	✓ *	—	✓s	—	✓ *	0	0
Altacor	✓s	✓ *	—	✓s	✓s	✓	✓s	0	0
Bioprotec CAF	—	✓ *	0	0	—	✓	—	0	0
Closer	—	—	✓	—	✓ *	—	✓ *	0	0
Delegate	—	✓ *	—	✓s *	—	✓	—	0	0
Dipel 2X DF	—	✓ *	0	0	—	✓	—	0	0
Envirdor 240 SC	0	0	0	0	0	0	—	✓ *	✓ *
Exirel	✓	✓ *	✓s	✓	—	✓	—	0	0
Intrepid	—	✓ * R	0	0	0	✓	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	—	✓	✓ *
Matador 120 EC	✓	✓s * R	✓	✓s	✓s	✓	✓ *	0	0
Movento 240 SC	—	—	—	—	✓ *	—	✓ *	0	0
Purespray Green Spray Oil 13 E (summer)	—	—	—	—	✓s	—	✓s	✓ *	✓s *
Sivanto Prime	—	—	✓	—	✓	—	✓ *	0	0
Surround WP	✓s	✓s	✓s *	✓s *	✓s	✓s	—	✓s	0
Vegol Crop Oil	—	—	—	—	✓s *	—	✓s *	✓	✓s *

\* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective, — = Information is unavailable. s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

<sup>1</sup> Efficacy based on plum curculio in Ontario apples. Impact on butternut curculio and chestnut weevil should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or chestnut/pecan calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit*, *Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

**Table 6–4.** Activity of Insecticides and Miticides on Hazelnut 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.

Insecticide	Brown marmorated stink bug	Japanese beetle	Oblique-banded leafroller	Potato leafhopper	Weevils <sup>1</sup>	Scale	Spring-feeding caterpillar	Aphids	Mites		
									Bud mite	European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	—	—	✓ *	✓ *
Admire 240 Flowable	✓s	✓s	—	✓ *	—	✓s	—	✓ *	—	0	0
Altacor	✓s	✓s	✓ *	—	✓s	✓s	✓	✓s	—	0	0
Bioprotec CAF	—	—	✓ *	0	0	—	✓	—	—	0	0
Closer	✓s	—	—	✓	—	✓ *	—	✓ *	—	0	0
Cygon 480 AG	—	—	0	✓	0	✓	—	✓ *	—	—	—
Delegate	✓s	—	✓ *	—	✓s *	—	✓	—	—	0	0
Dipel 2X DF	—	—	✓ *	0	0	—	✓	—	—	0	0
Envidor 240 SC	0	0	0	0	0	0	0	—	✓ exp	✓ *	✓ *
Exirel	—	✓	✓ *	✓s	✓	—	✓	—	—	0	0
Intrepid	✓s	—	✓ * R	0	0	0	✓	—	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	0	—	—	✓	✓ *
Lagon	—	—	0	✓	0	✓	—	✓ *	—	—	—
Matador 120 EC	✓s	✓	✓s * R	✓	✓s	✓s exp	✓	✓ *	—	0	0
Movento 240 SC	—	—	—	—	—	✓ *	—	✓ *	—	0	0
Purespray Green Spray Oil 13 E (summer)	—	—	—	—	—	✓s	—	✓s	—	✓ *	✓s *
Sivanto Prime	—	—	—	✓	—	✓	—	✓ *	—	0	0
Surround WP	✓s	✓s	✓s *	✓s *	✓s *	✓s	✓s	—	—	✓s	0
Vegol Crop Oil	—	—	—	—	—	✓s *	—	✓s *	—	✓	✓s *
Warhawk 480 EC	✓	—	—	—	✓	✓	—	✓ *	—	—	—

\* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective, — = Information is unavailable. s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

<sup>1</sup> Efficacy based on plum curculio in Ontario apples. Impact on weevil pests in hazelnut should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or hazelnut calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit, Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

**Table 6–5.** Activity of Fungicides on Eastern Filbert Blight (EFB)

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. See *Resistance management strategies by fungicide group and disease for Ontario fruit crops*, page 394.

Group	Fungicide	Active Ingredient	EFB Control
M1	Copper Spray	copper oxychloride	— *
M1	Guardman Copper Oxychloride	copper oxychloride	— *
M1	Cueva	copper octanoate	— *
M5	Bravo ZN	chlorothalonil	4
3	Quash	metconazole	3
11	Quadris Flowable	azoxystrobin	2–3
11	Flint	trifloxystrobin	3–4

0 = Not effective. 1 = Slight control. 2 = Fair. 3 = Good. 4 = Excellent. — = Information not available.

Adapted from *Pest Management Guide for the Willamette Valley*, Oregon State University Extension Service. Ratings are relative and based on full application rates and proper coverage/spray timing. Actual control will be affected by these factors and others including tree cultivar, disease pressure and weather conditions.

\* Copper oxychloride and copper octanoate were not evaluated in Oregon trials. However another formulation of copper, copper hydroxide, was evaluated against Eastern Filbert Blight in Oregon and was found to provide good control (ranking = 3) relative to other products evaluated.

**Table 6–6.** Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees <sup>1</sup>	Stethorus (spider mite destroyer)	Predatory mites		Aphidoletes (Aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
			Typhlodromus pyri	Amblyseius fallacis					
<b>Insecticides</b>									
Admire 240 Flowable	VT	MT	ST	ST	ST	MT	MT	MT	MT
Altacor	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bioprotec CAF	NT	NT	NT	NT	NT	NT	NT	NT	NT
Closer	VT	—	—	—	—	—	—	—	—
Cygon 480 AG	VT	MT	VT	VT	VT	—	—	—	—

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.

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

<sup>2</sup> May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Only registered products with toxicity data available are listed in this table. Consult label or manufacturer for more information.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and the *Pennsylvania Tree Fruit Production Guide* information tree nut products registered on other tree fruit.

**Table 6–6.** Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees <sup>1</sup>	<i>Stethorus</i> (spider mite destroyer)	Predatory mites		<i>Aphidoletes</i> (Aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
			<i>Typhlodromus</i> <i>pyri</i>	<i>Amblyseius</i> <i>fallacis</i>					
<b>Insecticides</b>									
Delegate	VT	ST	MT	MT	ST	ST	ST	ST	MT
Dipel 2X DF	NT	NT	NT	NT	NT	NT	NT	NT	NT
Entrust	VT	NT	ST	ST	NT	NT	NT	NT	ST
Exirel	VT	MT	ST	ST	ST	MT	ST	ST	MT
GF-120 Fruit Fly Bait	VT	NT	ST	ST	NT	NT	NT	NT	ST
Intrepid	NT	NT	NT	NT	NT	NT	NT	NT	NT
Lagon 480 E	VT	MT	VT	VT	VT	—	—	—	—
Matador 120 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT
Movento 240 SC	VT <sup>2</sup>	ST	NT	NT	ST	ST	ST	ST	—
Sivanto Prime	MT	MT	NT	NT	MT	MT	MT	MT	VT
Surround WP	I	MT	MT	MT	MT	MT	—	ST	MT
Warhawk 480 EC	VT	MT	MT	MT	—	—	—	—	—
<b>Miticides</b>									
Acramite 50 WS	MT	NT	MT	MT	ST	NT	NT	NT	—
Envidor 240 SC	MT	MT	NT	NT	—	—	—	—	—
Kanemite 15 SC	NT	ST	ST	ST	—	—	—	—	—
Purespray Green Spray Oil 13 E	—	ST	MT	MT	ST	ST	ST	ST	—
Vegol Crop Oil	—	ST	MT	MT	ST	ST	ST	ST	—
<b>Fungicides</b>									
Copper Spray	NT	—	—	—	—	—	—	—	—
Cueva	NT	—	—	—	—	—	—	—	—
Flint	NT	ST	NT	NT	—	—	—	—	—
Fontelis	NT	—	—	—	—	—	—	—	—
Kasumin	NT	—	—	—	—	—	—	—	—
Quadris Flowable	NT	ST	NT	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.

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

<sup>2</sup> May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Only registered products with toxicity data available are listed in this table. Consult label or manufacturer for more information.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and the *Pennsylvania Tree Fruit Production Guide* information tree nut products registered on other tree fruit.

## Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 6–7. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

**Table 6–7.** Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see [sprayers101.com](http://sprayers101.com) or Purdue Extension, *Adjuvants and the Power of the Spray* at [ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf](http://ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf).

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	<ul style="list-style-type: none"> <li>• wetter-spreader</li> <li>• compatible with most pesticides<sup>1</sup></li> <li>• helps pesticide penetrate plant cuticle</li> </ul>
Ipco Ag-Surf	15881	non-ionic surfactant	<ul style="list-style-type: none"> <li>• wetter-spreader</li> <li>• compatible with most pesticides<sup>1</sup></li> <li>• helps pesticide penetrate plant cuticle</li> </ul>
LI 700	23026	non-ionic surfactant	<ul style="list-style-type: none"> <li>• wetter-spreader</li> <li>• compatible with most pesticides<sup>1</sup></li> <li>• helps pesticide penetrate plant cuticle</li> <li>• additional properties: pH adjuster, sticker</li> </ul>
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	<ul style="list-style-type: none"> <li>• helps pesticide penetrate plant cuticle or insect exoskeleton</li> </ul>
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	<ul style="list-style-type: none"> <li>• wetter-spreader</li> <li>• helps pesticide penetrate plant cuticle</li> <li>• reduces surface tension</li> <li>• improves rainfastness</li> </ul>

<sup>1</sup> Check product label for precautions around surfactant compatibility before using.