Publication 360B

Crop Protection Guide for Berries

2021

Ministry of Agriculture,
Food and Rural Affairs

Ontario

Discard old editions of this publication. Each year a committee comprised of representatives from provincial government, industry, academia and grower organizations review the pesticides listed in the publication.

To the best knowledge of the committee, at the time of publishing, the pesticide products listed in this publication were federally registered.

The information in this publication is general information only. The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

This publication lists a number of brand names of pesticides. It is neither an endorsement of the product nor a suggestion that similar products are ineffective.

THE PESTICIDE LABEL

Consult each product label before you use a pesticide. The label provides specific information on how to use the product safely, hazards, restrictions on use, compatibility with other products, the effect of environmental conditions, etc.

The pesticide product label is a legal document. Follow all label instructions.

REGISTRATION OF PESTICIDE PRODUCTS

The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticide products for use in Canada following an evaluation of scientific data to ensure that the product has value, and the human health and environmental risks associated with its proposed use are acceptable.

1. Full Registration

Pesticide registrations are normally granted for a period of 5 years, subject to renewal.

2. Emergency Registration

An emergency registration is a temporary, time-limited registration of no more than 1 year, approved to deal with serious pest outbreaks. An emergency is generally deemed to exist when both of the following criteria are met:

A. An unexpected and unmanageable pest outbreak or pest situation occurs that can cause significant health, environmental or economic problems; and

B. Registered pesticides and cultural control methods or practices are insufficient to address the pest outbreak.

MAXIMUM RESIDUE LIMITS

The PMRA has established maximum residue limits (MRLs) for pesticides. An MRL is the maximum amount of pesticide residue that may remain on food after a pesticide is applied as per label directions and which can safely be consumed. Processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to-date records on pesticide use in each crop.

SUPPLEMENTAL/AMENDED LABELS

Supplemental/amended labels provide label directions for new approved uses for a registered pesticide that do not appear on the current label. These label directions MUST be followed when using the pesticide for these purposes.

Examples of when you must use a supplemental/amended label include:

- **Emergency Use Registration**
- **Minor Use Label Expansion**

You can obtain a copy of a supplemental amended label from the pesticide manufacturer or pesticide vendor, the grower association that sponsored the emergency registration or minor use, from OMAFRA crop specialists or PMRA's Pest Management Information Service.

For more information on the federal registration status, check the PMRA website at www.healthcanada.gc.ca/pmra or call 1-800-267-6315.

REGULATION OF PESTICIDES IN ONTARIO

The Ontario Ministry of Environment, Conservation and Parks (MECP) is responsible for regulating pesticide sale, use, transportation, storage and disposal in Ontario.

Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the Pesticides Act and Regulation 63/09.

All pesticides must be used in accordance with requirements under the Pesticides Act and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling the ServiceOntario Publications Toll-Free number: 1-800-668-9938 or 416-326-5300.

CLASSIFICATION OF PESTICIDES

As of May 1, 2020, Ontario's pesticides classes have been aligned with the federal government's pesticide categories to remove duplication and reduce complexity for the sale and use of pesticides in Ontario, while ensuring continued protection of human health and the environment.

MECP automatically classifies pesticides in Ontario as Class A, B, C, D or E. The Ontario pesticide classification system provides the basis for regulating the distribution, availability and use of pesticide products in Ontario. For more information on the classification of pesticides, visit the MECP website at ontario.ca/pesticides.

CERTIFICATION AND LICENSING

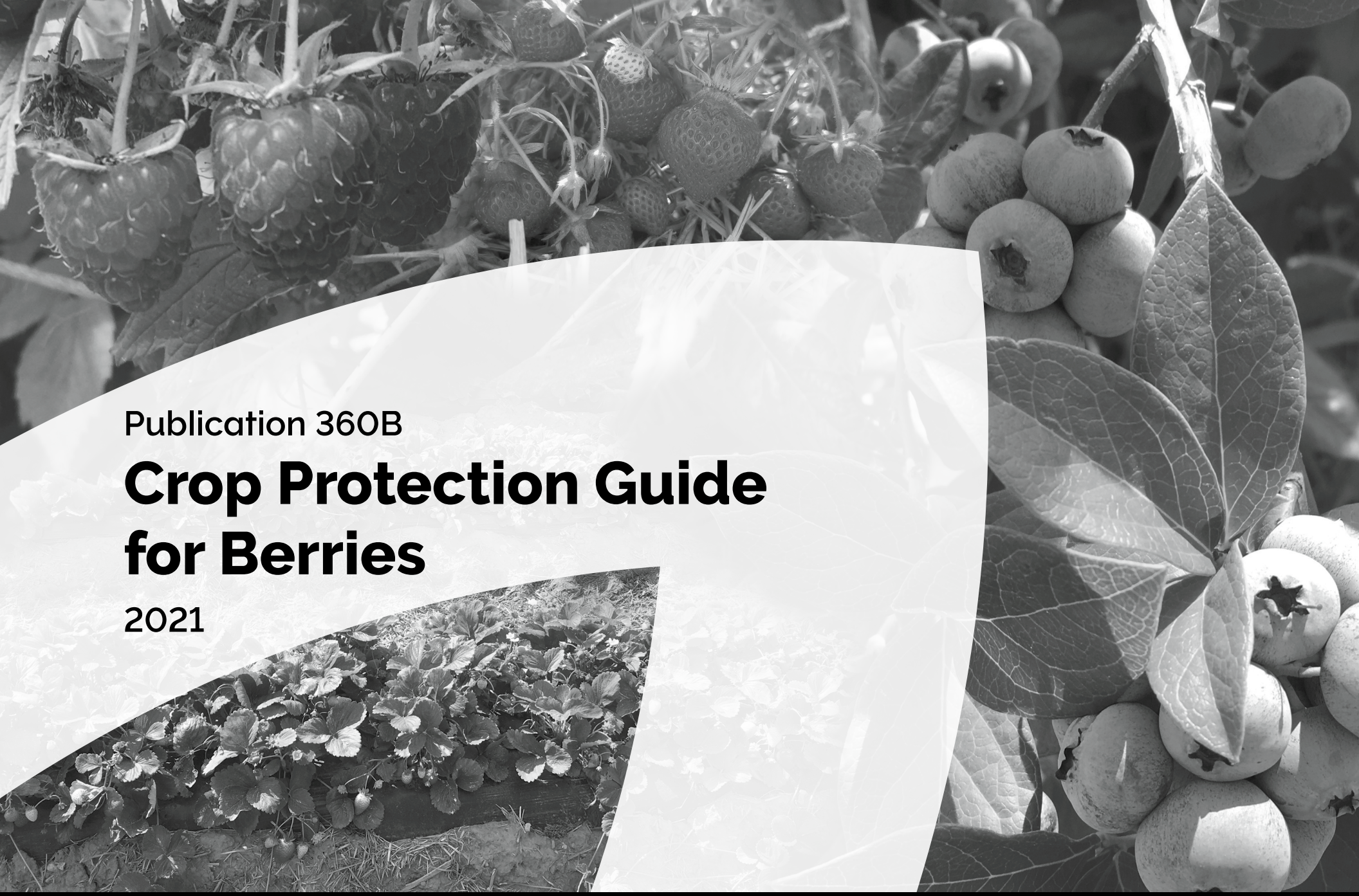
Growers and Their Assistants

For information about farmer training and certification requirements, visit the MECP website at ontario.ca/pesticides and for information on courses check the Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

Pesticide Commercial Applicators (Exterminators) and Their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician or call 1-800-265-5656 or e-mail pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca.



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Acknowledgements

The information contained in this publication is printed following review by the Fruit Technical Working Group, comprised of representatives from provincial and federal governments, academia and industry.

If you need technical or business information

Contact the Agricultural Information Contact Centre at
1-877-424-1300
ag.info.omafra@ontario.ca

Looking for fruit production information on the Internet?

Check the OMAFRA website at ontario.ca/crops

This publication contains pesticide control products that have been registered as of October 1, 2020, on berry crops. Any updates to this information will be posted on the OMAFRA website at ontario.ca/crops

Cover Images

Top left: Raspberries
Bottom left: Day-neutral strawberries
Top Middle: June-bearing strawberries
Right: Blueberries

COMING SOON!

For the 2022 growing season, you will be able to access the information currently listed in this publication through a new, digital application.

The application will replace OMAFRA's crop protection publications and provide you with information in one single location.

This one-stop tool for crop protection information will allow you to:

- ✔ customize and navigate through information based on your specific needs;
- ✔ access information when you need it to make important business decisions; and
- ✔ access information digitally, either through desktop, tablet or mobile.

Updates can be found at:
ontario.ca/crops

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Introduction

Products Listed in This Publication

- Products listed in this publication are registered for use on berry crops in Ontario as of October 1, 2020. The information contained in this publication has been prepared in consultation with the product registrants and the Fruit Technical Working Group, comprised of representatives from provincial and federal governments, academia and industry.
- This publication includes information on blueberries, currants, haskaps, gooseberries, raspberries, blackberries, Saskatoon berries, and strawberries. For products registered on other berry crops visit ONfruit at onfruit.ca, ONspecialtycrops at https://onspecialtycrops.ca, or follow the labels available at the Pest Management Regulatory Agency (PMRA) website at http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.
- Products are organized by pest. Consult each product label before you use a pest control product. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.

Crop Group Information

A crop group is a grouping of plant species based on botany and taxonomy (e.g., plant families), as well as on how the crops are produced. Crop groups are often further divided into smaller and more closely related subgroups. A pest control product may be registered on a subgroup, rather than the entire crop group. Crop groupings are used primarily to set maximum residue limits and establish a common pre-harvest interval (PHI) for a similar set of crops. It is important to remember that not all products have a crop group registration, and products registered on one crop are not necessarily registered on all members of its crop group. There are some crops that do not belong in a crop group. A complete list of all crops included in both original and revised crop groups can be found by searching "Residue Chemistry Crop Groups" on the Government of Canada's website: www.canada.ca.

Levels of Control for Fungicides and Insecticides/Miticides

The value of all insecticides, miticides and fungicides is evaluated by the Pest Management Regulatory Agency (PMRA) prior to registration, which includes an assessment of efficacy. Wording on the product label such as control, suppression or partial suppression is used to describe the level of pest management provided by these products. The definitions of "control" and "suppression" for insecticides have a somewhat different meaning than the same terms applied to fungicides, according to the Pest Management Regulatory Agency's Value Guidelines for New Plant Protection Products and Label Amendments.

Fungicides

Control: A consistent level of disease management, as defined by commercial standards and expectations in the market. In general, disease control ratings would be between 80%—100%.

Suppression: A consistent level of disease management that is less than full control, as defined by commercial standards and expectations in the market. In general, disease control ratings would be between 60%—100%. Suppression is defined as consistent disease reduction to a level that is not optimal but is still of commercial benefit.

Partial suppression: A level of disease management that is less than suppression, as defined by the commercial standards and expectations in the market. This label claim will generally only be considered for non-conventional fungicides. In general, disease control ratings would be less than 60%.

Insecticides/Miticides

Control: The product, when applied in accordance with the label directions, consistently reduces pest numbers or pest damage to a commercially acceptable level.

Suppression: The product, when applied in accordance with the label directions, does not reduce pest populations or damage to a level typically required to achieve commercially acceptable control. Under such situations, the level of performance offered by the product should still have value in a pest management program.

Source: Pest Management Regulatory Agency (PMRA), 2016.

Note: These guidelines are currently suggestions and are under review by the Pest Management Regulatory Agency. Current, approved Canadian labels may also include a statement "reduction in damage from" the target pest. This is an undefined level of control less than suppression, and this statement is still under review with the Pest Management Regulatory Agency

It is important to consider the level of control of a product and how it is incorporated into a pest management program. Together with cultural control, biological control or promoting natural enemies, products used for suppression might be enough to prevent significant crop damage. Products labelled for suppression may also play a role in resistance management. By alternating with products from different families, the risk of pest resistance to important products can be reduced. However, when using a new product for pest suppression, try to leave an untreated check and evaluate the benefits of using these products compared to the cost of application.

1. Using Pesticides in Ontario

Visit www.ontario.ca/usingpesticides for up-to-date information on provincial pesticide use requirements. Some of the information provided in this generic chapter may not apply to all crops.

Read the label before use.

Product labels may change.

Review the Grower Pesticide Safety Course Manual at https://www.opep.ca/courses/pick-up-a-gpsc-manual/

Keep detailed spray records.

Federal Registration of Pesticides

Before a pesticide (pest control product) can be sold or used in Ontario, it must be registered under the federal *Pest Control Products Act* (PCP Act). The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticides for use in Canada following an evaluation of scientific data to ensure that any human health and environmental risks associated with its proposed uses are acceptable, and that the products have value.

The PMRA re-evaluates registered pesticides to determine whether today's health and environmental protection standards are still met when the pesticide is used according to the label. The PMRA also assesses whether the pesticide still has value. Re-evaluations are initiated every 15 years. Outcomes of a re-evaluation can be:

- no change to the registration
- amendments to the label (e.g., changes to personal protective equipment requirements, restricted entry intervals, buffer zones)
- modifications to existing Maximum Residue Limits (MRLs)
- elimination or phasing-out of certain uses or formulations
- discontinuation of the registration

A special review of a registered pesticide can be initiated at any time by the PMRA if the PMRA has reason to believe its use may pose unacceptable risk to human health or the environment or the pesticide no longer has value. Special reviews focus on a specific concern (e.g., neonicotinoid pesticides and impacts to pollinator health).

The pesticide label is a legal document. Follow all label directions. Labels for all registered pesticides are under "Search Pesticide Labels" on the PMRA website at www.healthcanada.gc.ca/pmra. Ensure you have the most current label and are aware of any re-evaluation decisions. Emergency registrations are temporary registrations (1 year or less) for pesticides needed by growers to manage a new invasive pest or pest outbreak. Know the expiration date for pesticides you are using under an emergency registration.

Maximum Residue Limit (MRL)

When you apply a pesticide to a crop, some residue may remain on the crop at harvest time. A Maximum Residue Limit (MRL) is the maximum amount of pesticide residue that may remain on food after a pesticide is applied as per label directions and which can safely be consumed. The PMRA sets the MRL well below a level that may cause harm to human health. The MRL is specific for every pesticide-crop combination.

The Canadian Food Inspection Agency (CFIA) is responsible for enforcing the MRLs established by the PMRA. OMAFRA's Food Inspection Branch conducts an annual Produce Food Safety Monitoring Program which involves collecting Ontario grown fresh fruits and vegetables and testing them for pesticide residues and pathogenic organisms (e.g., *Listeria monocytogenes, E. coli* O157:H7).

If you apply a pesticide at a higher rate, make too many applications or harvest a crop before the Pre- Harvest Interval has ended, there may be pesticide residues in excess of the MRLs set by PMRA.

When exporting your food product, it is important to confirm the importing country's MRLs because it may be different than ours. Processors or retailers may demand more restrictive limits. Growers should seek advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to- date records on pesticide use in each crop.

For more information on MRLs, see:

- PMRA's MRL database at http://pr-rp.hc-sc.gc.ca/ mrl-lrm/index-eng.php provides information on established Canadian MRLs. This database includes importing MRLs that may have pesticide- crop combinations that are not registered for use in Canada. Always check the current Canadian pesticide label for registered uses.
- Global MRL Database at www.globalmrl.com provides free access to U.S. MRL information.
- Agricultural Chemical Companies can provide MRL information for their products. Companies' contact information are found on the pesticide labels, company websites and in OMAFRA's crop protection publications.
- Summaries of OMAFRA's Food Safety Monitoring Program results can be found at www.ontario.ca/producesafety.
- CFIA's Chemical Residue Surveillance Program at https://www.inspection.gc.ca/food-safety-for-industry/food-chemistry-and-microbiology/food-safety-testing-bulletin-and-reports/eng/1453324778043/1453327843364

Regulation of Pesticides in Ontario

The Ontario Ministry of the Environment, Conservation and Parks (MECP) is responsible for regulating the sale, use, transportation, storage and disposal of pesticides in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09. All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at ontario.ca/laws or by calling Service Ontario at 1-800-668-9938 or 416-326-5300.

Classification of Pesticides

The PMRA classifies a pesticide into one of four classes – manufacturing, restricted, commercial and domestic. As of May 1, 2020, Ontario's pesticides classes have been aligned with the federal government's pesticide categories to remove duplication and reduce complexity for the sale and use of pesticides in Ontario, while ensuring continued protection of human health and the environment.

The MECP automatically classifies pesticides in Ontario as Class A, B, C or D based on the federal classification system plus one additional class (Class E) for regulating the sale and use of neonicotinoid-treated corn and soybean seed.

Table 1–1. Federal and provincial classification

Federal product class	Federal Class Description	Provincial Class
Manufacturing	The pesticide is only used to manufacture a pest control product.	Class A
Restricted	The pesticide is restricted by the federal government out of concern of environmental risk or human health. Additional information must be shown on the label regarding essential conditions for display, distribution and limitations on use. Specific qualifications may be required for a person to use this product.	Class B
Commercial	The pesticide can only be used in commercial activities that are specified on the label.	Class C
Domestic	The pesticide is primarily used by the general public for personal use and in and around their homes.	Class D
N/A	—	Class E* Corn and soybean seeds that are treated with imidacloprid, clothianidin or thiamethoxam neonicotinoids

* Class E pesticides do not apply to:
- popping corn
- sweet corn
- corn used for the production of seed
- soybean seed planted for the purpose of producing a soybean seed crop of certified status under contract
- corn seed and soybean seed treated only with fungicide

Each Ontario Class has specific certification, licensing and/or permit requirements and restriction on its use and sale.

Certification and Licensing

Certified Farmers and Their Assistants

Farmers must be certified through the Grower Pesticide Safety Course (GPSC) in order to buy and use Class B and C pesticides on their farms. Certification is not required to buy and use Class D pesticides for agricultural purposes.

Farmers become certified by successfully completing one of the following certification options:

- one-day in-person course and pass an open book certification test with a mark of at least 75%, or
- online course and successfully complete quizzes and case studies to become certified.

Farmer assistants and supervised farmers using Class B or C pesticides must complete training and assist or be supervised by a certified farmer. Farmer assistants and supervised farmers must complete one of the two training options:

- participate in a GPSC (assessment is not required) or
- participate in an On-Farm training session given by an On-Farm Instructor.

For information about farmer training and certification requirements visit the MECP website at ontario.ca/pesticides and for information on courses visit the University of Guelph's Ontario Pesticide Education Program website at www.opep.ca or call 1-800-652-8573.

To buy and use Class E pesticides, farmers are required to:

1. Complete the Integrated Pest Management (IPM) Course for Corn and Soybean
2. Complete a pest risk assessment and a pest risk assessment report
3. Sign an IPM Written Declaration Form stating that you considered IPM principles to decrease the risk of early season insect damage.

Farmers must provide these pieces of information to a vendor sales representative or custom-seed treater in order to purchase Class E pesticides. They must retain these records for at least two years.

Farmers must also carry with them or have readily available at the field when they are planting a copy of their certificate of completion of the Integrated Pest Management (IPM) Course for Corn and Soybean and pest risk assessment report.

For information on the requirements for Class E pesticides visit the MECP website ontario.ca/pesticides. For information on the IPM Course visit the University of Guelph's website at IPMCertified.ca.

Pesticide Commercial Applicators (Exterminators) and Their Assisting Technicians

All applicants for a pesticide exterminator licence must first become certified by passing an examination. Once certified, you can apply to the MECP for an exterminator licence.

For more information on how to become certified, refer to Ontario Pesticide Training and Certification

University of Guelph, Ridgetown Campus
1-888-620-9999

Email: rcoptc@uoguelph.ca
Website: www.ontariopesticide.com

For further information on pesticide licensing please refer to the document Guide to Pesticide Licensing available at ontario.ca/pesticides.

For information on technician training, visit:

- the Ontario Pesticide Training and Certification website at www.ontariopesticide.com or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.horttrades.com/pesticide-technician or call 1-800-265-5656 or email pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

Ontario's Cosmetic Pesticide Ban and Excepted Uses

Ontario prohibits the use of certain pesticides for cosmetic (non-essential) purposes.

Only low risk pesticides and biopesticides may be used for cosmetic purposes such as in lawns and gardens, and these are listed in the publication "List of Active Ingredients Authorized for Cosmetic Uses (Allowable List)"

Under the ban, the use of an active ingredient that is not on the Allowable List is permitted for appropriately licensed individuals if the use falls under one of the exceptions to the ban. There are exceptions for public health and safety (including for public works, buildings and other structures that are not a public work, and to control poisonous plants), golf courses, specialty turf, specified sports fields, arboriculture and the protection of natural resources, if certain conditions are met. There are also exceptions for agriculture, forestry, research and scientific purposes, uses of pesticides for structural exterminations (e.g., in and around homes to control insects), and uses of pesticides required by other legislation.

To locate your local MECP District Office:
https://www.ontario.ca/environment-and-energy/ministry-environment-district-locator

To speak with your local MECP Pesticide Specialist:

South West Region – 519-668-9292

West Central Region – 905-512-0981

Central Region – 416-990-1694

Eastern Region – 613-540-6874

Northern Region – 705-562-0853

Pesticide Application Information

When you decide to use a pesticide, choose the least toxic and least volatile option for your situation. Use an appropriate application method and ensure equipment is properly maintained and calibrated. Take all possible precautions to prevent the exposure of people and non-target organisms to the pesticide, before, during and after the application. Read the most current pesticide label thoroughly before application. The pesticide label is a legal document and must be followed. Pesticides may only be used in accordance with label instructions. The label provides important information, such as:

- directions for use (e.g., rates of application, crops/sites it can be used on, target pests, crop rotation restrictions, total number of applications, droplet size, application equipment, timing, appropriate weather conditions)
- required personal protective equipment (PPE)
- hazard symbols and warnings
- restricted entry intervals
- pre-harvest intervals
- buffer zones / vegetative strips
- precautionary statements
- steps to be taken in case of an accident
- disposal
- equipment sanitation

For more information on hazards, consult the Safety Data Sheet (SDS) or contact the manufacturer.

For more information on pesticide application, see:

- Sprayers 101 at www.sprayers101.com
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos at www.opep.ca/resources/
- OMAFRA Agriculture and Agri-Food Canada booklet Best Management Practices — *Pesticide Storage, Handling and Application,* Order No. BMP13
- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies*
- PMRA's Factsheet *Understanding Restricted Entry Intervals for Pesticides* (English, French and Spanish): www.healthcanada.gc.ca/pmra, search for Restricted Entry Interval

Restricted Entry Intervals

Restricted Entry Interval (REI) is the minimum period of time that must elapse before hand labour tasks can be performed in an area treated with pesticide. The REI allows the pesticide residues and vapours to dissipate to safe levels to protect agricultural workers.

Hand labour tasks involve substantial worker contact with treated surfaces such as plants, plant parts or soil. Examples of these activities include planting, harvesting, pruning, detasseling, thinning, weeding, scouting, topping, sucker removal, mowing, roguing and packing produce into containers in the field or greenhouse. You can only perform these tasks after the REI has passed. Hand labour generally does not include operating, moving or repairing irrigation or water equipment, except for hand-set irrigation.

An REI can range from 12 hours to several days depending on the crop and the task (e.g., scouting, harvesting). A minimum 12-hour REI must be observed in agricultural crops, even if no REI is indicated on the label. However, REIs do not apply to biopesticides (e.g., microbials, pheromones) unless specified on the label. For golf courses and residential turf applications, the spray solution must be dry before re-entry can occur. When tank-mixing pesticides that have different REIs, you must observe the longest REI.

A Certified Farmer or Licensed Commercial Applicator (i.e., a holder of the appropriate Exterminator License, such as an Agriculture Exterminator License or a Greenhouse/Interior Plant Exterminator License) may need to enter a treated area early to do short-term tasks before the end of the REI. In these cases, the Certified Farmer or Licensed Commercial Applicator may enter between 4–12 hr after the application wearing a NIOSH-approved respirator and any other protective clothing (PC) and personal protective equipment stated on the label for mixing and loading. This Certified Farmer or Licensed Commercial Applicator (exterminator) must not be in the treated area during the REI for more than a total of 1 hr in any 24-hr period.

See Figure 1-1 for an example of a 24-hr REI on a pesticide label.

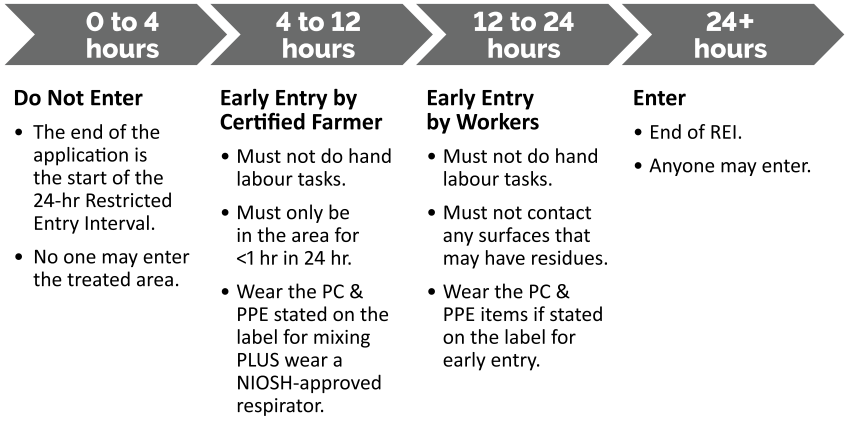

Figure 1–1. Example of a 24-hr REI on a pesticide label.

Certified Farmers and Licensed Commercial Applicators should plan pesticide applications around work tasks so that no one needs to enter treated areas before the restricted entry interval has passed.

Days to Harvest Intervals for Food Crops (Pre-harvest, Pre-grazing and Feeding Intervals)

These intervals state the minimum time that must pass between the last pesticide application and the harvesting of the crop or the grazing and cutting of the crop for livestock feed. If you harvest a crop before the pre-harvest interval (PHI) has ended, there may be pesticide residues in excess of the maximum residue limits (MRLs) set by PMRA.

"Up to the day of harvest" means the same as 0 days PHI; however, the REI may be more restrictive (e.g., a 12-hr restricted entry interval) and must be observed for harvesting that occurs on the day of pesticide application.

To avoid exceeding the maximum residue limits, always follow the directions on the label.

Spray Buffer Zones

Spray buffer zones are no-spray areas required at the time of application between the area being treated and the closest downwind edge of a sensitive aquatic or terrestrial habitat. Spray buffer zones reduce the amount of spray drift that enters non-target areas.

Sensitive terrestrial habitats include hedgerows, grasslands, shelterbelts, windbreaks, forested areas and woodlots.

Sensitive freshwater habitats include lakes, rivers, streams, creeks, reservoirs, marshes, wetlands and ponds.

The pesticide label indicates the size of the spray buffer zone, which depends on the product used, the method of application, and the crop being sprayed.

Unless forbidden by the pesticide label, Health Canada's online Buffer Zone Calculator may allow applicators to reduce the spray buffer zones based on weather conditions, the category of the spray equipment and the droplet size. For more information, search for "Buffer Zone Calculator" at www.canada.ca.

For soil fumigation, a buffer zone is an area established around the perimeter of each application block.

Vegetative Filter Strips

A vegetative filter strip is:

- a permanently vegetated strip of land.
- sits between an agricultural field and downslope surface waters.
- must be at least 10 m wide from edge of field to the surface water body.
- must be composed of grasses, but may also contain other vegetation (shrubs, trees, etc.).

Vegetative filter strips reduce the amount of pesticide entering surface waters from runoff by slowing runoff water and filtering out pesticides carried with the runoff. Certain pesticide labels will require a vegetative filter strip. Other labels will recommend a vegetative filter strip as a best management practice.

Protect the Environment

Protect Water Sources

According to the British Crop Protection Council (BCPC), 40%–70% of surface water pesticide contamination comes from mixing and filling areas.

Where possible, load or mix pesticides on impermeable surfaces located safely away from watercourses or environmentally sensitive areas. Collect drainage and run-off and dispose of it safely (Your Guide to Using Pesticides, BCPC 2007).

Clean your spray equipment away from wells, ponds, streams and ditches. Apply the diluted rinse water (usually at a ratio of 10:1) to the treatment area (crop), but do not exceed the pesticide rate recommended on the label.

Do not make a direct connection between any water supply (e.g., public supply, wells, watercourse or pond) and a spray tank. Use an anti-backflow device or intermediate system to prevent back-siphoning that could contaminate the water supply.

Immediately contain and clean up any spills to prevent contamination to water sources.

Check the pesticide label for specific instructions on protection of water sources.

For more information on protecting water sources, see ontario.ca/crops:

- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies*
- OMAFRA Factsheet *Groundwater — An Important Rural Resource: Protecting the Quality of Groundwater Supplies*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13

Bee Poisoning

Honey bees, native bee species (e.g., bumble bees, squash bees) and other pollinating insects are important pollinators for many Ontario crops.

Insecticides, some of which may negatively affect bees, require careful management to achieve both pollination and insect control of pest species. Growers and licensed commercial applicators can protect bees by following these suggestions:

- Time insecticide applications to minimize bee exposure (e.g., apply post bloom). Daytime treatments, when bees are foraging, are most hazardous. Insecticide applications in the evening are the safest, unless there is evidence of a strong temperature inversion or high humidity. Under normal circumstances, spraying after 8 p.m. allows the spray to dry before the bees are exposed to it the next day. Spraying during

early morning is the next best time, when fewer bees are foraging, but pesticide residues may still be present. Spraying should be completed well before 7 a.m. While honey bees and most other pollinating insects do not usually forage at temperatures below 13°C, bumblebees do. If you plan to spray in the morning, contact beekeepers who have bees within 5 km of your crop and spray site. The beekeepers may then have the option of taking any possible protective action.

- Do not apply insecticides while fruit trees are in bloom. The Bees Act makes it an offence to do so in Ontario. Do not spray any flowering crop on which bees are foraging.
- To prevent drift toward nearby hives, do not apply insecticides on windy days or when there is evidence of a strong temperature inversion.
- Bees and other pollinators may be poisoned by visiting flowering weeds, trees and cover crops that have come into contact with an insecticide via spray drift or drift of insecticide-contaminated dust during planting. Avoid spray drift to flowering weeds that are adjacent to or within the target field. Where possible, mow down flowering cover crops or flowering weeds in and bordering target fields prior to spraying to help safeguard the bees. Control dandelions and other flowering weeds within fields before spraying or planting seeds treated with an insecticide. Take measures to reduce movement of dust from insecticide seed treatments to flowering trees, weeds and water sources that are in or adjacent to the target field. For more information on reducing dust movement, search for "Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices" at www.canada.ca.
- Systemic insecticides may also pose a high risk to bees and other insect pollinators. Bees can be exposed to insecticide residues in or on flowers, leaves, pollen, nectar and/or surface water. Do not apply insecticide or allow it to drift onto blooming crops or off-site habitat if bees are foraging in or adjacent to the treatment area.
- In crop settings where pesticide use is highly likely, beekeepers should remove honey bee colonies as soon as pollination and bloom are complete in the crop and before any insecticides are applied post bloom.

  In emergency situations, if the colonies cannot be removed in time, beekeepers can place burlap or cloth soaked in water at the entrance of the hive to disrupt the flight of the bees for up to 12 hr and provide more time for spray to dry. To help prevent overheating of the hive during this time, keep an opening of 2.5 cm on each side of the hive entrance so bees can still get out and ventilate the hive. Also, the water on the burlap or cloth will help cool the colony.
- Not all pesticides are equally toxic to bees. If there is a risk of honey bee poisoning, try to choose an insecticide that is not highly toxic to bees. When there is a choice, choose a product formulation that is less hazardous to bees.
- Always read the most current pesticide label for guidance. Some pesticides cannot be used when bees are active in the crop.

For more information on ways to reduce bee poisoning, see:

- *Practices to Reduce Bee Poisoning from Agricultural Pesticides in Canada*, available at honeycouncil.ca. Select "Bee Health Roundtable."

Manage Drift

Pesticide drift is the aerial movement and unintentional deposit of pesticide outside the target area. Drift results in wasted product, may compromise crop protection and can adversely affect nearby sensitive environmental areas, crops and wildlife. The following strategies can help reduce the risk of pesticide drift:

- Do not spray when wind direction is changeable, or wind speeds are high or gusty. These conditions increase the potential for off-target drift. While most pesticide labels indicate allowable wind speeds, some do not.
- Regularly monitor wind conditions during spraying, preferably in the field with a handheld wind meter at nozzle height or elevated to the top of the target canopy from within the planted area. Record the wind speed and direction. As conditions change, make adjustments to manage drift potential. Adjustments may include a coarser droplet size, minimizing nozzle-to-target distance, adjusting air energy or vector on air-assisted sprayers, slowing travel speed, using a drift reducing adjuvant or discontinuing spraying until conditions improve.

- Do not spray during periods of dead calm. Periods of dead calm may occur between late evening and early morning and can result in the vapour or fine spray droplets remaining aloft, like fog. Spray-filled air can move unpredictably over great distances several hours after the spray event is completed.

Temperature inversions create problems for spray applicators because pesticide spray can:

- remain suspended and active in the air above the target for long periods of time
- move with light breezes in changeable and unpredictable directions
- move down slopes and concentrate in low-lying regions

Field air temperatures are often very different from local or regional forecasts, so the most reliable method of detecting inversion conditions is to measure temperatures at, and several metres above, the ground. Commercial hand-held inversion detectors are now available. Spray applicators can also recognize a temperature inversion from environmental cues, such as when:

- there is a big drop from daytime to nighttime temperature
- wind dies down by early evening and night
- far away sounds can be heard clearly
- odours seem more intense
- daytime cumulus clouds collapse toward evening
- overnight cloud cover is 25% or less
- smoke or dust hangs in the air and/or moves laterally in a sheet

Temperature inversions start to form about 3 hr prior to sunset, become stronger as the sun sets and continue until sunrise when the surface warms and air mixing begins. If you suspect there's an inversion, don't spray. Often, warnings for the risk of inversions are stated right on the product label.

- If specified, use the sprayer output indicated on the pesticide label.
- Use a nozzle at a pressure that will produce the droplet size specified on the pesticide label or delivers droplets appropriate for the job.
- Coarser droplets reduce drift significantly. Air induction nozzles used above 2bar (30psi) will produce Coarse to Ultra Coarse droplets. They can be used in the top nozzle positions on air-assist sprayers in specialty crops, or along conventional horizontal booms. Ensure the droplet size and volume are appropriate for the application being performed.
- Minimize the distance between nozzle and target as much as possible while still maintaining spray uniformity.
- Establish buffer zones for the protection of adjacent sensitive areas. Some pesticide labels will state buffer zone setbacks; follow these carefully.
- Use drift reduction technology, such as hoods, shrouds, screens or air curtains.
- If appropriate, use drift-reducing adjuvants in the spray tank. The intense agitation in air-assist sprayers for specialty crops has been shown to reduce the effectiveness of drift-reducing adjuvants. Certain combinations of drift-reducing adjuvants and air-induction nozzles have been shown to increase the incidence of fine droplets. Consult with the adjuvant manufacturer.
- When possible, use non-volatile pesticide formulations or products.

For more information about spray drift, see:

- Sprayers 101: www.sprayers101.com
- OMAFRA website: ontario.ca/spraydrift
- OMAFRA Factsheet Pesticide Drift from Ground Applications
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Drift of Pesticides video* series, available at www.opep.ca/resources (click the "YouTube" icon)

Waste Management

Empty Pesticide and Fertilizer Containers up to 23 L

Never re-use empty pesticide containers.

The Ontario Empty Pesticide and Fertilizer Container Recycling Program, an industry-led program, is available free of charge to growers and commercial applicators. Through this program, you can return triple-rinsed or pressure-rinsed plastic pesticide and fertilizer containers up to 23 L to container collection depots located throughout the province. Remove the cap and booklet from the pesticide container and metal handle from the fertilizer pail before recycling. To locate the closest container collection depot, visit www.cleanfarms.ca, call your local dealer or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Pesticide Containers Greater than 23 L (Totes and Drums)

Growers and commercial applicators should return pesticide containers that are greater than 23 L in size to the point of sale or local collection site for disposal. Contact your local dealer for details on disposal of these containers, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Empty Seed and Pesticide Bags

Growers can return their empty seed and pesticide bags to select retail locations. Contact your local dealer for details on disposal of these empty seed and pesticide bags, or contact Cleanfarms at 416-622-4460 (toll-free at 877-622-4460) or info@cleanfarms.ca.

Surplus Spray Mix

The best approach is to plan the spray job accurately to avoid creating a surplus.

When this is unavoidable, dispose of excess spray mix by spraying it on other crops that require an application of this pesticide. Before spraying, check the label to make sure the pesticide is registered for use on that other crop.

If you cannot find another allowable crop to spray, then dilute the remaining spray mix by adding 10 parts of water for each 1 part of spray mix.

The diluted solution can be safely applied to the original treated area as long as you do not exceed the pesticide rate recommended on the label. Be sure to check the label for any restrictions about crop rotation, days to harvest or disposal of surplus spray mix.

Never re-spray the treated field with undiluted spray mix. Spraying an area twice at the same pesticide rate will double the labeled pesticide rate. This may cause illegal pesticide residues in the harvested crop or harmful residues in the soil that can cause crop damage.

Surplus Pesticide Disposal

Be sure to safely dispose of pesticides that you do not need or cannot use. Options for proper disposal include:

- Contact the supplier. It is sometimes possible to return unused pesticide if it is still in its original, unopened container.
- Hire a licensed waste hauler who is licensed under Part V of the *Environmental Protection Act* to carry hazardous wastes.
- Cleanfarms operates a free Obsolete Pesticide and Animal Health Product Collection Program throughout the province every 3 years. To locate the closest collection point and date, visit the Cleanfarms website (www.cleanfarms.ca), contact Cleanfarms at 416-622-4460 (toll-free at 877-622- 4460) or info@cleanfarms.ca or contact your local dealer for program details.
- Contact your municipality to see if any hazardous waste collection days are scheduled and verify whether quantities of agricultural pesticides will be accepted.

Storing Pesticides

Ontario's *Pesticides Act* and Regulation 63/09 provide details on storage requirements for pesticide storage facilities. As shown in Table 1-2, the storage requirements that must be followed are dependent on which classes of pesticides you store.

Table 1–2. Requirements for Pesticide Storage Facilities

Storage requirements	Pesticide Classes		
	Class B****	Class C	Class D
No contact with food or drink	YES	YES	YES
Not an impairment to health and safety	YES	YES	YES
Clean and orderly	YES	YES	YES
Warning sign G posted*	YES	YES	YES
Emergency telephone numbers posted**	YES	YES	YES
Vented to outside	YES	YES	NO
Limited access (locked)	YES	YES	NO
No floor drain	YES	YES	NO
Respiratory protection and protective clothing kept readily available	YES	YES	NO
Area used primarily for pesticides	YES	YES***	NO

Note: Sufficient precautions are needed in your storage area to prevent the pesticide from entering the natural environment. Ensure your floor drain does not enter the natural environment.

* See ontario.ca for requirements for warning sign G (Search for sample warning signs for pesticide use). These signs can be purchased from your pesticide dealer/vendor.

** Emergency contact numbers must include telephone numbers for the local fire department, hospital and poison control centre. The number for the MECP Spills Action Centre (1-800-268-6060) should also be readily available.

*** Only applies to Class C pesticides that are fumigants

**** Does not apply to animal repellent products that only contain the active ingredient Capsaicin or Capsaicin and related capsaicinoids.

For more information about storing pesticides, see:

- OMAFRA Factsheet Farm Pesticide Storage Facility
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learn."

Pesticide Spills

Part X of the *Environmental Protection Act* defines a spill as a discharge of pollutant (including pesticides) that is abnormal in quality or quantity, from or out of a structure, vehicle or other container into the environment. An overturned pesticide sprayer that results in the release of the pesticide spray solution to the environment is an example of a spill. A pesticide container that ruptures and leaks its contents is another example of a spill. The discharge or spraying of a pesticide in an unapproved area is also considered a spill.

Part X of the *Environmental Protection Act* requires every person having control of a pollutant that is spilled or who spills, causes or permits a spill of a pesticide shall immediately notify:

- the Ministry (through the Spills Action Centre)
- the municipality within the boundaries of the spill, and
- the owner of the pesticide or the person having charge, management or control of the pesticide.

Ontario's Spills Action Centre receives calls 24 hours a day (1-800-268-6060). Your local municipality may have additional reporting numbers such as fire department and Medical Officer of Health.

Where a spill causes or is likely to cause an adverse effect as defined by the Act, Part X of the *Environmental Protection Act* requires the owner of the pesticide and the person having control of the pesticide to:

- immediately do everything practicable to prevent, eliminate and ameliorate any harm, and
- restore the natural environment or other property to the state it was in prior to the spill.

Additionally, Ontario Regulation 63/09 under the *Pesticides Act* requires the person responsible for a pesticide to immediately notify the Ministry's Spills Action Centre in the event of a fire or other occurrence that may result in the pesticide being discharged into the environment out of the normal course of events if the discharge would be likely to:

- cause impairment of the quality of the environment for any use that can be made of it;
- cause injury or damage to property or to plant or animal life;
- cause harm or material discomfort to any person;
- adversely affect the health of any person;
- impair the safety of any person; or
- render directly or indirectly any property or plant or animal life unfit for use by humans.

Before you begin to clean up a spill of any nature, remember to protect yourself against pesticide exposure. Wear the proper protective clothing and personal protective equipment. If the spill occurs inside an enclosed area (e.g., a pesticide storage area or a vehicle during transport), ventilate the area first. Once you have protected yourself and removed other persons or animals from the spill site, take additional measures to stop the spill at the source and prevent it from spreading and/or contaminating watercourses. Specific precautions, emergency contact information and first aid procedures may be found on the label.

For minor spills, it may be possible to rectify the problem:

- **For a liquid spill —** Cover the spill with a thick layer of absorbent material such as kitty litter, vermiculite or dry soil. Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.
- **For a dust, granular or powder spill —** Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.

For major spills, it is essential to stop the spill from spreading.

The clean-up guidelines above may not be appropriate for all spill situations. Once you have contained the spill, follow directions from the manufacturer and regulatory authorities on cleaning the contaminated area.

Some of the information contained in this chapter is not authoritative. It is derived from the *Pesticides Act*, Ontario Regulation 63/09, *Environmental Protection Act* and the federal *Pest Control Products Act, Fisheries Act* and *Species at Risk Act* and is for informational purposes only. Efforts have been made to make it as accurate as possible, but in the event of a conflict, inconsistency or error, the requirements set out in the referenced legislation take precedence. For specific legal details, please visit ontario.ca/laws (for Ontario legislation) and www.laws-lois.justice.gc.ca (for federal legislation) and consult your lawyer if you have questions about your legal obligations.

For information on preventing spills, see:

- OMAFRA Factsheet Ways to *Avoid Pesticide Spills*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at www.opep.ca. Select "Learn."

For pesticide poisonings and pesticide injuries, call:

Ontario Poison Centre: 1-800-268-9017
(TTY) 1-877-750-2233

For more information, see Emergency and First Aid Procedures for Pesticide Poisoning on inside back cover.

2. Pest Management

Integrated pest management (IPM) is an approach to managing pests that uses all available strategies to reduce pest populations below an economic injury level. IPM does not advocate a continuous pesticide spray program to eradicate pests. Instead, it promotes the integration of cultural, mechanical/physical, biological, behavioural and chemical control strategies. With IPM, adverse effects of pesticides are minimized and economic returns are maintained.

An IPM program makes management decisions based on:

- pest identification, biology and behaviour
- resistance management strategies
- beneficial organisms
- monitoring techniques
- use and timing of appropriate management tools
- stage of crop growth
- record keeping
- sprayer calibration

More detailed information on IPM for berry crops can be found on: Ontario Crop IPM, ontario.ca/cropIPM

Current information is also available on the OMAFRA website at www.omafra.gov.on.ca/english/crops/hort/berry.html and ONfruit blog at onfruit.ca. OMAFRA provides additional information via newsletters, meetings, field monitoring, and pest management workshops.

Pest Management Tools

Cultural and Mechanical/Physical

Integrated pest management incorporates cultural and mechanical/physical practices to prevent or delay the development of pest outbreaks. Management tools include, but are not limited to:

- Site selection — Choose sites less favourable for pest development. Avoid planting in poorly drained locations.
- Resistant/tolerant cultivars — Select cultivars less susceptible to disease or insect pressure.
- Crop rotation — Between planting new crops, rotate to a non-host crop to break the pest cycle.
- Clean, certified nursery stock — Use plants tested and determined to be free from virus and grown according to guidelines that minimize the presence of other pests.
- Field sanitation — Remove all sources of the pest, such as cull piles, dead/dying branches, and mummified or dropped fruit from the field.
- Elimination of alternative hosts — Maintain good weed control and eliminate wild hosts from within and adjacent to the field. Weeds and wild fruit trees, grapevines and brambles often act as alternate hosts for many pests.
- Inter-cropping — Use non-related crops planted in close proximity as a barrier to insects and diseases. Avoid inter-cropping plants with similar pest complexes.

- Encouraging natural enemies — Modify insect habitat through the introduction of cover crops, border crops or naturalized hedgerows to promote beneficial organisms.
- Pruning — Remove infected plant material to reduce pest pressure and improve air movement within the canopy to facilitate drying and improve spray coverage.
- Water management — Timely irrigation can reduce plant stress during drought and increase plant tolerance to pests. Schedule irrigation so that plants are not wet overnight.
- Nutrient management — Avoid excessively lush growth, which is more susceptible to some diseases and more attractive to some insect pests.

Biological

Biological control uses beneficial organisms to help suppress pest populations. These biological control agents may be predatory insects, parasites, pathogens or nematodes. Many beneficals occur naturally in the environment; others may be introduced.

Beneficials will not completely eliminate damage by pests. However, once they are established, they can maintain pest populations at lower levels. They can also be effective against indirect pests such as aphids, leafhoppers and mites, but may be less effective at keeping populations of direct pests, which attack the harvested product, at levels acceptable for commercial production. Important insects and mites for biological control include ground beetles, mullein bugs, minute pirate bugs, lacewings, lady bird beetles and phytoseiid mites.

Natural pathogens of insects and mites include bacteria, viruses, fungi and protozoa. Pathogens circulate naturally in insect populations. Under the right conditions, they can cause disease outbreaks in insects, which can significantly reduce insect populations. Aphids and caterpillars are routinely infected by cycles of viral or fungal disease, which thrive when the environment is moist.

Follow these practices to conserve and encourage beneficial insects in fruit crops:

- Avoid use of pesticides that are toxic to the most important beneficials in a cropping system.
- Encourage a diverse habitat within and/or around the perimeter of the field where beneficial insects can live. Small flowering plants are an important food source for parasitic wasps (e.g., alyssum perimeter border).
- Avoid ultra-clean cultivation. Crop residue, mulch or ground cover will encourage ground beetles and other important predators in the soil.

For additional information on predators and parasitoids, see Ontario CropIPM, ontario.ca/cropIPM or OMAFRA Publication 208, *Predatory Insects in Fruit Orchards*.

Chemical

Chemical controls include synthetic, inorganic, botanical and biological pesticides. They kill/inhibit development of target pests and thus limit subsequent pest populations. Plant defence activators (e.g., Regalia Maxx) induce natural plant defences against crop pests, but do not directly impact the plant pathogen itself. Applications of plant defence activators to crops may “activate” the defence response of the plant, thus inhibiting infection.

Chemical controls are important tools for crop protection when used as part of an IPM program. Understand the pest’s life cycle and apply chemicals at the stage when the pest is most vulnerable. Select the appropriate product for the target pests. To control insects and mites, monitor blocks closely. Spray according to action thresholds, degree-day timing (see below) or at critical stages of crop development. To control disease, apply fungicides prior to disease infection and development. Use factors such as weather conditions, crop stage and (where available) disease prediction models to assist in fungicide spray timing.

All organic pest control products must be registered by the PMRA on the pest and crop on which they are used and meet the requirements of the Canadian Organic Standards and any additional requirements of the local organic certification body.

While organic and biopesticide products are used most widely by organic producers, they can be useful tools for conventional growers as well. Possible advantages for conventional producers include:

- lower potential for pest resistance
- providing a rotational option to help manage resistance development in other conventional products
- shorter re-entry and preharvest intervals
- potentially lower toxicity to non-target organisms

Although many organic and biopesticide products are formulated, packaged and applied in a very similar fashion to conventional pesticides, the active ingredients are different. They have unique, specialized modes of action that make them more susceptible to numerous biological and environmental factors.

Some of the possible challenges associated with using these products are:

- more frequent applications needed to control pests
- slower acting than conventional pesticides
- may provide suppression rather than control of the pest
- more expensive than conventional pesticides
- fewer pests controlled

Degree-Day Modeling

Temperature, light and moisture affect the growth and development of plants and pests. Of these, temperature is the most important factor for insect and mite development. These pests need a certain amount of heat to move to the next development stage.

The amount of heat required for insect and mite development remains constant from year to year, but depending on weather conditions, the amount of actual time that it takes to complete development can vary. Insects and mites have a minimum and maximum base temperature below or above which development does not occur. These base temperatures are different for each organism.

Degree-Days Celcius (DDC) are used to estimate the growth and development of pests in the growing season. Events such as egg-laying, egg hatch, movement of crawlers or the occurrence of disease infection can be predicted and used to schedule inspection and spray programs. For example, degree-day calculations can predict the first hatch of obliquebanded leafroller eggs.

There are several methods used to calculate DDC, but the method commonly used with simple monitoring equipment is the averaging method or “max/min” method. DDC for a given organism are calculated as follows:

$$\text{DDC} = \frac{(\text{Daily max } °\text{C}) + (\text{Daily min } °\text{C})}{2} - \text{minimum base temperature}$$

Degree-Days Celcius are accumulated daily. The averaging method works well in most years. However, the actual DDC accumulations may be underestimated in extended periods of cool weather or overestimated in hot weather.

An example of the averaging method on a relatively cool spring day:

For a given pest:
Lower base temperature = 10°C
Upper base temperature = 35°C

On a given day:
Minimum temperature = 5°C
Maximum temperature = 15°C

Degree-Days Celcius (DDC) for that day is = (maximum + minimum temperature) / 2 – lower base temperature = (15+5) / 2 – 10 = 0 DDC

Note that the maximum temperature was higher than the base temperature for the insect, so growth and development were possible for at least part of the day. However, no DDC were accumulated. This illustrates how cool temperatures, especially over several days, could lead to an underestimation of insect development.

Table 2–1. Examples of Degree-Day Models Used in Fruit Crops

Pest	Base Temperature	Biofix	Predicted Event		Model (when to expect the event)
Berries					
Tarnished plant bug (strawberries)	12.1°C	April 1	1st nymphs in strawberries		30–40 DDC
Spotted wing drosophila[1]	10°C	January 1	overwintering generation	peak egg laying by overwintering females, 1st adult emergence	283 DDC
			1st generation	peak adult emergence	419 DDC
			2nd generation	peak adult emergence	694 DDC
			3rd generation	peak adult emergence	968 DDC
			4th generation	peak adult emergence	1243 DDC

[1] Coop, L. and Dreves, A.J. 2013. Predicting when spotted wing drosophila begins activity using a degree-day model. Oregon State University. Retrieved online at http://whatcom.wsu.edu/ipm/swd/documents/Article_DDModel.pdf.

Degree-Days Celcius are either accumulated from a set start date, such as April 1, or from a specific event known as a biofix. A biofix is a biological event or indicator of a developmental event, that initiates the beginning of DDC calculations. A common biofix used for insects is the first sustained catch in pheromone traps. Using a biofix provides predictions that are more accurate and requires tracking temperatures over a shorter period.

There are several limitations to degree-days models:

- Factors such as humidity, light intensity and rainfall also affect pest development. As a result, DDC predictions are only estimates of pest development. Verify these predictions with field observations.
- Temperatures used to determine DDC must represent the environment where organisms develop. Use weather data collected from within a mile or less of the actual orchard or field being monitored. Site specific information can be obtained by using data loggers. Ventilated heat shields should be used with temperature sensors data loggers to ensure accurate air temperatures. Place data loggers at locations in the crop where the pest is normally active.
- DDC models have been developed and validated for only a few fruit pests in Ontario.

Managing Pest Resistance

Pest Resistance to Fungicides, Insecticides and Miticides

Random natural mutation may result in a small proportion of a population that is resistant to a particular chemical, or group of chemicals, with similar modes of action. When a population is exposed to a pesticide, the resistant individuals survive and the susceptible individuals are killed. The resistant survivors then multiply and pass their resistant traits on to the next generation. When the same pesticide is applied again, the proportion of resistant individuals increases, replacing the susceptible ones in the population. Once the resistant population dominates, the pesticide has lost efficacy. A pest population is considered resistant when it is able to survive exposure to rates of a pesticide that previously controlled it.

Resistance to one pesticide can result in resistance to a different pesticide or a group of pesticides, where pesticides have similar action sites. This is called **cross-resistance**. It develops when exposure to one pesticide causes selection for resistance in other related ones and is the result of a single mechanism or genetic mutation.

Multiple resistance involves 2 or more mechanisms acquired independently through exposure to pesticides with different action sites. Pests with multiple resistance are resistant to pesticides from 2 or more groups at the same time.

Multiple resistance and **cross-resistance** create serious challenges to the success of integrated resistance management strategies.

Pest control failures are not necessarily caused by resistance. Factors such as product selection, timing, rate, spray coverage, spray water pH and weather conditions also affect the success or failure of a pesticide application.

Assessing Resistance Risk

The development of resistance depends on characteristics of both the pest and the group of pesticides involved, as well as the way in which pesticides are used. Table 2–2. *Factors Favouring the Development of Resistance* describes situations where resistance is most likely to occur.

Resistance can develop very quickly for some pesticides. If a product is prone to resistance, do not use the product repeatedly unless it is used in rotation or in combination with products from a different group.

Resistance Management Strategies

Resistance management strategies include rotating products from different groups and limiting the total number of applications from a single group within a growing season. Specific knowledge is required for growers to manage resistance effectively.

General Resistance Management Strategies

- Follow an integrated pest management program that makes use of a variety of different pest control strategies, including resistant varieties when available, monitoring, crop rotation and cultural, biological and chemical control options.
- Spray only when necessary. Use established thresholds and disease prediction models where available.
- Do not use pesticides at levels below label rates.
- Use adequate water volumes to deliver the pesticide to all tissues.
- Spray at the best timing for the pest and the product you are using.
- Make each spray application count. Be sure the sprayer is calibrated, the correct rate is applied and spray coverage is complete.
- Read the product label. New products include resistance management recommendations on the label.
- Know the active ingredient of a pesticide. Many chemicals with the same active ingredients are marketed under different brand names. For example, the insecticide spinosad is marketed under different brand names including Success and Entrust.
- Know the product group. Choose products from different groups when possible in your spray rotation. For example, both Assail and Admire are in the same insecticide group (Group 4A). To use Assail after Admire is equivalent to using Assail after Assail, since resistance to both chemicals develops in the same way.
- For a list of groups and their modes of action, see Table 2–3. *Fungicide/Bactericide Groups*, Table 2–4. *Insecticide/Miticide Groups* or the "Products Used On" tables at the end of each crop calendar.
- In addition to these general resistance management strategies for all products, more specific strategies have been developed for fungicides, insecticides and miticides.

Table 2–2. Factors Favouring the Development of Resistance

Pests most likely to develop resistance	Pesticides or use patterns where resistance is likely to develop
• have a prolific life cycle, with many generations per year, produce lots of spores, or multiply very quickly • have a pre-existing resistance to other products in the same group • do not migrate between crops/regions, so gene pool is not diluted	• are used repeatedly or have persistent residues, exposing many generations or life stages to these residues • are toxic to beneficial insects as well as the pest • have a specific mode of action that works on a single site • are used at deficient rates or improper times

Managing Resistance to Fungicides

- Know the fungicide groups. Over a season, choose fungicides from different groups whenever possible.
- Limit the total number of applications, and the number of sequential applications, of a particular fungicide group per season. Look for specific resistance management strategies on the product label.
- Know which disease is targeted by which fungicide group. For combination products, know which fungicide component is controlling which disease.
- Apply fungicides before disease occurs. Wherever possible, follow disease prediction models. Applications of fungicides after the disease is established are more likely to select for resistant populations of the pathogen.
- Make use of Group M fungicides. These fungicides are known as multi-site inhibitors (Table 2–3. *Fungicide/Bactericide Groups*). They affect a wide range of metabolic processes in fungi and are less prone to the development of resistance. While there is no significant risk of resistance development, integrated resistance management should still be applied. For example, bacteria causing fire blight or blister spot can develop resistance to copper products.
- Tank-mix products from different groups, where permitted. Wherever possible, one of the tank-mix partners should be a fungicide from Group M, with a multi-site mode of action (This is an accepted resistance management strategy for fungicides, although not recommended for insecticides).

Resistance management strategies by fungicide group and disease for Ontario berry crops

The suggested strategies for preventing fungicide resistance were developed using the recommendations of the Fungicide Resistance Action Committee (FRAC), which is a working group of Crop Life International. They were then adapted specifically for Ontario based on:

- the resistance risk of the pathogen to a particular fungicide group
- the number of rotational options registered for use at the time

Two components of a resistance management strategy for a fungicide group are limiting the number of consecutive applications before rotating to a different group and observing a maximum number of applications per season. These strategies reduce the risk for resistance development and may be more stringent than label guidelines.

- For high-risk pathogens with fungicide options from many groups, rotation to a different group is advisable after a single application of a resistance-prone fungicide, although this is not necessarily required by the label.
- For pathogens controlled by only a few registered fungicide groups, use no more than 2 consecutive applications of a resistance-prone fungicide and then alternate to a different fungicide group.

When a product contains active ingredients from more than one group, each application counts as a single use for each group. For example, one application of Pristine counts as a single use of boscalid (Group 7) and a single use of pyraclostrobin (Group 11).

In some cases, a single fungicide group can control more than one pathogen. In this case, the maximum number of consecutive and total applications per season should be based on the pathogen with the highest risk of developing resistance.

Solo products have one active ingredient. Combination products have more than one active ingredient and are indicated with an asterisk (*).

Group 1: Senator

For botrytis grey mould and common leaf spot, tank-mix with a Group M fungicide, where permitted.

*Group 3: Bumper, Fitness, Fullback, Funginex, Fungtion *, Indar, Inspire Super *, Jade, Mettle, Nova, Princeton, Proline, Propulse *, Quadris Top *, Quash, Quilt **

For powdery mildew, use no more than 2 consecutive applications then rotate to a different fungicide group. Use fungicides from this group no more than 4 times per season.

For mummy berry, tank-mix with a Group M fungicide, where permitted. Use no more than 2 consecutive applications then rotate to a different fungicide group.

See group 11 for recommendations for Quadris Top * use.

*Group 7: Cantus, Fontelis, Kenja, Luna Sensation *, Luna Tranquility *, Miravis Prime *, Pristine *, Propulse *, Sercadis*

For botrytis grey mould, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo or mixture product from this group. See Group 11 for recommendations for Pristine use.

*Group 9: Inspire Super *, Luna Tranquility *, Scala, Switch **

For botrytis grey mould and anthracnose, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo or mixture product from this group.

*Group 11: Azoshy, Cabrio, Flint, Fungtion *, Intuity, Luna Sensation *, Pristine *, Quadris, Quadris Top *, Quilt *, Tanos **

For botrytis grey mould, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo product from this group or no more than 50% of total fungicides applied per season if using combination products.

For anthracnose fruit rot, use once then rotate to a different fungicide group. Resistance to Group 11 fungicides has recently been confirmed in strawberry anthracnose fruit rot populations in Ontario. Tank-mix with a Group M fungicide, where permitted, to expand the spectrum of disease control.

Avoid using Group 11 products in strawberries with resistance.

*Group 12: Miravis Prime *, Scholar, Switch **

For botrytis grey mould and strawberry anthracnose fruit rot, use no more than 2 consecutive applications of Switch then rotate to a different fungicide group. No more than 50% of total fungicides applied per season should include a product from this group.

Group 17: Elevate

For botrytis grey mould, use once then rotate to a different fungicide group. Use no more than 2 times per season.

Group 50: Property

For powdery mildew, use no more than 2 consecutive applications then rotate to a different fungicide group.

Table 2–3. Fungicide/Bactericide Groups

Group	Chemical Group	Product Name	Active Ingredient	Resistance Risk[1]
1	MBC (methyl benzimidazole carbamates)	Senator 50 SC	thiophanate-methyl	High
3	DMI (demethylation inhibitors) Note: sometimes referred to as sterol inhibitors (SI)	Bumper 432 EC	propiconazole	Medium
		Fullback 125 SC	flutriafol	Medium
		Fitness	propiconazole	Medium
		Funginex DC	triforine	Medium
		Fungtion SC	propiconazole * + azoxystrobin	Medium
		Indar	fenbuconazole	Medium
		Inspire Super	difenoconazole * + cyprodinil	Medium
		Jade	propiconazole	Medium
		Mettle 125 ME	tetraconazole	Medium
		Nova	myclobutanil	Medium
		Princeton	propiconazole	Medium
		Proline 480 SC	prothioconazole	Medium
		Propulse	fluopyram + prothioconazole *	Medium
		Quadris Top	azoxystrobin + difenoconazole *	Medium
		Quash	metconazole	Medium
		Quilt	propiconazole * + azoxystrobin	Medium
4	PA (phenylamides)	Ridomil Gold 480 SL	metalaxyl	High
7	SDHI (succinate dehydrogenase inhibitors)	Cantus WDG	boscalid	Medium – High
		Fontelis	penthiopyrad	Medium – High
		Kenja 400 SC	isofetamid	Medium – High
		Luna Tranquility	fluopyram * + pyrimethanil	Medium
		Luna Sensation	fluopyram* + trifloxystrobin	Medium – High
		Miravis Prime	pydiflumetofen* + fludioxonil	Medium – High
		Pristine WG	boscalid * + pyraclostrobin	Medium – High
		Propulse	fluopyram* + prothioconazole	Medium
		Sercadis	fluxapyroxad	Medium – High
		Velum Prime	fluopyram	Medium – High
9	AP (anilinopyrimidines)	Inspire Super	difenoconazole + cyprodinil *	Low
		Luna Tranquility	fluopyram + pyrimethanil *	Medium
		Scala SC	pyrimethanil	Medium
		Switch 62.5 WG	cyprodinil * + fludioxonil	Low

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Host plant defence inducers * indicates the active ingredient (a.i.) that puts it in this group.

[1] According to Fungicide Resistance Action Committee (FRAC) Visit frac.info and search "FRAC Code List 2020".

Table 2–3. Fungicide/Bactericide Groups (cont'd)

Group	Chemical Group	Product Name	Active Ingredient	Resistance Risk[1]
11	QoI (quinone outside inhibitors) Note: strobilurins belong in this group, but not all QoI are strobilurins	Azoshy 250 SC	azoxystrobin	High
		Cabrio EG	pyraclostrobin	High
		Flint	trifloxystrobin	High
		Fungtion SC	propiconazole + azoxystrobin *	Medium
		Intuity	mandestrobin	High
		Luna Sensation	fluopyram + trifloxystrobin *	Medium – High
		Pristine WG	boscalid + pyraclostrobin *	Low – Medium
		Quadris Flowable	azoxystrobin	High
		Quadris Top	azoxystrobin + difenoconazole*	Medium
		Quilt	propiconazole + azoxystrobin *	Medium
		Tanos 50 DF	cymoxanil + famoxadone *	Medium
12	PP (phenylpyrroles)	Miravis Prime	pydiflumetofen + fludioxonil *	Low – Medium
		Scholar 230 SC	fludioxonil	Medium
		Switch 62.5 WG	cyprodinil + fludioxonil *	Medium
17	Hydroxyanilide	Elevate 50 WDG	fenhexamid	Unknown
19	Polyoxin	Diplomat 5 SC	polyoxin D zinc salt	Medium
21	QiI (quinone inside inhibitors)	Torrent 400 SC	cyazofamid	Medium – High
24	Antibiotic	Kasumin 2L	kasugamycin	Medium
27	Cyanoacetamide oxime	Tanos 50 DF	cymoxanil * + famoxadone	Low – Medium
29	2,6-dinitroaniline	Allegro 500 F	fluazinam	Low
46	Cell membrane disruption	Timorex Gold	tea tree oil	Low
50	Arylphenyl-ketones	Property 300 SC	pyriofenone	Medium
BM1	Polypeptide	Fracture	BLAD Polypeptide	Low
		ProBLAD	BLAD Polypeptide	Low
BM2	Microbial	Double Nickel LC, Double Nickel 55	*Bacillus amyloliquefaciens* strain D-747	Low
		Serenade OPTI	*Bacillus subtilis* strain QST 713	Low
M1	Inorganic	Copper 53 W	tri-basic copper sulphate	Low (except bacterial pathogens)
		Cueva	copper octanoate	Low (except bacterial pathogens)
M2	Inorganic	Cosavet Edge DF	sulphur	Low
		Kumulus DF	sulphur	Low
		Lime Sulphur	lime sulphur	Low
		Microscopic Sulphur WP	sulphur	Low
		Microthiol Disperss	sulphur	Low

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Host plant defence inducers * indicates the active ingredient (a.i.) that puts it in this group.

[1] According to Fungicide Resistance Action Committee (FRAC) Visit frac.info and search "FRAC Code List 2020".

Table 2–3. Fungicide/Bactericide Groups (cont'd)

Group	Chemical Group	Product Name	Active Ingredient	Resistance Risk[1]
M3	Dithiocarbamate	Ferbam WDG	ferbam	Low
		Granuflo T	thiram	Low
		Ridomil Gold MZ 68 WG	metalaxyl + mancozeb *	Low
M4	Phthalimide	Folpan 80 WDG	folpet	Low
		Maestro 80 WSP	captan	Low
		Supra Captan 80 WSP	captan	Low
M5	Chloronitrile	Bravo ZNC	chlorothalonil	Low
		Echo NP	chlorothalonil	Low
NC	Bicarbonate	MilStop	potassium bicarbonate	Low
		Sirocco	potassium bicarbonate	Low
	Biological	Actinovate SP	*Streptomyces lydicus*	Low
		Botector	*Aureobasidium pullulans*	Low
	Oil	Purespray Green Spray Oil 13 E	mineral oil	Low
		Vegol Crop Oil	canola oil	Low
P5	Plant extract	Regalia Maxx	*Reynoutria sachalinensis* extract	Unknown
P7	Phosphonate	Aliette WDG	fosetyl al	Low
		Confine Extra	mono- and dipotassium salts of phosphorous acid	Low
		Phostrol	mono- and dibasic sodium, potassium and ammonium phosphites	Low
		Rampart	mono- and dipotassium salts of phosphorous acid	Low

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Host plant defence inducers * indicates the active ingredient (a.i.) that puts it in this group.

[1] According to Fungicide Resistance Action Committee (FRAC) Visit frac.info and search "FRAC Code List 2020".

Managing Resistance to Insecticides and Miticides

- Know the insecticide groups. Rotate products from different groups. Avoid sequential applications of the same group or repeated use of any insecticide or group of insecticides.
- For insects with multiple, discrete generations (e.g., obliquebanded leafroller) manage each generation as separate units or "treatment windows". Use products from a single insecticide group to manage a given generation of a pest. If the pest emergence or activity of that generation is prolonged, apply a second application of the same product. This exposes each generation to only one group. Rotate to another insecticide group (or groups) for subsequent generations.
- For pests whose populations build quickly and with multiple, overlapping generations (e.g., aphids, mites), rotate between products in different insecticide groups for each spray.

- Avoid unnecessary or repeated applications of miticides and rotate among products in different groups. Many labels limit the number of applications of a product to one per season. Consider a multi-year rotation of miticides, so that mites are not exposed to products with a similar mode of action more frequently than once every 3–4 years.
- Consider annual delayed dormant oil or summer oils to suppress mite, aphid or scale populations and reduce the need for miticides when numbers exceed the treatment threshold(s).
- Time sprays to contact the most susceptible life stage of the pest. Consider the time of day when the pest is most active and location in the crop to maximize exposure with the treatment.
- Use mixtures with caution. Tank-mixes and pre-formulated mixtures are pest management tools, not insecticide resistance management tools. Mixtures can provide a broader range of target pest control; however, their repeated use increases the probability that the target pest population(s) will develop multiple resistances. Alternating or rotating among products with one active ingredient, rather than mixing them, is the preferred strategy for insecticides and miticides in most situations.
- Use regional or area-wide tactics rather than crop-by-pest management for cross-commodity pests, such as spotted wing drosophila.
- Encourage biological control by choosing pesticides less harmful to beneficial insects and by landscaping to provide flowering plants and unsprayed habitat for these natural enemies. This may reduce the need for insecticides or miticides, particularly those targeting indirect pests such as aphids and mites.
- Monitor problematic pests to detect shifts in sensitivity to a group of pesticides.

Resistance management strategies by insecticide group for Ontario berry crops

Solo products have one active ingredient. Combination products have more than one active ingredient and are indicated with an asterisk (*).

Group 1A & 1B: Cygon, Diazinon, Imidan, Lagon, Malathion, Orthene, Pyrinex, Sharphos, Sevin, Vydate, Warhawk

Resistance to these older, broad-spectrum insecticides has occurred in various fruit pest populations in Ontario. Documented cases include resistance to organophosphates in spotted tentiform leafminer, and codling moth on apples, obliquebanded leafroller on apples and pears, pear psylla on pears, and oriental fruit moth on peaches, nectarines, pears and apples. Repeated use (more than once per season) is discouraged because of the potential for further resistance development and toxicity to beneficial insects and mites.

Group 3: Danitol, Decis, Labamba, Matador, Poleci, Pyganic, Silencer, Up-Cyde

Documented cases of resistance in populations of obliquebanded leafroller on apples have been found. Repeated use (more than once per season) is discouraged because of the potential for further resistance development and toxicity to beneficial insects and mites.

*Group 4: 4A – Aceta, Actara, Admire, Alias, Assail, Cormoran *, 4D – Sivanto Prime*

Compounds from these subgroups are structurally distinct but share the same mode of action. The risk of cross-resistance between subgroups is considered low. However, where alternatives are available, rotate with other groups. If only Group 4 insecticides are registered against the pest but more than one subgroup is included, rotate between subgroups only if it is clear that cross-resistance does not exist in the target populations.

Group 5: Delegate, Entrust, GF-120, Scorpio, Success

Resistance in western flower thrips to this group is known in greenhouse crops and could also be present in outdoor crops.

Group 11: Bioprotec, Dipel, Foray

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Group 15: Rimon, Cormoran *

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Group 18: Confirm, Intrepid

Documented cross-resistance between organophospate insecticides and the growth regulators, Confirm and Intrepid, has been found in some obliquebanded leafroller and codling moth populations, respectively, in Ontario. Where resistance is suspected for obliquebanded leafroller or codling moth, do not use Group 18, 1A or 1B.

Group 28: Altacor, Exirel, Harvanta

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Resistance management strategies by miticide group for Ontario fruit crops

Group 6: Agri-Mek

There are no documented cases of resistant mite populations in Ontario to this group. Use resistance management principles. Apply this product early before threshold numbers are reached.

Group 10: Apollo

Isolated cases of mite resistance to Apollo have been found in Ontario. Resistance has occurred where Apollo has been applied repeatedly in one season or applied too late in the season. To delay resistance to Apollo, do not use Apollo every year. Apply Apollo when the mite population is synchronous and in the first summer-generation egg stage.

Group 20B, 20D, 21 & 25: Acramite, Kanemite, Nexter, Nealta

There are no documented cases of resistant mite populations in Ontario. Use resistance management principles.

Group 23: Envidor, Movento, Oberon

There are no documented cases of resistant mite populations in Ontario. Use resistance management principles. These products work slowly, so patient and careful monitoring is needed to assess the results.

Table 2–4. Insecticide/Miticide Groups

Group	Type of Action	Chemical Sub-group or Exemplifying Active Ingredient	Product Name	Active Ingredient
1	nerve	1A[1] Carbamates	Sevin XLR	carbaryl
			Vydate L	oxamyl
		1B[1] Organophosphates	Cygon 480-AG	dimethoate
			Diazinon 500 E	diazinon
			Imidan WP	phosmet
			Lagon 480 E	dimethoate
			Malathion 85 E	malathion
			Orthene 75% SP	acephate
			Pyrinex 480 EC	chlorpyrifos
			Sharphos	chlorpyrifos
			Warhawk 480 EC	chlorpyrifos
3	nerve	3A Pyrethroids Pyrethrins	Danitol	fenpropathrin
			Decis 5 EC, Decis 100 EC	deltamethrin
			Labamba 250 SC	lambda-cyhalothrin
			Matador 120 EC	lambda-cyhalothrin
			Poleci 2.5 EC	deltamethrin
			Pyganic EC 1.4 II	pyrethrins
			Silencer 120 EC	lambda-cyhalothrin
			Up-Cyde 2.5 EC	cypermethrin
4	nerve	4A Neonicotinoids	Aceta 70 WP	acetamiprid
			Actara 25 WG	thiamethoxam
			Admire 240 Flowable	imidacloprid
			Alias 240 SC	imidacloprid
			Assail 70 WP	acetamiprid
			Cormoran	novaluron + acetamiprid *
		4D Butenilides	Sivanto Prime	flupyradifurone
5	nerve	Spinosyns	Delegate	spinetoram
			Entrust	spinosad
			GF-120 Fruit Fly Bait	spinosad
			Scorpio Ant and Insect Bait	spinosad
			Success	spinosad
6	nerve and muscle	Avermectins	Agri-Mek SC	abamectin

* Indicates the active ingredient (a.i) that puts it in this group.

[1] All members of Group 1 may not be cross-resistant, although they share the same primary target site and mode of action. For this reason, Group 1 is divided into sub-groups Group 1A and 1B, each with different mechanisms of resistance. Assume that cross-resistance exists between pesticides in each sub-group, but that rotation of pesticides between sub-groups is an acceptable part of a resistance management program.

Table 2–4. Insecticide/Miticide Groups (cont'd)

Group	Type of Action	Chemical Sub-group or Exemplifying Active Ingredient	Product Name	Active Ingredient
11	disrupt midgut membrane	11A B.t. microbial (and the insecticidal proteins they produce)	Bioprotec PLUS	*Bacillus thuringiensis var. kurstaki*
			Dipel 2X DF	*Bacillus thuringiensis var. kurstaki*
			Foray 48 BA	*Bacillus thuringiensis var. kurstaki*
15	growth regulation	Benzoylureas	Rimon 10 EC	novaluron
			Cormoran	novaluron * + acetamiprid
10	growth regulation	10A Clofentezine	Apollo SC	clofentezine
18	growth regulation	Diacylhydrazine	Confirm 240 F	tebufenozide
			Intrepid 240 F	methoxyfenozide
20	energy metabolism	20B Acequinocyl	Kanemite 15 SC	acequinocyl
		20D Bifenzate	Acramite 50 WS	bifenzate
21	energy metabolism	21A Mitochondrial complex I electron transport inhibitors (METI)	Nexter	pyridaben
23	lipid synthesis, growth regulation	Tetronic and tetramic acid derivatives	Envidor 240 SC	spirodiclofen
			Movento 240 SC	spirotetramat
			Oberon Flowable	spiromesefin
25	energy metabolism	Beta-ketonitrile derivatives	Nealta	cyflumetofen
28	nerve and muscle	Diamides	Altacor	chlorantraniliprole
			Exirel	cyantraniliprole
			Harvanta 50 SL	cyclaniliprole
29	nerve	Chordotonal organ modulators - undefined target site	Beleaf 50 SG	flonicamid

* Indicates the active ingredient (a.i) that puts it in this group.

[1] All members of Group 1 may not be cross-resistant, although they share the same primary target site and mode of action. For this reason, Group 1 is divided into sub-groups Group 1A and 1B, each with different mechanisms of resistance. Assume that cross-resistance exists between pesticides in each sub-group, but that rotation of pesticides between sub-groups is an acceptable part of a resistance management program.

Handling and Mixing Pesticides

Water Volume and Coverage

When the pesticide label does not prescribe a water volume or concentration, the sprayer operator must decide the appropriate volume. Use sufficient water to disperse or dissolve the product and create enough spray to contact all target surface(s) with minimal runoff. The degree of contact is called *coverage,* which is a combination of the percent surface area covered and the droplet density on that surface. The operator must consider the following factors when choosing a volume:

- *The level of coverage required reflects the product's mode-of-action.* For example, a contact product generally requires a higher droplet density than a locally systemic product (which has limited translocation in plant tissues). A miticide intended to saturate bark is a dilute application that often incurs runoff. Plant growth regulators have very specific coverage requirements and should not be generalized.
- *The location and nature of the target.* For example, if the target is a mobile insect found predominately on the upper-side of the leaf, it may be controlled with less water than a disease found deep in the plant canopy. Further, the orientation and surface texture of the target will affect how spray is retained and how it spreads.
- *The impact of environmental conditions, sprayer design and the crop size, density and developmental stage.* For example, the more plant canopy to be protected per hectare, the more water volume will be required. More volume is required when sprayer air is poorly adjusted, the weather is dry and/or windy and the distance-to-target is long or convoluted (such as deep in unpruned canopies).

To understand the relationship between water volume and coverage, the sprayer operator requires a feedback mechanism. Visual inspection of foliar "wetness" or spray residue is subjective and transient, and therefore insufficient. Water-sensitive papers distributed within the target canopy provide a fast, repeatable and quantifiable means for evaluating coverage. Most conventional foliar products require minimal coverage of 10-15% with a droplet density of 85 droplets/cm^2.

Smartphone apps such as the GRDC's SnapCard (https://www.agric.wa.gov.au/grains/snapcard-spray-app) quickly calculate and record spray coverage for future consideration in light of the level of protection achieved.
For more information on quantifying coverage, see Sprayers101.com (www.sprayers101.com) and use the keyword "coverage" in the search engine. Download a copy of *Airblast 101, A Handbook of Best Practices in Airblast Spraying* on the Sprayers 101 website (https://sprayers101.com/airblast101/).

General Mixing Steps

1. *Read all product labels.* Know the product formulation (which affects mixing method and order). Look for information about the influence of water pH, hardness and any requirement for adjuvants. Defer to label instructions should they differ from these mixing steps.

2. *Shake any liquid products.* This ensures the active ingredient and inert ingredients are thoroughly mixed.

3. *Add water to the tank.* For water, fill the tank 50% with the required volume. For oil, fill the tank 75%.

4. *Agitate.* Agitation should continue through the mixing process. Excessive agitation may create foaming. If possible, reduce the level of agitation or use a defoamer adjuvant (50% of which should be added during step 3, and the remainder during step 7.)

5. *Add products in order.* The formulation type dictates the order in which tank-mix partners should be added (see *Product Order by Formulation* below). If using an inductor, flush with water between additions.

6. *Wait and check.* Dry products and water-soluble packets must fully disperse and/or dissolve before adding the next product. Several factors affect the duration, but 3–5 minutes is typical.

7. *Add remaining water.*

8. *Measure pH.* This is best done after all products are added to account for their impact on pH and buffering capacity. If required, pH adjusters can be added at the end of mixing to ensure the solution is in the range required by the label.

Product Order by Formulation

1. *Dry Formulations.* These include water dispersible granules (WDG or WG), wettable powders (WP) and soluble granules (SG). Allow more time for these products to dissolve and/or disperse completely. Best practice is to premix these products with water in a slurry before adding to the tank.

2. *Anti-drift adjuvants, compatibility agents or anti-foamers.* Consult labels as these products may require multiple additions or a different order than indicated here.

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

Water Soluble Packaging

Water-soluble packaging (WSP) is often used for dry formulations. The PVA (polyvinyl alcohol) packaging should dissolve completely when added directly to the tank water (not the basket filter). Protect them from moisture by leaving them in outer packing until just before use and do not handle them with wet gloves. Reseal them to protect remainder.

Do not mix WSP with any product incompatible with the PVA packaging. This includes residues from prior applications.

- Oils (e.g., Superior Oil)
- Emulsifiable Concentrate (EC) formulations containing mineral or vegetable oil
- Boron
- Chelated micronutrients
- Water-soluble fertilizers

Compatibility of Spray Materials

Tank-mixing is adding more than one formulated product in the tank at the same time for efficiency, resistance management and improved performance. However, the odds of incompatibility increase with the number of tank-mix partners.

Physical incompatibility can result in the solution thickening, foaming, separating or falling out of suspension, which in turn leads to poor coverage uniformity or plugged / damaged spray equipment. Chemical incompatibility (i.e. antagonism or synergy) can result in reduced pesticide efficacy or cause plant injury when sprayed on the crop.

For information on compatibility, always check the product label, product manufacturer or distributor. Do not decide on tank-mixes during loading; do so off-season. Before tank-mixing pest control products, ensure the following:

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

Registered product labels can be downloaded through Health Canada's label search webpage at http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php. Using the search function <ctrl> + F, search for the following keywords:

- Do not mix
- Mix
- Hours
- Agitation
- The trade name of any intended tank-mix partner

To avoid well-known tank-mix incompatibilities, do the following:

- Add Captan or Maestro before Emulsifiable Concentrate (EC) formulations of pyrethroids. Apply immediately with constant agitation.
- Do not mix pesticides with lime sulphur or streptomycin.
- Although not technically a tank-mix incompatibility, do not use oil sprays within 14 days of Captan or Maestro, including the oil used with Agri-Mek.

Jar Test for Pesticide Compatibility

If labels do not include compatibility, or you are considering a new tank-mix, use a *Jar Test* to test physical incompatibility. Note, this will not reveal a chemical incompatibility (which can affect efficacy). When performing a jar test, do so in a safe and ventilated area, away from sources of ignition, and always wear personal protective equipment (PPE).

1. Measure 500 mL of water into a 1 litre glass jar. Be sure to use the same water at the same temperature used in the sprayer.

2. Add ingredients according to Table 2–5. T*ank-Mix Order for Pesticide Compatibility Test*, stirring after each addition.

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

4. Keep records and retain the jars for the season. They may indicate products prone to settling or separating after prolonged rest (e.g. parking the sprayer overnight). They may also indicate potential problems during re-suspension or cleanout.

If you experience a physical incompatibility issue in the sprayer, do not immediately add water, ammonia, non-ionic surfactants or detergents to the tank. This may create further problems. First, contact the manufacturer or dealer for more information. Then, perform a Reverse Jar Test by sampling the solution and attempting to break down a small volume before doing so in the sprayer. If you succeed in re-suspending the solution, it may no longer be viable and must be safely discarded.

Table 2–5. Tank-mix Order for Pesticide Compatibility Test

Order	Ingredient	Quantity for 500 mL or 500 g of Product Labeled for 1,000 L of Final Spray Volume
1	Compatibility agents	5 mL (1 teaspoon)
2	Water-soluble packets, wettable powders and dry flowables. Include a ~1cm^2 cutting of the PVA packaging.	15 g (1 tablespoon)
3	Liquid drift retardants	5 mL (1 teaspoon)
4	Liquid concentrates, micro-emulsions and suspension concentrates	5 mL (1 teaspoon)
5	Emulsifiable concentrates	5 mL (1 teaspoon)
6	Water-soluble concentrates or solutions	5 mL (1 teaspoon)
7	Remaining adjuvants and surfactants	5 mL (1 teaspoon)

Spray drift

Do you know what pesticide drift looks like or what you can do about it? OMAFRA and CropLife Canada have created two short videos with innovative visual demonstrations using dyes and night-spraying to show what drift actually looks like. See how spray particles behave and discover what changes can be made to your spray program to greatly reduce the risk of pesticide drift. Learn more at ontario.ca/spraydrift.

If there is a spray drift issue, please contact the Ministry of Environment, Conservation and Parks. The local District Office contact information can be found on Info Go at http://www.infogo.gov.on.ca/infogo/home.html#orgProfile/-270/en.

After business hours, please contact the Pollution Hotline at 1-866-MOE-TIPS (1-866-663-8477).

For more information on pesticide handling and operator safety, consult the Ontario Pesticide Education Program (OPEP) Grower Pesticide Safety course (www.opep.ca/resources).

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They can improve pesticide performance by modifying the spray pattern, quality, uptake and penetration into the plant or insect exoskeleton. Other benefits to adjuvants may include:

- Keep pesticide from binding to minerals suspended in water.
- Adjust water pH so pesticide is less likely to break down.
- Manipulate droplet size to reduce on-target and off-site movement of pesticide.
- Improve odds that a spray droplet will stay on the target by reducing factors that cause droplets to bounce and roll off.
- Modify or reduce surface tension to enhance the ability of a droplet to be retained on or spread across the target surface.
- Minimize spray droplet evaporation.
- Prevent spray deposit from being washed off the leaf surface.
- Protect the droplet from degrading in sunlight.
- Improve pesticide's absorption and uptake by the plant or insect exoskeleton.

Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them. However, if use of an adjuvant is stated on the product label, pesticide performance and efficacy can be significantly reduced if it is not included. There are many types of adjuvants which include:

- surfactants / wetter-spreaders (e.g., non-ionic surfactant, including organosilicones)
- stickers / spreader-sticker (e.g., kaolin clay)
- oil concentrates (e.g., petroleum-based crop oil, modified/methylated seed oils)
- water conditioning agents
- evaporation retardants
- anti-foaming agents
- pH adjusters (e.g., acidifiers, buffering agents)
- drift suppressing agents

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 and in combination with the pesticide being applied. Always use adjuvants as directed on the product label. For specific adjuvants, consult your local input retailer or product registrant.

General cautions around the use of adjuvants include:

- Avoid the use of adjuvants that help with penetration into plant tissue with copper, sulphur or captan fungicides. This includes the use of oils. Penetrants should not be used with contact or surface pesticides.
- Avoid adjuvants with sticker activity that could impede movement of systemic pesticides in plant tissue.

- Avoid adjuvants with sticker activity early in the growing season when redistribution is important to protect newly emerging leaves. However, this may be a desirable characteristic during wet springs.

For more information on adjuvants, see the Sprayers 101 website at sprayers101.com, or Table 2-6. *Adjuvants Used in Ontario.*

Table 2–6. 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 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. Always read product labels closely for additional precautions around product compatibility with surfactants or crop oils. Contact the registrant for more information on using adjuvants. It is recommended that a small area be tested to demonstrate safety to fruit and leaves before using in large areas. For more information on adjuvants, see sprayers101.com or Purdue Extension, Adjuvants and the Power of the Spray at 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	• wetter-spreader • compatible with most pesticides[1] • helps pesticide penetrate plant cuticle
Hasten NT Spray Adjuvant	28277	vegetable oil	• Helps pesticide penetrate plant cuticle or insect exoskeleton
Ipco Ag-Surf	15881	non-ionic surfactant	• wetter-spreader • compatible with most pesticides[1] • helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	• wetter-spreader • compatible with most pesticides[1] • helps pesticide penetrate plant cuticle • additional properties: pH adjuster, sticker
MSO Concentrate with Leci-Tech	28385	methylated seed oil	• Helps pesticide penetrate plant cuticle
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	• helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	• wetter-spreader • helps pesticide penetrate plant cuticle • reduces surface tension • improves rainfastness

[1] Check product label for precautions around surfactant compatibility before using.

3. Berry Crop Protection Calendars

Blueberry

In this section:

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Blueberry Calendar

Consult the product label for suggested water volumes. For mature highbush blueberries, use 700–1,000 L of water per ha unless otherwise noted on the label. For preharvest interval, restricted entry interval (REI) and maximum number of applications, see Table 3–2. *Products Used on Blueberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–3. *Activity of Fungicides on Blueberry Diseases and Impact on Honeybees*, and Table 3–4. *Activity of Insecticides on Blueberry Pests and Impact on Honeybees* 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 N° 1, Spécial phytoprotection bio. 18 juin 2020,* 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to blueberries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–3. *Activity of Fungicides on Blueberry Diseases and Impact on Honeybees*, and Table 3–4. *Activity of Insecticides on Blueberry Pests and Impact on Honeybees*.

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–1. Blueberry Calendar

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Dormant (late winter)						
Scale	**General Comments:** • Apply when plants are dormant. • Use 1,000–1,500 L water/ha and spray to the point of runoff.					
	M	Lime Sulphur * plus dormant oil	36.7 L/1,000 L water plus 12.5 L/1,000 L water	48 hours	dormant	Do not spray when foliage is wet.
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	dormant	**Lecanium scale only (Purespray Green, Superior Oil).** Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all cultivars. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan or Maestro fungicides. For Purespray Green, do not use within 10 days of Bravo or Echo fungicides. For Superior Oil and Vegol Crop Oil, do not use within 30 days of sulphur. Do not apply Vegol Crop Oil to wet foliage.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	dormant	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Early spring, prior to bud break						
Phytophthora root rot	**General Comments:** • Improve soil water drainage and adjust irrigation schedules to reduce problems with this disease.					
	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	80 days	Apply to the soil surface in a 1-m band centered over the row. Use at least 2,000 L water/ha. Alternatively, use Aliette at **Bud swell to green tip**.
Bud swell to green tip						
Leaf tiers	**General Comments:** • Damage from this occasional pest occurs very early in the season. • If leaf tier was a problem in the past, spray at the bud cluster stage as flower buds begin to swell and pink tissue becomes visible.					
	3	Decis 5 EC or Decis 100 EC or Poleci 2.5 EC	150 mL/ha 75 mL/ha 300 mL/ha	12 hours	14 days	No product specific comments.
Obliquebanded leafroller	**General Comments:** • Where obliquebanded leafroller has been a problem in the past, spray if overwintering larvae are easy to find. • Alternatively, use pheromone traps to monitor for adults and spray for the summer generation at **Green fruit**. • Many of these products are also labelled for spanworms (known as inchworms or loopers) and other caterpillars. See product label for a complete list of registered uses.					
	5	Delegate	200 g/ha	12 hours	3 days	No product specific comments.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	No product specific comments.
	18	Confirm 240 F	1.0 L/ha	12 hours	14 days	No product specific comments.
		Intrepid	0.5 L/ha	12 hours	7 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bud swell to green tip (cont'd)						
Mummy berry (*Monilinia*)	**General Comments:** • Cultivate before bud break to bury overwintering inoculum. • Monitor for trumpet-shaped structures erupting from mummified berries on the ground and spray when these are present. Spray buds and foliage to prevent primary infection of blueberry shoots. • Make the first application when the flower buds swell and repeat until first bloom.					
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours[1]/ 5 days[2]	60 days	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide, where permitted. For Proline use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not use Funginex after **Pink bud**.
		Funginex DC	1.7–3.0 L/ha	12 hours[1]/ 6 days[3]	60 days	
		Indar	140 g/ha	12 hours	30 days	
		Proline 480 SC	315–420 mL/ha	24 hours[1]/ 72 hours[3]	7 days	
		Quash	180 g/ha	12 hours[1]/ 72 hours[2]	7 days	
	3+7	Propulse	750 mL/ha	24 hours[1]/ 72 hours[3]	7 days	No product specific comments.
	3+9	Inspire Super	558–836 mL/ha	12 hours	1 day	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide, where permitted.
	3+11	Fungtion SC or Quilt	1 L/ha	12 hours	30 days	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide, where permitted. Do not tank-mix or make sequential applications with Exirel.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	**Suppression only.** Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	No product specific comments.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**
	BM2	Double Nickel 55	0.5–1 kg/ha	12 hours	0 days	**Suppression only.**
		Serenade OPTI *	2.0–3.3 kg/ha	12 hours	0 days	**Suppression only.**

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bud swell to green tip (cont'd)						
Mummy berry (*Monilinia*) (cont'd)	NC	Actinovate SP	425–840 g/ha	1 hour	—	**Partial suppression only.** For best results, use multiple applications or rotate with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		OxiDate 2.0 *	1.0 % v/v	4 hours or when dry	0 days	**Partial suppression only.** Use sufficient spray mix to thoroughly wet target. Spray to point of run-off. Use 1% v/v (e.g., 10 L/1000 L water). For increased coverage, use a compatible surfactant, where permitted. Do not spray OxiDate 2.0 during conditions of intense heat, drought or poor plant vigor. Avoid application before rain or when winds are gusty. OxiDate 2.0 works best using a solution of neutral pH. Do not apply when bees and beneficial insects are active. Refer to label for specific bee toxicity statements.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products. Apply 0.125% (1.25 L in 1,000 L water) or up to 0.25% (2.5 L in 1,000 L water) in rotation with other fungicides. Will also suppress alternaria fruit rot.
Phytophthora root rot	**General Comments:** • Improve soil water drainage and adjust irrigation schedules to reduce problems with this disease.					
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	Apply in spring when there is 7 cm of new growth and reapply 14–21 days later.
Green tip						
Anthracnose fruit rot, Phomopsis	**General Comments:** • Apply fungicides to prevent twig blights and reduce overwintering inoculum.					
	M	Bravo ZNC or Echo NP	7.2 L/ha 5 L/ha	12 hours[1]/ 72 hours[3]	54 days	Will also control alternaria fruit rot. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	3	Quash	180 g/ha	12 hours[1]/ 72 hours[2]	7 days	**Suppression only (phomopsis).** Control of anthracnose.
	3+9	Inspire Super	1.16–1.48 L/ha	12 hours	1 day	**Anthracnose only.** Use no more than 2 consecutive applications before rotating to a different fungicide group.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Use 1.6 kg/ha for phomopsis stem canker. Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green tip (cont'd)						
Anthracnose fruit rot, Phomopsis (cont'd)	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Anthracnose only. Suppression only.** Not compatible with certain fungicides including Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Reapply as needed on a 7–10-day interval up to harvest. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
		OxiDate 2.0 *	1.0 % v/v	4 hours or when dry	0 days	**Phomopsis only. Partial suppression only.** Use sufficient spray mix to thoroughly wet target. Spray to point of run-off. Use 1% v/v (e.g., 10 L/1000 L water). For increased coverage, use a compatible surfactant, where permitted. Do not spray OxiDate 2.0 during conditions of intense heat, drought or poor plant vigor. Avoid application before rain or when winds are gusty. OxiDate 2.0 works best using a solution of neutral pH. Do not apply when bees and beneficial insects are active. Refer to label for specific bee toxicity statements.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Anthracnose only. Suppression only.** Will also suppress alternaria fruit rot. For best results, use multiple applications or rotate with other products.
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	**Suppression only (phomopsis).** Control of anthracnose. Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	**Anthracnose only. Suppression only.** Apply at 7–21-day intervals.
Mummy berry (Monilinia)	Use one of the products listed for Mummy berry at **Bud swell to green tip.**					
Pink bud						
Phytophthora root rot	P7	Phostrol	2.9–5.8 L/ha	12 hours	0 days	**Suppression only.** May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
Anthracnose fruit rot, Phomopsis	Use one of the products listed for Anthracnose fruit rot and phomopsis at **Green tip.**					
Mummy berry (*Monilinia*)	Use one of the products listed for Mummy berry at **Bud swell to green tip.**					

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Anthracnose fruit rot	**General Comments:** • For anthracnose, most infections occur during bloom to green fruit, especially when weather is warm and wet.					
	3	Quash	180 g/ha	12 hours[1]/ 72 hours[2]	7 days	No product specific comments.
	3+9	Inspire Super	1.16–1.48 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	3+11	Fungtion SC or Quilt	1 L/ha	12 hours	30 days	Rotate with products from different fungicide groups. Do not tank-mix or make sequential applications with Exirel.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** Will also suppress alternaria fruit rot. For best results, use multiple applications or rotate with other products.
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	**Suppression only.** Apply at 7–21-day intervals.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** See comments on this product for Anthracnose at **Green tip**.
Phomopsis	3	Quash	180 g/ha	12 hours[1]/ 72 hours[2]	7 days	**Suppression only.**
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	**Suppression only.** Apply at 14–21-day intervals.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom (cont'd)						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis twig and blossom blight, Botrytis grey mould	**General Comments:** • Apply fungicides for botrytis blight when wet weather occurs. Repeat at 7–10-day intervals through bloom if wet weather continues.					
	M	Ferbam 76 WDG	3.75 kg/1,000 L water	12 hours	40 days	Do not use later than mid-bloom. Ferbam is currently under a phase-out period. The last date of use for growers is **December 14, 2021**.
		Maestro 80 WSP or Supra Captan 80 WSP	2.25 kg/ha	12 hours[1]/ 5 days[4]/6 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis, or Timorex Gold. Restricted entry interval for hand harvest is 5 days.
	3+9	Inspire Super	1.03–1.48 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once and then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–660 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days	Use once and then rotate to a different fungicide group. Will also control powdery mildew.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Use once and then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	7+12	Miravis Prime	0.8–1.0 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with Captan, Maestro or sulphur products. See label for precautions on compatibility.
	BM2	Double Nickel 55	0.5–1 kg/ha	12 hours	0 days	**Suppression only.**
		Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom (cont'd)						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis twig and blossom blight, Botrytis grey mould (cont'd)	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** Not compatible with certain fungicides including Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Reapply as needed on a 7–10-day interval up to harvest. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products. Will also suppress alternaria fruit rot.
Petal fall						
Cherry fruitworm, Cranberry fruitworm	**General Comments:** • Moths lay eggs on developing crop and larvae tunnel into fruit upon hatching. Use pheromone traps to monitor moth activity and to time the spray accurately. • If traps are not used, spray at petal fall and again in 7–14 days. • Apply in a high-volume spray to ensure thorough coverage. • If bloom or bee hives are still present, choose a product with low bee toxicity, such as Dipel, Bioprotec, Altacor or Intrepid for the petal fall spray. Refer to label for bee toxicity statements.					
	1	Malathion 85 E	1 L/ha	48 hours	1 day	Apply at peak trap capture. Reapply at 4–5-day intervals. If cranberry fruitworm is not a problem, use 550 mL/ha for cherry fruitworm.
		Sevin XLR	4 L/ha	5 days[1]/ 9 days[2,4]	2 days	**Cranberry fruitworm only.** Apply at peak trap capture. Reapply 10 days later if trap catches remain elevated. Do not apply during bloom.
	3	Danitol	779–1169 mL/ha	see comments	3 days	**Cherry fruitworm only.** The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
	4A	Aceta 70 WP or Assail 70 WP	160 g/ha	12 hours[1]/ 48 hours[2]	7 days 1 day	Active on eggs and young larvae. Apply when trap captures are increasing or at peak trap capture. Reapply in 10–14 days if trap catches rise again. Maximum 2 applications of products from Group 4A per season.
	4A +15	Cormoran	1.4 L/ha	12 hours	8 days	Reapply in 10–14 days if trap catches rise again. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	11	Bioprotec PLUS * or Dipel 2X DF *	0.9–1.8 L/ha 1.68 kg/ha	4 hours	0 days	Active on young larvae as they emerge from eggs and feed on treated tissue. Spray at first upswing in trap captures and continue at 3–7-day intervals. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	15	Rimon 10 EC	1.35–2.0 L/ha	12 hours	8 days	Active on eggs and young larvae. Spray at first upswing in trap captures and reapply in 10–14 days. May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds. Avoid spraying if bees are visiting the treatment area.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Petal fall (cont'd)						
Cherry fruitworm, Cranberry fruitworm (cont'd)	18	Confirm 240 F	1.2 L/ha	12 hours	14 days	**Cranberry fruitworm only (Intrepid).** Active on eggs and young larvae. Spray at first upswing in trap captures and reapply in 10–14 days.
		Intrepid	0.5 L/ha	12 hours	7 days	
	28	Altacor	215–285 g/ha	12 hours	1 day	**Cranberry fruitworm only (Exirel).** Spray at first upswing in trap catch and reapply in 7–10 days. Do not tank-mix or make sequential applications of Exirel with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	
White-marked tussock moth	**General Comments:** • White-marked tussock moth is a sporadic pest. Larvae devour foliage. • A second generation may require control in late summer.					
	11	Bioprotec PLUS * or Foray 48 BA	2.5 L/ha 4 L/ha	4 hours 12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 2–5 days apart, when larvae are very small, usually just after **Bloom**. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
European chafer (larvae), Japanese beetle (larvae)	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Do not apply during bloom or when bee hives are present. Apply just prior to egg hatch (shortly after adults are active) to damp soil around bushes and to grass-covered areas around blueberry field. Apply in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application but avoid overwatering. Maximum of 1 application per season, at **Petal fall, Green fruit** or **Postharvest**. These products will reduce numbers of white grub larvae but may not provide control. Soil applications of Admire and Alias are under a phase-out. **The last date of use for growers is April 11, 2022.**
Anthracnose fruit rot	**General Comments:** • Most fruit infections occur from **Bloom** to **Green fruit**. Infected fruit soften near harvest time and orange spore masses develop on the fruit.					
	M	Bravo ZNC or Echo NP	7.2 L/ha 5 L/ha	12 hours[1]/ 72 hours[3]	54 days	Will also control alternaria fruit rot. May cause fruit injury if applied to green fruit. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	3+9	Inspire Super	1.16–1.48 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	3+11	Fungtion SC or Quilt	1 L/ha	12 hours	30 days	Rotate with products from different fungicide groups. Do not tank-mix or make sequential applications with Exirel.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Petal fall (cont'd)						
Anthracnose fruit rot (cont'd)	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1.0 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** See comments on this product for Anthracnose at **Green tip**.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products.
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	**Suppression only.** Apply at 7–21-day intervals.
Phomopsis	M	Bravo ZNC or Echo NP	7.2 L/ha 5 L/ha	12 hours[1]/ 72 hours[3]	54 days	Will also control alternaria fruit rot. May cause fruit injury if applied to green fruit. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	**Suppression only.**
	P7	Aliette	5.6 kg/ha	12 hours[1]/ 72 hours[3]	1 day	**Suppression only.** Apply at 14–21-day intervals.
	NC	OxiDate 2.0 *	1.0 % v/v	4 hours or when dry	0 days	**Partial suppression only.** See comments on this product for Phomopsis at **Green Tip.**
Green fruit						
Blueberry aphids	**General Comments:** • Aphids are rarely a problem on blueberries at this time. • Monitor suckers and new shoots. Apply when population starts to build, but before winged aphids are seen. • Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Apply postbloom after bees have been removed. Refer to label for specific bee toxicity statements.					
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Blueberry aphids (cont'd)	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours[1]/ 48 hours[2]	7 days, 1 day	Do not apply following a soil application of Admire or Alias for white grubs. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	No product specific comments.
	28	Exirel	0.75–1.5 L/ha	12 hours	3 days	Use a surfactant, where permitted, for optimum control. See label and *Adjuvants Used in Fruit Crops*, Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	NC	Kopa *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all cultivars. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan or Maestro fungicides and 30 days of sulphur. Do not apply to wet foliage.
Obliquebanded leafroller	**General Comments:** • Apply when eggs are hatching and young larvae are present. • Place pheromone traps in crop by early June. Apply insecticides for summer-generation larvae at 240–280 DDC (base 6.1°C) after first sustained moth catch. See *Degree Day Modeling*, Chapter 2. • Many of these products are also labelled for spanworms (known as inchworms or loopers) and other caterpillars. See label for a complete list of registered uses.					
	5	Delegate	100–200 g/ha	12 hours	3 days	Reapply as necessary on a 7–10-day schedule. Toxic to bees exposed to direct treatment, drift or residues on blooming plants.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Obliquebanded leafroller (cont'd)	11	Bioprotec PLUS * or Dipel 2X DF *	0.9–1.8 L/ha 525–1,125 g/ha	4 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 5–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Confirm 240 F	1.0 L/ha	12 hours	14 days	Active on eggs and young larvae.
		Intrepid	0.5 L/ha	12 hours	7 days	
	28	Altacor	285 g/ha	12 hours	1 day	Do not tank-mix or make sequential applications of Exirel with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	
Plum curculio	**General Comments:** • Scout field edges for crescent-shaped scars on green blueberry fruit. Apply insecticide at the first sign of injury.					
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Japanese beetle adults	**General Comments:** • Apply at the first sign of adult activity. Check product label and Table 3–2. *Products Used on Blueberries* for preharvest intervals.					
	1B	Imidan WP	1.6 kg/1,000 L water	72 hours[1,5]/ 15 days[6]	15 days	No product specific comments.
	3	Danitol	779–1169 mL/ha	See comments	3 days	Reapply a minimum of 14 days later if needed. The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
	4A	Assail	80 g/ha	12 hours[1]/ 48 hours[2]	1 day	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	700 mL/ha	12 hours	8 days	Reapply in 10–14 days if needed. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	28	Altacor	285 g/ha	12 hours	1 day	**Suppression only.**
		Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
European chafer (larvae), Japanese beetle (larvae)	Spray once, as a high-volume spray on the soil at **Petal fall**, **Green fruit** or **Postharvest**, using one of the products listed for European chafer (larvae) and Japanese beetle (larvae) at **Petal fall**.					

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Fruit ripening						
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Apply insecticides weekly when fruit is ripening or ripe and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies.					
	1B	Imidan WP	1.6 kg/1,000 L water	72 hours[1,5]/ 15 days[6]	15 days	Note the 15 days to harvest interval.
		Malathion 85E	1L/1,000L water	48 hours	1 day	**Suppression only.**
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
		Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 day	No product specific comments.
	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
		Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when SWD pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops*, Chapter 2, for more information. Use high rate and shorten interval between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.
Blueberry maggot	**General Comments:** • Monitor using yellow sticky traps and apply when first flies are trapped or when berries begin to turn blue, about July 5–15 depending on the area and season. Reapply 5–12 days later, depending on the product. Protection is needed as long as adults are active. • Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1A	Sevin XLR	4 L/ha	5 days[1]/ 9 days[2,4]	2 days	Residual activity is 5–7 days.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Fruit ripening (cont'd)						
Blueberry maggot (cont'd)	1B	Cygon 480-AG or Lagon 480 E	830 mL/ha	12 hours[1]/ 9 days[4] (Lagon)	21 days	Do not use on crops destined for U.S. markets. Residual activity is 10–12 days.
		Imidan WP	1.6 kg/ha/ 1,000 L water	72 hours[1,5]/ 15 days[6]	15 days	Residual activity is 10–12 days.
		Malathion 85 E	550 mL/ha	48 hours	1 day	Residual activity is 5–7 days.
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
	4A	Aceta 70 WP or Assail 70 WP	136–160 g/ha	12 hours[1]/ 48 hours[2]	7 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	1.2–1.4 L/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	0.75–1.0 L/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	5	GF-120 Fruit Fly Bait *	1.5 L/ha	when dry	—	Begin applications when first flies are trapped or 2–3 weeks before fruit begins to ripen. GF-120 should be diluted with water to produce a concentrate. See label for more instructions. Reapply every 7 days, or sooner if rain or overhead irrigation 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.
	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops*, Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
White-marked tussock moth	**General Comments:** • White-marked tussock moth is a sporadic pest. Larvae devour foliage.					
	11	Bioprotec PLUS * or Foray 48 BA	2.5 L/ha 4 L/ha	4 hours 12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 2–5 days apart, when larvae are very small, usually just after **Bloom**. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Fruit ripening (cont'd)						
Botrytis grey mould	**General Comments:** • Spray at 7–10-day intervals if botrytis grey mould was not well controlled during Bloom.					
	M	Maestro 80 WSP or Supra Captan 80 WSP	2.25 kg/ha	12 hours[1]/ 5 days[4]/6 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis, or Timorex Gold. Restricted entry interval for hand harvest is 5 days.
	3+9	Inspire Super	1.03–1.48 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating with a different fungicide group.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once, then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days	Apply prior to harvest to improve postharvest disease control. Use once, then rotate to a different fungicide group. Will also control powdery mildew.
	7+12	Miravis Prime	0.8-1.0 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with Captan, Maestro or sulphur products. See label for precautions on compatibility.
	BM2	Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** See comments on this product for Botrytis at **First bloom**.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products.
Anthracnose fruit rot	**General Comments:** • Most infections take place during bloom. Fungicides at this time are not necessary if good control was achieved earlier.					
	3	Quash	180 g/ha	12 hours[1]/ 72 hours[2]	7 days	No product specific comments.
	3+9	Inspire Super	1.16–1.48 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Fruit ripening (cont'd)						
Anthracnose fruit rot (cont'd)	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[4]	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours[1]/ 24 hours[4]	1 day	Do not tank-mix or make sequential applications with Exirel.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications at 7–10-day intervals or rotate with other products.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** See comments on this product for Anthracnose at **Green tip**.
Postharvest						
Leafhoppers	**General Comments:** • The sharp-nosed leafhopper is a vector of the blueberry stunt phytoplasma, a virus-like organism that causes blueberry stunt disease. Postharvest leafhopper control is important if blueberry stunt is a problem. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval(REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
		Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0 and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
Phytophthora root rot	P7	Phostrol	2.9–5.8 L/ha	12 hours	0 days	**Suppression only.** May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
European chafer (larvae), Japanese beetle (larvae)	Spray once, as a high-volume spray on the soil at **Petal fall**, **Green fruit** or **Postharvest**, using one of the products listed for European chafer (larvae), Japanese beetle (larvae) at **Petal fall**.					
Special sprays These pests are not common in Ontario. Spray if and when monitoring indicates the need.						
Lecanium scale	**General Comments:** • If lecanium scale is a problem, use one of the products listed for Scale at **Dormant (late winter)** and follow up with Movento when crawlers are present, as indicated on black sticky tape.					
	23	Movento 240 SC	365–585 mL/ha	12 hours	7 days	**Use postbloom only.** Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays (cont'd) These pests are not common in Ontario. Spray if and when monitoring indicates the need.						
Tipworm	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	**Use postbloom only.** Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.
Gall midge	**General Comments:** • Blueberry gall midge feed in buds and cause new leaves in shoot tips to be distorted, dried up or blackened. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	**Use postbloom only.**
	28	Exirel	0.75–1.0 L/ha	12 hours	3 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops*, Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Brown marmorated stink bug	**General Comments:** • At time of printing this publication, this pest has not been detected in blueberries, but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies.					
	4A	Actara 25 WG	280 g/ha	12 hours	3 days	**Suppression only.** Maximum 2 applications of products from Group 4A per season. This product is toxic to beneficial insects and should be used only when necessary. Actara is currently under a phase-out period. **The last date of use for growers is April 11, 2022.**
Blueberry bud mite	**General Comments:** • This pest has not been detected in Ontario but is present in Michigan.					
	23	Envidor 240 SC	1.3 L/ha	12 hours	7 days	No product specific comments.
Alternaria leaf spot	3+9	Inspire Super	0.836 –1.48 L/ha	12 hours	1 day	Apply at **Green tip, Pink bud** and **Petal fall** if the weather is cool and wet and there is a history of disease.
Septoria leaf spot	3	Proline 480 SC	315 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	3+7	Propulse	750 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.**

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–1. Blueberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays (cont'd) These pests are not common in Ontario. Spray if and when monitoring indicates the need.						
Septoria leaf spot (cont'd)	3 +11	Fungtion SC	1L/ha	12 hours	30 days	**Suppression only.** Do not tank-mix or make sequential applications with Exirel.
	7	Sercadis	250–666 mL/ha	12 hours	0 days	No product specific comments.
	P7	Phostrol	2.9–5.8 L/ha	12 hours	0 days	Use the higher rate and shorten interval between applications under high disease pressure. May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
Leaf rust	3	Proline 480 SC	400 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	3+7	Propulse	1 L/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.**
	3+9	Inspire Super	836 mL/ha	12 hours	1 day	**Suppression only.**
	3+11	Fungtion SC	1L/ha	12 hours	30 days	Do not tank-mix or make sequential applications with Exirel.
Valdensinia leaf spot	3	Proline 480 SC	400 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	3+7	Propulse	1 L/ha	24 hours[1]/ 72 hours[3]	7 days	**Suppression only.**
	3+11	Fungtion SC	1L/ha	12 hours	30 days	**Suppression only.** Do not tank-mix or make sequential applications with Exirel.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Personal protective equipment required for certain activities. See label. [6] Pick your own harvest.
— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Table 3–2. Products Used on Blueberries

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

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

The **restricted entry interval (REI)** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no REI is stated on the label, assume it is 12 hours. Where the REI exceeds the preharvest interval, follow the REI.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 (REI)	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Aceta 70 WP	33298	acetamiprid	4A	7 days	12 hours[1]/48 hours[2]	4	—
Actara 25 WG	28408	thiamethoxam	4A	3 days	12 hours	2	—
Admire 240 Flowable	24094	imidacloprid	4A	14 days[3]	24 hours	1[3]	—
Alias 240 SC	28475	imidacloprid	4A	14 days	24 hours	1	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	2/3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	1 day/7 days[4]	12 hours[1]/48 hours[2]	4	—
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	4	*
Confirm 240 F	24503	tebufenozide	18	14 days	12 hours	4 (max 4.6 L/ha)	—
Cormoran	33353	Acetamiprid + novaluron	4A+15	8 days	12 hours	3	—
Cygon 480-AG	25651	dimethoate	1B	21 days	12 hours	2	—
Danitol	33817	fenpropathrin	3	3 days	Variable REI[5]	2	—
Decis 5 EC	22478	deltamethrin	3	14 days	12 hours	3	—
Decis 100 EC	33700	deltamethrin	3	14 days	12 hours	3	—
Delegate	28778	spinetoram	5	3 days[6]/1 day[7]	12 hours	3	—
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	4	*
Entrust	30382	spinosad	5	3 days[6]/1 day[7]	when dry	3	*
Envidor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—
Foray 48 BA	24978	*Bacillus thuringiensis*	11	—	12 hours	—	—
GF-120 Fruit Fly Bait	28336	spinosad	5	—	12 hours	5	*

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

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

[1] General re-entry. [2] Hand pruning. [3] Soil application. [4] 7 day PHI for blueberry maggot control, 1 day for all other pests.

[5] The restricted entry intervals (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.

[6] For Obliquebanded leafroller control. [7] For spotted wing drosophila control. [8] Personal protective equipment required for certain activities. See label. [9] Pick your own harvest. [10] Hand harvest.

[11] Maximum 6 applications per year with no more than 2 dormant applications. [12] Handset irrigation. [13] Maximum 3 applications per year for anthracnose or 4 applications for mummy berry.

[14] Maximum 2 applications per year for botrytis, 4 applications per year for mummy berry and max 5.9 L/ha for other diseases.

Table 3–2. Products Used on Blueberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression (cont'd)							
Harvanta 50 SL	32889	cyclaniliprole	28	1 day	12 hours	3 (max 4.8 L/ha)	—
Imidan WP	29064	phosmet	1B	15 days	72 hours[1,8]/15 days[9]	2	—
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4 (max. 2 L/ha)	—
Kopa	31433	potassium salts of fatty acids	NC	0 hours	12 hours	—	*
Lagon 480 E	9382	dimethoate	1B	21 days	12 hours[1]/9 days[10]	2	—
Lime Sulphur	16465	calcium polysulphide	M	dormant	48 hours	1	*
Malathion 85 E	8372	malathion	1B	1 day	48 hours	3	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.8 L/ha	—
Poleci 2.5 EC	32446	deltamethrin	3	14 days	12 hours	3	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	dormant	12 hours	1	*
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8	*
Rimon 10 EC	28881	novaluron	15	8 days	12 hours	3	—
Scorpio Ant and Insect Bait	33306	spinosad	5	1 day	12 hours	3	*
Sevin XLR	27876	carbaryl	1A	2 days	5 days[1]/9 days[2,10]	2	—
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	max. 2 L/ha	—
Success	26835	spinosad	5	3 days[6]/1 day[7]	when dry	3	—
Superior 70 Oil	9542, 14981	mineral oil	NC	dormant	12 hours	1	*
Up-Cyde 2.5 EC	28795	cypermethrin	3	2 days	12 hours	2	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[11]	*
Products used for disease control or suppression							
Actinovate SP	28672	*Streptomyces lydicus*	NC	—	1 hour	—	—
Aliette	27688	fosetyl al	33	1 day	12 hours[1]/72 hours[12]	4	—
Allegro 500 F	27517	fluazinam	29	30 days	24 hours	4	—
Botector	31248	Aureobasidium pullulans	NC	0 days	4 hours	6	*
Bravo ZNC	33515	chlorothalonil	M	54 days	12 hours[1]/72 hours[12]	2	—

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

[1] General re-entry. [2] Hand pruning. [3] Soil application. [4] 7 day PHI for blueberry maggot control, 1 day for all other pests.

[5] The restricted entry intervals (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.

[6] For Obliquebanded leafroller control. [7] For spotted wing drosophila control. [8] Personal protective equipment required for certain activities. See label. [9] Pick your own harvest. [10] Hand harvest.

[11] Maximum 6 applications per year with no more than 2 dormant applications. [12] Handset irrigation. [13] Maximum 3 applications per year for anthracnose or 4 applications for mummy berry.

[14] Maximum 2 applications per year for botrytis, 4 applications per year for mummy berry and max 5.9 L/ha for other diseases.

Table 3–2. Products Used on Blueberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for disease control or suppression (cont'd)							
Bumper 432 EC	28017	propiconazole	3	60 days	12 hours[1]/5 days[2]	2	—
Cabrio EG	27323	pyraclostrobin	11	1 day	12 hours[1]/24 hours[10]	4	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	—
Supra Captan 80 WSP	33641	captan	M	2 days	12 hours[1]/5 days[10]/ 6 days[12]	6	—
Confine Extra	30648	mono- and di-potassium salts of phosphorous acid	P7	1 day	12 hours	5	—
Diplomat 5 SC	32918	polyoxin D zinc salt	19	0 days	when dry	2.77 L/ha	—
Double Nickel 55	31888	*Bacillus amyloliquefaciens*	BM2	0 days	12 hours	—	—
Echo NP	33479	chlorothalonil	M	54 days	12 hours[1]/72 hours[12]	2	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Ferbam 76 WDG	20136	ferbam	M	40 days	12 hours	—	—
Fitness	32639	propiconazole	3	60 days	12 hours[1]/5 days[2]	2	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	5 (max 5.25 L/ha)	—
Funginex DC	27686	triforine	3	60 days	12 hours[1]/6 days[12]	3	—
Fungtion SC	32878	propiconazole + azoxystrobin	3+11	30 days	12 hours	3/4[13]	—
Indar	27294	fenbuconazole	3	30 days	12 hours	4	—
Inspire Super	30827	difenoconazole + cyprodinil	3+9	1 day	12 hours	2/4[14]	—
Jade	24030	propiconazole	3	60 days	12 hours[1]/5 days[2]	2	—
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	—
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	0 days	12 hours	2	—
Maestro 80 WSP	33488	captan	M	2 days	12 hours[1]/5 days[10]/ 6 days[12]	6	—
Miravis Prime	33208	pydiflumetofen + fludioxonil	7+12	1 day	12 hours	2 L/ha	—
OxiDate 2.0	32907	hydrogen peroxide + peroxyacetic acid	NC	0 days	4 hours or when dry	8	*

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

— = Information is not specified on the product label. * = Potentially organic. Check with certifying body.
[1] General re-entry. [2] Hand pruning. [3] Soil application. [4] 7 day PHI for blueberry maggot control, 1 day for all other pests.
[5] The restricted entry intervals (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
[6] For Obliquebanded leafroller control. [7] For spotted wing drosophila control. [8] Personal protective equipment required for certain activities. See label. [9] Pick your own harvest. [10] Hand harvest.
[11] Maximum 6 applications per year with no more than 2 dormant applications. [12] Handset irrigation. [13] Maximum 3 applications per year for anthracnose or 4 applications for mummy berry.
[14] Maximum 2 applications per year for botrytis, 4 applications per year for mummy berry and max 5.9 L/ha for other diseases.

Table 3–2. Products Used on Blueberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for disease control or suppression (cont'd)							
Phostrol	30449	mono- and dibasic sodium, potassium and ammonium phosphites	P7	0 days	12 hours	4	—
Princeton	33840	propiconazole	3	60 days	12 hours[1]/5 days[2]	2	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry[1]/24 hours[10]	4	—
Proline 480 SC	28359	prothioconazole	3	7 days	24 hours[1]/72 hours[12]	2	—
Propulse	30511	prothioconazole & fluopyram	3+7	7 days	24 hours[1]/3 days[12]	2	—
Quash	30402	metconazole	3	7 days	12 hours[1]/72 hours[2]	3	—
Quilt	28328	propiconazole + azoxystrobin	3+11	30 days	12 hours	3/4[13]	—
Regalia Maxx	30199	extract of Reynoutria sachalinensis	P5	0 days	when dry	—	*
Ridomil Gold 480 SL	28474	metalaxyl-M and S-isomer	4	80 days	12 hours	1	—
Scala SC	28011	pyrimethanil	9	0 days	12 hours	2	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	Bacillus subtilis	BM2	0 days	12 hours	—	*
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	*

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

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[1] General re-entry. [2] Hand pruning. [3] Soil application. [4] 7 day PHI for blueberry maggot control, 1 day for all other pests.
[5] The restricted entry intervals (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
[6] For Obliquebanded leafroller control. [7] For spotted wing drosophila control. [8] Personal protective equipment required for certain activities. See label. [9] Pick your own harvest. [10] Hand harvest.
[11] Maximum 6 applications per year with no more than 2 dormant applications. [12] Handset irrigation. [13] Maximum 3 applications per year for anthracnose or 4 applications for mummy berry.
[14] Maximum 2 applications per year for botrytis, 4 applications per year for mummy berry and max 5.9 L/ha for other diseases.

Notes on Blueberry Diseases and Insects

Table 3–3. Activity of Fungicides on Blueberry Diseases and Impact on Honeybees

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.

Group	Product	Mummy berry (shoot blight)	Phomopsis stem canker	Anthracnose fruit rot	Botrytis fruit rot	Alternaria fruit rot	Phytophthora root rot	Honeybee Toxicity[1]
M	Bravo ZNC	1	2 *	2 *	1	1 *	0	NT
M	Echo NP	1	2 *	2 *	1	1 *	0	NT
M	Ferbam 76 WDG	1	—	—	1 *	1	0	NT
M	Lime Sulphur	1	1	1	—	—	0	NT
M	Maestro 80 WSP	1 *	1	2	1–2 *	1	0	MT
M	Supra Captan 80 WSP	1 *	1	2	1–2 *	1	0	MT
3	Bumper 432 EC	3 *	1	2	0	0	0	NT
3	Fitness	3 *	1	2	0	0	0	NT
3	Funginex DC	3 *	2	0	0	0	0	NT
3	Indar	3 *	2	0	1–2	—	0	NT
3	Jade	3 *	1	2	0	0	0	NT
3	Princeton	3 *	1	2	0	0	0	NT
3	Proline 480 SC	3 *	2	2	—	—	0	NT
3	Quash	3 *	2 *	2 *	0	0	0	NT
3 + 7	Propulse	3 *	—	3	2	2	0	NT
3+9	Inspire Super	3 *	2	— *	3 *	— *	0	NT
3+11	Fungtion SC	3 *	—	3 *	—	—	0	NT
3+11	Quilt	3 *	—	3 *	—	—	0	NT
4	Ridomil Gold 480 SL	0	0	0	0	0	3 *	NT
7	Cantus WDG	0	—	—	3 *	2	0	NT
7	Kenja 400 SC	—	—	—	— *	—	—	NT
7	Fontelis	1 *	—	3	— *	—	—	NT
7	Sercadis	—	—	—	1 *	1	0	NT

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Host plant defence inducers.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. * (shaded area) = Disease is listed on the product label for control or suppression.
— = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–3. Activity of Fungicides on Blueberry Diseases and Impact on Honeybees (cont'd)

Group	Product	Mummy berry (shoot blight)	Phomopsis stem canker	Anthracnose fruit rot	Botrytis fruit rot	Alternaria fruit rot	Phytophthora root rot	Honeybee Toxicity[1]
7+9	Luna Tranquility	2	—	2	3 *	2	0	NT
7+11	Pristine WG	1–2	3 *	3 *	3 *	2	0	NT
7+12	Miravis Prime	3	2	2	3 *	3	0	NT
9	Scala SC	—	—	1	3 *	—	0	NT
9+12	Switch 62.5 WG	1 *	1	2–3 *	2–3 *	3	0	NT
11	Cabrio EG	1	3 *	3 *	1	1	0	NT
17	Elevate 50 WDG	0	0	0	3 *	0	0	NT
19	Diplomat 5 SC	1 *	1	2	2 *	1–2	0	NT
29	Allegro 500 F	1 *	1 *	1–2 *	—	1	0	NT
46	Timorex Gold	—	—	—	2 *	—	—	NT
BM2	Double Nickel 55	1 *	0	1	1 *	1	0	NT
BM2	Serenade OPTI	2 *	1	0	1 *	—	0	NT
NC	Actinovate SP	0–1 *	—	—	1	—	0	NT
NC	Botector	—	—	— *	— *	—	—	NT
NC	OxiDate 2.0	0–1 *	0–1 *	—	0–1	—	—	MT
P5	Regalia Maxx	1 *	—	1 *	1 *	1 *	—	NT
P7	Aliette	0	2 *	2 *	—	2	2 *	NT
P7	Confine Extra	0	2	1 *	—	2	2	NT
P7	Phostrol	1	1	1	—	1	1 *	NT

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Host plant defence inducers.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. * (shaded area) = Disease is listed on the product label for control or suppression.
— = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–4. Activity of Insecticides on Blueberry Pests and Impact on Honeybees

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

Group	Insecticide	Aphid	Blueberry maggot	Cranberry fruitworm, Cherry fruitworm	Japanese beetle (adult)	Leafroller	Plum curculio	Scale insects	Spotted wing drosophila (adult)	White grubs (larva)	Honeybee Toxicity[1]
1A	Sevin XLR	—	2 *	2 *	3	1 *	2	1 *	1	0	HT
1B	Cygon 480-AG	2	3 *	3	—	—	1	—	3 *	0	HT
1B	Imidan WP	—	3 *	3	3 *	3	3	—	3 *+	0	HT
1B	Lagon 480 E	2	3 *	3	—	—	1	—	3 *	0	HT
1B	Malathion 85 E	1 *	2 *	2 *	1	1 *	2	—	3 *	0	HT
3	Danitol	—	2 *	3 *	2–3 *	3	2 *	—	3 *	—	HT
3	Decis 5 EC	—	2	—	—	2	1	—	3	0	HT
3	Decis 100 EC	—	2	—	—	2	1	—	3	0	HT
3	Poleci 2.5 EC	—	2	—	—	2	1	—	3	0	HT
3	Pyganic EC 1.4 II	1 *	0	—	—	—	—	0	1	0	HT
3	Up-Cyde 2.5 EC	1	1	—	2	3	2	1	3 *	—	HT
4A	Aceta 70 WP	3*	3 *	2 *	2	—	2	—	1	0	MT
4A	Actara 25 WG	3	2	—	2	—	3	—	0	2	HT
4A	Admire 240 Flowable	3	2	0	2	—	—	—	0	2 *	HT
4A	Alias 240 SC	3	2	0	2	—	—	—	0	2 *	HT
4A	Assail 70 WP	3 *	3 *	2 *	2 *	—	2	—	1	0	MT
4A+15	Cormoran	3 *	2 *	3 *	2 *	3	2	—	3	—	HT
4D	Sivanto Prime	3 *	2–3 *	—	—	—	—	—	—	—	MT
5	Delegate	0	2	3	0	3 *	2	0	3 *	0	HT
5	Entrust	0	2	3	0	3 *	1	0	2–3 *	0	HT
5	GF-120 Fruit Fly Bait	0	2 *	0	0	0	0	0	—	0	HT
5	Scorpio Ant and Insect Bait	—	—	—	—	—	—	—	1 *	—	NT
5	Success	0	2	3	0	3 *	1	0	3 *	0	HT

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
* (shaded area) = Pest is listed on the product label for control or suppression. — = No information is available. + Product efficacy may be reduced due to long preharvest intervals.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–4. Activity of Insecticides on Blueberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide	Aphid	Blueberry maggot	Cranberry fruitworm, Cherry fruitworm	Japanese beetle (adult)	Leafroller	Plum curculio	Scale insects	Spotted wing drosophila (adult)	White grubs (larva)	Honeybee Toxicity[1]
11	Bioprotec PLUS	0	0	1 *	0	2 *	0	0	0	0	NT
11	Dipel 2X DF	0	0	1 *	0	2 *	0	0	0	0	NT
11	Foray 48 BA	0	0	1	0	2	0	0	0	0	NT
15	Rimon 10 EC	—	—	3 *	0	3	0	—	1	0	MT[2]
18	Confirm	0	0	3 *	0	3 *	0	0	0	0	NT
18	Intrepid	0	0	3 *	0	3 *	0	0	0	0	NT
23	Movento 240 SC	3 *	3 *	—	—	—	—	3 *	1	0	HT[2]
28	Altacor	0	—	3 *	1 *	3 *	0	0	0	0	NT
28	Exirel	3 *	1 *	3 *	3 *	3 *	3 *	—	3 *	0	HT
28	Harvanta 50 SL	0	2	3	1	3 *	1–2	0	3 *	—	HT
NC	Kopa	1 *	—	—	0	—	—	1 *	—	—	NT
NC	Purespray Green Spray Oil 13 E	2	0	0	0	0	0	3 *	0	0	—
NC	Superior 70 Oil	2	0	0	0	0	0	3 *	0	0	—
NC	Vegol Crop Oil	2 *	—	—	—	—	—	3 *	—	—	—

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
* (shaded area) = Pest is listed on the product label for control or suppression. — = No information is available. + Product efficacy may be reduced due to long preharvest intervals.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Currant, Haskap and Gooseberry

In this section:

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Currant, Haskap and Gooseberry Calendar

Another common name for haskap is edible honeysuckle. Products included in this calendar have either haskap or edible honeysuckle on the label. Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point.

For preharvest interval, restricted entry interval (REI) and maximum number of applications, see Table 3–6. *Products Used on Currants, Haskaps and Gooseberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to currants, haskaps and gooseberries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–6. *Products Used on Currants, Haskaps and Gooseberries*.

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and will carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–5. Currant, Haskap, and Gooseberry Calendar

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Just before blossoms open						
DO NOT APPLY INSECTICIDES WHILE CURRANTS, HASKAPS, OR GOOSEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Aphids	**General Comments:** • Currant blister aphid feeds on new growth, causing leaf curl and red blisters. Spray if aphids are abundant. • Ensure good coverage of undersides of curled leaves. • Do not apply during bloom of crops or weeds in treatment area.					
	4A	Assail 70 WP	56–86 g/ha	12 hours[1]/ 48 hours[2]	1 day	Maximum 2 applications of Group 4A products per season. Toxic to certain beneficial insects. Do not apply when bees are actively foraging.
	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Reapply in 10–14 days if needed. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Feeding deterrent only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or sulphur.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Leaf spot	**General Comments:** • Two different fungi can cause leaf spot on currants: Anthracnose (*Drepanopeziza ribis*) and Septoria Leaf Spot (*Septoria ribis* = *Mycosphaerella ribis*). Leaf spots develop on susceptible varieties, reducing yield and vigour. • Rake or cultivate to bury old infected leaves before bud break. • If the disease was a problem the previous season, apply sprays at 7-day intervals in spring. Start when the first new leaf is fully open and repeat as long as wet weather continues. • Postharvest sprays applied in the fall may also help to reduce overwintering inoculum.					
	M	Copper 53 W * plus hydrated lime	5 kg/1,000 L water plus 4 kg lime/1,000 L	48 hours	2 days	**Currants and gooseberries only.** Refer to label for specific handling and storage requirements. This mixture is incompatible with all other insecticides and fungicides.
		Ferbam 76 WDG	6.75 kg/ha	12 hours	14 days	**Currants only.** Ferbam is currently under a phase-out period. The last date of use for growers is **December 14, 2021**.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Mechanical harvest. [6] Preharvest interval is 0 days for currants and haskaps and 7 days for gooseberries.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–5. Currant, Haskap, and Gooseberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Just before blossoms open (cont'd)						
DO NOT APPLY INSECTICIDES WHILE CURRANTS, HASKAPS, OR GOOSEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Leaf spot (cont'd)	3	Proline 480 SC	315 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Septoria leaf spot only. Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	3+7	Propulse	750 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Septoria leaf spot only. Suppression only.**
	7	Sercadis	250–666 mL/ha	12 hours	0 days	**Septoria leaf spot only. Currants and gooseberries only.**
Powdery mildew	**General Comments:** • Resistant varieties are available. See Table 3–7. *Disease Ratings on Selected Currant and Gooseberry Varieties*. • Prune out infected twig tips in fall and avoid excessive nitrogen. • If warm and humid conditions persist, spray weekly until fruit begins to colour. Apply before symptoms develop.					
	M	Microscopic Sulphur WP *	5 kg/ha	24 hours	1 day	**Currants and gooseberries only.** Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
	3	Mettle 125 ME	219–365 mL/ha	12 hours	14 days	**Gooseberries only.**
		Nova	340 g/ha	12 hours	6 days[4]/ 1 day[5]	**Currants and gooseberries only.** Apply with a minimum of 250 L water/ha.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days/ 7 days[6]	Use once then rotate to a different fungicide group.
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/ 29 days[4]	0 days	**Suppression only. Currants and gooseberries only.** Do not tank-mix or make sequential applications with Exirel.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Gooseberries only. Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only. Currants and gooseberries only (Purespray Green, Vegol Crop Oil).** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has notbeen determined for all varieties. Test a small area first. Do notapply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or sulphur.
		SuffOil-X*	13 L/1,000 L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Mechanical harvest. [6] Preharvest interval is 0 days for currants and haskaps and 7 days for gooseberries.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–5. Currant, Haskap, and Gooseberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Just before blossoms open (cont'd)						
DO NOT APPLY INSECTICIDES WHILE CURRANTS, HASKAPS, OR GOOSEBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould	**General Comments:** • Botrytis infection during bloom causes early fruit drop, or "runoff" in currants. • Apply fungicides at **First bloom** and make subsequent applications at 7–10-day intervals during bloom.					
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis). Currants and gooseberries only (Cantus, Sercadis).** Use once and then rotate to a different fungicide group.Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days/ 7 days[6]	Use once, then rotate to a different fungicide group.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 29 days[4]	0 days	**Currants and gooseberries only.** Use once, then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	7+12	Miravis Prime	0.8–1.0 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9	Scala SC	2 L/ha	12 hours	7 days	**Gooseberries only.**
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	**Currants and gooseberries only.**
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	**Suppression only.**
	BM2	Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only. Currants and gooseberries only.** For best results, use multiple applications or rotate with other products.
White pine blister rust	**General Comments:** • Apply at the first sign of disease development and reapply in 7–14 days.					
	M	Cueva *	5 L in 500 L water/ha	4 hours	1 day	**Currants and gooseberries only.** Use a 1% solution v/v, in 470–940 L water/ha.
	3	Nova	340 g/ha	12 hours	6 days[4]/ 1 day[5]	**Currants and gooseberries only.** Apply with a minimum of 250 L water/ha.
Bloom						
Botrytis grey mould	Apply one of the products listed for Botrytis grey mould at **Just before blossoms open**.					
White pine blister rust	Apply one of the products listed for White pine blister rust at **Just before blossoms open**.					

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Mechanical harvest. [6] Preharvest interval is 0 days for currants and haskaps and 7 days for gooseberries.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–5. Currant, Haskap, and Gooseberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit						
Currant fruit fly	At the time of printing this publication, there are no products registered for this pest.					
Leaf spot	M	Copper 53 W * plus hydrated lime	5 kg/1,000 L water plus 4 kg lime/ 1,000 L water	48 hours	2 days	**Currants and gooseberries only.** Refer to label for specific handling and storage requirements. This mixture is incompatible with all other insecticides and fungicides.
	3	Proline 480 SC	315 mL/ha	24 hours[1]/ 72 hours[3]	7 days	**Septoria leaf spot only. Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	3+7	Propulse	750 mL/ha;	24 hours[1]/ 72 hours[3]	7 days	**Septoria leaf spot only. Suppression only.**
	7	Sercadis	250–666 mL/ha	12 hours	0 days	**Septoria leaf spot only. Currants and gooseberries only.**
Powdery mildew	Use one of the products listed for Powdery mildew at **Just before blossoms open**.					
Leafhoppers	**General Comments:** • Monitor for leaf curling on new growth. Spray red and white currants immediately after fruit is picked.					
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
Aphids	**General Comments:** • Monitor for leaf curling on new growth. Spray red and white currants immediately after fruit is picked. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Refer to label for bee toxicity statements.					
	4A	Assail 70 WP	56–86 g/ha	12 hours[1]/ 48 hours[2]	1 day	Maximum 2 applications of products from Group 4A per season. Toxic to certain beneficial insects.
	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Reapply in 10–14 days if needed. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	**Postbloom use only.**
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Feeding deterrent only.** See comments on this product for Aphids at **Just before blossoms open**.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Aphids at **Just before blossoms open**.
Obliquebanded leafroller	**General Comments:** • This pest is rarely a problem on currants and gooseberries.					
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	Also control spanworms or other leafrollers. See label for complete list of pests.

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Mechanical harvest. [6] Preharvest interval is 0 days for currants and haskaps and 7 days for gooseberries.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–5. Currant, Haskap, and Gooseberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Obliquebanded leafroller (cont'd)	11	Bioprotec PLUS * or Dipel 2X DF *	0.9–1.8 L/ha 525–1,125 g/ha	4 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 5–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	0.5 L/ha	12 hours	7 days	Also controls spanworms or other leafrollers. See label for complete list of pests.
	28	Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan or Maestro. See product label for numerous other tank-mix restrictions. Also controls spanworms or other leafrollers. See label for complete list of pests.
Postharvest						
Aphids	Use one of the products listed for Aphids at **Green fruit**.					
Leafhoppers	Use one of the products listed for Leafhoppers at **Green fruit**.					
Japanese beetle	**General Comments:** • Japanese beetle is not usually a problem on currants. • Apply pre- or postharvest if necessary.					
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
	4A	Assail	80 g/ha	12 hours[1]/ 48 hours[2]	1 day	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	700 mL/ha	12 hours	8 days	Reapply in 10–14 days if needed. Maximum 2 applications of products from Group 4A per season.
	28	Altacor	285 g/ha	12 hours	1 day	**Suppression only.**
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan or Maestro. See product label for numerous other tank-mix restrictions.
Leaf spot, Powdery mildew	If leaf spot or powdery mildew continues to be a problem, spray after harvest with a product listed for these diseases at **Green fruit** to avoid premature defoliation.					

[1] General re-entry. [2] Hand pruning. [3] Handset irrigation. [4] Hand harvest. [5] Mechanical harvest. [6] Preharvest interval is 0 days for currants and haskaps and 7 days for gooseberries.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–6. Products Used on Currants, Haskaps and Gooseberries

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 (REI)** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no restricted entry Interval is stated on the label, assume it is 12 hours. Where the REI exceeds the preharvest interval, follow the REI.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 (REI)	Maximum Applications	Crop Registration (C=currant, H= haskap, G=gooseberry)	Potentially Organic	Honeybee Toxicity†
Products used for insect and mite control or suppression									
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	C,H,G	—	NT
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours[1]/ 48 hours[2]	4	C,H,G	—	MT
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	—	C,H,G	*	NT
Cormoran	33353	Acetamiprid + novaluron	4A+15	8 days	12 hours	3	C,H,G	—	MT
Danitol	33817	fenpropathrin	3	3 days	Variable REI[3]	2	C,H,G	—	HT
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	—	C,H,G	*	NT
Entrust	30382	spinosad	5	3 days	when dry	3	C,H,G	*	HT
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max 4.5 L/ha)	C,H,G	—	HT
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4 (max 2 L/ha)	C,H,G	—	NT
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max 1.8 L/ha	C,H,G	—	HT **
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	C,H,G	*	—
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	2 L/ha	C,H,G	—	MT
Success	26835	spinosad	5	3 days	when dry	3	C,H,G	—	HT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[4]	C,H G	*	—

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.
*= Potentially organic. Check with certifying body.

[1] General re-entry. [2] Hand pruning. [3] The restricted entry interval (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days. [4] Maximum 6 applications per season with no more than 2 dormant applications. [5] Preharvest interval is 0 days for currants and haskaps or 7 days for gooseberries. [6] Maximum of 2 applications per year for botrytis or maximum 4 L/ha per year for powdery mildew. [7] Hand harvest. [8] Mechanical harvest. [9] Handset irrigation

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
† Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
** Movento may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–6. Products Used on Currants, Haskaps and Gooseberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Crop Registration (C=currant, H= haskap, G=gooseberry)	Potentially Organic	Honeybee Toxicity†
Products used for disease control or suppression									
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	C,G	—	NT
Cueva	31825	copper octanoate	M	1 day	4 hours	—	C,G	*	NT
Copper 53 W	9934	tribasic copper sulphate	M	2 days	48 hours	4	C,G	*	MT
Diplomat 5 SC	32918	polyoxin D zinc salt	19	0 days	when dry	2.77 L/ha	C,H,G	—	NT
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	C,G	—	NT
Ferbam 75 WDG	20136	ferbam	M	14 days	12 hours	—	C	—	NT
Fontelis	30331	penthiopyrad	7	0 days	12 hours	5 (max 5.25 L/ha)	C,H,G	—	NT
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	C,H,G	—	NT
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	0 days/7 days[5]	12 hours	2(max. 4 L/ha)[6]	C H,G	—	NT
Mettle 125 ME	30673	tetraconazole	3	14 days	12 hours	2	G	—	NT
Miravis Prime	33207	pydiflumetofen + fludioxonil	7+12	1 day	12 hours	2 L/ha	C,H,G	—	NT
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	C,G	*	NT
Nova	22399	myclobutanil	3	6 days[7]/1 day[8]	12 hours	3	C,G	—	NT
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry[1]/29 days[7]	4	C,G	—	NT
Proline 480 SC	28359	prothioconazole	3	7 days	24 hours[1]/72 hours[9]	2	C,H,G	—	NT
Property 300 SC	32376	pyriofenone	50	0 days	12 hours	1.2 L/ha	G	—	—
Propulse	30511	prothioconazole & fluopyram	3 + 7	7 days	24 hours[1]/72 hours[9]	2	C,H,G	—	NT
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	C,G	*	—
Scala SC	28011	pyrimethanil	9	7 days	12 hours	3	G	—	NT
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	C,G	—	NT
Serenade OPTI	31666	*Bacillus subtilis*	BM2	0 days	12 hours	—	C,G	*	NT

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.
*= Potentially organic. Check with certifying body.

[1] General re-entry. [2] Hand pruning. [3] The restricted entry interval (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days. [4] Maximum 6 applications per season with no more than 2 dormant applications. [5] Preharvest interval is 0 days for currants and haskaps or 7 days for gooseberries.
[6] Maximum of 2 applications per year for botrytis or maximum 4 L/ha per year for powdery mildew. [7] Hand harvest. [8] Mechanical harvest. [9] Handset irrigation

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
† Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
** Movento may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–6. Products Used on Currants, Haskaps and Gooseberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Crop Registration (C=currant, H= haskap, G=gooseberry)	Potentially Organic	Honeybee Toxicity†
Products used for disease control or suppression (cont'd)									
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	C,H,G	*	—
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	C,H,G	—	NT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[4]	C,G	*	—

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.
*= Potentially organic. Check with certifying body.

[1] General re-entry. [2] Hand pruning. [3] The restricted entry interval (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days. [4] Maximum 6 applications per season with no more than 2 dormant applications. [5] Preharvest interval is 0 days for currants and haskaps or 7 days for gooseberries. [6] Maximum of 2 applications per year for botrytis or maximum 4 L/ha per year for powdery mildew. [7] Hand harvest. [8] Mechanical harvest. [9] Handset irrigation

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
† Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
** Movento may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Notes on Currant and Gooseberry Diseases

Table 3–7. Disease Ratings on Selected Currant and Gooseberry Varieties

Type	Variety	Mildew Resistance	Rust Resistance
Black currant	Ben Alder	resistant	very susceptible
	Ben Connan	resistant	moderately resistant
	Ben Sarek	resistant	moderately resistant
	Titania	immune	immune
Red currant	Red Lake	susceptible	susceptible
	Rovada	resistant	moderately resistant
	Jonkheer van Tets	moderately resistant	resistant
Gooseberry	Captivator	moderately resistant	—
	Invicta	moderately resistant	moderately resistant
	Hinnonmaki Red	resistant	moderately resistant

Resistant = Does not show symptoms of rust (only Titania has genetic resistance).
Moderately resistant = Shows symptoms at low frequency, yield not affected.
Susceptible = Noticeable levels of rust infection, not affecting yield.
Very susceptible = Severe infection, affecting yield.
— = Information is not available.

Source:
Adam Dale, HortTechnology 10(3) 2000, pg. 553.
Hummer and Barney, HortTechnology 12(3) 2002, pp. 382–383, or Currants, Gooseberries, Jostaberries, Guide for Growers. Food Products Press 2005.
Dick McGinnis, McGinnis Berry Crops, B.C., personal communication.

Raspberry and Blackberry

In this section:

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete inform

Summer Fruiting Raspberry and Blackberry Calendar

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

For preharvest interval, restricted entry interval (REI), and maximum number of applications, see Table 3–10. *Products Used on Raspberries and Blackberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–11. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees* and Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, 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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to raspberries and blackberries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–11. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees* and Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Before planting						
Root lesion nematode, Phytophthora root rot	NC	MustGrow *	1,121–2,240 kg/ha	24 hours[1]	—	**Suppression only.** Apply with a calibrated spreader, in early spring, when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil is well-moistened.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Delayed dormant to green tip						
Spur blight, Cane blight, Rust	**General Comments:** • This timing reduces overwintering inoculum and is the first step in a good disease control program.					
	M	Lime Sulphur *	26 L/1,000 L water	48 hours	1/4 inch green	**Raspberries only.** Apply in a high-volume spray to ensure thorough coverage to point of near drip. Do not use later than ¼-inch green. Do not spray on wet foliage.
Early bud break						
Phytophthora root rot	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	prebloom	**Raspberries only. Use in non-bearing plantings only.** Apply as a soil drench after planting in a 1 m band centered over the row. Use at least 2,500 L water/ha. Reapply mid to late October (before the ground is frozen). In established plantings, apply in the fall only at **Postharvest**.
	P7	Aliette	5.50 kg/ha	12 hours[2]/ 48 hours[3]	60 days	Use as a preventive treatment. Do not tank-mix with copper, foliar fertilizers or surfactants. Apply after bud break at 7 cm of new growth. Reapply 3–4 weeks later, if needed.
		Phostrol	5.2 L/ha	12 hours	0 days	**Raspberries only. Suppression only.** Use as a preventive treatment. Do not tank-mix with copper, foliar fertilizers or surfactants. Apply after bud break at 7 cm of new growth. Reapply 3–4 weeks later, if needed.
Raspberry crown borer	**General Comments:** • If more than 5% of the crowns are infested, spray lower portions of canes and the crown area. • See **Postharvest** for more control options for this pest.					
	1B	Diazinon 500 E	1 L/1,000 L water	12 hours	prebloom	Apply in 4,000–5,000 L water/ha as a drench to crowns and base of plants. Apply in spring to control young larvae before they tunnel into crowns and when new growth is about 10 cm above ground. Do not apply after first bloom. Do not apply more than once a year. Treat infested plantings at least 2 years in a row.
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	**Suppression only.** Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Soil must be lightly pre-wetted to break soil surface tension prior to application. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Prebloom (until blossoms open)						
Anthracnose, Spur blight	**General Comments:** • Protect new growth. Apply when new canes are 25–30 cm tall and just before first bloom.					
	M	Ferbam 76 WDG	2.5 kg/1,000 L water	12 hours	prebloom	Ferbam is currently under a phase-out period. The last date of use for growers is **December 14, 2021**.
	11+27	Tanos	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Prebloom (until blossoms open) (cont'd)						
Powdery mildew	**General Comments:** • In problem areas, spray when mildew is first observed. Reapply in 7–10 days.					
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	**Raspberries only.**
	3	Nova	340 g/ha	12 hours	1 day[4]/6 days[5]	Apply with a minimum of 250 L water/ha.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
		SuffOil-X*	13L/1,000 L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Raspberry sawfly, Raspberry fruitworm	At the time of printing this publication, there are no products registered for these pests. See Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact to Honeybees*, for products that may provide some activity on these pests.					
Obliquebanded leafroller	**General Comments:** • Leafrollers are not usually a problem in Ontario. Substantial damage can occur without crop loss.					
	5	Delegate	200 g/ha	12 hours	1 day	Apply to eggs and small larvae.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	
	11	Bioprotec PLUS * or Dipel 2X DF * or Foray 48 BA	0.9–1.8 L/ha 525–1,125 g/ha 1.4–2.8 L/ha	4 hours 4 hours 12 hours	0 days	**Raspberries only (Foray).** Do not use on blackberries. Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	500–750 mL/ha	12 hours	3 days	Sequential applications must be at least 30 days apart.
Clipper weevil	1B	Malathion 85 E	1,345 mL/ha	24 hours	1 day	**Raspberries only.**
Aphids, Leafhoppers	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Prebloom (until blossoms open) (cont'd)						
Aphids, Leafhoppers (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	**Aphids only.** Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	**Aphids only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Two-spotted spider mite	**General Comments:** • Beneficial mites can be introduced to prevent mite build-up. • Thorough coverage of both leaf surfaces is necessary for good control.					
	10	Apollo SC	500 mL/ha	12 hours[2]/ 10 days[6]	15 days	**Raspberries only.** Kills mite eggs and young nymphs. Apply when mites are mostly in the egg stage.
	20B	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up and mostly in the nymph stage.
	20D	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up and mostly in the nymph stage.
	23	Oberon Flowable	880–1,160 mL/ha	12 hours	3 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X)** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or sulphur. Do not apply to wet foliage.
		SuffOil-X *	13 L/1,000 L	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Bloom						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES AND BLACKBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould	**General Comments:** • Bloom is the most important time to control botrytis grey mould. Begin at 5%–10% bloom and if the weather is wet. Reapply every 7 days.					
	M	Maestro 80 WSP or Supra Captan 80 WSP	2.5 kg/ha	Variable REI — see comments.	2 days	Apply in 1,000 L water/ha. The rate on blackberry is 2.25 kg/ha. Also controls spur blight. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis, or Timorex Gold. Restricted entry interval for raspberry hand harvest is 6 days; for handset irrigation is 7 days. Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for all other activities is 12 hours.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES AND BLACKBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	**Raspberries only.** Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[2]/ 24 hours[5,6]	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	**Raspberries only.**
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	**Raspberries only.** Apply in a high-volume spray to ensure thorough coverage Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	BM2	Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or rotate with other products.
Fire blight	24	Kasumin 2L	5 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes. refer to the water volume chart indicated on the label for rate recommendations.
Powdery mildew	Use one of the products listed for Powdery mildew at **Prebloom (before blossoms open).**					
Green fruit						
Anthracnose, Spur blight, Cane botrytis	**General Comments:** • Ensure thorough spray coverage of primocanes in the row. Keep rows narrow by mowing primocanes as they emerge at the row edges. • Captan and Maestro used at this timing will also control spur blight.					
	11+27	Tanos	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.
Obliquebanded leafroller	Use one of the products listed for Obliquebanded leafroller at **Prebloom (until blossoms open)**.					
Aphids	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	See comments on this product for Aphids at **Prebloom (until blossoms open).**
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Aphids (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento	220–365 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Apply postbloom in a minimum of 300 L water/ha.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Aphids at **Prebloom (until blossoms open).**
Japanese beetle	1A	Sevin XLR	5.25 L/ha	6 days[2]/ 10 days[5,6]	11 days	Apply when adults appear and reapply as necessary at 7–10-day intervals.
	4A	Assail	80 g/ha	12 hours	1 day	Do not make a foliar application following a soil application of a group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
Rose chafers	1B	Malathion 85 E	610–975 mL/ 1,000 L water	12 hours	7 days	**Blackberries only.**
Leafhoppers	**General Comments:** • Potato leafhopper can be a problem when nearby hay fields are mowed. New plantings are especially susceptible. Leafhoppers feed on primocane leaves and cause new growth to turn yellow and curl under. • Monitor for small green nymphs on lower leaf surface. Spray when nymphs are present, and symptoms are evident. • These products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	12 hours[7]/ 24 hours[8]	1 day[8]/ 7 days[7]	Rate for blackberries is 610–975 mL/ha.
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed, but not within 7 days. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present. Also controls aphids.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Raspberry cane borer	**General Comments:** • Raspberry cane borer makes 2 rings of puncture marks around the top of the cane, causing the primocane to wilt. • Spray to control beetles when damage is first observed.					
	28	Altacor	215–285 g/ha	12 hours	3 days	Apply soon after damage first appears.
Red-necked cane borer	**General Comments:** • Red-necked cane borer attacks the lower primocane, causing canes to break off 0.5–1.0 m above the ground later in the season. • If there is a history of this pest, spray when beetles are active.					
	At the time of printing this publication, there are no products registered for this pest. See Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees* for products that may provide some activity on this pest.					
White grubs (larvae of European chafer)	**General Comments:** • Apply in young plants where populations are high.					
	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	**Reduction in numbers only.** Apply just prior to egg hatch (shortly after adults are active) to damp soil in the plant row and in the alleys. Use in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application. Do not apply prebloom, during bloom, or when bees are actively foraging. Maximum 1 application of products from Group 4A if it is a soil application. Do not make a foliar application following a soil application of a Group 4A insecticide. Soil applications of Admire and Alias are under a phase-out. **The last date of use for growers is April 11, 2022.**
Two-spotted spider mite	**General Comments:** • Beneficial mites can be introduced to prevent mite build-up. • Thorough coverage of both leaf surfaces is necessary for good control.					
	20B	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	20D	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	23	Oberon Flowable	880–1,160 mL/ha	12 hours	3 days	No product specific comments.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Two-spotted spider mite (cont'd)	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** See comments on these products for Two-spotted spider mite at **Prebloom**.
		SuffOil-X *	13 L/1,000 L	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Preharvest and harvest						
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Apply insecticides weekly when fruit is ripening or ripe and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	1B	Malathion 85 E	975 mL/1,000 L water	12 hours[7]/ 24 hours[8]	1 day[8]/ 7 days[7]	**Suppression only.**
	3	Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 days	No product specific comments.
	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
		Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when spotted wing drosophila pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Preharvest and harvest (cont'd)						
Spotted wing drosophila (cont'd)	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Use high rate and shorten intervals between applications under heavy pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan or Maestro. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.
Spanworms	**General Comments:** • Spanworms, also known as inch-worms or loopers, appear just before harvest on raspberry fruit.					
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	No product specific comments.
Botrytis grey mould	**General Comments:** • Although bloom is the most important time to control botrytis grey mould, preharvest sprays are required if the weather is wet.					
	M	Maestro 80 WSP or Supra Captan 80 WSP	2.5 kg/ha	Variable REI — see comments.	2 days	Apply in 1,000 L water/ha. The rate on blackberry is 2.25 kg/ha. Also controls spur blight. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis, or Timorex Gold. Restricted entry interval (REI) for raspberry hand harvest is 6 days; for handset irrigation is 7 days. Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for all other activities is 12 hours.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	**Raspberries only.** Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once, then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[2]/ 24 hours[5, 6]	0 days	Use once, then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	**Raspberries only.**
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	**Raspberries only.** Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	BM2	Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Postharvest						
Anthracnose, Spur blight, Cane botrytis	**General Comments:** • Ensure thorough spray coverage of primocanes in the row. Narrow rows and good weed control will reduce disease pressure in the row by allowing air flow and faster drying.					
	11+27	Tanos	840 g/ha	9 days	9 days	Apply once or twice after harvest to protect primocanes.
Leaf spot	**General Comments:** • Raspberry leaf spot can cause severe defoliation on some varieties. Postharvest fungicides are important for control of this disease.					
	7	Sercadis	250–666 mL/ha	12 hours	0 days	No product specific comments.
Phytophthora root rot	**General Comments:** • Apply after harvest when conditions favour disease development (high soil moisture and cool temperatures).					
	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	post-harvest	**Raspberries only.** Apply as a soil drench in a 1 m band centred over the row. Use at least 2,500 L of water/ha. Apply before mid to late October (before the ground is frozen).
	21	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply as a soil drench in up to 1,000 L water/ha. Do not use with a surfactant.
	P7	Aliette	5.5 kg/ha	12 hours[2]/ 48 hours[3]	60 days	Apply to foliage. Reapply 3–4 weeks later, if needed, at least 30 days before leaf drop.
		Phostrol	5.2 L/ha	12 hours	0 days	**Raspberries only. Suppression only.** Apply to foliage. Reapply 3–4 weeks later, if needed, at least 30 days before leaf drop.
Aphids	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	3 days	Apply postbloom in a minimum of 300 L water/ha when aphids are first observed.
Leafhoppers	**General Comments:** • Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	12 hours[7]/ 24 hours[8]	1 day[8]/ 7 days[7]	Rate for blackberries is 610–975 mL/ha.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of products from Group 4A per season.
	NC	Surround WP *	25 kg/ha	12 hours	0 days	**Raspberries only.** Efficacy depends on complete coverage of leaves. Apply at 7–14-day intervals when leafhoppers are first detected by monitoring. For early applications, use 25 kg/500 L of water. Once a base coat is established, rate can be reduced for follow-up applications to 12.5 kg/500 L of water. Do not use when fruit is present or during bloom. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Postharvest (cont'd)						
Two-spotted spider mite	**General Comments:** • Check lower leaf surface for mites and webbing. • Thorough spray coverage of the lower leaf surface is required. • Beneficial mites can be introduced to prevent mite build-up. • For resistance management, alternate miticides between years.					
	6	Agri-Mek SC	225 mL/ha	12 hours[2]/ 72 hours[3]	7 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	20B	Kanemite	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	20D	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up and mostly in the nymph stage.
	21	Nexter	0.5–1.0 L/ha	24 hours	post-harvest	**Raspberries only.**
	23	Oberon Flowable	880–1,160 mL/ha	12 hours	3 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** See comments on this product for Two-spotted spider mite at **Prebloom**.
		SuffOil-X *	13 L/1,000 L	12 hours	12 hours	
White grubs (larvae of European chafer)	**General Comments:** • Apply in young plantings where populations are high.					
	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	**Reduction in numbers only.** Apply to damp soil in the plant row and in the alleys. Use in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application. Maximum 1 application of products from Group 4A if it is a soil application. Do not make a foliar application following a soil application of a group 4A insecticide. Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Read the specific bee toxicity statements on the label. Soil applications of Admire and Alias are under a phase-out. **The last date of use for growers is April 11, 2022.**
Raspberry crown borer	**General Comments:** • If more than 5% of the crowns are infested, spray lower portions of canes and the crown area. Treat infested plantings at least 2 years in a row. • Apply in late summer or early fall at egg hatch to first-instar larvae when they are actively feeding in the cambium, before they tunnel into the crown or canes.					
	28	Altacor	215–285 g/ha	12 hours	3 days	Reapply, if necessary, at 14-day intervals. Apply in a high-volume spray to ensure thorough coverage to base of primocanes. Use high rate under high pest pressure.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–8. Summer Fruiting Raspberry and Blackberry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays These pests are not common in Ontario. Spray varieties or areas where problems have occurred in the past.						
Yellow rust, late leaf rust	**General Comments:** • There are several different rust diseases on raspberries: late leaf rust, yellow rust and orange rust. Late leaf rust and orange rust are the most common in Ontario; yellow rust is rarely seen. • Apply in spring at first sign of disease on developing leaves. Reapply 14 days later.					
	3	Nova	175 g/ha	12 hours	1 day[4]/ 6 days[5]	**Yellow rust only.** Apply with a minimum of 250 L water/ha.
		Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hrs 4 hrs[9]/72 hrs[2] 4 hrs[9]/72 hrs[2] 72 hrs	30 days	**Yellow rust only.** Apply in a minimum of 500 L water/ha.
	7	Fontelis	1.0-1.75 L/ha	12 hours	0 days	Use once and then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
Downy mildew	**General Comments:** • Downy mildew causes small red spots, extending along the veins, and leaf distortion. White-grey spore masses are produced on the underside of leaves, under the red spots. Infected fruit becomes dry and shriveled. • Remove suckers early to reduce spore production potential.					
	P7	Rampart	3–8 L/ha	4 hours	—	**Blackberries only. Suppression only.** Apply in early spring when conditions favour disease (cool, wet) but before symptoms develop. Apply in a high-volume spray to ensure thorough coverage of lower leaves as primocanes emerge. Reapply as needed.
Slugs, snails	NC	Deadline M-Ps	11.2–22.5 kg/ha	12 hours	6 days	Apply as a soil surface band treatment between rows. Do not allow this product into direct contact with foliage or edible fruit. Apply in the evening and avoid application before heavy rain.

[1] After activation with water in soil. [2] General re-entry. [3] Handset Irrigation [4] Mechanical harvest. [5] Hand harvest. [6] Hand labour (e.g., pruning, training, tying). [7] Blackberry. [8] Raspberry. [9] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Fall-bearing Raspberry Calendar (primocane fruiting)

This calendar is for primocane-fruiting raspberry varieties that fruit on the tips of the current year's growth and are mowed annually.

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point. For preharvest interval, restricted entry interval (REI) and maximum number of applications, see Table 3–10. *Products Used on Raspberries and Blackberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–11. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees* and Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, 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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to raspberries during bloom — do not apply them while bees are active. 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,* Chapter 1, and honeybee toxicity ratings in Table 3–11. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees,* and Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees.*

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Before planting						
Root knot nematode, Phytophthora root rot, Verticillium wilt	NC	MustGrow *	1,121–2,240 kg/ha	24 hours[1]	—	**Suppression only.** Apply with a calibrated spreader, in early spring, when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil is well-moistened.
Primocanes emerge						
Anthracnose, Spur blight	**General Comments:** • Cane diseases are rarely a problem in primocane-fruiting varieties because old canes are mowed down in spring, removing most inoculum. • If cane diseases are a perennial problem, apply when new canes are 25–30 cm tall and again in 10 days. Continue at 10–14-day intervals until just before first bloom.					
	M	Ferbam 76 WDG	2.5 kg/1,000 L water	12 hours	prebloom	Ferbam is currently under a phase-out period. The last date of use for growers is **December 14, 2021**.
	11+27	Tanos	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.
Phytophthora root rot	21	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply in up to 1,000 L water/ha in early spring but at least 90 days before harvest. Reapply after harvest when conditions favour disease development (high soil moisture and cool temperatures). Apply as a high-volume soil drench. Do not use with a surfactant.
Raspberry sawfly	At the time of printing this publication, there are no products registered for these pests. See Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees* for products that may provide some activity on this pest.					
Obliquebanded leafroller	**General Comments:** • Leafrollers are not usually a problem in Ontario. Substantial damage can occur without crop loss.					
	5	Delegate	200 g/ha	12 hours	1 day	Apply to eggs and small larvae.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	
	11	Bioprotec PLUS * or Dipel 2X DF * or Foray 48 BA	0.9–1.8 L/ha 525–1,125 g/ha 1.4–2.8 L/ha	4 hours 4 hours 12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	500–750 mL/ha	12 hours	3 days	Sequential applications must be at least 30 days apart.
Two-spotted spider mite	**General Comments:** • Beneficial mites can be introduced to prevent mite build-up. • Thorough spray coverage of the lower leaf surface is required.					
	10	Apollo SC	500 mL/ha	12 hours[2]/ 10 days[3]	15 days	Kills mite eggs and young nymphs. Apply early in the season.
	20B	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	20D	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up and mostly in the nymph stage.

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Primocanes emerge (cont'd)						
Two-spotted spider mite (cont'd)	23	Oberon Flowable	880–1,160 mL/ha	12 hours	3 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or sulphur.
		SuffOil-X *	13 L/1,000 L	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Root knot nematode, Root lesion nematode;	7	Velum Prime	500 mL/ha	12 hours	0 days	**Suppression only.** Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Soil must be lightly pre-wetted to break soil surface tension prior to application. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Prebloom						
Aphids	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficials are present.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Japanese beetle	1A	Sevin XLR	5.25 L/ha	6 days[2]/ 10 days[3,4]	11 days	Apply when adults are active. Reapply at 7–10-day intervals, if needed. Do not apply during bloom.
	4A	Assail	80 g/ha	12 hours	1 day	Do not make a foliar application following a soil application of a group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
Rose chafers	At the time of printing this publication, no products were registered for Rose chafers. See Table 3–12. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees* for products that may provide some activity on this pest.					

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Prebloom (cont'd)						
Leafhoppers	**General Comments:** • Potato leafhopper can be a problem when nearby hay fields are mowed. New plantings are especially susceptible. Leafhoppers feed on primocane leaves and cause new growth to turn yellow and curl under. • Monitor for small green nymphs on lower leaf surface. Spray when nymphs are present and symptoms are evident. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	24 hours	1 day	No product specific comments.
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present. Also controls aphids.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Maximum 2 applications of products from Group 4A per season.
Bloom (mid-July to August)						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould	**General Comments:** • Bloom is the most important time to control botrytis grey mould. Begin at 5%–10% bloom and if the weather is wet. Reapply at 7–10-day intervals.					
	M	Maestro 80 WSP or Supra Captan 80 WSP	2.5 kg/ha	12 hours[2]/ 6 days[4]/ 7 days[5]	2 days	Apply in 1,000 L water/ha. Also controls spur blight. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis, or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[2]/ 24 hours[3,4]	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat	463–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (mid-July to August) (cont'd)						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES ARE IN BLOOM. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	BM2	Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.
Fire blight	24	Kasumin 2L	5.0 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes, refer to the water volume chart indicated on the label for rate recommendations.
Bloom to green fruit						
Raspberry cane borer	**General Comments:** • Prune out and remove old canes during the dormant period to reduce populations of larvae inside the cane. • Remove all nearby wild raspberries because these are good hosts for cane borers.					
	28	Altacor	215–285 g/ha	12 hours	3 days	Apply soon after damage first appears.
Aphids, Leafhoppers	**General Comments:** • Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use high rate. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	**Aphids only.** Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	**Aphids only.** See comments on this product for Aphids at **Prebloom**.

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom to green fruit (cont'd)						
Two-spotted spider mite	**General Comments:** • Beneficial mites can be introduced to prevent mite build-up. • Thorough spray coverage of the lower leaf surface is required.					
	20B	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	20D	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	23	Oberon Flowable	880–1,160 mL/ha	12 hours	3 days	No product specific comments.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
	NC (cont'd)	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** See comments on these products for Two-spotted spider mite at **Primocanes emerge**.
		SuffOil-X *	13 L/1,000 L	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Preharvest and harvest						
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. Fall-bearing raspberries are especially susceptible to this pest. • Apply insecticides weekly when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	1B	Malathion 85 E	975 mL/1,000 L water	24 hours	1 day	**Suppression only.**
	3	Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 days	No product specific comments.
	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Preharvest and harvest (cont'd)						
Spotted wing drosophila (cont'd)	5 (cont'd)	Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when spotted wing drosophila pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan or Maestro. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.
Botrytis grey mould	Although bloom is the most important time to control botrytis grey mould, preharvest sprays are required if the weather is wet. Use one of the products listed for Botrytis grey mould at **Bloom (mid-July to August)**.					
Powdery mildew	**General Comments:** • In problem areas, spray when mildew is first observed. Repeat in 7–10 days.					
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	No product specific comments.
	3	Nova	340 g/ha	12 hours	6 days[4]/ 1 day[6]	Apply with a minimum of 250 L water/ha.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
		SuffOil-X*	13 L/1,000 L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Postharvest						
Phytophthora root rot	2	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply in up to 1,000 L water/ha after harvest when conditions favour disease development (high soil moisture and cool temperatures). Apply as a high-volume soil drench. Do not use with a surfactant.

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–9. Fall-bearing Raspberry Calendar (Primocane Fruiting) (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays These pests are not common in fall-bearing raspberries. Spray if and when monitoring indicates the need.						
Yellow rust, late leaf rust	**General Comments:** • There are several different rust diseases on raspberries: late leaf rust, yellow rust and orange rust. Late leaf rust and orange rust are the most common in Ontario, yellow rust is rarely seen. • Apply in spring at first sign of disease on developing leaves. Reapply 14 days later.					
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours 4 hours[7]/72 hours[2] 4 hours[7]/72 hours[2] 72 hours	30 days	**Yellow rust only.** Apply in a minimum of 500 L water/ha.
		Nova	175 g/ha	12 hours	6 days[4]/ 1 day[6]	**Yellow rust only.** Apply with a minimum of 250 L water/ha.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Use once and then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
Slugs, snails	NC	Deadline M-Ps	11.2–22.5 kg/ha	12 hours	6 days	Apply as a soil surface band treatment between rows. Do not allow this product into direct contact with foliage or edible fruit. Apply in the evening and avoid application before heavy rain.
Brown marmorated stink bug	At time of printing this publication, this pest has not been detected in raspberries but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies for control.					
Raspberry crown borer	Prune out old canes close to the ground when plants are dormant. If this pest is a problem, use one of the products listed for Raspberry crown borer under Summer-fruiting Raspberries at **Postharvest**.					
Phytophthora root rot	If this disease is a problem, use one of the products listed for Phytophthora root rot under Summer-fruiting Raspberries at **Early bud break** and **Postharvest**.					
Septoria leaf spot	7	Sercadis	250–666 mL/ha	12 hours	0 days	Apply at first sign of leaf spot. Raspberry leaf spot can cause severe defoliation on some varieties.

[1] After activation with water in soil. [2] General re-entry. [3] Hand labour (e.g., pruning, training, tying). [4] Hand harvest. [5] Handset irrigation. [6] Mechanical harvest. [7] Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–10. Products Used on Raspberries and Blackberries

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** (REI) is the minimum interval that must be observed between the application of pesticide and work in the treated crop without protective equipment. If no REI is stated on the label, assume it is 12 hours. Where the REI exceeds the preharvest interval, follow the REI.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 (REI)	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for insect and mite control or suppression								
Aceta 70 WP	33298	acetamiprid	4A	1 day	12 hours	4	B, R;	—
Acramite 50 WS	27925	bifenazate	20D	1 day	12 hours	1	B, R	—
Admire 240 Flowable	24094	imidacloprid	4A	14 days[1]	24 hours	1[1]	B, R	—
Agri-Mek SC	31607	abamectin	6	7 days	12 hours[2]/ 72 hours[3]	5[4]	B, R	—
Alias 240 SC	28475	imidacloprid	4A	14 days[1]	24 hours	1[1]	B, R	—
Altacor	28981	chlorantraniliprole	28	3 days	12 hours	2/3[5] (max. 645 g/ha)	B, R	—
Apollo SC	21035	clofentezine	10	15 days	12 hours[2]/ 10 days[6]	1	R	—
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours	4	B, R	—
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	—	B, R	*
Deadline M-Ps	26650	metaldehyde	NC	6 days	12 hours	3	B, R	—
Delegate	28778	spinetoram	5	1 day	12 hours	3	B, R	—
Diazinon 500 E	11889	diazinon	1B	prebloom	12 hours	1	B, R	—
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	—	B, R	*
Entrust	30382	spinosad	5	1 day	when dry	3	B, R	*
Exirel	30895	cyantraniliprole	28	1 day	12 hours	4	B, R	—
Foray 48 BA	24978	*Bacillus thuringiensis*	11	0 days	12 hours	—	R	—
Harvanta 50 SL	32889	cyclaniliprole	28	1 day	12 hours	3 (max 4.8 L/ha)	B, R	—

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label
* = Potentially organic. Check with certifying body.

[1] Soil application. [2] General re-entry. [3] Handset irrigation. [4] Maximum 3 applications pre-harvest and 2 post-harvest. [5] Maximum 2 applications per year at high rate or 3 applications per year at low rate. [6] Hand labour (e.g., pruning, training, tying). [7] Preharvest interval is 1 day for raspberry and for spotted wing drosophila suppression on blackberries, or 7 days for blackberry for all other uses. [8] Hand harvest. [9] Maximum 6 applications per year with no more than 2 dormant applications. [10] Re-entry with personal protective equipment. See label for more details. [11] Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for raspberry hand harvest is 6 days; for handset irrigation is 7 days. General re-entry is 12 hours. [12] After activation with water in soil. [13] Mechanical harvest.

Table 3–10. Products Used on Raspberries and Blackberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for insect and mite control or suppression (cont'd)								
Intrepid	27786	methoxyfenozide	18	3 days	12 hours	3 (max. 2 L/ha)	B, R	—
Kanemite 15 SC	28641	acequinocyl	20B	1 day	12 hours	2 (max 4.1 L/ha)	B, R	—
Kopa	31433	potassium salts of fatty acids	NC	0 days	12 hours	—	R	*
Malathion 85 E	8372	malathion	1B	1 day/7 days[7]	12 hours/ 24 hours[7]	2	B, R	—
Movento 240 SC	28953	spirotetramat	23	3 days	12 hours	3 (max. 1.1 L/ha)	B, R	—
Nexter	33433	pyridaben	21	postharvest	24 hours	2 (max. 2 L/ha)	R	—
Oberon Flowable	28905	spiromesifen	23	3 days	12 hours	3	B, R	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	B, R	*
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8	R	*
Scorpio Ant and Insect Bait	33306	Spinosad	5	1 day	12 hours	3	B, R	*
Sevin XLR	27876	carbaryl	1A	11 days	6 days[2]/10 days[6,8]	2	B, R	—
Sivanto Prime	31452	flupyradifurone	4D	0 days	12 hours	max. 2 L/ha	B, R	—
Success	26835	spinosad	5	1 day	when dry	3	B, R	—
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	B,R	*
Surround WP	27469	kaolin	NC	0 days	12 hours	—	R	*
Up-Cyde 2.5 EC	28795	cypermethrin	3	2 days	12 hours	3	B, R	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[9]	B, R	*
Vydate L	17995	oxamyl	1A	postharvest	12 hours	1	R	—
Products used for disease control or suppression								
Aliette	27688	fosetyl al	P7	60 days	12 hours[2]/ 48 hours[3]	4	B, R	—
Bumper 432 EC	28017	propiconazole	3	30 days	12 hours	2	B, R	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	B, R	—
Diplomat 5 SC	32918	polyoxin D zinc salt	19	0 days	when dry	Max. 2.77 L/ha	B, R	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	B, R	—
Ferbam 76 WDG	20136	ferbam	M	prebloom	12 hours	3	B, R	—

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[1] Soil application. [2] General re-entry. [3] Handset irrigation. [4] Maximum 3 applications pre-harvest and 2 post-harvest. [5] Maximum 2 applications per year at high rate or 3 applications per year at low rate. [6] Hand labour (e.g., pruning, training, tying). [7] Preharvest interval is 1 day for raspberry and for spotted wing drosophila suppression on blackberries, or 7 days for blackberry for all other uses. [8] Hand harvest. [9] Maximum 6 applications per year with no more than 2 dormant applications. [10] Re-entry with personal protective equipment. See label for more details. [11] Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for raspberry hand harvest is 6 days; for handset irrigation is 7 days. General re-entry is 12 hours. [12] After activation with water in soil. [13] Mechanical harvest.

Table 3–10. Products Used on Raspberries and Blackberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for disease control or suppression (cont'd)								
Fitness	32639	propiconazole	3	30 days	4 hours[10]/ 72 hours[2]	2	B, R	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	5 (max 5.25L/ha)	B, R	—
Jade	24030	propiconazole	3	30 days	4 hours[10]/ 72 hours[2]	2	B, R	—
Kasumin 2L	30591	kasugamycin	24	1 day	12 hours	4	B, R	—
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	B, R	—
Lime Sulphur	16465	calcium polysulphide	M	¼ inch green	48 hours	—	B, R	*
Maestro 80 WSP	33488	captan	M	2 days	Variable REI[11]	6	B, R	—
MustGrow	30263	oriental mustard seed meal	NC	—	24 hours[12]	1	B, R	*
Nova	22399	myclobutanil	3	1 day[13]/6 day[8]	12 hours	3	B, R	—
Phostrol	30449	mono- and di-basic sodium, potassium and ammonium phosphites	P7	0 days	12 hours	4	R	—
Princeton	33840	propiconazole	3	30 days	72 hours	2	B, R	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry[2]/ 24 hours[6,8]	4	B, R	—
Property 300 SC	32376	pyriofenone	50	0 days	12 hours	1.2 L/ha	B, R	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	B, R	*
Rampart	30654	mono- and dipotassium salts of phosphorous acid	P7	—	4 hours	5	B	—
Ridomil Gold 480 SL	28474	metalaxyl-M and S-isomer	4	postharvest	12 hours	—	R	—
Scala SC	28011	pyrimethanil	9	0 days	12 hours	2	R	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 3.08 L/ha	R	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	B, R	—
Serenade OPTI	31666	*Bacillus subtilis*	BM2	0 days	12 hours	—	B, R	*
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	B,R	*
Supra Captan 80 WSP	33641	captan	M	2 days	Variable REI[11]	6	B, R	—

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* = Potentially organic. Check with certifying body.

[1] Soil application. [2] General re-entry. [3] Handset irrigation. [4] Maximum 3 applications pre-harvest and 2 post-harvest. [5] Maximum 2 applications per year at high rate or 3 applications per year at low rate. [6] Hand labour (e.g., pruning, training, tying). [7] Preharvest interval is 1 day for raspberry and for spotted wing drosophila suppression on blackberries, or 7 days for blackberry for all other uses. [8] Hand harvest. [9] Maximum 6 applications per year with no more than 2 dormant applications. [10] Re-entry with personal protective equipment. See label for more details. [11] Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for raspberry hand harvest is 6 days; for handset irrigation is 7 days. General re-entry is 12 hours. [12] After activation with water in soil. [13] Mechanical harvest.

Table 3–10. Products Used on Raspberries and Blackberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for disease control or suppression (cont'd)								
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	B, R	—
Tanos 50 DF	27435	famoxadone + cymoxanil	11+27	9 days	9 days	3	B, R	—
Torrent 400 SC	30392	cyazofamid	21	90 days	12 hours	2	B, R	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	R	*
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[9]	B, R	*
Velum Prime	32108	fluopyram	7	0 days	12 hours	2	B, R	—

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label
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[1] Soil application. [2] General re-entry. [3] Handset irrigation. [4] Maximum 3 applications pre-harvest and 2 post-harvest. [5] Maximum 2 applications per year at high rate or 3 applications per year at low rate. [6] Hand labour (e.g., pruning, training, tying). [7] Preharvest interval is 1 day for raspberry and for spotted wing drosophila suppression on blackberries, or 7 days for blackberry for all other uses. [8] Hand harvest. [9] Maximum 6 applications per year with no more than 2 dormant applications. [10] Re-entry with personal protective equipment. See label for more details. [11] Restricted entry interval for blackberry hand harvest is 5 days; for handset irrigation is 6 days. Restricted entry interval for raspberry hand harvest is 6 days; for handset irrigation is 7 days. General re-entry is 12 hours. [12] After activation with water in soil. [13] Mechanical harvest.

Notes on Raspberry and Blackberry Diseases and Insects

Table 3–11. Activity of Fungicides on Raspberry and Blackberry Diseases and Impact on Honeybees

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.

Group	Fungicide	Anthracnose (elsinoe)	Spur blight	Cane botrytis	Botrytis grey mould	Raspberry leaf spot	Late leaf rust	Yellow rust	Powdery mildew	Phytophthora root rot	Crown gall	Fire blight	Honeybee Toxicity[1]
M	Ferbam 76 WDG	1 *	1 *	1	NA	—	1 D	1 *	—	0	0	0	NT
M	Lime Sulphur	1	1 *	1	0	1	1 D *	1 *	—	0	0	0	NT
M	Maestro 80 WSP	2	2 *	1	2 *	1–2	0	0	—	0	0	0	MT
M	Supra Captan 80 WSP	2	2 *	1	2 *	1–2	0	0	—	0	0	0	MT
1	Senator 50 SC	2	2	1	0–1 R *	2	0	0	2 *	0	0	0	NT
3	Bumper 432 EC	—	—	—	—	—	3	3 *	3	0	0	0	NT
3	Fitness	—	—	—	—	—	3	3 *	3	0	0	0	NT
3	Jade	—	—	—	—	—	3	3 *	3	0	0	0	NT
3	Nova	—	—	—	—	—	3	3 *	3 *	0	0	0	NT
3	Princeton	—	—	—	—	—	3	3 *	3	0	0	0	NT
4	Ridomil Gold 480 SL	0	0	0	0	0	0	0	0	3 *	0	0	NT
7	Cantus WDG	—	0	—	3 *	—	—	—	—	0	0	0	NT
7	Fontelis	—	—	—	—	—	— *	— *	—	—	—	—	NT
7	Kenja 400 SC	—	—	—	2–3 *	—	—	—	—	—	—	—	NT
7	Sercadis	—	—	—	1 *	3 *	—	—	2	0	0	0	NT
7+11	Pristine WG	3	3	3	3 *	3	3	3	3	0	0	0	NT
9	Scala SC	—	—	—	3 *	—	—	—	—	0	0	0	NT
9+12	Switch 62.5 WG	—	—	3	3 *	—	—	—	1	0	0	0	NT
11+27	Tanos	2 *	2 *	1 *	1 *	—	—	—	—	—	—	—	NT
17	Elevate 50 WDG	—	1	3	3 *	0	0	—	1	0	0	0	NT
19	Diplomat 5 SC	—	—	—	1 *	—	—	—	—	—	—	—	NT

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. — = No information is available. * (shaded area) = Disease is listed on the product label for control or suppression. NA = Not used at the timing for this pest. R = Resistance to this pathogen has occurred in some areas. D = Delayed dormant timing.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–11. Activity of Fungicides on Raspberry and Blackberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Anthracnose (elsinoe)	Spur blight	Cane botrytis	Botrytis grey mould	Raspberry leaf spot	Late leaf rust	Yellow rust	Powdery mildew	Phytophthora root rot	Crown gall	Fire blight	Honeybee Toxicity[1]
21	Torrent 400 SC	—	—	—	—	—	—	—	—	— *	—	—	—
24	Kasumin 2L	—	—	—	—	—	—	—	—	—	—	— *	NT
50	Property 300 SC	—	—	—	—	—	—	—	2–3 *	—	—	—	—
BM2	Serenade OPTI	—	—	—	1 *	—	—	—	2	—	—	—	NT
NC	Purespray Green Spray Oil 13 E	—	0	0	0	0	0	0	1 *	0	0	0	—
NC	SuffOil-X	—	0	0	0	0	0	0	1 *	0	0	0	—
NC	Vegol Crop Oil	—	0	0	0	0	0	0	1 *	0	0	0	—
P7	Aliette	0	0	0	0	0	0	0	0	2 *	0	—	NT
P7	Phostrol	0	0	0	0	0	0	0	0	2 *	0	—	NT
P7	Rampart	0	0	0	0	0	0	0	0	—	0	0	NT

BM = Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label.

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Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–12. Activity of Insecticides on Raspberry and Blackberry Pests and Impact on Honeybees

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

Group	Insecticide	Aphids	Raspberry sawfly	Raspberry fruitworm (beetle)	Leafrollers	Clipper weevil	Leafhoppers	Spider mites	Inchworms and loopers	Rose chafer	Raspberry cane borer	Raspberry crown borer (larvae)	Japanese beetle (adults)	Spotted wing drosophila (adult)	Honeybee Toxicity[1]
1A	Sevin XLR	2 *	—	1	2 *	—	2 *	0	2	2	1	0	3 *	1	HT
1B	Diazinon 500 E	2	3	3	2	1	1	0	NA	NA	2	3 *	NA	NA	HT
1B	Malathion 85 E	1 *	3	3	2	2 *	2 *	— *	2	2 *	2	NA	2	2 *	HT
3	Up-Cyde 2.5 EC	1	—	—	3	3	2	0	—	—	—	—	2	2 *	HT
3	Pyganic 1.4 EC II	1 *	—	—	—	—	1 *	0	—	—	—	—	—	1	HT
4A	Aceta 70 WP	3 *	—	—	—	—	3 *	0	—	—	—	—	2	1	MT
4A	Admire 240 Flowable	3	—	2	—	2	2	0	—	2	2	—	2	—	HT
4A	Alias 240 SC	3	—	2	—	2	2	0	—	2	2	—	2	—	HT
4A	Assail 70 WP	3 *	—	—	—	—	3 *	0	—	—	—	—	2 *	1	MT
4D	Sivanto Prime	3 *	—	—	—	—	—	—	—	—	—	—	—	—	MT
5	Delegate	0	—	3	3 *	—	—	0	2	—	—	NA	—	3 *	HT
5	Entrust	—	—	3	3 *	—	—	0	2 *	—	—	NA	—	3 *	HT
5	Scorpio Ant and Insect Bait	—	—	—	—	—	—	—	—	—	—	—	—	1 *	NT
5	Success	—	—	3	3 *	—	—	0	2 *	—	—	NA	—	3 *	HT
6	Agri-Mek SC	0	0	0	0	0	—	3 *	0	0	0	0	0	0	HT
10	Apollo SC	0	0	0	0	0	0	2 *	0	0	0	0	0	0	NT
11	Bioprotec PLUS	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT
11	Dipel 2X DF	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT
11	Foray 48 BA	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT
18	Intrepid	0	—	0	3 *	0	0	0	3	0	0	—	0	0	NT

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
NA = Not used at the timing for this pest. — = No information is available. * (shaded area) = Pest is listed on the product label for control or suppression. PH = Postharvest only.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–12. Activity of Insecticides on Raspberry and Blackberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide	Aphids	Raspberry sawfly	Raspberry fruitworm (beetle)	Leafrollers	Clipper weevil	Leafhoppers	Spider mites	Inchworms and loopers	Rose chafer	Raspberry cane borer	Raspberry crown borer (larvae)	Japanese beetle (adults)	Spotted wing drosophila (adult)	Honeybee Toxicity[1]
20B	Kanemite 15 SC	0	0	0	0	0	0	3 *	0	0	0	0	0	0	NT
20D	Acramite 50 WS	0	0	0	0	0	0	3 *	0	0	0	0	0	0	MT
21	Nexter	0	0	0	0	0	0	3 PH *	0	0	0	0	0	0	HT
23	Movento 240 SC	3 *	—	—	—	—	—	—	—	—	—	—	—	1	MT[2]
23	Oberon Flowable	0	0	0	0	0	0	3 *	0	0	0	0	0	0	NT
28	Altacor	0	—	—	3	—	—	0	3	—	— *	2 *	1	—	NT
28	Exirel	3	—	—	3	—	—	—	—	—	—	—	3 *	3 *	HT
28	Harvanta 50 SL	0	—	—	3 *	—	2	0	—	—	—	—	2	3 *	HT
NC	Kopa	1 *	—	—	—	—	1	1 *	—	—	—	—	0	—	NT
NC	Purespray Green Spray Oil 13 E	1 *	0	0	0	0	0	1 *	0	0	0	0	0	0	—
NC	SuffOil-X	1 *	0	0	0	0	0	1 *	0	0	0	0	0	0	—
NC	Surround WP	1	—	—	—	—	2 *	1	—	—	—	0	—	—	—
NC	Vegol Crop Oil	1 *	0	0	0	0	0	1 *	0	0	0	0	0	0	—

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
NA = Not used at the timing for this pest. — = No information is available. * (shaded area) = Pest is listed on the product label for control or suppression. PH = Postharvest only.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Saskatoon Berry

In this section:

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Saskatoon Berry Calendar

Always consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. For preharvest interval, restricted entry interval (REI), and maximum number of applications, see Table 3–14. *Products Used on Saskatoon Berries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to Saskatoon berries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–14. *Products Used on Saskatoon Berries*.

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–13. Saskatoon Berry Calendar

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Early bud break						
Saskatoon bud moth, Fruit tree leafroller	3	Labamba	104 mL/ha	24 hours	21 days	**Saskatoon bud moth only.**
	NC	Superior 70 Oil *	20 L/1,000 L water	12 hours	1/4-inch green	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all varieties. Test a small area first. Do not use oil within 48 hours of freezing temperatures, prior to rain or on heat- or moisture-stressed crop. Do not use within 30 days of sulphur.
Flower bud break						
Obliquebanded leafroller, Winter moth, Fruit tree leafroller, Spanworm	**General Comments:** • Not all products are labelled for all pests. Choose a product based on which type of spring-feeding caterpillar is predominant.					
	4A+15	Cormoran	1.4 L/ha	12 hours	8 days	**Use for spanworm.** Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	**Use for obliquebanded leafroller, winter moth, and spanworm.**

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Flower bud break (cont'd)						
Obliquebanded leafroller, Winter moth, Fruit tree leafroller, Spanworm (cont'd)	11	Bioprotec PLUS * or Dipel 2X DF *	0.9–1.8 L/ha 525–1,125 g/ha	4 hours	0 days	**Use for most leafrollers.** Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	0.5 L/ha	12 hours	7 days	**Use for obliquebanded leafroller and spanworm.**
	28	Altacor	215–285 g/ha	12 hours	1 day	**Use for leafrollers.** Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
		Exirel	0.5– 1.0 L/ha	12 hours	3 days	
Saskatoon-juniper rust	**General Comments:** • This disease causes yellow spots and swelling on leaves and fruit. • Infections on juniper spread up to 2 km to saskatoons. Prune out rust galls on juniper or remove entire juniper plants to reduce disease pressure. • Spray before symptoms develop.					
	3	Funginex DC	3 L/ha	12 hours	60 days	Apply once between **Flower bud break and White tip.**
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/29 days[2]	0 days	Do not tank-mix or make sequential applications with Exirel.
Entomosporium leaf and berry spot	**General Comments:** • Angular brown spots develop first on lower leaves, causing yellowing, defoliation and fruit cracking. • Spray before symptoms develop. Apply at **Flower bud break** and reapply at 10–14-day intervals while disease risk persists.					
	M	Cosavet DF Edge * or Kumulus DF * or Microthiol Disperss *	7.5 kg/ha	24 hours	1 day	Do not apply if temperatures are over 27°C or leaf injury may result. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	3	Funginex DC	3 L/ha	12 hours	60 days	Apply once between **Flower bud break** and **White tip**.
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/29 days[2]	0 days	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours[1]/ 10 days[2,3]	1 day	**Suppression only.**
White tip						
Saskatoon-juniper rust	**General Comments:** • This disease causes yellow spots and swellings on leaves and fruit. • Infections on juniper spread up to 2 km to saskatoons. Prune out rust galls on juniper or remove entire juniper plants to reduce disease pressure. • Spray before symptoms develop.					
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	38 days	Apply in a minimum of 200 L water/ha.
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/29 days[2]	0 days	Do not tank-mix or make sequential applications with Exirel.

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
White tip (cont'd)						
Entomosporium leaf and berry spot	**General Comments:** • Angular brown spots develop first on lower leaves, causing yellowing, defoliation and fruit cracking. • Spray before symptoms develop. Apply at **Flower bud break** and reapply at 10–14-day intervals while disease risk persists.					
	M	Cosavet DF Edge * or Kumulus DF * or Microthiol Disperss *	7.5 kg/ha	24 hours	1 day	Do not apply if temperatures are over 27°C or leaf injury may result. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	38 days	Apply in a minimum of 200 L water/ha.
	7+11	Pristine WG	1.6 kg/ha	when dry[1]/29 days[2]	0 days	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours[1]/ 10 days[2,3]	1 day	**Suppression only.**
Bloom						
Powdery mildew	**General Comments:** • Apply before disease symptoms develop. Reapply 10 days later, if needed. • Alternate with products outside of Group 3 for entomosporium leaf and berry spot control.					
	3	Nova	113 g/1,000 L water or 340 g/ha	12 hours[1]/ 72 hours[2,3]	14 days	No product specific comments.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
Fire blight	24	Kasumin 2L	5.0 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes, refer to the water volume chart indicated on the label for rate recommendations.
Petal fall						
Weevils	3	Decis 100 EC	1 mL in 4.5 L water for 100 m^2 of orchard face row	12 hours	21 days	Apply to both sides of a row. Calculate the area of the orchard face using the height of the bushes and length of the row.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Apply to foliage to control adult weevils in buds or foliage. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Saskatoon-juniper rust	Use one of the products listed for Saskatoon-juniper rust at **White tip**.					
Entomosporium leaf and berry spot	Use one of the products listed for Entomosporium leaf and berry spot at **White tip**.					

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit						
Powdery mildew	**General Comments:** • Apply before disease symptoms develop. Reapply 10 days later, if needed.					
	3	Nova	113 g/1,000 L water or 340 g/ha	12 hours[1]/ 72 hours[2,3]	14 days	Alternate with products outside of Group 3 for entomosporium leaf and berry spot control.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
		SuffOil-X*	13 L/1,000 L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Saskatoon-juniper rust	Use one of the products listed for Saskatoon-juniper rust at **White tip**.					
Entomosporium leaf and berry spot	Use one of the products listed for Entomosporium at **White tip**.					
Obliquebanded leafroller	**General Comments:** • Apply when eggs are hatching or young larvae are present. Use pheromone traps and spray at peak trap catch.					
	28	Altacor	215–285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Japanese beetle	3	Danitol	779–1169 mL/ha	see comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning and frost control is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
	4A	Assail	80 g/ha	12 hours[1]/ 48 hours[2]	1 days	Do not make a foliar application following soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	700 mL/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Japanese beetle (cont'd)	28	Altacor	215–285 g/ha	12 hours	1 day	**Suppression only.**
		Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Weevils	Use one of the products listed for Weevils at **Petal fall.**					
After harvest						
Woolly elm aphid, Woolly apple aphid	**General Comments:** • These aphids feed on plant roots and reduce plant vigour. After harvest, dig up suspect bushes and examine the root systems for waxy white aphid colonies. Young plantings are especially susceptible. • Make 1 application in mid-July to mid-August, after harvest is complete.					
	1	Orthene 75% SP	1.7 g/plant	72 hours	11 months	Application is by soil injection. Mix 0.85 g in 1 L of water and apply 2 L/plant. Inject in 3–5 injection points about 12 in. deep. See product label for special application instructions.
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	14 days	**Reduction in numbers only.** Apply to soil with sufficient water volume to move the product to the root zone. Use prior to egg hatch (shortly after adults are active) to control young larvae. Maximum 1 application of Admire if it is a soil application. Do not make a foliar application following a soil application for a group 4A insecticide. Soil applications of Admire and Alias are under a phase-out. **The last date of use for growers is April 11, 2022.**
Special sprays These pests are not a common problem on saskatoons. Spray if and when monitoring indicates the need.						
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Apply insecticides weekly when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	1B	Malathion 85 E	1 L/1,000 L water	12 hours	1 day	**Suppression only.**
	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning and frost control is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
		Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 days	No product specific comments.

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays (cont'd) These pests are not a common problem on saskatoons. Spray if and when monitoring indicates the need.						
Spotted wing drosophila (cont'd)	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
		Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when spotted wing drosophila pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Use high rate and shorten intervals between applications under heavy pressure. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.
Aphids	**General Comments:** • Aphids are not normally a problem in saskatoon berries. • Apply when aphid populations are high, but not during **Bloom.** Some of these products are toxic to bees. Refer to label for specific bee toxicity statements. • This spray does not control root-feeding woolly elm or apple aphids.					
	4A	Assail 70 WP	56–86 g/ha	12 hours[1]/ 48 hours[3]	1 day	Do not make a foliar application following soil application of a Group 4A insecticide. Do not apply from bud stage to bloom or when bees are actively foraging. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	750 mL/ha	12 hours	8 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	**Postbloom only.**

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–13. Saskatoon Berry Calendar (cont'd)

Disease or Insect	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Special sprays (cont'd) These pests are not a common problem on saskatoons. Spray if and when monitoring indicates the need.						
Aphids (cont'd)	NC	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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Leafhoppers	3	Danitol	779–1169 mL/ha	See comments	3 days	The restricted entry interval (REI) for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days.
Brown marmorated stink bug	**General Comments:** • At time of printing this publication, this pest has not been detected in berry crops, but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies.					
	4A	Actara 25 WG	280 g/ha	12 hours	3 days	**Suppression only.** This product is highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Maximum 2 applications of products from Group 4A per season. Actara is currently under a phase-out period. **The last date of use for growers is April 11, 2022.**

[1] General re-entry. [2] Hand harvest. [3] Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–14. Products Used on Saskatoon Berries

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** (REI) is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no REI is stated on the label, assume it is 12 hours. Where the REI exceeds the preharvest interval, follow the REI.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 (REI)	Maximum Applications	Potentially Organic	Honeybee Toxicity[1]
Products used for insect and mite control or suppression								
Actara 25 WG	28408	thiamethoxam	4A	3 days	12 hours	2	—	HT
Admire 240 Flowable	24094	imidacloprid	4A	14 days[1]	24 hours	1[1]	—	HT
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	2/3 (max. 645 g/ha)	—	NT
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours[2]/48 hours[3]	4	—	MT
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	—	*	NT
Cormoran	33353	Acetamiprid+ novaluron	4A+15	8 days	12 hours	3	—	HT
Danitol	33817	fenpropathrin	3	3 days	Variable REI[4]	2	—	HT
Decis 100 EC	33700	deltamethrin	3	21 days	12 hours	3	—	HT
Delegate	28778	spinetoram	5	1 days	12 hours	3	—	HT
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	—	*	NT
Entrust	30382	spinosad	5	3 days[5]/1 day[6]	when dry	3	*	HT
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—	HT
Harvanta 50 SL	32889	cyclaniliprole	28	1 day	12 hours	3 (max 4.8 L/ha)	—	HT
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4 (max. 2 L/ha)	—	NT
Labamba	33576	lambda-cyhalothrin	3	21 days	24 hours	2	—	HT
Malathion 85 E	8372	Malathion	1B	1 day	12 hours	3	—	HT
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.8 L/ha	—	HT[2]
Orthene 75% SP	14225	acephate	1B	11 months	72 hours	1	—	HT
Scorpio Ant and Insect Bait	33306	spinosad	5	1 day	12 hours	3	*	NT

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.
* = Potentially organic. Check with certifying body.

[1] Soil application. [2] General re-entry. [3] Hand pruning and thinning. [4] The restricted entry interval (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning and frost control is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days. [5] For obliquebanded leafroller, winter moth and spanworm. [6] For spotted wing drosophila.
[7] Maximum 6 applications per year with no more than 2 dormant applications. [8] Hand harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–14. Products Used on Saskatoon Berries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic	Honeybee Toxicity[1]
Products used for insect and mite control or suppression (cont'd)								
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	max. 2 L/ha	—	MT
Success	26835	spinosad	5	3 days[5]/1 day[6]	when dry	3	—	HT
Superior 70 Oil	9542	mineral oil	NC	¼-inch green	12 hours	1	*	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	2 days	12 hours	2	—	HT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[7]	*	—
Products used for disease control or suppression								
Bumper 432 EC	28017	propiconazole	3	38 days	12 hours	3	—	NT
Cosavet DF Edge	31869	sulphur	M	1 day	24 hours	8	*	NT
Fitness	32639	propiconazole	3	38 days	12 hours	3	—	NT
Funginex DC	27686	triforine	3	60 days	12 hours	1	—	NT
Jade	24030	propiconazole	3	38 days	12 hours	3	—	NT
Kasumin 2L	30591	kasugamycin	24	1 day	12 hours	4	—	NT
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	*	NT
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	*	NT
Nova	22399	myclobutanil	3	14 days	12 hours[2]/72 hours[3,8]	3	—	NT
Princeton	33840	propiconazole	3	38 days	12 hours	3	—	NT
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry[2]/29 days[8]	4	—	NT
Property 300 SC	32376	pyriofenone	50	0 days	12 hours	1.2 L/ha	—	NT
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	*	—
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	*	—
Switch 62.5 WG	28189	cyprodinil and fludioxonil	9+12	1 day	12 hours[2]/10 days[3,8]	3	—	NT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[7]	*	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.
* = Potentially organic. Check with certifying body.

[1] Soil application. [2] General re-entry. [3] Hand pruning and thinning. [4] The restricted entry interval (REI) for Danitol for general re-entry is 24 hours, for mechanical harvest is 3 days, for hand pruning and frost control is 7 days, for hand harvest is 15 days, and for handset irrigation is 17 days. [5] For obliquebanded leafroller, winter moth and spanworm. [6] For spotted wing drosophila.
[7] Maximum 6 applications per year with no more than 2 dormant applications. [8] Hand harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Strawberry

In this section:

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Non-bearing Strawberry Calendar (planting year)

Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. For preharvest interval, restricted entry interval (REI) and maximum number of applications, see Table 3–18. *Products Used on Strawberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees* and Table 3–20. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, 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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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.

Plant growth regulators (PGRs) are chemicals used to control runner production in strawberries. Information on the timing and rates of application for PGRs can be found in the crop calendar. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.html and click on *Plant Growth Regulators for Fruit Crops*.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario.*

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Before planting						
Red stele, Root knot nematode, Root lesion nematode, Verticillium wilt	NC	MustGrow *	1,121–2,240 kg/ha	24 hours[1]	—	**Suppression only.** Apply with a calibrated spreader, in early spring when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil is well-moistened.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
At planting or shortly after						
Black root rot	**General Comments:** • Apply in the transplant furrow at planting or as a high-volume application directed at the crown in 1,000–1,500 L water/ha within a week after planting. • Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. • For drench application, use 10 L water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. • These products are also registered for application through drip irrigation systems. See label for details.					
	11	Azoshy 250 SC	1.1 L/ha	12 hours	365 days	**Suppression only.** 6 mL/100m of row in 1200 L water/ha for in-furrow. Apply once in-furrow at planting or a banded drench application immediately after planting up to 8 days post planting.
		Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	**Suppression only.** Can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	**Suppression only.**
Wireworms	5	Scorpio Ant and Insect Bait*	25–50 kg/ha	12 hours	1 day	**Reduces damage only, does not provide control or suppression.** Incorporate into the soil at planting to a depth of 10–20 cm. There is limited experience with this product in Ontario.
Vegetative growth modification	NC	Apogee or Kudos 27.5 WDG	450 g/1,000 L water or 135 g/ha	12 hours	21 days	Apply prior to beginning of runner initiation after desired field density has been reached. Reapply at 14–21-day intervals. Use a surfactant, where permitted, for optimum efficacy. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix with calcium sprays. This is a new tool for Ontario. Test on a small scale to evaluate effectiveness on different varieties and production systems. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.html and click on *Plant Growth Regulators for Fruit Crops.*
May or early June (when new growth begins after transplanting)						
Strawberry aphids	**General Comments:** • Control aphids to reduce spread of virus diseases to new fields. • Apply when growth begins after planting. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Spray before buds open or after deblossoming. Read the specific bee toxicity statements on the label.					
	1B	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Apply as a foliar spray.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
May or early June (when new growth begins after transplanting) (cont'd)						
Strawberry aphids (cont'd)	4A	Admire 240 Flowable	175 mL/ha	24 hours	7 days	Also suppresses leafhoppers. Remove all bloom and blossom clusters before application and apply as a foliar spray. Maximum 2 applications of products from Group 4A per season.
		Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Apply as a foliar spray. Use a 7-day interval between applications. Use high rate under high pest pressure.
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120-160 g/ha	12 hours	0 days	Safe on beneficial insects and bees
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
Leafrollers	**General Comments:** • Apply only if leafrollers are easy to find.					
	1B	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
May or early June (when new growth begins after transplanting) (cont'd)						
Leafrollers (cont'd)	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	No product specific comments.
	11	Bioprotec PLUS * or Dipel 2X DF *	0.9–1.8 L/ha 525–1,125 g/ha	4 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	28	Altacor	215–285 g/ha	12 hours	1 day	No product specific comments.
Cutworm	**General Comments:** • Apply if cutworm activity is evident, usually June 1–15. • Do not confuse cutworm damage with deer browsing.					
	1	Pyrinex 480 EC or Sharphos or Warhawk 480 EC	1.2 L/ha	24 hours	20 days	Apply in 2,000 L water/ha. **Use for strawberry cutworm (crown borer).**
	28	Altacor	215–285 g/ha	12 hours	1 day	**Use for climbing cutworm.**
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	**Suppression only.** Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
One month after planting and again once or twice at 2-week intervals						
Common leaf spot	**General Comments:** • Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface. • Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[2]/ 6 days[3]/9 days[4]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	1 day	Make 1st application when disease levels are no more than 5%. Apply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
One month after planting and again once or twice at 2-week intervals (cont'd)						
Common leaf spot (cont'd)	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[2]/ 24 hours[3]	1 day	Do not tank-mix or make sequential applications with Exirel.
Strawberry aphids	**General Comments:** • Continue to monitor for aphids and protect new plants when aphids are present. • Remove all bloom and blossom clusters before application and apply as a foliar spray.					
	1B	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Do not apply when bees are actively foraging.
	4A	Admire 240 Flowable	175 mL/ha	24 hours	7 days	Also suppresses leafhoppers. Remove all bloom and blossom clusters before application and apply as a foliar spray. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Also controls leafhoppers. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on **Kopa** for Strawberry aphids at **May or early June (when new growth begins after transplanting)**.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on **Vegol Crop Oil** for Strawberry aphids at **May or early June (when new growth begins after transplanting)**.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
July to mid-August						
Potato leafhopper	**General Comments:** • Potato leafhoppers migrate long distances and often appear when nearby hay fields are mowed. • Check underside of leaves and spray when nymphs are present. Repeated applications may be necessary. • Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	**Suppression only (Admire).** Remove all bloom and blossom clusters before application and apply as a foliar spray. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Admire 240 Flowable	175 mL/ha	24 hours	7 days	
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	NC	Surround WP *	25 kg/ha	12 hours	0 days	Apply at 7–14-day intervals when leafhoppers are first detected by monitoring. Efficacy depends on complete coverage of leaves. For early applications, use 25 kg/ha per 500 L of water. Once a base coat is established, use 12.5 kg/ha per 500 L of water for subsequent sprays. Do not apply during bloom or when fruit is present. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil.
Strawberry aphids	Use one of the products listed for Aphids at **One month after planting**.					
Powdery mildew	**General Comments:** • Begin applications when conditions favour disease or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. • Shorten interval between applications when pest pressure is severe.					
	M	Cueva *	5 L in 500 L water/ha	4 hours	1 day	Use a 1% solution v/v in 470–940 L water/ha.
	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours[2,5]/ 2 days[3]	3 days	No product specific comments.
	3+11	Quadris Top	0.87–1.0 L /ha	12 hours	1 day	Quadris Top is extremely phytotoxic to certain apple varieties. Extreme care must be taken to prevent injury to apple trees and fruit. Do not spray Quadris Top where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
July to mid-August (cont'd)						
Powdery mildew (cont'd)	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Begin applications when conditions favour disease development and continue as needed on a 7–10-day interval. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	250–333 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Luna Sensation	300–400 mL/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.6 kg/ha	when dry[2]/ 24 hours[3]	1 day	
	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
	19	Diplomat 5 SC	259–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	BM1	Fracture or ProBLAD	1.5–3.3 L/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	BM2	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	**Suppression only.**
	NC	Actinovate SP	425 g/ha	1 hour	—	**Suppression only.** Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Milstop*	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Milstop can be used preventively for powdery mildew on strawberries when conditions are favourable for disease development. Apply preventively at 2.8 kg/ha every 1–2 weeks until conditions improve. If required, MilStop can also be used curatively for powdery mildew; in such cases, apply up to the maximum rate (5.6 kg/ha) every week for 3 weeks and then revert to use of the preventive rate. Creates a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
July to mid-August (cont'd)						
Powdery mildew (cont'd)	NC (cont'd)	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Works as eradicant and has little protective activity. Creates a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		SuffOil-X *	13 L/ 1,000 L water	12 hours	12 hours	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur.
		Tivano *	1.4% v/v + surfactant, where permitted.	4 hours or when dry	0 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	**Suppression only.** Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides, where permitted, or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–15. Non-bearing Strawberry Calendar (Planting Year) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
July to mid-August (cont'd)						
Angular leaf spot	NC	Tivano*	1.7% v/v	4 hours or when dry	0 days	**Suppression only.** Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active (bacterial exudates) to prevent the spread by rain or mechanical disturbance. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	30 days	**Reduction in numbers only.** Apply just prior to egg hatch (shortly after adults are active) to control young larvae. Apply to soil, before mulch is applied. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season. Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Soil applications of Admire are under a phase-out. **Last date of use for growers is April 11, 2022.**
Common leaf spot	If leaf spot is present, continue fungicide applications at regular intervals, prior to wetting periods. Use one of the products listed for Common leaf spot at **One month after planting**.					
Mid-August and again once or twice						
Powdery mildew	Use one of the products listed for Powdery mildew at **July to mid-August**.					
Common leaf spot	This is an important timing for control. If leaf spot is present, or on susceptible varieties, continue fungicide applications at regular intervals, prior to wetting periods. Use one of the products listed for Common leaf spot at **One month after planting**.					
Black root rot	Use one of the products listed for Black root rot **At planting or shortly after**.					
Strawberry aphids	This is a critical time for aphid control. Populations tend to build up unnoticed at this time. Check new growth and continue an aphid control program if aphids are present. Use one of the products listed for Strawberry aphids at **One month after planting**.					
Fall						
Red stele	**General Comments:** • This disease is sporadic and favoured by wet or compacted soil. See Table 3–21. *Strawberry Variety Disease Ratings*, for susceptible varieties. • To reduce the chance of resistance, spray only where Red stele has been observed or a high-risk situation occurs.					
	4A	Ridomil Gold 480 SL	1 L/ha	12 hours	postharvest	Make first application in early September and reapply in late October, no later than October 31. Apply in a high-volume spray (2,500 L/ha) to ensure movement into the root zone.
	P7	Aliette	5.6 kg/ha	12 hours	30 days	Maximum of 4 applications per season: 2 in spring and 2 in fall. Apply as a foliar spray in spring when plants start active growth. Apply at 30–60-day intervals. Make fall applications when soil conditions favour disease development (e.g., high soil moisture, cool temperatures).

[1] After activation with water in soil. [2] General re-entry. [3] Training, pinching, hand pruning and hand harvest. [4] Handset irrigation. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

June-bearing Strawberry Calendar (fruiting years)

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. For preharvest interval, restricted entry interval (REI) and maximum number of applications, see Table 3–18. *Products Used on Strawberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, and Table 3–20. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees* 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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies,* Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to strawberries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, and Table 3–20. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*.

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When new growth appears						
Red stele	**General Comments:** • This disease is sporadic and favoured by wet or compacted soil. See Table 3–21. *Strawberry Variety Disease Ratings,* for susceptible varieties. • Spray only where Red stele has been observed or a high-risk situation occurs.					
	P7	Aliette	5.6 kg/ha	12 hours	30 days	Maximum 4 applications per season: 2 in spring and 2 in fall. Apply in spring when plants start active growth. Apply at 30–60-day intervals. Do not apply within 30 days of harvest or after first bloom.
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	**Suppression only.** Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Botrytis grey mould	**General Comments:** • Botrytis is a serious disease for strawberries in Ontario. • Use products that provide excellent control under high disease pressure. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*.					
	M	Bravo ZNC or Echo NP	3.5 L/ha 2.5 L/ha	12 hours	30 days	Reduces disease inoculum and prevents infection of senescent leaves. Reapply 10 days later. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
Black root rot	11	Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	**Suppression only.** Apply as a high-volume application directed at the crown in 1,000–1,500 L/ha water. Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. For drench application, use 10 L of water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. These products are also registered for application through drip irrigation systems. See label for details. Quadris can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	
When flower buds are visible in the crown						
Cyclamen mite	**General Comments:** • Apply where cyclamen mite has been a problem in the past. • These tiny mites feed on developing leaves in the plant crown, causing leaf distortion and stunted growth.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Apply in a high-volume spray to ensure thorough leaf coverage. Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	NC	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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When flower buds are visible in the crown (cont'd)						
Strawberry aphids	**General Comments:** • Apply when aphid populations start to build but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply these products to blooming crops while bees are active. Refer to label for specific bee toxicity statements.					
	1B	Cygon 480 AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Apply as a foliar spray.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When flower buds are visible in the crown (cont'd)						
Common leaf spot	**General Comments:** • Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface. • Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[1]/ 6 days[2]/9 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Reapply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	Do not tank-mix or make sequential applications with Exirel.
Angular leaf spot	NC	Tivano *	1.7% v/v	4 hours or when dry	0 days	**Suppression only.** Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active (bacterial exudates) to prevent the spread by rain or mechanical disturbance. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).
As flower buds extend from crown						
Strawberry clipper weevil	**General Comments:** • Check edges of fields for clipped buds. • Spray when first injury is detected or wait until threshold is reached (approximately 13 clipped buds per m of row). • Reapply if new injury is detected 7 days later.					
	3	Up-Cyde 2.5 EC	280 mL/ha	12 hours	7 days	No product specific comments.
		Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
As flower buds extend from crown (cont'd)						
Tarnished plant bug (adults)	1B	Cygon 480-AG	2.75 L/ha	48 hours	7 days	This product is very toxic to bees. Do not use during bloom or when bees are active. Refer to label for specific bee toxicity statements.
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
First bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE *BEE POISONING*, CHAPTER 1.						
Strawberry aphids	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. Will also provide suppression of tarnished plant bug if used at the high rate.
Tarnished plant bugs	**General Comments:** • Do not spray when bees are active. Refer to label for specific bee toxicity statements. • During bloom and green fruit stage, shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Decis 5 EC or Decis 100 EC or Poleci 2.5 EC	200 mL/ha 100 mL/ha 400 mL/ha	12 hours	14 days	These products also control spittle bug and, except Decis and Poleci, clipper weevil. Toxic to beneficial insects. Use of these products may lead to mite outbreaks.
		Up-Cyde 2.5 EC	400 mL/ha	12 hours	7 days	
		Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	Apply when nymphs are still in early instar stages. Reapply 10–14 days later.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	**Suppression only.** Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Botrytis grey mould	**General Comments:** • Botrytis is a serious disease for strawberries in Ontario. • Apply in a high-volume spray to ensure thorough coverage to keep all flower parts protected with fungicide during bloom. • Typically 2–3 sprays at 7–10-day intervals during bloom will give good control. Shorten spray interval between applications (e.g., 5–7 days) during wet weather. • Use products that product excellent control under high disease pressure. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees.*					
	M	Folpan 80 WDG	2.5 kg/ha	24 hours	1 day	Folpan has recently undergone a re-evaluation, resulting in an increased Restricted entry interval. Label changes must be made by **January 2022.** Refer to label for the latest information.
		Granuflo T	2.25–2.5 kg/ 1,000 L water	24 hours	3 days	Use up to 2,000 L water/ha. Granuflo T is currently under a phase-out period. The last date of use for growers is **December 14, 2021.**

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	M	Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[1]/ 6 days[2]/ 9 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once then rotate to a different fungicide group.Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	0 days	
		Sercadis	500–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Use once then rotate to a different fungicide group.
	7+11	Luna Sensation	500–600 mL/ha	12 hours	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
		Pristine	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	
	7+12	Miravis Prime	1 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9	Scala SC	2 L/ha	12 hours	1 day	No product specific comments.
	9+12	Switch 62.5 WG	975 g/ha	12 hours	1 day	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	0 days	Apply prior to infection. Use high rate under high disease pressure. Do not make more than 2 sequential applications. Do not tank-mix or make sequential applications with Exirel.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	259–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	BM1	Fracture or ProBLAD	1.5–3.3 L/ha	12 hours	0 days	For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	BM2	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.
		Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE *BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	NC	Actinovate SP	425 g/ha	1 hour	—	**Suppression only.** Apply in 1,100 L water/ha. For best results, use multiple applications or in rotation with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** See comments on this product for Botrytis at **When new growth appears**.
		OxiDate 2.0 *	1.0 % v/v	4 hours or when dry	0 days	
	P5	Regalia Maxx *	0.25% v/v in 500–1,000 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products. Use 0.25% (2.5 L in 1,000 L water) in rotation with other Botrytis fungicides.
Anthracnose fruit rot	**General Comments:** • Bloom is the best time to control this disease. Warm wet weather during bloom favours the development of anthracnose fruit rot.					
	3 + 11	Quadris Top	0.87–1.0 L /ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides*, Chapter 2. Quadris Top is extremely phytotoxic to certain apple varieties. Extreme care must be taken to prevent injury to apple trees and fruit. Do not spray Quadris Top where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	7+11	Luna Sensation	500–600 mL/ha	12 hours	0 days	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides*, Chapter 2. Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	
	9+12	Switch 62.5 WG	775–975 mL/ha	12 hours	1 day	Maximum 2 sequential applications before rotating to a different fungicide group.
	11	Cabrio EG	1 kg/ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides*, Chapter 2. Do not tank-mix or make sequential applications with Exirel.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	No product specific comments.
	NC	Actinovate SP	425 g/ha	1 hour	—	**May reduce symptoms but does not provide control or suppression.** Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
First bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE *BEE POISONING*, CHAPTER 1.						
Leather rot	**General Comments:** • Begin applications at 10% bloom and continue at 7-day intervals if conditions favour disease (heavy rains, standing water, rain-splashed soil, history of damage).					
	P7	Confine Extra	4–5 L/ha	12 hours	1 day	**Suppression only.**
		Phostrol	2.9–5.8 L/ha	12 hours	3 days	No product specific comments.
7 to 10 days after first bloom						
Botrytis grey mould	Use one of the products listed for Botrytis at **First bloom**.					
Anthracnose fruit rot	Use one of the products listed for Anthracnose at **First bloom**.					
Tarnished plant bugs	This is a critical time for control. Continue to monitor for tarnished plant bug. If thresholds are reached, use one of the products listed for Tarnished plant bug at **First bloom**.					
Thrips	**General Comments:** • Check blossoms and under calyces for small thread-like yellow thrips. Expect more problems where insecticides have not been applied for tarnished plant bug. • If populations are high, reapply at 3–4-day intervals. • These products are toxic to bees exposed to direct treatment, drift or residues on blooming plants. Do not apply during bloom or when bees are active.					
	5	Delegate	280 g/ha	12 hours	1 day	**Suppression only.**
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	**Suppression only.** Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	**Suppression only.**
Green fruit						
Leather rot (suppression)	Use one of the products listed for Leather rot at **First bloom** if conditions are favourable for infection.					
Strawberry aphids	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	These products will also control or suppress tarnished plant bug when used at the high rate. Maximum 2 applications of products from Group 4A per season. Do not apply when bees are actively foraging.
	4A + 15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Strawberry aphids (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. This product will also control or suppress tarnished plant bug when used at the high rate.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on **Kopa** for Strawberry aphids at **When flower buds are visible in the crown**.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Tarnished plant bug (nymphs)	**General Comments:** • During **Bloom** and **Green fruit**, shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. • For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Decis 5 EC or Decis 100 EC or Poleci 2.5 EC	200 mL/ha 100 mL/ha 400 mL/ha	12 hours	14 days	These products also control spittle bug and, except Decis and Poleci, clipper weevil. Toxic to beneficial insects. These products may lead to mite outbreaks.
		Up-Cyde 2.5 EC	400 mL/ha	12 hours	7 days	
		Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	4A	Aceta 70 WP or Assail 70 WP	84–210 g/ha	12 hours	1 day	This is the best timing for these products. Do not spray when bees are active. Use a 7-day interval between sprays. Use the high rate under high pest pressure. Maximum 2 applications of products from Group 4A per season
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	This is the best timing for Rimon. Do not spray when bees are active. Apply when nymphs are still in the early instar stages. Reapply 10–14 days later.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Tarnished plant bug (nymphs) (cont'd)	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	**Suppression only.** Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Two-spotted spider mite	**General Comments:** • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–22. *Miticides Registered on Strawberries* for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	10	Apollo SC	500 mL/ha	12 hours	15 days	Kills mite eggs and young nymphs. Apply when mites are mostly in the egg stage.
	21	Nexter	0.5–1.0 L/ha	24 hours	10 days	Do not spray when bees are active.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance, where permitted.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Green fruit (cont'd)						
Two-spotted spider mite (cont'd)	NC (cont'd)	SuffOil-X *	13 L/1,000L	12 hours	12 hours	**Suppression only (SuffOil-X).** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Preharvest						
Botrytis grey mould	Use one of the products listed for Botrytis at **First bloom**. If sprinkler irrigation is used, water early in the day to allow plants to dry off before nightfall.					
Anthracnose fruit rot	Warm wet weather favours development of anthracnose. In these conditions, use one of the products listed for Anthracnose at **First bloom**.					
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Apply insecticides weekly when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	1B	Malathion 85 E	1 L/1,000 L water	12 hours	3 days	**Suppression only.**
	3	Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 days	No product specific comments.
	5	Delegate	280 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	292–364 mL/ha 145–182 mL/ha	when dry	1 day	
		Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when spotted wing drosophila pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Preharvest (cont'd)						
Spotted wing drosophila (cont'd)	28	Exirel	1–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.
Slugs	NC	Deadline M-Ps	11.2–27.5 kg/ha	12 hours	6 days	Apply as a soil surface band treatment between rows. Do not allow this product into direct contact with foliage or edible fruit. Apply in the evening and avoid application before heavy rain.
		Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply when infestation begins to moist soil. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Renovation (after mowing to July)						
Cyclamen mite	**General Comments:** • These tiny mites feed on developing leaves in the plant crown, causing leaf distortion and stunted growth. • High water volumes are needed to contact the new growth in the crown.					
	NC	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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Black vine weevil (adults)	**General Comments:** • These products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	**Suppression only.** Apply when adult weevil activity begins, but not until after harvest. May be less effective at high temperatures (over 27°C).
	4A	Actara 25 WG	210–280 g/ha	12 hours	3 days[4]	Apply to foliage when weevil adults are present, usually during and after harvest. Do not apply if a soil application of a Group 4A insecticide was applied. Also controls cranberry weevils. Maximum 2 applications of products from Group 4A per season. Actara is currently under a phase-out period. **The last date of use for growers is April 11, 2022.**

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August)						
Strawberry aphids	**General Comments:** • Monitor for aphids and apply to foliage when populations build up again after mowing. • Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable	175 mL/ha	24 hours	7 days	These products will also control (Aceta, Assail) or suppress (Admire) leafhoppers. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
		Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on **Kopa** for Strawberry aphids at **When flower buds are visible in the crown**.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Strawberry aphids at **Green fruit**.
Two-spotted spider mite	**General Comments:** • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–22. *Miticides Registered on Strawberries* for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	21	Nexter	0.5–1.0 L/ha	24 hours	10 days	No product specific comments.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance, where permitted.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August) (cont'd)						
Two-spotted spider mite (cont'd)	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on Kopa for two-spotted spider mites at **Green fruit**.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** See comments on Purespray Green Spray Oil, SuffOil-X, and Vegol Crop Oil for Two-spotted spider mite at **Green fruit.**
		SuffOil-X *	13 L/1,000L	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Powdery mildew	**General Comments:** • Begin applications when conditions favour disease development or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. • Shorten interval between applications when disease pressure is severe.					
	M	Cueva *	5 L in 500 L water/ha	4 hours	1 day	Use a 1% solution v/v, in 470–940 L water/ha.
	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours[1,5]/ 48 hours[2]	3 days	No product specific comments.
	3 + 11	Quadris Top	0.87–1.0 L /ha	12 hours	1 day	Quadris Top is extremely phytotoxic to certain apple varieties. Extreme care must be taken to prevent injury to apple trees and fruit. Do not spray Quadris Top where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	250–333 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Luna Sensation	300–400 mL/ha	12 hours	0 days	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	
	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
	19	Diplomat 5 SC	259–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August) (cont'd)						
Powdery mildew (cont'd)	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	BM1	Fracture or ProBLAD	1.5–3.3 L/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotationwith other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	BM2	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	**Suppression only.**
	NC	Actinovate SP	425 g/ha	1 hour	—	**Suppression only.** Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Milstop *	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Milstop can be used preventively for powdery mildew on strawberries when conditions are favourable for disease development. Apply preventively at 2.8 kg/ha every 1–2 weeks until conditions improve. If required, MilStop can also be used curatively for powdery mildew; in such cases, apply up to the maximum rate (5.6 kg/ha) every week for 3 weeks and then revert to use of the preventive rate. Creates a mildly alkaline solution. Do no tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Works as eradicant and has little protective activity. Creates a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		SuffOil-X *	13 L/1,000 L water	12 hours	12 hours	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Tivano *	1.4% v/v + surfactant, where permitted	4 hours or when dry	0 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August) (cont'd)						
Powdery mildew (cont'd)	NC (cont'd)	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	**Suppression only.** Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	30 days	**Reduction in numbers only.** Apply to soil, before mulch is applied. Apply just prior to egg hatch (shortly after adults are active) to control young larvae. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Soil applications of Admire and Alias are under a phase-out. **The last date of use for growers is April 11, 2022.**
Mid-August and again once or twice						
Strawberry aphids	This is a critical time for aphid control. Populations tend to build up unnoticed at this time. Check new growth and continue an aphid control program if aphids are present. Use one of the products listed for Aphids at **New growth after renovation (late July to early August)**. Do not exceed the maximum applications per season for each product.					
Powdery mildew	Use one of the fungicides for Powdery mildew at **New growth after renovation.**					
Angular leaf spot	NC	Tivano *	1.7% v/v	4 hours or when dry	0 days	**Suppression only.** Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active (bacterial exudates) to prevent the spread by rain or mechanical disturbance. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).
Common leaf spot	**General Comments:** • Apply in a high-volume spray to ensure thorough coverage of the lower leaf surface. • Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[1]/ 6 days[2]/9 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
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Table 3–16. June-bearing Strawberry Calendar (Fruiting Years) (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Mid-August and again once or twice (cont'd)						
Common leaf spot (cont'd)	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Apply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.
Black root rot	Use one of the fungicides for Black root rot **When new growth appears**.					
Fall						
Slugs	NC	Deadline M-Ps	11.2–27.5 kg/ha	12 hours	6 days	Apply as a soil surface band treatment between rows. Do not allow this product into direct contact with foliage or edible fruit. Apply in the evening and avoid application before heavy rain.
		Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply to moist soil in late summer and early fall to suppress populations for next spring. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Botrytis grey mould	M	Bravo ZNC or Echo NP	3.5 L/ha 2.5 L/ha	12 hours	30 days	Control this disease by reducing inoculum. Apply in late October.
Red stele	**General Comments:** • This disease is sporadic and favoured by wet or compacted soil. See Table 3–21. *Strawberry Variety Disease Ratings* for susceptible varieties. • Spray only where Red stele has been observed or a high-risk situation occurs.					
	4	Ridomil Gold 480 SL	1 L/ha	12 hours	post-harvest	Do not apply later than October 31. Apply in sufficient water (2,500 L/ha) to ensure movement into the root zone.
	P7	Aliette	5.6 kg/ha	12 hours	30 days	Maximum of 4 applications per season: 2 in spring and 2 in fall. Apply at 30–60-day intervals. Make postharvest applications when soil conditions favour disease development (e.g., high soil moisture and cool soil temperatures).

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Apply postharvest only for larva. [5] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Day-neutral Strawberry Calendar

The information in this chapter is provided as a guideline only. 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/ls-re/index-eng.php. Many pesticides are in various stages of re-evaluation by PMRA and may change within the lifetime of this publication. Consult the most recent label on the PMRA website and/or product registrant for complete information.

Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. For preharvest intervals, restricted entry intervals (REI) and maximum number of applications, see Table 3–18. *Products Used on Strawberries*.

Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, and Table 3–20. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees* 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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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.

Plant growth regulators (PGRs) are chemicals used to control runner production in strawberries. Information on the timing and rates of application for PGRs can be found in the crop calendar. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.html and click on *Plant Growth Regulators for Fruit Crops*.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies,* Chapter 2. The chemical group is indicated in the column before the product name. 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 is undetermined for others (U or UN).

Fungicide resistance management

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

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

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

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. For others, use extreme caution when applying insecticides to strawberries during bloom — do not apply them while bees are active. 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*, Chapter 1, and honeybee toxicity ratings in Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees* and Table 3–20. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*

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. Unfortunately, this model does not account for water 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 and fruit quality on berry 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/berry.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 D: *Accredited Soil-Testing Laboratories in Ontario*.

Pesticide Persistence

Some products are persistent and may carry over from one year to the next. Where possible, avoid using these products in areas treated during the previous season. Consult product labels for product-specific information.

Table 3–17. Day-neutral Strawberry Calendar

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
New growth (early spring) or at planting						
Black root rot	**General Comments:** • Apply as a high-volume application directed at the crown in 1,000–1,500 L/ha water. • Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. • For drench application, use 10 L of water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. • These products are also registered for application through drip irrigation systems. See label for details.					
	11	Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	**Suppression only.** Can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	**Suppression only.**
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	**Suppression only.** Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Vegetative growth modification	NC	Apogee or Kudos 27.5 WDG	450 g/1,000 L water or 135 g/ha	12 hours	21 days	Apply prior to beginning of runner initiation where runners are not needed to increase plant density. Reapply at 14–21-day intervals. Use a surfactant, where permitted, for optimum efficacy. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Test on a small scale to evaluate effectiveness on different varieties and production systems. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.html and click on *Plant Growth Regulators for Fruit Crops.*
When flower buds extend from the crown – late April, early May (established plantings planted previous year)						
Strawberry clipper weevil	**General Comments:** • Strawberry clipper weevil is rarely a problem in first-year plantings. • Check for clipped buds in overwintered plantings, especially near woods, bush or under floating row covers. • Apply an insecticide when the threshold is reached. For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Up-Cyde 2.5 EC	280 mL/ha	12 hours	7 days	No product specific comments.
		Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year) (cont'd)						
Strawberry aphids	**General Comments:** • Apply a foliar spray when aphid populations start to build up, but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Read the specific bee toxicity statements on the label.					
	1B	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	No product specific comments.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Use high rate under high pest pressure. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		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. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year) (cont'd)						
Two-spotted spider mite	**General Comments:** • Occasionally two-spotted spider mites are a problem early in the season, especially where row covers are used. • Overwintering mites are bright orange. Do not spray for this stage. Wait for this generation to lay eggs. • Apply in a high-volume spray to ensure thorough coverage of both upper and lower leaf surfaces. • See Table 3–22. *Miticides Registered on Strawberries*, for details on timing.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	10	Apollo SC	500 mL/ha	12 hours	15 days	Kills mite eggs and young nymphs. Apply when mites are mostly in the egg stage.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance, where permitted.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. This product 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 details. Avoid application in direct sunlight or to plants under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		SuffOil-X *	13 L/1,000L	12 hours	12 hours	**Suppression only (SuffOil-X).** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year) (cont'd)						
Tarnished plant bug (adults)	1B	Cygon 480-AG	2.75 L/ha	48 hours	7 days	This product Is very toxic to bees. Do not apply during bloom or when bees are active. Read the specific bee toxicity statements on the label. Maximum 2 applications of products from Group 4A per season.
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
Common leaf spot	**General Comments:** • Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[1]/ 6 days[2]/9 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	3	Bumper 432 EC or Fitness or Jade or Princeton	300 mL/ha 300 mL/ha 500 mL/ha 300 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Reapply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	Do not tank-mix or make sequential applications with Exirel.
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Strawberry aphids	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Tarnished plant bug	**General Comments:** • Shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm. • In established plantings that were overwintered, monitor as soon as row covers are removed (early May) and continue at weekly intervals when bloom and green fruit are present. • In new plantings, remove blossom clusters until plants are well-established (6–8 new leaves). Subsequent bloom in new plantings typically coincides with the second generation of tarnished plant bug (early July). Pressure is high at this time and damage can occur quickly. • Some of these products may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	3	Decis 5 EC or Decis 100 EC or Poleci 2.5 EC	200 mL/ha 100 mL/ha 400 mL/ha	12 hours	14 days	These products, except Decis and Poleci, also control clipper weevil. Toxic to beneficial insects. Products from this group may lead to mite or thrips outbreaks.
		Up-Cyde 2.5 EC	400 mL/ha	12 hours	7 days	
		Labamba or Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	4A	Aceta 70 WP or Assail 70 WP	84–210 g/ha	12 hours	1 day	In order to meet restrictions limiting the number of applications, most growers will reserve the use of this product until closer to harvest. Use a 7-day interval between sprays. Works best on small nymphs in early instars. Use high rate under high pest pressure and older nymphs (3rd–5th instar). Maximum 2 applications of products from Group 4A per season.
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	In order to meet restrictions limiting the number of applications, most growers will reserve the use of this product until closer to harvest. Apply when nymphs are still in the early instar stages. Reapply in 10–14 days.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	**Suppression only.** Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Botrytis grey mould	**General Comments:** • Botrytis is a serious disease for strawberries in Ontario. • Apply in a high-volume spray to ensure thorough coverage to keep all flower parts protected with fungicide during bloom. • Typically 2–3 sprays at 7–10-day intervals during bloom will give good control. Shorten spray interval between applications (e.g., 5–7 days) during wet weather. • Use products that product excellent control under high disease pressure. See Table 3–19. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*.					
	M	Folpan 80 WDG	2.5 kg/ha	24 hours	1 day	Folpan has recently undergone a re-evaluation, resulting in an increased restricted entry interval. Label changes must be made by **January 2022.** Refer to label for the latest information.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	M (cont'd)	Granuflo T	2.25–2.5 kg/ 1,000 L water	24 hours	3 days	Use up to 2,000 L water/ha. Granuflo T is currently under a phase-out period. The last date of use for growers is **December 14, 2021**.
		Maestro 80 WSP or Supra Captan 80 WSP	3.5 kg/ha	12 hours[1]/ 6 days[2]/ 9 days[3]	2 days	Apply in 1,000 L water/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold. Restricted entry interval for hand harvest is 6 days.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide, where permitted.
	7	Cantus WDG	560 g/ha	12 hours	0 days	**Suppression only (Sercadis).** Use once then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	0 days	
		Sercadis	500–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Use once then rotate to a different fungicide group.
	7+11	Luna Sensation	500–600 mL/ha	12 hours	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	
	7+12	Miravis Prime	1 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9	Scala SC	2 L/ha	12 hours	1 day	No product specific comments.
	9+12	Switch 62.5 WG	975 g/ha	12 hours	1 day	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	0 days	Apply prior to infection. Use high rate and shorten interval between applications under high disease pressure. Do not make more than 2 sequential applications. Do not tank-mix or make sequential applications with Exirel.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	19	Diplomat 5 SC	259–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	BM1	Fracture or ProBLAD	1.5–3.3 L/ha	12 hours	0 days	For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Botrytis grey mould (cont'd)	BM2	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.
		Serenade OPTI *	1.7–3.3 kg/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products.
	NC	Actinovate SP	425 g/ha	1 hour	—	**Suppression only.** Apply in 1,100 L water/ha. For best results, use multiple applications or in rotation with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
		OxiDate 2.0 *	1.0 % v/v	4 hours or when dry	0 days	**Suppression only.** Use sufficient spray mix to thoroughly wet target. Spray to point of run-off. Use 1% v/v (e.g., 10 L/1000 L water). For increased coverage, use a compatible surfactant,where permitted. Do not spray OxiDate 2.0 during conditions of intense heat, drought or poor plant vigor. OxiDate 2.0 works best using a solution of neutral pH. Do not apply when bees and beneficial insects are active. Refer to label for specific bee toxicity statements.
	P5	Regalia Maxx *	0.25% v/v in 500–1,000 L water/ha	when dry	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products. Use 0.25% (2.5 L in 1,000 L water) in rotation with other Botrytis fungicides.
Anthracnose fruit rot	**General Comments:** • Warm, wet weather during bloom favours disease development.					
	3 + 11	Quadris Top	0.87–1.0 L /ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides,* Chapter 2. Quadris Top is extremely phytotoxic to certain apple varieties. Extreme care must be taken to prevent injury to apple trees and fruit. Do not spray Quadris Top where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	7+11	Luna Sensation	500–600 mL/ha	12 hours	0 days	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides,* Chapter 2. Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.3–1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Anthracnose fruit rot (cont'd)	9+12	Switch 62.5 WG	775–975 mL/ha	12 hours	1 day	Maximum 2 sequential applications before rotating to a different fungicide group.
	11	Cabrio EG	1 kg/ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified In Ontario. Tank-mix with a Group M product, where permitted. See *Managing Resistance to Fungicides,* Chapter 2. Do not tank-mix or make sequential applications with Exirel.
	19	Diplomat 5 SC	463–926 mL/ha	when dry	0 days	No product specific comments.
	NC	Actinovate SP	425 g/ha	1 hour	—	**May reduce symptoms but does not provide control or suppression.** Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	**Suppression only.** Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
Angular leaf spot	NC	Tivano *	1.7% v/v	4 hours or when dry	0 days	**Suppression only.** Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active (bacterial exudates) to prevent the spread by rain or mechanical disturbance. Apply in sufficient spray volume to ensure thorough coverage (usually 500–700 L/ha).
Powdery mildew	**General Comments:** • Begin applications when conditions favour disease or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. • Shorten interval between applications when disease pressure is severe.					
	M	Cueva *	5 L in 500 L water/ha	4 hours	1 day	Use 1% v/v in 470–940 L water/ha.
	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours[1,4]/ 48 hours[2]	3 days	No product specific comments.
	3 + 11	Quadris Top	0.87–1.0 L /ha	12 hours	1 day	Quadris Top is extremely phytotoxic to certain apple varieties. Extreme care must be taken to prevent injury to apple trees and fruit. Do not spray Quadris Top where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Powdery mildew (cont'd)	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Begin applications when conditions favour disease development. Continue as needed on a 7–10-day interval. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	250–333 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Luna Sensation	300–400 mL/ha	12 hours	0 days	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.
		Pristine WG	1.6 kg/ha	when dry[1]/ 24 hours[2]	1 day	
	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
	19	Diplomat 5 SC	259–926 mL/ha	when dry	0 days	**Suppression only.**
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility
	50	Property 300 SC	300–366 mL/ha	12 hours	0 days	**Suppression only.** Do not make more than 2 consecutive applications before rotating to a different fungicide group.
	BM1	Fracture or ProBLAD	1.5–3.3 L/ha	12 hours	0 days	**Suppression only.** For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	BM2	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	**Suppression only.**
	NC	Actinovate SP	425 g/ha	1 hour	—	**Suppression only.** Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Milstop *	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Milstop can be used preventively for powdery mildew on strawberries when conditions are favourable for disease development. Apply preventively at 2.8 kg/ha every 1–2 weeks until conditions improve. If required, MilStop can also be used curatively for powdery mildew; in such cases, apply up to the maximum rate (5.6 kg/ha) every week for 3 weeks and then revert to use of the preventive rate. Creates a mildly alkaline solution. Do no tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom (cont'd)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. *SEE BEE POISONING*, CHAPTER 1.						
Powdery mildew (cont'd)	NC (cont'd)	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	**Suppression only.** Works as eradicant and has little protective activity. Creates a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		SuffOil-X *	13 L/1,000 L water	12 hours	12 hours	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Tivano *	1.4% v/v + surfactant, where permitted.	4 hours or when dry	0 days	**Suppression only.** Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not use silicone-based surfactant if angular leaf spot disease is active. Apply when disease is active. Apply in sufficient spray volume to ensure thorough coverage (usually 500-700 L/ha).
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	**Suppression only.** Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage. Avoid application during bloom.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	**Suppression only.** Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides, where permitted.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom and green fruit						
Two-spotted spider mite	**General Comments:** • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–22. *Miticides Registered on Strawberries*, for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Use a surfactant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information.
	10	Apollo SC	500 mL/ha	12 hours	15 days	Kills spider mite eggs and young nymphs. Apply when spider mites are mostly in the egg stage.
	21	Nexter	0.5–1.0 L/ha	24 hours	10 days	Do not spray when bees are active.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance, where permitted.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on **Kopa** for two-spotted spider mites at **When flower buds extend from the crown - late April, early May (established plantings planted previous year)**
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** See comments on Purespray Green Spray Oil, SuffOil-X, and Vegol Crop Oil for Two-spotted spider mite at **When flower buds extend from the crown - late April, early May (established plantings planted previous year).** Avoid application during bloom.
		SuffOil-X *	13 L/1,000L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Tarnished plant bug	Continue to monitor for tarnished plant bug. If thresholds are reached, use one of the products listed for Tarnished plant bug at **Bloom**, but check the preharvest interval. Late May and early July are periods of peak activity, but populations vary due to the use of row covers, crop management, weed species in the field, nearby alfalfa and clover crops, and insecticides applied for other pests. Weekly monitoring is important.					
Bloom, green fruit and harvest (June, July, August)						
Strawberry aphids	**General Comments:** • Apply a foliar spray when aphid populations start to build up, but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Read the specific bee toxicity statements on the label.					
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate to products outside of Group 4.
	4A+15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (June, July, August) (cont'd)						
Strawberry aphids (cont'd)	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.
Spotted wing drosophila	**General Comments:** • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Apply insecticides weekly when fruit is ripening or ripe and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	1B	Malathion 85 E	1 L/1,000 L water	12 hours	3 days	**Suppression only.**
	3	Up-Cyde 2.5 EC	245–285 mL/ha	12 hours	2 days	No product specific comments.
	5	Delegate	280 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	292–364 mL/ha 145–182 mL/ha	when dry	1 day	
		Scorpio Ant and Insect Bait*	35–45 kg/ha	12 hours	1 day	**Suppression only.** Scatter the bait on the soil around or near the plants to be protected. Bait can be placed in a ring around the base of individual plants. Apply at the higher rate when spotted wing drosophila pressure is high. Reapply after heavy rain or watering. Reapply as the bait is consumed or every 4 weeks. This is a different use pattern than other insecticides registered for spotted wing drosophila control and there is limited commercial experience with this product in Ontario.
	28	Exirel	1–1.5 L/ha	12 hours	1 day	Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	No product specific comments.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (June, July, August) (cont'd)						
Tarnished plant bugs	**General Comments:** • These products have short preharvest intervals and can be used during harvest. • Shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm. • Some of these products may be toxic to bees exposed to direct treatment or residues on flowering crops and weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	4A	Aceta 70 WP or Assail 70 WP	84–210 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Works best on small nymphs in early instars. Use high rate under high pest pressure and older nymphs (3rd–5th instar). Maximum 2 applications of products from Group 4A per season
	4A+15	Cormoran	900 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	Apply when nymphs are in the early instar stages. Reapply in 10–14 days.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	**Suppression only.** Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Thrips	**General Comments:** • Check blossoms and under calyces for small thread-like yellow thrips. • These products are highly toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	5	Delegate	280 g/ha	12 hours	1 day	**Suppression only.** Shorten interval between applications under high pest pressure.
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	**Suppression only.** Use high rate and shorten interval between applications under high pest pressure. Use an adjuvant, where permitted, for optimum control. See label, and *Adjuvants Used in Fruit Crops,* Chapter 2, for more information. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Harvanta 50 SL	1.2–1.6 L/ha	12 hours	1 day	**Suppression only.** No product specific comments.

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (June, July, August) (cont'd)						
Two-spotted spider mite	**General Comments:** • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–22. *Miticides Registered on Strawberries* for details on timing. • For resistance management, do not use more than once per season.					
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance, where permitted.
	NC	Kopa *	2% v/v in 700–1,900 L/ha	12 hours	0 days	See comments on **Kopa** for two-spotted spider mites at **When flower buds extend from the crown – late April, early May (established plantings planted previous year)**.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	**Suppression only (Purespray Green Spray Oil, SuffOil-X).** See comments for **Purespray Green Spray Oil**, **SuffOil-X**, and **Vegol Crop Oil** for Two-spotted spider mite at **When flower buds extend from the crown – late April, early May (established plantings planted previous year)**. Avoid application during bloom.
		SuffOil-X *	13 L/1,000L water	12 hours	12 hours	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Potato leafhopper	**General Comments:** • Check leaf edges for yellowing and check the lower leaf surface for small, rapidly moving bright green nymphs. • Potato leafhoppers have many hosts and often build up in strawberry fields after the first few cuts of local hay. • Albion is especially susceptible to leafhoppers.					
	1B	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.
	4A	Aceta 70 WP or Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Use high rate under high pest pressure. Maximum 2 applications of products from Group 4A per season.
	4A+ 15	Cormoran	500–750 mL/ha	12 hours	1 day	Do not apply more than once every 10–14 days. Do not apply when bees are active. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
Angular leaf spot (suppression)	Use one of the products listed for Angular leaf spot at **Bloom**.					
Botrytis grey mould	Use one of the products listed for Botrytis at **Bloom**.					
Common leaf spot	Use one of the products listed for Common leaf spot **When flower buds extend from the crown**.					
Anthracnose fruit rot	Use one of the products listed for Anthracnose at **Bloom**.					
Powdery mildew	This is an important time for mildew control. Use one of the products listed for Powdery mildew at **Bloom**.					

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–17. Day-neutral Strawberry Calendar (cont'd)

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval (REI)	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (September)						
Spotted wing drosophila	Use one of the products listed for Spotted wing drosophila at **Bloom, Green fruit and harvest (June, July, August)**.					
Tarnished plant bug	Continue to monitor for tarnished plant bug. If thresholds are reached in early September, use one of the products listed for Tarnished plant bug at **Bloom, Green fruit and harvest (June, July, August)**.					
Slugs	NC	Deadline M-Ps	11.2–27.5 kg/ha	12 hours	6 days	Apply as a soil surface band treatment between rows. Do not allow this product into direct contact with foliage or edible fruit. Apply in the evening and avoid application before heavy rain.
		Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply to moist soil. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Angular leaf spot	Use one of the products listed for Angular leaf spot at **Bloom**.					
Botrytis grey mould	Use one of the products listed for Botrytis at **Bloom**.					
Powdery mildew	This is an important time for mildew control. Use one of the products listed for Powdery mildew at **Bloom**.					
Black root rot	Use one of the products listed for Black root rot at **New growth (early spring)**.					

[1] General re-entry. [2] Training, pinching and hand harvest. [3] Handset irrigation. [4] Scouting, weeding, irrigation and mulching.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–18. Products Used on Strawberries

Use this 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** (REI) is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no REI is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

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* N° 1, *Spécial phytoprotection bio.* 18 juin 2020, 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 (REI)	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Aceta 70 WP	33298	acetamiprid	4A	1 day	12 hours	2	—
Actara 25 WG	28408	thiamethoxam	4A	3 days	12 hours	2[1]	—
Admire 240 Flowable	24094	imidacloprid	4A	7 days[2]/30 days[3]	24 hours	2[2]/1[3]	—
Agri-Mek SC	31607	abamectin	6	3 days	12 hours	2	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	2/3 (max. 645 g/ha)	—
Apollo SC	21035	clofentezine	10	15 days	12 hours	1	—
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours	2	—
Beleaf 50 SG	29796	flonicamid	29	0 days	12 hours	3	—
Bioprotec PLUS	32425	*Bacillus thuringiensis*	11	0 days	4 hours	—	*
Cormoran	33353	Acetamiprid + novaluron	4A+15	1 day	12 hours	3	—
Cygon 480-AG	25651	dimethoate	1B	7 days	48 hours	2	—
Deadline M-Ps	26650	metaldehyde	NC	6 days	12 hours	3	—
Decis 5 EC	22478	deltamethrin	3	14 days	12 hours	2	—
Decis 100 EC	33700	deltamethrin	3	14 days	12 hours	2	—
Delegate	28778	spinetoram	5	1 day	12 hours	3	—
Dipel 2X DF	26508	*Bacillus thuringiensis*	11	0 days	4 hours	—	*
Entrust	30382	spinosad	5	1 day	when dry	3	*
Exirel	30895	cyantraniliprole	28	1 day	12 hours	4 (max 4.5 L/ha)	—
Harvanta 50 SL	32889	cyclaniliprole	28	1 day	12 hours	3 (max 4.8 L/ha)	—
Kopa	31433	potassium salts of fatty acids	NC	12 hours	0 days	—	*
Labamba	33576	lambda-cyhalothrin	3	7 days	24 hours	3	—
Lagon 480 E	9382	dimethoate	1B	7 days	48 hours	2	—
Malathion 85 E	8372	malathion	1B	3 days	12 hours	2	—
Matador 120 EC	24984	lambda-cyhalothrin	3	7 days	24 hours	3	—

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

[1] Preharvest application. [2] Foliar application. [3] Soil application. [4] 2 day REI for spotted wing drosophila, 7 days for all other pests. [5] Maximum 6 applications per year with no more than 2 dormant applications. [6] Maximum 3 applications per year with 2 in the spring and 1 post-harvest. [7] General re-entry. [8] Hand harvest. [9] Handset irrigation. [10] Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. [11] After activation with water in soil. [12] Scouting, weeding, irrigation and mulching. [13] Training, pinching, and hand harvest. [14] Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–18. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression (cont'd)							
Nealta	31284	cyflumetofen	25	1 day	12 hours	2	—
Nexter	33433	pyridaben	21	10 days	24 hours	2 (max. 2 L/ha)	—
Oberon Flowable	28905	spiromesifen	23	3 days	12 hours	3	—
Poleci 2.5 EC	32446	deltamethrin	3	14 days	12 hours	2	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	*
Pyrinex 480 EC	23705	chlorpyrifos	1B	20 days	24 hours	1	—
Rimon 10 EC	28881	novaluron	15	1 day	12 hours	3	—
Scorpio Ant and Insect Bait	33306	Spinosad	5	1 day	12 hours	3	*
Sharphos	32768	chlorpyrifos	1B	20 days	24 hours	1	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Sivanto Prime	31452	flupyradifurone	4D	0 days	12 hours	max. 2 L/ha	—
Sluggo Professional	30025	ferric phosphate	NC	—	12 hours	—	*
Success	26835	spinosad	5	1 day	when dry	3	—
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	*
Surround WP	27469	kaolin	NC	0 days	12 hours	—	*
Up-Cyde 2.5 EC	28795	cypermethrin	3	2 days/7 days[4]	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[5]	*
Warhawk 480 EC	29984	chlorpyrifos	1B	20 days	24 hours	1	—
Products used for disease control or suppression							
Actinovate SP	28672	*Streptomyces lydicus*	NC	—	1 hour	—	—
Aliette	27688	fosetyl al	P7	30 days	12 hours	4	—
Azoshy 250 SC	32263	azoxystrobin	11	365 days	12 hours	1	—
Botector	31248	*Aureobasidium pullulans*	NC	0 days	4 hours	6	*
Bravo ZNC	33515	chlorothalonil	M	30 days	12 hours	3[6]	—
Bumper 432 EC	28017	propiconazole	3	1 day	12 hours	4	—
Cabrio EG	27323	pyraclostrobin	11	1 day	12 hours	5	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Supra Captan 80 WSP	33641	captan	M	2 days	12 hours[7]/ 6 days[8]/9 days[9]	6	—

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

[1] Preharvest application. [2] Foliar application. [3] Soil application. [4] 2 day REI for spotted wing drosophila, 7 days for all other pests. [5] Maximum 6 applications per year with no more than 2 dormant applications. [6] Maximum 3 applications per year with 2 in the spring and 1 post-harvest. [7] General re-entry. [8] Hand harvest. [9] Handset irrigation. [10] Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. [11] After activation with water in soil. [12] Scouting, weeding, irrigation and mulching. [13] Training, pinching, and hand harvest. [14] Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–18. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for disease control or suppression (cont'd)							
Confine Extra	30648	mono- and di-potassium salts of phosphorus acid	P7	1 day	12 hours	5	—
Copper 53 W	9934	tri-basic copper sulphate	M	2 days	48 hours	5	*
Cueva	31825	copper octanoate	M	1 day	4 hours	3	*
Diplomat 5 SC	32918	polyoxin D zinc salt	19	0 days	when dry	2.77 L/ha	—
Double Nickel LC	31887	*Bacillus amyloliquefaciens*	BM2	0 days	when dry	—	*
Echo NP	33479	chlorothalonil	M	30 days	12 hours	3[6]	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Fitness	32639	propiconazole	3	1 day	12 hours	4	—
Flint	30619	trifloxystrobin	11	0 days	12 hours	3	—
Folpan 80 WDG	27733	folpet	M	1 day	24 hours	6	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	max. 5.25 L/ha	—
Fracture	32139	BLAD polypeptide	BM1	0 days	12 hours	5	—
Fullback 125 SC	31679	flutriafol	3	8 days	12 hours	max. 2.05 L/ha	—
Granuflo T	30548	thiram	M	3 days	24 hours	5	—
Intuity	32288	mandestrobin	11	0 days	12 hours	max. 3.51 L/ha	—
Jade	24030	propiconazole	3	1 day	12 hours	4	—
Kenja 400 SC	31758	isofetamid	7	0 days	12 hours	5	—
Luna Sensation	32107	fluopyram & trifloxystrobin	7+11	0 days	12 hours	max 1980 mL/ha	—
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	1 day	12 hours	2 (max. 4 L/ha [10])	—
Maestro 80 WSP	33488	captan	M	2 days	12 hours[7]/ 6 days[8]/9 days[9]	6	—
Mettle 125 ME	30673	tetraconazole	3	0 days	12 hours	4	—
Milstop	28095	potassium bicarbonate	NC	0 days	4 hours	10	*
Miravis Prime	33207	pydiflumetofen + fludioxonil	7+12	1 day	12 hours	2 L/ha	—
MustGrow	30263	oriental mustard seed meal	NC	—	24 hours[11]	1	*
Nova	22399	myclobutanil	3	3 days	12 hours[7, 12]/48 hours[8]	6	—
OxiDate 2.0	32907	hydrogen peroxide + peroxyacetic acid	NC	0 days	4 hours or when dry	8	*
Phostrol	30449	mono and dibasic sodium, potassium and ammonium phosphites	P7	3 days	12 hours	4	—

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

[1] Preharvest application. [2] Foliar application. [3] Soil application. [4] 2 day REI for spotted wing drosophila, 7 days for all other pests. [5] Maximum 6 applications per year with no more than 2 dormant applications. [6] Maximum 3 applications per year with 2 in the spring and 1 post-harvest. [7] General re-entry. [8] Hand harvest. [9] Handset irrigation. [10] Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. [11] After activation with water in soil. [12] Scouting, weeding, irrigation and mulching. [13] Training, pinching, and hand harvest. [14] Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–18. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval (REI)	Maximum Applications	Potentially Organic
Products used for disease control or suppression (cont'd)							
Princeton	33840	propiconazole	3	1 day	12 hours	4	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry[7]/24 hours[13]	5	—
ProBLAD	31782	BLAD polypeptide	BM1	0 days	12 hours	5	—
Property 300 SC	32376	pyriofenone	50	0 days	12 hours	1.2 L/ha	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	*
Quadris Flowable	26153	azoxystrobin	11	1 day	12 hours	2	—
Quadris Top	30518	difenoconazole + azoxystrobin	3 + 11	1 day	12 hours	3	—
Regalia Maxx	30199	extract of *Reynoutria sachalinensis*	P5	0 days	when dry	—	*
Ridomil Gold 480 SL	28474	metalaxyl-M and S-isomer	4	postharvest	12 hours	2	—
Scala SC	28011	pyrimethanil	9	1 day	12 hours	3	—
Scholar 230 SC	29528	fludioxonil	12	1 day	12 hours	2[14] (max 2.4 L/ha)	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 3.08 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	*Bacillus subtilis*	BM2	0 days	12 hours	—	*
Sirocco	31091	potassium bicarbonate	NC	0 days	4 hours	10	*
SuffOil-X	33099	mineral oil	NC	12 hours	12 hours	8	*
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	*
Tivano	30468	citric acid + lactic acid	NC	0 days	4 hours or when dry	—	*
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4[5]	*
Velum Prime	32108	fluopyram	7	0 days	12 hours	2	—
Plant Growth Regulators							
Apogee	28042	prohexadione calcium	NC	21 days	12 hours	3	—
Kudos 27.5 WDG	33010	prohexadione calcium	NC	21 days	12 hours	3	—

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

[1] Preharvest application. [2] Foliar application. [3] Soil application. [4] 2 day REI for spotted wing drosophila, 7 days for all other pests. [5] Maximum 6 applications per year with no more than 2 dormant applications. [6] Maximum 3 applications per year with 2 in the spring and 1 post-harvest. [7] General re-entry. [8] Hand harvest. [9] Handset irrigation. [10] Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. [11] After activation with water in soil. [12] Scouting, weeding, irrigation and mulching. [13] Training, pinching, and hand harvest. [14] Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Notes on Strawberry Diseases and Insects

Table 3–19. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees

Please see the product label or crop calendars for registered uses. Use fungicides only for diseases listed on the product label for the crop and for the disease. 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.

Group	Fungicide	Angular leaf spot	Anthracnose (C. acutatum)	Anthracnose (C. gloeosporioides)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity[1]
M	Bravo ZNC	0	1	—	2 *	—	1	—	1	1	0	—	0	NT
M	Copper 53 W	2 P	1 P	1 P	1 P	—	1 * P	1 P	1 P	1 P	0	1 P	0	MT
M	Cueva	1	—	—	—	—	—	—	—	—	—	2 *	0	NT
M	Echo NP	0	1	—	2 *	—	1	—	1	1	0	—	0	NT
M	Folpan 80 WDG	0	2	2	2 *	—	3 *	1	—	1–2	0	0	0	NT
M	Granuflo T	0	—	—	2 *	—	—	—	—	—	—	—	—	NT
M	Maestro 80 WSP	0	2	2	2 *	—	3 *	1	—	1–2	0	0	0	MT
M	Supra Captan 80 WSP	0	2	2	2 *	—	3 *	1	1	1–2	0	0	0	MT
1	Senator 50 SC	0	—	—	0–1 * R	—	2 *	—	—	—	—	2	—	NT
3	Bumper 432 EC	0	0	1	0	—	3 *	0	—	3	0	3	0	NT
3	Fullback 125 SC	0	0	0	0	0	3	0	—	—	0	3 *	0	MT
3	Fitness	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
3	Jade	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
3	Mettle 125 ME	0	0	0	0	—	3	0	—	3	0	3 *	0	NT
3	Nova	0	0	0	0	—	3	0	—	3	0	3 *	0	NT
3	Princeton	0	0	0	0	—	3 *	0	—	3	0	3	0	NT

BM= Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
P = May be phytotoxic. R = Pathogen resistance to the fungicide or fungicide group has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.
— = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–19. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Angular leaf spot	Anthracnose (C. acutatum)	Anthracnose (C. gloeosporioides)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity[1]
3 + 11	Quadris Top	—	3 * R	3 *	1–2	—	3	2	2	2	—	3 *	—	NT
4	Ridomil Gold 480 SL	0	0	0	0	—	0	2	0	0	2–3	0	2–3 *	NT
7	Cantus WDG	0	—	—	3 *	—	3	0	3	0	0	2	0	NT
7	Fontelis	0	—	—	3 *	—	—	0	—	—	0	2 *	0	NT
7	Kenja 400 SC	0	0	0	3 *	—	—	0	—	—	0	2	0	NT
7	Sercadis	0	—	—	1 *	—	—	0	—	—	0	3 *	0	NT
7+9	Luna Tranquility	0	0	0	3 *	—	1–2 *	0	—	0	0	2 *	0	NT
7+11	Pristine WG	0	3 * R	3	3 *	—	3 *	0	3	3	0	3 *	0	NT
7+11	Luna Sensation	0	3 * R	2	3 *	—	2-3	2	—	2–3	0	3 *	0	NT
7+12	Miravis Prime	—	2	2	3*	—	—	—	—	—	—	2	—	NT
9	Scala SC	0	1	—	3 *	—	—	0	—	1–2	0	—	0	NT
9+12	Switch 62.5 WG	—	2 *	—	3 *	—	1	0	2	2	0	1 *	0	NT
11	Cabrio EG	0	3 * R	3	1–2	—	1	0	2	3	0	3	0	NT
11	Flint	0	—	—	—	1	—	0	—	—	0	3 *	0	NT
11	Intuity	—	0–1	—	1–2 *	—	—	0	—	—	0	3	0	NT
11	Azoshy 250 SC	0	—	—	—	2 *	—	0	—	—	0	—	0	NT
11	Quadris Flowable	0	—	—	—	2 *	—	0	—	—	0	—	0	NT
12	Scholar 230 SC	0	—	—	—	2 *	—	0	—	—	0	—	0	NT
17	Elevate 50 WDG	0	0	0	3 *	—	0	0	0	0	0	0	0	NT
19	Diplomat 5 SC	—	2 *	—	2 *	—	—	—	—	—	—	1 *	—	NT

BM= Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
P = May be phytotoxic. R = Pathogen resistance to the fungicide or fungicide group has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.
— = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–19. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Angular leaf spot	Anthracnose (C. acutatum)	Anthracnose (C. gloeosporioides)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity[1]
50	Property 300 SC	—	—	—	—	—	—	—	—	—	—	2-3*	—	—
BM1	Fracture	—	—	—	1 *	—	—	—	—	—	—	1 *	0	NT
BM1	ProBLAD	—	—	—	1*	—	—	—	—	—	—	1*	0	NT
BM2	Double Nickel LC	—	—	—	1 *	—	—	—	—	—	—	2 *	0	NT
BM2	Serenade OPTI	—	—	—	1 *	—	—	—	—	—	—	—	0	NT
NC	Actinovate SP	—	0–1 *	1	1 *	—	—	—	—	—	—	1 *	0	NT
NC	MilStop	—	—	—	—	—	—	—	—	—	—	1 *	—	NT
NC	OxiDate 2.0	—	—	—	— *	—	—	—	—	—	—	1	—	MT
NC	Purespray Green Spray Oil 13 E	—	—	—	—	—	—	—	—	—	—	2 *	0	—
NC	Sirocco	—	—	—	—	—	—	—	—	—	—	1 *	—	NT
NC	SuffOil-X	—	—	—	—	—	—	—	—	—	—	2 *	0	—
NC	Tivano	1 *	—	—	—	—	—	—	—	—	—	1 *	0	NT
NC	Vegol Crop Oil	—	—	—	—	—	—	—	—	—	—	1–2 *	0	—
P5	Regalia Maxx	—	—	—	1 *	—	—	—	—	—	—	1 *	0	NT
P7	Aliette	0	—	—	0	—	0	2	0	0	2	0	2 *	NT
P7	Confine Extra	0	1	—	0	—	0	2 *	0	0	2	0	2	NT
P7	Phostrol	0	—	—	0	—	0	2 *	0	0	2	0	2	NT

BM= Biologicals with multiple modes of action. M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Host plant defence inducers.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.
P = May be phytotoxic. R = Pathogen resistance to the fungicide or fungicide group has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.
— = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–20. Activity of Insecticides and Miticides on Strawberry Pests and Impact on Honeybees

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

Group	Insecticide/Miticide	Aphids	Clipper weevils	Tarnished plant bugs	Cutworm	Root weevil (adults)	Flower thrips	Leafrollers	Potato leafhoppers	Two-spotted spider mites	Cyclamen mites	Spittle bugs	Spotted wing drosophila	Honeybee Toxicity[1]
1B	Cygon 480-AG	3 *	1	3 *	2	—	NA	3	2	0 *	0	2	NA	HT
1B	Lagon 480 E	3 *	1	3 *	2	—	NA	3	2	0 *	0	2	NA	HT
1B	Malathion 85 E	1 *	1	2	2	0	—	2 *	2 *	— *	0	2	2 *	HT
1B	Pyrinex 480 EC	1	1	1	3 *	0	—	2	2	0	0	2	NA	HT
1B	Sharphos	1	1	1	3 *	0	—	2	2	0	0	2	NA	HT
1B	Warhawk 480 EC	1	1	1	3 *	0	—	2	2	0	0	2	NA	HT
3	Decis 5 EC	0	0	3 *	—	0	2	3	2	0	0	2	3	HT
3	Decis 100 EC	0	0	3 *	—	0	2	3	2	0	0	2	3	HT
3	Labamba	0	3 *	3 *	—	2 *	2	3	2	0	0	2 *	3	HT
3	Matador 120 EC	0	3 *	3 *	—	2 *	2	3	2	0	0	2 *	3	HT
3	Poleci 2.5 EC	0	0	3 *	—	0	2	3	2	0	0	2	3	HT
3	Silencer 120 EC	0	3 *	3 *	—	2 *	2	3	2	0	0	2 *	3	HT
3	Up-Cyde 2.5 EC	0	3 *	3 *	—	2	2	3	2	0	0	2 *	3 *	HT
4A	Aceta 70 WP	3 *	—	2 *	—	—	—	—	3 *	0	0	2	1	MT
4A	Actara 25 WG	2	2	1	—	2 *	—	—	1	0	0	—	—	HT
4A	Admire 240 Flowable	3 *	2	—	—	1	—	—	1 *	0	0	—	—	HT
4A	Assail 70 WP	3 *	—	2 *	—	—	—	—	3 *	0	0	2	1	MT
4A+15	Cormoran	3 *	— *	3 *	—	—	3	3	3 *	—	—	—	3	HT
4D	Sivanto Prime	3 *	—	—	—	—	2	—	—	—	—	—	—	MT
5	Delegate	—	—	—	2	—	2 *	2	—	0	0	—	3 *	HT
5	Entrust	0	—	—	2	—	2	3 *	—	0	0	—	3 *	HT

NC = Not classified by FRAC/IRAC, or group not indicated on product label.
0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. NA = Not used at the timing for this pest.
* (shaded area) = Pests are listed on the product label for control or suppression. — = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
I = Irritant. White film barrier on plant tissue may act as a repellent to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–20. Activity of Insecticides and Miticides on Strawberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide/Miticide	Aphids	Clipper weevils	Tarnished plant bugs	Cutworm	Root weevil (adults)	Flower thrips	Leafrollers	Potato leafhoppers	Two-spotted spider mites	Cyclamen mites	Spittle bugs	Spotted wing drosophila	Honeybee Toxicity[1]
5	Scorpio Ant and Insect Bait	—	—	—	1	—	—	—	—	—	—	—	1 *	NT
5	Success	0	—	—	2	—	2	3 *	—	0	0	—	3 *	HT
6	Agri-Mek SC	0	0	0	0	0	1	0	1	3 *	2 *	—	0	HT
10	Apollo SC	0	0	0	0	0	0	0	0	3 *	0	0	0	NT
11	Bioprotec PLUS	0	0	0	—	0	0	2 *	0	0	0	0	0	NT
11	Dipel 2X DF	0	0	0	—	0	0	2 *	0	0	0	0	0	NT
15	Rimon 10 EC	—	—	3 *	—	—	—	3	—	0	0	—	0	MT[2]
21	Nexter	0	0	0	0	0	0	0	0	3 *	2	0	0	HT
23	Oberon Flowable	0	0	0	0	0	0	0	0	3 *	—	0	0	NT
28	Altacor	0	—	0	3 *	—	—	3 *	0	0	0	0	0	NT
28	Exirel	3 *	—	2	—	—	2 *	3	—	—	—	—	3 *	HT
28	Harvanta 50 SL	0	—	0	2	—	1 *	3	2	0	—	—	3 *	HT
29	Beleaf 50 SG	3 *	0	2 *	0	0	0	0	0	0	0	0	0	NT
NC	Kopa	1 *	—	—	—	—	—	—	1	1 *	—	—	—	NT
NC	Purespray Green Spray Oil 13 E	1 *	0	—	—	0	—	—	—	1 *	—	—	0	—
NC	SuffOil-X	1	—	—	—	—	—	—	—	1 *	1	—	—	—
NC	Surround WP	—	—	—	—	—	NA	—	2 *	2	—	—	—	I
NC	Vegol Crop Oil	— *	—	—	—	—	—	—	—	— *	— *	—	—	—

NC = Not classified by FRAC/IRAC, or group not indicated on product label.
0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. NA = Not used at the timing for this pest.
* (shaded area) = Pests are listed on the product label for control or suppression. — = No information is available.
Adapted from several sources including Michigan Fruit Management Guide 2020.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.
MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.
NT = Relatively non-toxic to bees.
I = Irritant. White film barrier on plant tissue may act as a repellent to bees.
[1] Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.
[2] May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–21. Strawberry Variety Disease Ratings

Variety	Leaf spot *	Leaf scorch[1]	Powdery mildew	Botrytis grey mould	Verticillium	Red stele[2] *	Bacterial angular leaf spot[3]	Black root rot	Anthracnose fruit rot
Albion	MR	—	MR	S	R	—	S	—	MR
Allstar	MR	—	MR	MR	MR	S	HS	S	—
Annapolis	MR	MR	S	S	MR	R	HS	—	S
Brunswick	MR	MR	MR	MR	—	R	—	MR	—
Cabot	MR	MR	R	S	S	R	—	MR	—
Cavendish	MR	R	S	MR	MR	R	HS	MR	S
Evangeline	MR	R	MR	MR	S	S	—	S	—
Gov. Simcoe	MR	MR	HS	S	MR	S	S	—	HS
Honeoye	MR	MR	MR	MR	HS	S	HS	S	—
Jewel	MR	MR	S	MR	S	S	HS	HS	—
Kent	HS	HS	MR	S	S	S	HS	HS	S
L'Amour	—	—	S	MR	—	MR	S	MR	—
Mira	HS	R	R	MR	S	R	S	S	—
Mohawk	MR	MR	MR	MR	MR	MR	—	—	—
Sable	R	R	S	S	—	R	HS	—	—
St. Pierre	MR	S	MR	R	—	S	—	—	S
Sapphire	—	MR	MR	—	—	—	—	—	S
Seascape	S	—	HS	—	—	—	—	—	—
Serenity	—	MR	MR	—	—	—	—	—	S
Sparkle	S	MR	MR	MR	S	HR	S	—	—
Summer Dawn (V151)	S	S	—	—	—	—	—	—	HS
Summer Rose (R14)	—	—	—	—	—	—	—	—	S
Summer Ruby (2V55)	—	—	—	—	—	—	—	—	S
Summer Evening (108Y79)	—	—	—	—	—	—	—	—	S
Tribute	MR	MR	S	MR	R	MR	—	—	—
Tristar	MR	MR	S	MR	R	MR	MR	—	—
Valley Sunset	—	—	S	S	—	—	S	—	—
Wendy	S	MR	MR	MR	S	MR	HS	S	—

HR = Highly Resistant. R = Resistant. MR = Moderately Resistant. S = Susceptible. HS = Highly Susceptible. — = Information is unavailable.

* Race dependent.

[1] Leaf scorch ratings according to Xue, Sutton, Dale, and Sullivan (1996), for some cultivars.

[2] Red stele ratings from Dr. N. Nickerson and Dr. A. Jamieson, Agriculture & Agri-Food Canada, Kentville, Nova Scotia.

[3] P.D. Hildebrand, P.G. Braun et. al., *Can. J. Plant. Pathol.* 27:16–24 (2005) and field observation.

Table 3–22. Miticides Registered on Strawberries

Miticide	Mite Species Controlled	Stage of Mite Controlled	Timing and Comments	Preharvest Interval
Agri-Mek SC	two-spotted spider mite, cyclamen mite	nymphs, adults	Apply to active mites (adults or nymphs). Agri-Mek is translaminar (locally systemic). It is absorbed best by new, expanding leaves, and less effective late in the season when foliage is hardened.	3 days
Apollo SC	two-spotted spider mite	eggs, very young nymphs	Apply when most mites are in the egg stage. This miticide works best if applied early in the season, when generations tend to be most synchronous.	15 days
Nexter	two-spotted spider mite	nymphs, adults	Nexter is a contact miticide providing rapid knock-down of adults and nymphs.	10 days
Oberon Flowable	two-spotted spider mite	eggs, nymphs, adults	Oberon is a slow-acting miticide which prevents eggs from hatching and nymphs from moulting to the next stage. Best used when mites are young.	3 days
Nealta	two-spotted spider mite	eggs, nymphs, adults	Nealta has intermediate activity and works best if applied as mite populations build, before damage is observed. Knockdown may be enhanced by increased coverage and the addition of a surfactant, where permitted.	1 day
Purespray Green Spray Oil 13 E	two-spotted spider mite	eggs, nymphs, adults	Mineral oil acts as a miticide by suffocating mites and mite eggs on contact. Excellent coverage is needed for control, because there is no residual control from this product. Apply at first sign of activity.	—
SuffOil-X	two-spotted spider mite	eggs, nymphs, adults	Mineral oil acts as a miticide by suffocating mites and mite eggs on contact. Excellent coverage is needed for control, because there is no residual control from this product. Apply at first sign of activity.	0 days
Vegol Crop Oil	two-spotted spider mite, cyclamen mite	eggs, nymphs, adults	Canola oil acts as a miticide by suffocating mites and mite eggs on contact. Excellent coverage is needed for control, because there is no residual control from this product. Apply at first sign of activity.	0 days

4. Nematodes

Plant Parasitic Nematodes in Ontario

There are many beneficial nematodes in agricultural soil, however some nematodes are plant parasitic. When plant parasitic nematodes are present in high numbers in soil, they can cause significant yield losses to horticultural crops. The extent of loss depends on the crop, nematode species and soil populations.

The most destructive and common plant parasitic nematodes in Ontario fruit crops are root-lesion (*Pratylenchus penetrans*) and northern root-knot (*Meloidogyne hapla*). The northern root-knot nematode is becoming more prevalent. The pin (*Paratylenchus sp.*) and dagger (*Xiphinema sp.*) nematodes occasionally cause yield losses to some fruit crops in isolated fields. The dagger nematode is mainly a virus vector on raspberry.

Generally, symptoms of nematode injury include:

- uneven plant growth
- poor plant establishment
- plants weakening over time
- poor root growth
- knots or galls on roots
- excessive branching of roots, hairy root symptoms

On strawberries:

- Root-lesion nematodes cause discolouration of the fine feeder roots and tiny brown scratch-like lesions on the young white roots. These lesions merge to form large brown areas. Root-lesion nematodes are involved in the black root rot complex and aggravate verticillium wilt of strawberries and other host plants. Severely infected plants appear stunted and unthrifty.
- Root-knot nematode feeding stimulates root cells to enlarge. Groups of enlarged cells look like small galls or beads (1 mm). As more and more nematodes establish feeding sites in the same region of the root, the groups of enlarged cells become one larger root-knot.

On raspberries:

- Root-lesion nematode feeding causes scratch-like lesions on roots, similar to the symptoms on strawberry roots. Severely infested plants have thinner and fewer canes per crown. Up to 25% of first-year canes may be killed by severe infestations of these nematodes.
- Dagger nematodes spread tomato ringspot virus, which causes crumbly berries, mottled leaves and cane dieback.

Thresholds

Nematode populations above economic thresholds can significantly reduce yields. The economic threshold for nematode populations refers to the population at planting. Planting a susceptible crop in soils with a population of nematodes near or above the economic threshold will result in crop losses over time. For economic thresholds, see Table 4–1. *Nematode Thresholds for Fruit Crops*.

Table 4–1. Nematode Thresholds for Fruit Crops

Type of Nematode	Economic Threshold (nematodes/kg soil)
Root-lesion	1,000 (exception: 500 on strawberries)
Root-knot	1,000
Pin	5,000
Dagger	100
Bulb and stem	100

- Nematode problems are most often found in sandy-loam and sandy soils. Always sample these soils for nematode populations before planting berry crops.
- Root-lesion and root-knot nematode problems are not usually found in clay or clay-loam soils. Sample these soils for nematodes before planting in replant sites or where susceptible crops have been recently grown.
- Sample clay or clay-loam soils for dagger nematode before planting virus-susceptible raspberry or blueberry.

For more information, see OMAFRA Factsheet, *Sampling Soil and Roots for Plant Parasitic Nematodes*. Information on how to sample soil for nematodes and where to send the samples can be found in Appendix E: *Diagnostic Services*.

Nematode Management

Nematode management starts a year before planting a susceptible crop. Try to reduce nematode populations so that clean stock can establish well before the nematodes rebound to damaging levels. Young plants tolerate much less nematode feeding than established plants. Use a combination of the following methods to manage nematodes:

- Start new fields with transplants free from nematodes and grown by an accredited plant propagator.
- Rotate susceptible crops with non-host crops for several years.
- Grow nematode-suppressing cover crops in the years prior to establishing fruit crops.
- Destroy residual crop roots.
- Plant resistant fruit cultivars where available.
- Control weeds, as they are good hosts of nematodes.
- Use soil fumigation before planting when nematode populations in soil reach or exceed thresholds (see Table 4–1. *Nematode Thresholds for Fruit Crops*).

Cover Crops for Nematode Suppression

Cover crops may reduce populations of plant parasitic nematodes when properly managed in the year before planting. In Ontario, these nematode-suppressing cover crops have been successful:

- oilseed radish
- certain white and oriental mustard cultivars like White Gold, Pacific Gold, Caliente, Cutlass or Forge
- specific sorghum × sudan-grass hybrids
- African marigold cultivars like Crackerjack or Creole
- Canadian Forage Pearl Millet 101 (root lesion nematode suppression)

Not all cultivars of the above cover crops reduce nematode populations. Choose the right variety. One or more years of nematode-suppressing cover crops may be required to reduce nematodes below economic thresholds.

Cover crops suppress nematodes in different ways:

- Canadian Forage Pearl Millet 101 is a poor host and inhibits the ability of root lesion nematodes to reproduce in its root-system.
- Certain cultivars of African marigolds produce a root exudate that is toxic to nematodes in the soil.
- Nematode-suppressing cultivars of oilseed radish and certain white and oriental mustards produce glucosinolates and an enzyme in their leaves, stems and petioles. The enzyme converts the glucosinolates into isothiocyanates, which are toxic to nematodes when the cover crop is cut green and incorporated immediately into the soil.

Exclude cover crops such as clovers and buckwheat from berry and orchard rotations. These are excellent hosts for root-lesion nematodes. Wheat or barley are the best cereal crops to grow before planting.

For more information, visit ontario.ca/crops and search the *Soil Management*, *Fertilizer Use*, *Crop Nutrition* and *Cover Crops for Fruit Production* webpage.

Other Cultural Practices to Reduce Nematodes

Nematode populations can build on many weed species. A good weed control program is essential the year before planting fruit crops. Plan an intensive weed management strategy for the cover crop where nematode-suppressing cover crops are grown.

Keep land fallow the year before planting to reduce nematode numbers. A disadvantage to fallow land is increased susceptibility to soil erosion. In orchards, choose ground covers for planting between the rows that do not support nematodes, such as annual or perennial ryegrass, or creeping red fescue.

Soil Fumigation

Pre-plant soil fumigation is the most effective method of controlling nematode problems. Fumigants can be broadcast over the whole field or applied only in bands where crop will be planted. Row application, or the treatment of a 2.0–2.5 m strip centered on the row, is more economical, but requires good planning. However, broadcast fumigation will reduce the risk of re-contamination if non-fumigated soil is mixed into the fumigated strip.

For products, rates and other information on fumigants, refer to Table 4–2. *Products for Management of Nematodes and Other Soil-borne Pests*.

Application of fumigants before planting

Most fumigants are applied by shank injection using specialized application equipment. Some formulations of metam sodium can be applied to the soil surface and irrigated in. See the product label for application instructions.

- Fumigate when soil temperatures are above 4°C at 20 cm depth. Warmer temperatures (15°C and over) are preferred for more rapid fumigant dispersal in the soil. Fumigation in the early fall before planting is best for fruit crops which are planted in early spring when soils are still cool (i.e., bare root stock).
- Land preparation is critical for effective fumigant application. Fumigants cannot easily penetrate large clumps of soil and organic matter. Remove trash and old root systems. One week prior to fumigation, work the soil to a depth of 25–30 cm and obtain good seedbed tilth and moisture. Keep soil moist and if necessary irrigate the treated area during the week prior to fumigation. A light cultivation immediately before fumigation may be necessary if a soil crust has developed.
- Soil moisture in the top 15–20 cm must be at the level stipulated by the fumigant label prior to and during fumigation. If soil moisture is not sufficient, it must be adjusted before product application can occur. For best results, keep the soil surface moist during application and for 24 hours after application.
- Seal the soil surface immediately after injection of the fumigant. The best method for sealing the soil is covering it with tarps, however, sealing the soil by rolling or cultipacking immediately behind the fumigant applicator can also be used. Some fumigants have specific requirements for sealing the soil-consult product labels to determine what is legally permissible for the fumigant and type of application. Light watering after application will further prevent the escape of fumigant from the soil.
- Leave soil undisturbed for at least 1 week after injection of the fumigant. Colder soils (below 15°C) require longer periods from injection to aeration.
- Work the soil and aerate for about a week before planting. For fall planting, work the soil and aerate for 2 weeks before planting. The time interval between fumigation and planting into fumigated soil depends upon the product used the rate and the temperature following fumigation (consult product label).
- Use high-quality planting stock, preferably grown in fumigated soil. Nursery operators can provide information on how to manage nematodes.
- Always read the product label. All fumigant labels now contain detailed Good Agricultural Practices for soil conditions, sealing, application and re-entry. Restricted entry timings are mandatory and must be followed for all fumigant applications.

Fumigating single-plant sites before planting replacement bushes

When blueberries are replanted within an existing field, nematodes and diseases can be controlled in the planting hole using Vapam or Busan before planting. Refer to the product label for application details, rates and safety precautions.

Table 4–2. Products for Management of Nematodes and Other Soil-borne Pests

CAUTION: These products are very toxic. Read the label and follow instructions for handling and application. Always follow manufacturer's directions carefully for dosage and methods of use.The applicator must wear suitable protective clothing, etc. These requirements vary between products and can be found on the label.

Product	Active Ingredient	Pests Controlled[1]			Fruit Crop Registrations	Rates (shank injection or surface applied)	Rates (sprinkler application)
		Nematodes	Soil-borne Diseases	Weeds			
Busan 1020	metam sodium 33%	yes	yes	yes	fruit crops	375–935 L/ha (shank injection)	700–935 L/ha
Busan 1180	metam potassium 54%	yes	yes	yes	fruit crops	231–576 L/ha (shank injection)	431–576 L/ha
Busan 1236	metam sodium 42%	yes	yes	yes	fruit crops	274–683 L/ha (shank injection)	511–683 L/ha
Chloropicrin 100	chloropicrin 99%	yes	yes	no	strawberry, raspberry	93 L/ha[2] (shank injection)	do not apply with sprinklers
Enfuse M 510	metam sodium 42%	yes	yes	yes	fruit crops	260 L/ha (surface applied)	do not apply with sprinklers
Pic Plus	chloropicrin 85.1%	yes[3]	yes	no	strawberry, raspberry	108 L/ha[4] (shank injection)	do not apply with sprinklers
MustGrow	oriental mustard seed meal 100%	yes[5]	yes[5]	no	strawberry, raspberry	1121–2240 kg/ha (surface applied)	do not apply with sprinklers
Vapam HL	metam sodium 42%	yes	yes	yes	fruit crops	279–696 L/ha (shank injection)	350–670 L/ha
Velum Prime	fluopyram (500 g/L)	yes[6]	yes[7]	no	strawberry, raspberry, specialty bushberry[8]	do not surface apply	500 mL/ha (chemigation)[9]

[1] See label for exact registrations. [2] Use 140 L/ha Chloropicrin 100 for strawberry plant production (runner production). [3] Pic Plus is labelled for root-knot nematode but is not labelled for root-lesion nematode.
[4] Use 162 L/ha Pic Plus for strawberry plant production (runner production). [5] Provides suppression rather than control. [6] Provides suppression of soil-dwelling, root feeding nematodes (juveniles, adults).
[7] Provides control of foliar disease (powdery mildew). [8] Low-bush blueberry, bearberry, bilberry, cloudberry, cranberry, lingonberry, muntries, partridgeberry.
[9] Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment.

New requirements for fumigants

Health Canada's Pest Management Regulatory Agency (PMRA) has changed the label requirements for soil fumigant products containing chloropicrin, metam sodium and metam potassium. These requirements are intended to further limit user exposure and increase protection of workers, bystanders and the environment. The changes took effect in September 2014. Growers and applicators should ensure they have the most current version of product labels before applying any fumigant. Detailed instructions can be found on product labels, but requirements include:

- A Fumigation Management Plan (FMP) must be completed prior to the start of any fumigant application. This is an organized, written description of the steps involved to ensure a safe and effective fumigation. The specific requirements for the FMP will be listed on the product label.
- Mandatory Good Agricultural Practices are now required. This standardizes many practices already on existing labels and helps improve the safety and efficacy of soil fumigations. These practices will vary with the product and application method but will include identifying optimal weather conditions, proper soil preparation, requirements for soil moisture and temperature, methods for soil sealing and use of proper application depths.
- DO NOT apply these products when a temperature inversion is occurring or is predicted to occur within 48 hours after application is complete, as fumigant vapours may drift. For more information on how inversions affect drift of pest control products, see www.sprayers101.com/inversion-operators/.
- DO NOT apply these products if light wind conditions (less than 3 km/h) are forecast to persist for more than 18 consecutive hours from the time the application starts until 48 hours after the application is complete. Calm conditions could indicate a temperature inversion, which could lead to spray drift. See www.sprayers101.com for more information on temperature inversions.
- Any person involved in the use of fumigants is considered a fumigant handler. All fumigant handlers must hold an appropriate pesticide applicator certificate or license recognized by the provincial pesticide regulatory agency where the pesticide application is to occur.
- Entry into fumigant application blocks by any person (other than fumigant handlers, emergency personnel and local, provincial or federal officials performing inspection, sampling or other official duties) is **PROHIBITED** during the Application Block Period.
- The Application Block Period begins at the start of application and expires at least 5 days after the application is complete. The length of the period will depend on application criteria (e.g., tarped or non-tarped, etc.). The applicator must verbally warn workers of the application.
- Fumigant application signs must be posted on all entrances to the application block. Signs must be posted prior to the start of the application (but no earlier than 24 hours prior to application) and remain posted for the duration of the Application Block Period. Signs must be removed within 3 days of the end of the Application Block Period.
- Only fumigant handlers with an appropriate pesticide applicator certificate or license recognized by the provincial regulatory agency may be in the application block from the start of the application until the Application Block Period expires, and in the buffer zone during the Buffer Zone Period.

Buffer zones

- A buffer zone must be established for all fumigant applications. A buffer zone is an area around the perimeter of the fumigated area that extends equally in all directions. The size of the buffer zone area will depend on the product and application criteria.
- Only fumigant handlers with appropriate certification may enter the buffer zone during the Buffer Zone Period, the 48-hour period following application. All non-handlers, including field workers, residents and pedestrians must be excluded from the buffer zone during the Buffer Zone Period, except for transit (e.g., vehicular or bicycle traffic).
- The size of the buffer zone will vary with application method, rate and field size. Product labels will include tables to determine the required buffer zone distance.

- Buffer zones cannot include any residential area or occupied building, outdoor residential areas (e.g., lawns, gardens, play areas) or other areas that may be occupied during the 48-hour period following application.
- An emergency preparedness plan will be required when residences or businesses are located in close proximity to the outer edge of the buffer zone.

Nematode Suppression After Planting

Velum Prime

Velum Prime is a broad-spectrum nematicide/fungicide (Fungicide Group 7) with preventative, systemic, and curative properties for the suppression of certain soil plant pathogenic nematodes and control of certain crop diseases. Velum Prime is best suited for use in a preventative treatment program. For best results, this product should be applied in the root zone through drip irrigation equipment only beginning at planting. As the roots take up the product, it suppresses root feeding nematodes and moves up into the foliar plant tissue to control certain fungal diseases such as powdery mildew.

- To limit the potential for disease resistance developing to Group 7 fungicides, do not make more than 2 sequential applications of Velum Prime or any other Group 7 product before rotating to a different fungicide group registered for the same use.
- Fungicides other than Group 7 with a different mode of action should be applied for the first foliar fungicide application.
- Do not apply more than 1 litre of Velum Prime/ha per year, regardless of formulation or method of application.
- Velum Prime can be applied up to the day of harvest.

Vydate

Vydate will suppress nematodes after planting raspberries. Vydate is less effective than pre-plant soil fumigation and does not control soil-borne disease. Refer to the product label for application methods, mixing instructions, rates and precautions.

- Vydate is highly toxic to bees. Do not apply during the bloom period.
- Vydate is very toxic to humans. Follow application instructions closely.

Raspberry-specific strategies:

- Treat raspberry plants with 1 application of Vydate as a soil drench over roots in the fall before October 31. Do not apply Vydate to raspberries in the spring.
- Do not apply to raspberries more than once a year.
- Do not re-enter treated fields for 12 hours after application.

5. Appendices

APPENDIX A: Additional Resources for Ontario Fruit Growers

Many factsheets, publications and other resources are available from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). These can be ordered from Service Ontario:

- Online at ServiceOntario Publications: ontario.ca/publications
- In person or by appointment at OMAFRA Resource Centres. Many can also be found online at ontario.ca/omafra

OMAFRA Publications

- *Agronomy Guide for Field Crops* – Publication 811
- *Growing Strawberries in Ontario* – Publication 513
- *Growing Red Raspberries in Ontario* – Publication 105
- *Fruit Crop Protection Guide* – Publication 360 (Apples, Berries, Tender Fruit, Grapes, Tree Nuts)
- *Guides to Weed Control* – Publication 75A Field Crops & Publication 75B Hort Crops
- *Integrated Pest Management for Ontario Apples* – Publication 310
- *Soil Fertility Handbook* – Publication 611
- *Vegetable Crop Protection Guide* – Publication 838

Websites

Websites for technical information on pests and production in Ontario fruit crops:

- OMAFRA gateway to information on crops: ontario.ca/crops
- Spotted wing drosophila: ontario.ca/spottedwing
- Brown marmorated stink bug: ontario.ca/stinkbug
- Crop IPM (integrated pest management) modules: ontario.ca/cropipm
- ONfruit blog to find regular information on fruit crop production and pest management: onfruit.ca
- Health Canada's Label Search Tool to find labels for pesticides and products registered for use in Canada: http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php
- Information on pesticide application technology: www.sprayers101.com
- Specialty Cropportunities to find information on specialty berries and fruit: ontario.ca/crops (search on "cropportunities")

OMAFRA Factsheets

- *Mating Disruption for Management of Insect Pests*
- *How Weather Conditions Affect Spray Applications*
- *Six Elements of Effective Spraying in Orchards and Vineyards*
- *Calibrating Airblast Sprayers*
- *Adjusting, Maintaining and Cleaning Airblast Sprayers*
- *Pesticide Drift from Ground Applications*

Resources on Application Technology

Ontario Pesticide Education Program: www.opep.ca

Airblast 101 Course Materials: basic tools for applying pesticides and plant growth modifiers in an effective, economic and environmentally responsible manner. For more information, contact the ministry Application Technology Specialist, or visit https://sprayers101.com/airblast101/.

APPENDIX B: Suppliers of Pest Monitoring Equipment and Biological Control Agents

This list includes sources of weather monitoring equipment, pest monitoring supplies and biological control agents. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

Company	Address	Telephone/Fax/Email	Products
Anatis Bioprotection www.anatisbioprotection.com	278 rang Saint-André Saint-Jacques-le-Mineur, QC J0J 1Z0	Toll-free: 1-800-305-7714 Email: info@anatisbioprotection.com	• beneficial insects and mites
Biobest Canada Ltd. www.biobestgroup.com	2020 Foxrun Rd. R.R. #4 Leamington, ON N8H 3V7	Tel: 519-322-2178 Email: info@biobest.ca	• beneficial insects, mites, nematodes • pheromone lures and traps • bumblebee hives for pollination
Cooper Mill Ltd. www.coopermill.com	31 Hastings Rd. R.R. #3 Madoc, ON K0K 2K0	Tel: 613-473-4847 Fax: 613-473-5080 Email: ipm@coopermill.com	• pheromone lures and traps
Distributions Solida Inc. www.solida.ca	480 rang St-Antoine St. Ferreol-les-Neiges, QC G0A 3R0	Tel: 418-826-0900 Email: info@solida.ca	• pheromone lures and traps • tangle traps, insect trap coating • hand lens magnifiers • tally counters
Gempler's www.gemplers.com	P.O. Box 5175 Janesville, WI USA 53547	Toll-free: 1-800-382-8473 Email: customerservice@gempler.com	• weather monitoring equipment • pheromone lures and traps • tangle traps • hand lens magnifiers • tally counters
Great Lakes IPM, Inc. www.greatlakesipm.com	7563 N Crystal RD Vestaburg, MI USA 48891	Tel: 989-268-5693 Toll-free: 1-800-235-0285 Email: glipm@greatlakesipm.com	• pheromone lures and traps • tangle traps • hand lens magnifiers • tally counters • insect sweep nets
Koppert Canada Ltd. www.koppert.ca	40 Ironside Cres. #3 Scarborough, ON M1X 1G4	Tel: 1-800-567-4195 Fax: 416-291-0902 Email: info@koppert.ca	• beneficial insects, mites • insect traps • BioWorks products
Natural Insect Control www.naturalinsectcontrol.com	3737 Netherby Rd. Stevensville, ON L0S 1S0	Tel: 905-382-2904 Fax: 905-382-4418 Email: info@nicniagara.com	• beneficial insects, mites and nematodes (Canadian strains) • pheromone lures and traps • mating disruption devices • bird houses
N.M. Bartlett Inc. www.bartlett.ca	4509 Bartlett Rd. Beamsville, ON L0R 1B1	Tel: 905-563-8261 Toll-free: 1-800-263-1287 Fax: 905-563-7882 Email: info@bartlett.ca	• pheromone lures and traps • mating disruption devices
PheroTech	7572 Progress Way Delta, BC V4G 1E9	Tel: 604-940-9944 Toll-free: 1-800-665-0076 Fax: 604-940-9433 Email: sales@pherotech.com	• pheromone lures and traps
Plant Products Inc. www.plantproducts.com	50 Hazelton St. Leamington, ON N8H 3W1	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Email: info@plantproducts.com	• pheromone lures and traps • mating disruption devices • rodent and tangle traps • sticky tape and cards • beneficial insects

APPENDIX C: Safety Supply Companies

This is a list of safety supply companies in Ontario providing protective clothing and personal protective equipment. Ask safety supply companies for help to select protective clothing and personal protective equipment. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

Company	Address	Telephone/Fax/Email
3M Canada Company www.3mcanada.ca	300 Tartan Dr. London, ON N5V 4M9	Toll-free: 1-800-364-3577
Acklands Grainger www.acklandsgrainger.com	123 Commerce Valley Drive East Suite 700 Thornhill, ON L3T 7W8	Tel: 1-888-602-0000
Dupont Personal Protection Equipment www.personalprotection.dupont.ca	P.O. Box 2200 Streetsville Mississauga, ON L5M 2H3	Toll-free: 1-800-387-2122
Dutch Industries “Protect-Air Cab Filter” www.dutchopeners.com www.hurontractor.com	Huron Tractor 39995 Harvest Rd. Exeter, ON N0M 1S3	Tel: 519-235-1115
Hamisco Industrial Sales Inc. www.hamisco.com	3392 Wonderland Rd. S. London, ON N6L 1A8	Tel: 519-652-9800 Toll-free: 1-800-668-9800
Levitt-Safety (Eastern) Ltd. www.levitt-safety.com	2872 Bristol Circle Oakville, ON L6H 5T5	Toll-free: 1-888-453-8488 Fax: 905-829-2919 Email: csr@levitt-safety.com
The Mitt & Robe Company Ltd.	751 Norfolk St. N. Simcoe, ON N3Y 3R6	Tel: 519-428-4050
MSA Canada www.msasafety.com	100 Westmore Dr., Unit 23 Toronto, ON M9V 5C3	Toll-free: 1-800-672-2222 Email: canada.cs@msasafety.com
Plant Products Inc. www.plantproducts.com	50 Hazelton St. Leamington, ON N8H 3W1	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Email: info@plantproducts.com
Safety Express www.safetyexpress.com	D1-3680 Odyssey Drive Mississauga, ON L5M 0Y9	Tel: 905-608-0111 Toll-free: 1-800-465-3898 Fax: 905-608-0091 Email: info@safetyexpress.com
The St. George Company Ltd. www.thestgeorgeco.com	20 Consolidated Dr. P.O. Box 430 Paris, ON N3L 3T5	Tel: 519-442-2046 Toll-free: 1-800-461-4299 Fax: 519-442-7191 Email:sales@thestgeorgeco.com

APPENDIX D: Accredited Soil-Testing Laboratories in Ontario

The following labs are accredited to perform soil tests for pH, buffer pH, potassium, phosphorus, magnesium and nitrate-nitrogen on Ontario soils.

Laboratory Name	Address	Telephone/Fax/Email
A & L Canada Laboratories Inc. www.alcanada.com	2136 Jetstream Rd. London, ON N5V 3P5	Tel: 519-457-2575 Fax: 519-457-2664 Email: alcanadalabs@alcanada.com
Activation Laboratories Ltd. www.actlabsag.com	141 Bittern St. Ancaster, ON L9G 4V5	Tel: 1-888-228-5227 Fax: 905-648-9613
SGS Agri-Food Laboratories www.agtest.com	503 Imperial Rd., Unit #1 Guelph, ON N1H 6T9	Tel: 519-837-1600 Toll-free: 1-800-265-7175 Fax: 519-837-1242 Email: ca.agri.guelph.lab@sgs.com
Brookside Laboratories, Inc. www.blinc.com	200 White Mountain Dr. New Bremen, OH USA 45869	Tel: 419-977-2766 Fax: 419-977-2767 Email: info@blinc.com
Eurofins Environment Testing Canada Inc. www.eurofins.ca	8-146 Colonnade Rd. Ottawa, ON K2E 7Y1	Tel: 613-727-5692 Fax: 613-727-5222
Honeyland Ag Service www.honeylandag.com	3918 West Corner Dr. Ailsa Craig, ON N0M 1A0	Tel: 226-377-8485 Email: croelands@honeylandag.com
University of Guelph Laboratory Services https://guelphlabservices.com/	University of Guelph P.O. Box 3650, 95 Stone Rd. W. Guelph, ON N1H 8J7	Tel: 519-767-6299 Toll-free: 1-877-863-4235 Fax: 519-767-6240 Email: aflinfo@uoguelph.ca
Stratford Agri Analysis www.stratfordagri.ca	1131 Erie St. Box 760 Stratford, ON N5A 6W1	Toll-free: 1-800-323-9089 Email: info@stratfordagri.ca

There is no official accreditation in Ontario for tissue analysis, but all the accredited soil-testing labs are monitored for proficiency on tissue analyses.

APPENDIX E: Diagnostic Services

Samples for disease diagnosis, insect or weed identification, nematode counts and Verticillium testing can be sent to:

Agriculture & Food Laboratory
Laboratory Services Division
University of Guelph
95 Stone Rd. W.,
Guelph, ON N1H 8J7
Tel: 519-767-6299
Fax: 519-767-6240
Website: www.afl.uoguelph.ca
Email: aflinfo@uoguelph.ca

Payment must accompany samples at the time of submission. Submission forms are available at http://afl.uoguelph.ca/submitting-samples#forms.

To obtain information on the fee schedule, visit www.afl.uoguelph.ca or phone the Pest Diagnostic Clinic.

A and L Canada Laboratories Inc.
2136 Jetstream Rd.
London, ON
N5V 3P5
Tel: 519-457-2575
Fax: 519-457-2664
Website: www.alcanada.com
Email: alcanadalabs@alcanada.com

Cool Climate Oenology and Viticulture Institute
Grapevine Virology Lab
Brock University
1812 Sir Isaac Brock Way
St. Catharines, ON, Canada L2S 3A1
Ph: 905-688-5550 Ext. 3510
Email: virustesting@brocku.ca

Norgen Biotek Corp.
Grapevine Virus Testing
3430 Schmon Parkway
Thorold, ON L2V 4Y6
Tel: 905-227-8848
(Toll-free) 1-866-667-4362
Fax: 905-227-1061
E.mail: info@norgenbiotek.com,
norgenbiotek.com

How to Sample for Nematodes

Soil

When to sample

Soil and root samples can be taken at any time of the year that the soil is not frozen. In Ontario, nematode soil population levels are generally at their highest in May and June, and again in September and October.

How to sample soil

Use a soil sampling tube, trowel or narrow-bladed shovel to take samples. Sample soil to a depth of 20–25 cm (8–10 in.). If the soil is bare, remove the top 2 cm (1 in.) prior to sampling.

A sample should consist of 10 or more subsamples combined. Mix well, then take a sample of ½–1 L (1 pint–1 qt) from this. No single sample should represent more than 2.5 ha (6.25 acre). Mix subsamples in a clean pail or plastic bag.

Sampling pattern

If living crop plants are present in the sample area, take samples within the row and from the area of the feeder root zone (with trees, this is the drip line).

Number of subsamples

Based on the total area sampled:
500 m^2 (5,400 ft^2) 10 subsamples
500 m^2–0.5 ha (5,400 ft^2–1.25 acre) 25 subsamples
0.5 ha–2.5 ha (1.25–6.25 acre) 50 subsamples

Roots

From small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g (½–1 oz.), dig fresh weight from the feeder root zone and submit.

Problem areas

Take soil and root samples from the margins of the problem area where the plants are still living. If possible, also take samples from healthy areas in the same field. If possible, take both soil and root samples from problem and healthy areas in the same field.

Sample Handling

Soil samples

Place in plastic bags as soon as possible after collecting.

Root samples

Place in plastic bags and cover with moist soil from the sample area.

Storage

Store samples at 5°–10°C (40°–50°F) and do not expose them to direct sunlight or extreme heat or cold (freezing). Only living nematodes can be counted. Accurate counts depend on proper handling of samples.

Submitting Plant for Disease Diagnosis or Identification

Sample submission forms

Forms can be obtained from on the Agriculture and Food Laboratory website at https://afl.uoguelph.ca/sites/default/files/pdf/general-submission-form.pdf. It is important to include the cropping history of the area for the past three years and this year's pesticide use records.

Choose a complete, representative sample showing early symptoms. Submit as much of the plant as is practical, including the root system, or several plants showing a range of symptoms. If symptoms are general, collect the sample from an area where they are of intermediate severity. Completely dead material is usually inadequate for diagnosis.

With plant specimens submitted for identification, include at least a 20–25 cm sample of the top portion of the stem with lateral buds, leaves, flowers or fruits in identifiable condition. Wrap plants in newspaper and put in a plastic bag. Tie the root system off in a separate plastic bag to avoid drying out and contamination of the leaves by soil. Do not add moisture, as this encourages decay in transit. Cushion specimens and pack in a sturdy box to avoid damage during shipping. Avoid leaving specimens to bake or freeze in a vehicle or in a location where they could deteriorate.

Delivery

Deliver to the diagnostic lab as soon as possible by first-class mail or by courier at the beginning of the week.

Submitting Insect Specimens for Identification

Collecting samples

Place dead, hard-bodied insects in vials or boxes and cushion with tissues or cotton. Place soft-bodied insects and caterpillars in vials containing alcohol. Do not use water, as this results in rot. Do not tape insects to paper or send them loose in an envelope.

Place live insects in a container with enough plant "food" to support them during transit. Be sure to write "live" on the outside of the container.

APPENDIX F: Ontario Ministry of Agriculture, Food and Rural Affairs – Fruit Crop Advisory Staff

Application Technology Specialist	Jason Deveau	Tel: 519-209-1883	jason.deveau@ontario.ca
Crop Protection Specialist	Denise Beaton	Tel: 519-400-3636	denise.beaton@ontario.ca
Entomologist, Horticulture	Hannah Fraser	Tel: 905-708-8014	hannah.fraser@ontario.ca
Fresh Market Quality Specialist	Jennifer R. DeEll	Tel: 519-410-1806	jennifer.deell@ontario.ca
Fruit Crop Specialist (berry)	Erica Pate	Tel: 519-410-0624	erica.pate@ontario.ca
Fruit Crop Specialist (tender fruit, grape)	Kathryn Carter	Tel: 905-687-1280	kathryn.carter@ontario.ca
Horticulture IPM Specialist (pome fruit)	Kristy Grigg-McGuffin	Tel: 519-420-9422	kristy.grigg-mcguffin@ontario.ca
Horticulture IPM Specialist (specialty crops)	Melanie Filotas	Tel: 519-428-4340	melanie.filotas@ontario.ca
Horticulture IPM Specialist (tender fruit, grape)	Wendy McFadden-Smith	Tel: 905-932-8965	wendy.mcfadden-smith@ontario.ca
Horticulture Sustainability Specialist	vacant	—	—
Maple, Tree Nut and Agroforestry Specialist	Jenny Liu	Tel: 519-835-5872	jenny.liu2@ontario.ca
Minor Use Coordinator	Jim Chaput	Tel: 519-546-2482	jim.chaput@ontario.ca
New Crop Development Specialist	Evan Elford	Tel: 519-420-9343	evan.elford@ontario.ca
Pathologist, Horticulture	Katie Goldenhar	Tel: 519-835-5792	katie.goldenhar@ontario.ca
Soil Fertility Specialist, Horticulture	Tejendra Chapagain	Tel: 519-835-5794	tejendra.chapagain@ontario.ca
Soil Management Specialist, Horticulture	Anne Verhallen	Tel: 519-359-6707	anne.verhallen@ontario.ca
Surveillance Coordinator & Data Analyst	Cora Loucks	Tel: 519-546-8245	cora.loucks@ontario.ca
Tree Fruit Specialist	Erika DeBrouwer	Tel: 226-931-4098	erika.debrouwer@ontario.ca
Weed Management Specialist, Horticulture	Kristen Obeid	Tel: 519-965-0107	kristen.obeid@ontario.ca

A complete list of Ontario Ministry of Agriculture, Food and Rural Affairs crop advisory staff is available on the OMAFRA website at ontario.ca/crops.

In Case of Pesticide Drift Concerns:

Please contact the Ministry of Environment, Conservation and Parks+ local District or Area office. The local District Office contact information can be found from http://www.infogo.gov.on.ca/infogo/home.html#orgProfile/-270/en.

After business hours, please contact the Pollution Hotline at 1-866-MOE-TIPS (1-866-663-8477).

Spills Action Centre

Under provincial regulations, you must immediately report spills of pollutants that you control to Ontario's Spills Action Centre. More information can be found here: https://www.ontario.ca/page/report-pollution-and-spills#section-1.

Tel: 416-325-3000
Toll-free: 1-800-268-6060

Agricultural Information Contact Centre

Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.
1 Stone Rd. W., Guelph, ON N1G 4Y2
Tel: 1-877-424-1300
Fax: 519-826-3442
Email: ag.info.omafra@ontario.ca

APPENDIX G: The Metric System

Metric Units

Linear Measures (length)

10 millimetres (mm)	=	1 centimetre (cm)
100 centimetres (cm)	=	1 metre (m)
1,000 metres	=	1 kilometre (km)

Square Measures (area)

100 m × 100 m	=	10,000 m^2 = 1 hectare (ha)
100 ha	=	1 square kilometre (km^2)

Cubic Measures (volume)

DRY MEASURE

1,000 cubic millimetres (mm^3)	=	1 cubic centimetre (cm^3)
1,000,000 cm^3	=	1 cubic metre (m^3)

LIQUID MEASURE

1,000 millilitres (mL)	=	1 litre (L)
100 L	=	1 hectolitre (hL)

Weight-Volume Equivalents (for water)

(1.00 kg) 1,000 grams	=	1 litre (1.00 L)
(0.5 kg) 500 g	=	500 mL (0.5 L)
(0.1 kg) 100 g	=	100 mL (0.1 L)
(0.01 kg) 10 g	=	10 mL (0.01 L)
(0.001 kg) 1 g	=	1 mL (0.001 L)

Weight Measures

1,000 milligrams (mg)	=	1 gram (g)
1,000 g	=	1 kilogram (kg)
1,000 kg	=	1 tonne (t)
1 mg/kg	=	1 part per million (ppm)

Dry–Liquid Equivalents

1 cm^3	=	1 mL
1 m^3	=	1,000 L

Approximate Metric Conversions

5 mL	=	1 tsp
15 mL	=	1 tbsp
28.5 mL	=	1 Imp. fl. oz.

Application Rate Conversions

Metric to Imperial or U.S. (approximate)

litres per hectare × 0.09	=	Imp. gallons per acre
litres per hectare × 0.11	=	U.S. gallons per acre
litres per hectare × 0.36	=	Imp. quarts per acre
litres per hectare × 0.43	=	U.S. quarts per acre
litres per hectare × 0.71	=	Imp. pints per acre
litres per hectare × 0.86	=	U.S. pints per acre
millilitres per hectare × 0.014	=	U.S. fluid ounces per acre
grams per hectare × 0.014	=	ounces per acre
kilograms per hectare × 0.89	=	pounds per acre
tonnes per hectare × 0.45	=	tons per acre

Imperial or U.S. to Metric (approximate)

Imp. gallons per acre × 11.23	=	litres per hectare (L/ha)
U.S. gallons per acre × 9.35	=	litres per hectare (L/ha)
Imp. quarts per acre × 2.8	=	litres per hectare (L/ha)
U.S. quarts per acre × 2.34	=	litres per hectare (L/ha)
Imp. pints per acre × 1.4	=	litres per hectare (L/ha)
U.S. pints per acre × 1.17	=	litres per hectare (L/ha)
Imp. fluid ounces per acre × 70	=	millilitres per hectare (mL/ha)
U.S. fluid ounces per acre × 73	=	millilitres per hectare (mL/ha)
tons per acre × 2.24	=	tonnes per hectare (t/ha)
pounds per acre × 1.12	=	kilograms per hectare (kg/ha)
pounds per acre × 0.45	=	kilograms per acre (kg/acre)
ounces per acre × 70	=	grams per hectare (g/ha)

Liquid Equivalents

LITRES/HECTARE		APPROXIMATE GALLONS/ACRE	
IMPERIAL GALLONS		U.S. GALLONS	
50	=	4.45	5.35
100	=	8.9	10.7
150	=	13.53	16.05
200	=	17.8	21.4
250	=	22.25	26.75
300	=	26.7	32.1

Approximate Dry Weight Equivalents

GRAMS/HECTARE		OUNCES/ACRE
100	=	1 ½
200	=	3
300	=	4 ¼
500	=	7
700	=	10

KILOGRAMS/HECTARE		POUNDS/ACRE
1.10	=	1
1.50	=	1 ¼
2.00	=	1 ¾
2.50	=	2 ¼
3.25	=	3
4.00	=	3 ½
5.00	=	4 ½
6.00	=	5 ¼
7.50	=	6 ¾
9.00	=	8
11.00	=	10
13.00	=	11 ½
15.0	=	13 ½

Handy Metric Conversion Factor

litres per hectare × 0.4 = litres per acre
kilograms per hectare × 0.4 = kilograms per acre

Conversion Table – Metric to Imperial (approximate)

Length

1 millimetre (mm)	=	0.04 inch
1 centimetre (cm)	=	0.4 inch
1 metre (m)	=	39.4 inches
1 metre (m)	=	3.28 feet
1 metre (m)	=	1.09 yards
1 kilometre (km)	=	0.62 mile

Area

1 square centimetre (cm^2)	=	0.16 square inch
1 square metre (m^2)	=	10.77 square feet
1 square metre (m^2)	=	1.2 square yards
1 square kilometre (km^2)	=	0.39 square mile
1 hectare (ha)	=	107,636 square feet
1 hectare (ha)	=	2.5 acres

Volume (dry)

1 cubic centimetre (cm^3)	=	0.061 cubic inch
1 cubic metre (m^3)	=	1.31 cubic yards
1 cubic metre (m^3)	=	35.31 cubic feet
1,000 cubic metres (m^3)	=	0.81 acre-foot
1 hectolitre (hL)	=	2.8 bushels

Volume (liquid)

1 millilitre (mL)	=	0.035 fluid ounce (Imp.)
1 litre (L)	=	1.76 pints (Imp.)
1 litre (L)	=	0.88 quart (Imp.)
1 litre (L)	=	0.22 gallon (Imp.)
1 litre (L)	=	0.26 gallon (U.S.)

Weight

1 gram (g)	=	0.035 ounce
1 kilogram (kg)	=	2.21 pounds
1 tonne (t)	=	1.1 short tons
1 tonne (t)	=	2,205 pounds

Pressure

1 kilopascal (kPa)	=	0.15 pounds/in^2

Speed

1 metre per second	=	3.28 feet per second
1 metre per second	=	2.24 miles per hour
1 kilometre per hour	=	0.62 mile per hour

Temperature

°F	=	(°C × ⁹⁄₅) + 32

Conversion Tables – Imperial to Metric (approximate)

Length

1 inch	=	2.54 cm
1 foot	=	0.3 m
1 yard	=	0.91 m
1 mile	=	1.61 km

Area

1 square foot	=	0.09 m^2
1 square yard	=	0.84 m^2
1 acre	=	0.4 ha

Volume (dry)

1 cubic yard	=	0.76 m^3
1 bushel	=	36.37 L

Volume (liquid)

1 fluid ounce (Imp.)	=	28.41 mL
1 pint (Imp.)	=	0.57 L
1 gallon (Imp.)	=	4.55 L
1 gallon (U.S.)	=	3.79 L

Weight

1 ounce	=	28.35 g
1 pound	=	453.6 g
1 ton	=	0.91 tonne

Pressure

1 pound per square inch	=	6.90 kPa

Temperature

ºC	=	(ºF – 32) × ⁵⁄₉

Abbreviations

%	=	percent (by weight)
ai	=	active ingredient
cm	=	centimetre
cm2	=	square centimetre
e.g.	=	for example
g	=	gram
ha	=	hectare
kg	=	kilogram
km/h	=	kilometres per hour
kPa	=	kilopascal
L	=	litre
m	=	metre
m/s	=	metres per second
m2	=	square metre
mL	=	millilitre
mm	=	millimetre
t	=	tonne
v/v	=	volume/volume

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Ontario Poison Centre: Toronto 1-800-268-9017

PREVENT ACCIDENTS

- **Read the label.** Follow all the precautions the label recommends. Read the First Aid section of the label BEFORE you begin to handle any pesticide.
- **Make sure that someone knows** what pesticides you are working with and where you are.
- **Keep a file of labels and product Safety Data Sheets (SDS) for the pesticides you use.** Make sure everyone knows where to find this in case of an emergency.
- **Post emergency numbers near all telephones.**
- **Keep clean water, paper towels, extra gloves and clean coveralls close by** in case you spill pesticide on yourself.

If someone has been working with pesticides and you see any possible symptoms of pesticide poisoning or injury, take emergency action immediately.

IF AN ACCIDENT OR POISONING HAPPENS

- protect yourself from injury first.
- Stop the exposure to the pesticide. Move the victim away from the contaminated area.
- Check the four basic facts — identify the pesticide, the quantity, the route of entry and time of exposure.
- Call an ambulance or the Ontario Poison Centre.
- Start first aid. This is not a substitute for professional medical help.
- **Provide the label, SDS sheet, container or a clear photo of the container to emergency personnel** at the scene — or take it with you to the hospital. Do not transport pesticide containers in the passenger compartment of the vehicle.

FIRST AID

If a pesticide comes in contact with skin:

- remove all contaminated clothing; wash skin thoroughly with lots of soap and warm water.
- dry skin well and cover with clean clothing or other clean material.

If pesticide comes in contact with eyes:

- hold eyelids open; wash the eyes with clean running water for 15 minutes or more.

If pesticide was inhaled:

- move the victim to fresh air and loosen tight clothing.
- give artificial respiration if the victim is not breathing.

Do not breathe in the exhaled air from the victim — you could also be poisoned.

If a pesticide was swallowed:

- call the Ontario Poison Centre IMMEDIATELY.

To obtain a digital copy of this publication visit ontario.ca and search for the publication number and title.

To order a print copies of this or any other OMAFRA publication, visit ontario.ca/publications

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Agricultural Information Contact Centre

1-877-424-1300
1-855-696-2811 (TTY)
email: ag.info.omafra@ontario.ca
ontario.ca/omafra

For a major spill, a theft or a fire involving a pesticide:

Call the Ontario Ministry of the Environment, Conservation and Parks **Spills Action Centre** at **1-800-268-6060** (24 hr a day, 7 days a week).

Notify your municipality.