12. 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
- By phone through the ServiceOntario Contact Centre
  Monday–Friday, 8:30 AM–5:00 PM

  416-326-5300
  416-325-3408 (TTY)
  1-800-668-9938 Toll-free across Canada
  1-800-268-7095 TTY Toll-free across Ontario
- In person at ServiceOntario Centres located throughout the province or at any OMAFRA Resource Centre. Many can also be found online at ontario.ca/omafra
- For a complete list of publications from OMAFRA:
  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
- *Guide to Fruit Production* – Publication 360
- *Guide to Weed Control* – Publication 75
- *Integrated Pest Management for Ontario Apples* – Publication 310
- *Ontario Field Vegetable Guide* – Publication 839 (expected release date of late 2016)
- *Soil Fertility Handbook* – Publication 611
- *Vegetable Crop Protection Guide* – Publication 838

Websites

Websites for technical information on pests 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
- 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.ca

Specialty Cropportunities to find information on specialty berries and fruit: ontario.ca/crops (search on "cropportunities")

Resources on Application Technology

- Ontario Pesticide Education Program:
  www.opep.ca

OMAFRA Factsheets:

- *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*

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.

Best Management Practices

The Best Management Practices series of publications presents a practical, affordable approach to conserving a farm's soil and water resources without sacrificing productivity.

A sampling of titles appears below. For a complete list of books in the BMP series, see: ontario.ca/omafra.

- BMP01E *Farm Forestry and Habitat Management*
- BMP06E *Soil Management*
- BMP07E *Water Management*
- BMP08E *Irrigation Management*
- BMP09E *Integrated Pest Management*
- BMP13E *Pesticide Storage, Handling and Application*
- BMP15E *Buffer Strips*
- BMP16E *Manure Management*
- BMP20E *Managing Crop Nutrients*

APPENDIX B: Degree-Day Modeling

Temperature, light and humidity affect the growth and development of plants, disease-causing pathogens 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. For pathogens, temperature and moisture play key roles in the development and infection of the plant.

The amount of heat required for insect, mite and pathogen 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, mites and pathogens have a minimum (lower) and maximum (upper) base temperature—below or above which development does not occur. These base temperatures are different for each organism.

Degree-Days Celsius (DDC) are used to estimate the growth and development of pests in the growing season (see Table 12–1. *Examples of Degree-Day Models Used in Fruit Crops*, page 336). Events such as peak egg-laying activity, 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 codling moth eggs or the percentage of apple scab ascospores that have matured in the orchard.

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:

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

Degree-Days Celsius 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 Celsius (DDC) for that day is = (15 + 5)/2 – 10 = 0

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.

Degree-Days Celsius 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 2 km 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-sensor 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.

DDC model calculators can be found on-line, such as http://uspest.org/cgi-bin/ddmodel.us?spp=swd

Keep in mind that many of these models have not been validated under Ontario conditions. Use precise temperature data measured on or very close to your farm for the best estimate of the development of these pests.

Table 12–1. Examples of Degree-Day Models Used in Fruit Crops

Pest	Base Temperature	Predicted Event		Model (when to expect the event)
Tarnished plant bug (strawberries)	12.1°C	1st nymphs in strawberries		• 30–40 DDC after April 1
Codling moth (apples)	10°C	1st egg hatch		• 139 DDC after first sustained moth catch (biofix)
Obliquebanded leafroller (apples)	6.1°C	1st egg hatch		• 220–244 DDC after first sustained moth catch (biofix)
Oriental fruit moth (peach)	7.2°C	1st generation	10% egg hatch	• 95 DDC after first sustained moth catch (biofix)
			55% egg hatch	• 195 DDC after first sustained moth catch (biofix)
			end of egg hatch	• 359 DDC after first sustained moth catch (biofix)
		2nd generation	10% egg hatch	• 639 DDC after first sustained moth catch (biofix)
			55% egg hatch	• 780 DDC after first sustained moth catch (biofix)
			end of egg hatch	• 1,083 DDC after first sustained moth catch (biofix)
		3rd generation	10% egg hatch	• 1,167 DDC after first sustained moth catch (biofix)
			55% egg hatch	• 1,375 DDC after first sustained moth catch (biofix)
			end of egg hatch	• 1,765 DDC after first sustained moth catch (biofix)
Grape berry moth[1]	8.3°C	1st generation	1st egg hatch	• 450 DDC after 50% bloom on wild grapes
		2nd generation	1st egg hatch	• 900 DDC after 50% bloom on wild grapes
		3rd generation	1st egg hatch	• 1,350 DDC after 50% bloom on wild grapes
Spotted wing drosophila[2]	10°C	overwintering generation	peak egg laying by overwintering females and 1st adult emergence	• 283 DDC after Jan 1
		1st generation	peak adult emergence	• 419 DDC after Jan 1
		2nd generation	peak adult emergence	• 694 DDC after Jan 1
		3rd generation	peak adult emergence	• 968 DDC after Jan 1
		4th generation	peak adult emergence	• 1243 DDC after Jan 1
Apple scab[3]	0°C	high risk of primary infections	rapid maturation of ascospores	• 125 DDC after bud break on McIntosh
		end of the primary infection period	95% of the ascospores should be depleted if sufficient rainfall has occurred	• 418 DDC after bud break on McIntosh

[1] Tobin, P.C., Nagarkatti, S. and Saunders, M.C. 2001. Modeling development in grape berry moth (Lepidoptera: Tortricidae). *Environmental Entomology* 30(4):692–699.
[2] 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.
[3] Gadoury, D.M. and MacHardy, W.E. 1982. A model to estimate the maturity of asocospore of *Venturia inaequalis*. *Phytopathology* 72:901–904.

APPENDIX C: Crop Groupings for Pesticide Registrations in Canada

To facilitate the establishment of Maximum Residue Limits (MRLs), the Pest Management Regulatory Agency (PMRA) uses crop groups. Individual crops are allocated to a crop group based on botanical and taxonomic criteria, as well as cultivation practices. Crop groups simplify the establishment of MRLs by using residue data for crops that are representative of the whole group to extend to all crops within the crop group. Crop groups can also contain smaller and more closely related crop subgroups.

Some products with crop groups listed on the label will omit a few crops within that group. Specialty fruit growers should check labels to ensure their crop is listed in the list of crops following the crop group designation.

Many new registrations apply to entire crop groups, providing pest control options for new or minor crops not listed in the pest control calendars in this publication. These are listed below. Products with crop group registrations are indicated in Table 11–6. *Pesticides Used on Fruit Crops in Ontario*, page 321.

CROP GROUP 11: Pome Fruits Group
Representative commodities: apple and pear.

- Apple
- Crabapple
- Loquat
- Mayhaw
- Pear
- Pear, oriental
- Quince

CROP GROUP 11-09: Pome Fruits Group
Representative commodities: apple and pear.

- Apple
- Azarole
- Crabapple
- Loquat
- Mayhaw
- Medlar
- Pear
- Pear, Asian
- Quince
- Quince, Chinese
- Quince, Japanese
- Tejocote
- Cultivars, varieties and/or hybrids of these

CROP GROUP 12: Stone Fruits Group
Representative commodities: sweet cherry or sour cherry, peach, and plum or fresh prune.

- Apricot
- Cherry, sweet
- Cherry, sour
- Nectarine
- Peach
- Plum
- Plum, Chickasaw
- Plum, Damson
- Plum, Japanese
- Plumcot
- Prune (fresh)

CROP GROUP 12-09: Stone Fruits Group
Representative commodities: sweet or sour cherry, peach, and plum or prune plum.

- Apricot
- Apricot, Japanese
- Capulin
- Cherry, black
- Cherry, Nanking
- Cherry, sweet
- Cherry, sour
- Chokecherry
- Nectarine
- Peach
- Plum
- Plum, American
- Plum, beach
- Plum, Canada
- Plum, cherry
- Plum, Chickasaw
- Plum, Damson
- Plum, Japanese
- Plum, Klamath
- Plum, prune
- Plumcot
- Sloe
- Cultivars, varieties, and hybrids of these

CROP SUBGROUP 12-09A: Cherry subgroup
Representative commodities: sweet or sour cherry.

- Capulin
- Cherry, black
- Cherry, Nanking
- Cherry, sweet
- Cherry, sour
- Chokecherry
- Cultivars, varieties, and hybrids of these

CROP SUBGROUP 12-09B: Peach subgroup
Representative commodities: peach.

- Nectarine
- Peach
- Cultivars, varieties, and hybrids of these

CROP SUBGROUP 12-09C: Plum subgroup
Representative commodities: plum or prune plum.

- Apricot
- Apricot, Japanese
- Plum
- Plum, American
- Plum, beach
- Plum, Canada
- Plum, cherry
- Plum, Chickasaw
- Plum, Damson
- Plum, Japanese
- Plum, Klamath
- Plum, prune
- Plumcot
- Sloe
- Cultivars, varieties, and hybrids of these

Source: Health Canada, *Regulatory Directive DIR98-02* and its revisions.

CROP GROUP 13: Berries Group
Representative commodities: blackberry or raspberry, and blueberry.

- Blackberry
- Blueberry
- Currant
- Elderberry
- Gooseberry
- Huckleberry
- Loganberry
- Raspberry, black and red

CROP SUBGROUP 13A: Caneberry subgroup
Representative commodity: blackberry or raspberry.

- Blackberry
- Loganberry
- Raspberry, black and red

CROP SUBGROUP 13B: Bushberry subgroup
Representative commodity: highbush blueberry.

- Blueberry
- Currant
- Elderberry
- Gooseberry
- Huckleberry

CROP GROUP 13-07: Berry and Small Fruit Crop Group
Representative commodities: blackberry or raspberry, highbush blueberry, elderberry or mulberry, grape, strawberry, and fuzzy kiwifruit.

- Blackberry
- Blueberry, highbush
- Blueberry, lowbush
- Currant, black
- Currant, red
- Elderberry
- Gooseberry
- Huckleberry
- Raspberry, black and red
- Amur river grape
- Aronia berry
- Bayberry
- Bearberry
- Bilberry
- Buffalo currant
- Buffaloberry
- Che
- Chilean guava
- Chokecherry
- Cloudberry
- Cranberry
- European barberry
- Grape
- Highbush cranberry
- Honeysuckle, edible
- Jostaberry
- June (Saskatoon) berry
- Kiwifruit, fuzzy
- Kiwifruit, hardy
- Lingonberry
- Maypop
- Mountain pepper berries
- Mulberry
- Muntries
- Native currant
- Partridgeberry
- Phalsa
- Pincherry
- Riberry
- Salal
- Schisandra berry
- Sea buckthorn
- Serviceberry
- Strawberry
- Wild raspberry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07A: Caneberry subgroup
Representative commodities: blackberry or raspberry.

- Blackberry
- Loganberry
- Raspberry, black and red
- Wild raspberry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07B: Bushberry subgroup
Representative commodity: highbush blueberry.

- Blueberry, highbush
- Blueberry, lowbush
- Currant, black
- Currant, red
- Elderberry
- Gooseberry
- Huckleberry
- Aronia berry
- Buffalo currant
- Chilean guava
- European barberry
- Highbush cranberry
- Honeysuckle, edible
- Jostaberry
- June (saskatoon) berry
- Lingonberry
- Native currant
- Salal
- Sea buckthorn
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07C: Large Shrub/Tree Berry subgroup
Representative commodities: elderberry or mulberry.

- Elderberry
- Bayberry
- Buffaloberry
- Che
- Chokecherry
- June (saskatoon) berry
- Mountain pepper berries
- Mulberry
- Phalsa
- Pincherry
- Riberry
- Salal
- Serviceberry
- Cultivars, varieties and/or hybrids of these

Source: Health Canada, *Regulatory Directive DIR98-02* and its revisions.

CROP SUBGROUP 13-07D: Small Fruit Vine Climbing subgroup
Representative commodities: grape and fuzzy kiwifruit.

- Gooseberry
- Amur river grape
- Grape
- Kiwifruit, fuzzy
- Kiwifruit, hardy
- Maypop
- Schisandra berry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07E: Small Fruit Vine Climbing subgroup, except Grape
Representative commodity: fuzzy kiwifruit.

- Gooseberry
- Amur river grape
- Kiwifruit, fuzzy
- Kiwifruit, hardy
- Maypop
- Schisandra berry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07F: Small Fruit Vine Climbing subgroup, except Fuzzy Kiwifruit
Representative commodity: grape.

- Gooseberry
- Amur river grape
- Grape
- Kiwifruit, hardy
- Maypop
- Schisandra berry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07G: Low Growing Berry subgroup
Representative commodity: strawberry.

- Blueberry, lowbush
- Bearberry
- Bilberry
- Cloudberry
- Cranberry
- Lingonberry
- Muntries
- Partridgeberry
- Strawberry
- Cultivars, varieties and/or hybrids of these

CROP SUBGROUP 13-07H: Low Growing Berry subgroup, except Strawberry
Representative commodity: cranberry.

- Blueberry, lowbush
- Bearberry
- Bilberry
- Cloudberry
- Cranberry
- Lingonberry
- Muntries
- Partridgeberry
- Cultivars, varieties and/or hybrids of these

CROP GROUP 14: Tree Nuts Group
Representative commodities: almond and pecan.

- Almond
- Beech Nut
- Brazil Nut
- Butternut
- Cashew
- Chestnut
- Chinquapin
- Filbert (hazelnut)
- Hickory nut
- Macadamia nut (bush nut)
- Pecan
- Walnut, black
- Walnut, English

CROP GROUP 14-11: Tree Nuts Crop Group
Representative commodities: almond and pecan.

- African nut tree
- Almond
- Beechnut
- Brazil nut
- Brazilian pine
- Bunya
- Bur Oak
- Butternut
- Cajou
- Candlenut
- Cashew
- Chestnut
- Chinquapin
- Coconut
- Coquito nut
- Dika nut
- Ginkgo
- Guiana chestnut
- Hazelnut (Filbert)
- Heartnut
- Hickory nut
- Japanese horse-chestnut
- Macadamia nut
- Mongongo nut
- Monkey-pot
- Monkey puzzle nut
- Okari nut
- Pachira nut
- Peach palm nut
- Pecan
- Pequi
- Pili nut
- Pine nut
- Pistachio
- Sapucaia nut
- Tropical almond
- Walnut, black
- Walnut, English
- Yellowhorn
- Cultivars, varieties, and/or hybrids of these

Source: Health Canada, *Regulatory Directive DIR98-02* and its revisions.

APPENDIX D: Suppliers of Pest Monitoring Equipment and Biological Control Agents

This list includes sources of weather monitoring equipment, pest monitoring supplies and biological control agents. For a more extensive list of beneficial insects and mite suppliers, see the OMAFRA website at ontario.ca/crops. 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.biobest.ca	2020 Foxrun Rd. R.R. #4 Leamington, ON N8H 3V7	Tel: 519-322-2178 Fax: 519-322-1271 Email: info@biobest.ca	• beneficial insects, mites, nematodes • pheromone lures and traps • bumblebee hives for pollination
Contech Enterprises Inc. www.contech-inc.com	7572 Progress Way Delta, BC V4G 1E9	Tel: 604-940-9944 Toll-free: 1-800-767-8658 Fax: 604-940-9433 Email: sales@contech-inc.com	• pheromone lures and traps
Cooper Mill Ltd. www.coopermill.com	31 Hastings Road 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 Fax: 418-826-0901 Email: info@solida.ca	• pheromone traps and lures • tangle traps, insect trap coating • hand lens magnifiers • tally counters • product technical support
Gempler's www.gemplers.com	P.O. Box 5175 Janesville, WI USA 53547	Toll-free: 1-800-382-8473 Fax: 1-800-551-1128 Email: customerservice@gempler.com	• weather monitoring equipment • pheromone lures and traps • tangle traps • magnifiers • tally counters
Great Lakes IPM, Inc. www.greatlakesipm.com	10220 Church Road NE Vestaburg, MI USA 48891	Tel: 989-268-5693 Toll-free: 1-800-235-0285 Fax: 989-268-5311 Email: glipm@greatlakesipm.com	• apple scab monitoring equipment • pheromone lures and traps • tangle traps • magnifiers • tally counters • insect sweep nets • field diagnostic equipment
Koppert Canada Ltd. www.koppertonline.ca	50 Ironside Cres. #2 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: nic@niagara.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: 1-800-767-8658 Fax: 905-563-7882 Email: info@bartlett.ca	• pheromone lures and traps • mating disruption devices
PheroTech www.pherotech.com	7572 Progress Way Delta, BC V4G 1E9	Tel: 604-940-9944 Fax: 604-940-9433 Email: sales@pherotech.com	• pheromone lures and traps
Plant Products Inc. www.plantproducts.com	50 Hazelton Street Leamington, ON N8H 1B8	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Fax: 519-326-9290 Email: info@plantproducts.com	• pheromone lures and traps • mating disruption devices • rodent traps • sticky tape and cards • tangle traps • beneficial insects

Company	Address	Telephone/Fax/Email	Products
Warwick Orchards and Nursery	7056 Egremont Rd. R.R. #8 Watford, ON N0M 2S0	Tel: 519-849-6730 Fax: 519-849-6731 Email: warwickorchards@brktel.on.ca	• DeWitt leaf wetness sensor

APPENDIX E: 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
3-M Canada Company www.3mcanada.ca	300 Tartan Drive London, ON N5V 4M9	Toll-free: 1-800-364-3577 Toll-free fax: 1-800-603-7758
Acklands Grainger www.acklandsgrainger.com	90 W. Beaver Creek Rd. Richmond Hill, ON L4B 1E7	Tel: 905-731-5516 Toll-free: 1-866-248-8801 Fax: 905-731-6053 Email: contact@agi.ca
Dupont Personal Protection Equipment www.personalprotection.dupont.ca	P.O. Box 2200 Streetsville Mississauga, ON L5M 2H3	Tel: 905-821-3300 Toll-free: 1-800-931-3456 Fax: 905-816-3059
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 Fax: 519-235-1939
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 Fax: 519-652-9661
Levitt-Safety (Eastern) Ltd. www.levitt-safety.com	2872 Bristol Circle Oakville, ON L6H 5T5	Tel: 905-829-3299 Toll-free: 1-888-453-8488 Fax: 905-829-2919 Email: csr@levitt-safety.com
The Mitt & Robe Company Ltd. www.mittrobe.ca	751 Norfolk St. N. Simcoe, ON N3Y 3R6	Tel: 519-428-4050 Toll-free: 1-877-893-6565 Fax: 519-428-5142 Email: sales@mittrobe.ca
MSA Canada www.msasafety.com	100 Westmore Dr., Unit 23 Toronto, ON M9V 5C3	Tel: 416-620-4225 Toll-free: 1-800-672-2222 Fax: 416-679-2875 Email: info@msasafety.com
Plant Products Inc. www.plantproducts.com	50 Hazelton St. Leamington, ON N8H 1B8	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Fax: 519-326-9290 Email: info@plantproducts.com
Safety Express www.safetyexpress.com	4190 Sladeview Cres., Unit 1 & 2 Mississauga, ON L5L 0A1	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 F: 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	Contact
A & L Canada Laboratories Inc. www.alcanada.com	2136 Jetstream Rd. London, ON N5V 3P5	Tel: 519-457-2575 Fax: 519-457-2664 Email: aginfo@alcanada.com	Greg Patterson Ian McLachlin
Activation Laboratories Ltd. www.actlabsag.com	141 Bittern Street Ancaster, ON L9G 4V5	Tel: 905-648-9611 Fax: 905-648-9613 Email: victoriapechorina@actlabs.com	Rob Deakin Victoria Pechorina
SGS Agri-Food Laboratories www.agtest.co	503 Imperial Rd., Unit #1 Guelph, ON N1H 6T9	Tel: 519-837-1600 Toll-free: 1-800-265-7175 Fax: 519-837-1242 Email: lab@agtest.com	Jack Legg Papken Bedirian
Brookside Laboratories, Inc. www.blinc.com	200 White Mountain Dr. New Bremen, OH USA 45869	Tel: 419- 977-2766 Fax: 419- 977-2767 Email: jbrackman@blinc.com	Jackie Brackman Mark Flock
Exova Canada Inc. www.exova.com	8-146 Colonnade Rd. Ottawa, ON K2E 7Y1	Tel: 613-727-5692 Fax: 613-727-5222	
FoReST Laboratory http://lucas.lakeheadu.ca/forest	955 Oliver Rd. BB1005D Thunder Bay, ON P7B 5E1	Tel: 807-343-8639 Fax: 807-343-8116 Email: soilslab@lakeheadu.ca	Breanne Neufeld Joel Symonds
University of Guelph Laboratory Services www.labservices.uoguelph.ca/units/soil-nutrient	University of Guelph P.O. Box 3650, 95 Stone Rd. W. Guelph, ON N1H 8J7	Tel: 519-767-6299 Fax: 519-767-6240 Email: aflinfo@uoguelph.ca	Nick Schrier
Stratford Agri Analysis www.stratfordagri.ca	1131 Erie St. Box 760 Stratford, ON N5A 6W1	Tel: 519-273-4411 1-800-323-9089 Fax: 519-273-2163 Email: info@stratfordagri.ca	Keith Lemp Mark Aikman

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 G: Diagnostic Services

Samples for disease diagnosis, insect or weed identification, nematode counts and Verticillium testing can be sent to:

Pest Diagnostic Clinic
Laboratory Services Division
University of Guelph
95 Stone Rd. W.
Guelph, ON N1H 8J7
Tel: 519-767-6299
Fax: 519-767-6240
Website: www.guelphlabservices.ca
Email: aflinfo@uoguelph.ca

Payment must accompany samples at the time of submission. Submission forms are available at www.guelphlabservices.com/AFL/submit_samples.aspx

To obtain information on the fee schedule, visit www.guelphlabservices.ca or phone the Pest Diagnostic Clinic.

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 your local Ontario Ministry of Agriculture, Food and Rural Affairs office. Carefully fill in all of the categories on the form. In the space provided, draw the most obvious symptom and the pattern of the disease in the field. 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 Pest Diagnostic Clinic 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 H: Ontario Ministry of Agriculture and Food – Fruit Crop Advisory Staff

Agroforestry Specialist	Todd Leuty	Tel: 519-826-3215	todd.leuty@ontario.ca
Application Technology Specialist	Jason Deveau	Tel: 519-426-8934	jason.deveau@ontario.ca
Berry Crop Specialist	Pam Fisher	Tel: 519-426-2238	pam.fisher@ontario.ca
Crop Protection Program Lead	Denise Beaton	Tel: 519-826-6594	denise.beaton@ontario.ca
Entomology, Horticulture Program Lead	Hannah Fraser	Tel: 905-562-1674	hannah.fraser@ontario.ca
Fresh Market Quality Program Lead	Jennifer R. DeEll	Tel: 519-426-1408	jennifer.deell@ontario.ca
Minor Use Coordinator	Jim Chaput	Tel: 519-826-3539	jim.chaput@ontario.ca
New Crop Development Specialist	Evan Elford	Tel: 519-426-4509	evan.elford@ontario.ca
Nutrient Management Horticulture Program Lead	Deanna Nemeth	Tel: 905-562-1170	deanna.nemeth@ontario.ca
Nutrition – Horticulture Program Lead	Christoph Kessel	Tel: 519-824-4120 ext. 52480	christoph.kessel@ontario.ca
Pathologist – Horticulture Program Lead	Michael Celetti	Tel: 519-824-4120 ext. 58910	michael.celetti@ontario.ca
Pome Fruit IPM Specialist	Kristy Grigg-McGuffin	Tel: 519-426-4322	kristy.grigg-mcguffin@ontario.ca
Soil Management Specialist	Anne Verhallen	Tel: 519-674-1614	anne.verhallen@ontario.ca
Specialty Crops IPM Specialist	Melanie Filotas	Tel: 519-426-4434	melanie.filotas@ontario.ca
Tender Fruit and Grape IPM Specialist	Wendy McFadden-Smith	Tel: 905-562-3833	wendy.mcfadden-smith@ontario.ca
Tender Fruit and Grape Specialist	Kathryn Carter	Tel: 905-562-1639	kathryn.carter@ontario.ca
Transition Crop Specialist	Jim Todd	Tel: 519-426-3823	jim.todd@ontario.ca
Tree Fruit Specialist	Amanda Green	Tel: 519-426-1102	amanda.green@ontario.ca
Weed Management Program Lead—Horticulture	Kristen Obeid	Tel: 519-738-1232	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.

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 I: Ontario Ministry of the Environment and Climate Change – Regional Contact Information

Region/County	Address	Telephone/Fax
Central Region Toronto, Halton, Peel, York, Durham, Muskoka, Simcoe	5775 Yonge St., 8th Floor Toronto, ON M2M 4J1	Tel: 416-326-6700 Toll-free: 1-800-810-8048 Fax: 416-325-6345
West-Central Region Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant	Ontario Government Building 119 King St. W., 9th Floor Hamilton, ON L8P 4Y7	Tel: 905-521-7640 Toll-free: 1-800-668-4557 Fax: 905-521-7820
Eastern Region Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/Dundas & Glengarry, Haliburton, Peterborough, Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark, District of Nipissing (Twp. of South Algonquin)	1259 Gardiners Rd., Unit 3 PO Box 22032 Kingston, ON K7M 8S5	Tel: 613-549-4000 Toll-free: 1-800-267-0974 Fax: 613-548-6908
Southwestern Region Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth	733 Exeter Rd. London, ON N6E 1L3	Tel: 519-873-5000 Toll-free: 1-800-265-7672 Fax: 519-873-5020
Northern Region (East) Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie	199 Larch St., Ste. 1201 Sudbury, ON P3E 5P9	Tel: 705-564-3237 Toll-free: 1-800-890-8516 Fax: 705-564-4180
Northern Region (West) Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay	435 James St. S., Ste. 331 Thunder Bay, ON P7E 6S7	Tel: 807-475-1205 Toll-free: 1-800-875-7772 Fax: 807-475-1745
Standards Development Branch	Pesticides Section 40 St. Clair Ave. W. 7th Floor Toronto, ON M4V 1L5	Tel: 416-327-5519 Fax: 416-327-2936
Approvals Branch	Pesticides Licensing 2 St. Clair Ave. W. 12A Floor Toronto, ON M4V 1L5	Tel: 416-314-8001 Toll-free: 1-800-461-6290 Fax: 416-314-8452

APPENDIX J: Other Contacts

Agriculture and Agri-Food Canada Research Centres

www.agr.gc.ca/index_e.php

Eastern Cereals and Oilseeds Research Centre
960 Carling Ave.
Ottawa, ON K1A 0C6
Tel: 613-759-1858

Greenhouse and Processing Crops Centre
2585 County Road 20
Harrow, ON N0R 1G0
Tel: 519-738-2251

Southern Crop Protection and Food Research Centre
1391 Sandford St.
London, ON N5V 4T3
Tel: 519-457-1470

Vineland Research Farm
4902 Victoria Ave. N.
Vineland, ON L0R 2E0
Tel: 905-562-4113

Guelph Food Research Centre
93 Stone Road West
Guelph, N1G 5C9
Tel: 519-829-2400

Canadian Food Inspection Agency Regional Offices (Plant Protection)

www.inspection.gc.ca

Belleville
345 College St. E.
Belleville, ON K8N 5S7
Tel: 613-969-3333

Brantford
625 Park Rd. N., Suite 6
Brantford, ON N3T 5P9
Tel: 519-753-3478

Hamilton
709 Main St. W., Ste. 101
Hamilton, ON L8S 1A2
Tel: 905-572-2201

London
19-100 Commissioners Rd. E.
London, ON N5Z 4R3
Tel: 519-691-1300

St. Catharines
395 Ontario St., PO Box 19
St. Catharines, ON L2N 7N6
Tel: 905-937-8232

Ottawa District
38 Auriga Dr., Unit 8
Ottawa, ON K2E 8A5
Tel: 613-274-7374, ext. 221

Toronto
1124 Finch Ave. W., Unit 2
Downsview, ON M3J 2E2
Tel: 416-665-5055

Guelph
174 Stone Rd W
Guelph, N1G 4T1
Tel: 519-837-9400

University of Guelph

Main Campus
Guelph, ON N1G 2W1
Tel: 519-824-4120
www.uoguelph.ca

Ridgetown Campus
Ridgetown, ON N0P 2C0
Tel: 519-674-1500
www.ridgetownc.uoguelph.ca

Department of Plant Agriculture
www.plant.uoguelph.ca

Department of Plant Agriculture, Guelph
50 Stone Rd. W.
Guelph, ON N1G 2W1
Tel: 519-824-4120, ext. 56083
Fax: 519-763-8933

Department of Plant Agriculture, Simcoe
1283 Blueline Road, PO Box 587
Simcoe, ON N3Y 4N5
Tel: 519-426-7127
Fax: 519-426-1225

Department of Plant Agriculture, Vineland
4890 Victoria Ave. N., PO Box 7000
Vineland Station, ON L0R 2E0
Tel: 905-562-4141
Fax: 905-562-3413

Lab Services Division
95 Stone Rd. W., PO Box 3650
Guelph, ON N1H 8J7
Tel: 519-767-6299
www.uoguelph.ca/labserv

Trace Organics and Pesticides
Tel: 519-767-6485

Pest Diagnostic Clinic
Tel: 519-767-6256

Vineland Research and Innovation Centre

4890 Victoria Ave. N.
Vineland Station, ON L0R 2E0
Tel: 905-562-0320
Fax: 905-562-0084
www.vinelandresearch.com

APPENDIX K: Production Insurance

Production Insurance (PI) covers production losses and yield reductions caused by insured perils. This includes adverse weather, disease, wildlife and insect infestations. Depending on the plan, coverage is available on a total-yield, dollar-value or acreage-loss basis. Producers can choose the type and level of coverage that best meets their needs. When enrolled in PI, producers are guaranteed a level of production, based on their yield history and their chosen coverage level. Claims are paid when an insured peril causes a yield to fall below the guaranteed production.

In Ontario, Agricorp administers PI on behalf of the Government of Ontario and Agriculture and Agri-Food Canada. More than 15,000 producers and 2 million hectares (5 million acres) of Ontario farmland are insured each year.

Production Insurance is part of programming available under the federal-provincial-territorial initiative Growing Forward 2. In most plans, producers pay 40% of the total premium cost and none of the administration cost. Together, the federal and provincial governments contribute the other 60%. Administrative costs are fully funded by both levels of government.

PI is available to all Ontario farmers, landlords and sharecroppers who grow or manage eligible agricultural products. Coverage is available on approximately 90 commercially produced agricultural products in Ontario in the following sectors:

- bees
- forage
- fresh vegetables
- fruit
- grains and oilseeds
- processing vegetables
- specialty crops

For more information, contact Agricorp.

Agricorp

1 Stone Rd. W.
Box 3660, Stn. Central
Guelph, ON N1H 8M4
Open weekdays, 7 AM – 5 PM
Tel: 1-888-247-4999
TTY: 1-877-275-1380
Fax: 519-826-4118
Email: contact@agricorp.com
Web: www.agricorp.com

Ontario Agricultural Products Covered by Production Insurance (as of 2016)

General Crops

- canola
- coloured beans (black, cranberry, kidney, Japanese/other)
- corn (conventional, organic options)
- flax
- forage (excess and insufficient options)
- mustard
- new forage seeding (premium and standard)
- peanuts
- popping corn
- soybeans (conventional, tofu, natto and organic options available)
- spring grain
- seed corn
- spring wheat
- sugar beets
- sunflower
- white beans
- winter spelt, organic
- winter wheat (soft white, hard white, soft red, hard red, organic options)

Specialty Crops

- industrial hemp
- honey
- ginseng
- tobacco (black, burley, flue-cured)

Fruit Crops

- apples and apple trees
- cherries (sweet, sour)
- grapes and grape vines
- peaches/nectarines
- pears
- plums
- strawberries

Vegetable Crops – average farm yield or total production

- asparagus
- broccoli
- green beans and wax beans (processing)
- butternut squash (processing)
- cabbage
- carrots (fresh)
- carrots (processing)
- cauliflower
- celery
- cucumbers (processing)
- lettuce
- lima beans (processing)
- onions (seed, set, Spanish)
- parsnips
- peas (processing)
- peppers (banana, bell)
- potatoes (fresh)
- potatoes (processing)
- red beets (processing)
- rutabagas
- sweet corn (fresh)
- sweet corn (processing)
- tomatoes (fresh)
- tomatoes (processing)

Fresh Market Vegetables – acreage loss

Root vegetables

- carrots
- celeriac
- French shallots
- garlic
- green onions
- leeks
- parsnips
- radishes
- red beets
- rutabagas
- Spanish onions
- sweet potatoes
- turnips
- yellow onions

Leafy vegetables

- bok choy
- broccoli
- Brussels sprouts
- cauliflower
- celery
- Chinese cabbage
- gai ian
- kale
- lettuce
- mesclun
- mustard greens
- spinach
- cabbage (summer, winter)
- yu choy

Fruit vegetables

- cucumbers
- eggplant
- melons
- bell and specialty peppers
- pumpkins
- squash
- tomatoes
- watermelon
- zucchini

Other vegetables

- broad beans
- green and wax beans
- green peas
- sweet corn

Livestock

- bees

APPENDIX L: 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

Application Rate Conversions (cont'd)

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 m2
1 square yard	=	0.84 m2
1 acre	=	0.4 ha

Volume (dry)

1 cubic yard	=	0.76 m3
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

°C	=	(°F – 32) × 5/9

Abbreviations

%	=	percent (by weight)
ai	=	active ingredient
cm	=	centimetre
cm^2	=	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
m^2	=	square metre
mL	=	millilitre
mm	=	millimetre
t	=	tonne

APPENDIX M: Spraying Record

This table is a spraying record form. After spraying, record the crop or field number, spraying date, material used, rate or amount of spray, weather and soil conditions at the time of spraying in the blank cells.

Crop or Field No.	Date	Material Used	Rate or Amount	Weather and Soil Conditions

Spraying Record

This table is a spraying record form. After spraying, record the crop or field number, spraying date, material used, rate or amount of spray, weather and soil conditions at the time of spraying in the blank cells.

Crop or Field No.	Date	Material Used	Rate or Amount	Weather and Soil Conditions

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries call the Poison Information Centre:

Toronto 1-800-268-9017
1-877-750-2233 (TTY)

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 Material Safety Data Sheets (MSDS) 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 Poison Information Centre.
- Start first aid. This is not a substitute for professional medical help.
- **Provide the label, MSDS sheet or 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.

To obtain copies of this or any other OMAFRA publication, please order:
- online at ontario.ca/publications
- by phone through the ServiceOntario Contact Centre, Monday to Friday, 8:30 AM to 5:00 PM ET
  - 416-326-5300
  - 416-326-3408 (TTY)
  - 1-800-668-9938, toll-free across Canada
  - 1-800-368-7095 (TTY), toll-free across Ontario
- in person at ServiceOntario Centres across Ontario

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 Poison Information Centre IMMEDIATELY.**

Emergency numbers are listed at the front of each Bell telephone directory.

For a major spill,
a theft or a fire involving a pesticide:
Call the Ministry of the Environment and Climate Change **Spills Action Centre** at 1-800-268-6060 (24 hr a day, 7 days a week).
Notify your municipality.

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