



PROTECTION GUIDE FOR TURFGRASS

2017

Publication 384

Discard old editions of this publication. Each year the appropriate sub-committee of the Ontario Pest Management Research and Services Committee reviews the pesticides listed in this publication.

To the best knowledge of the committee, at the time of printing, the pesticide products listed in this publication were:

- **federally registered**
- **classified by the Ministry of the Environment and Climate Change (MOECC)**

The information in this publication is general information only. The Ontario Ministry of Agriculture, Food and Rural Affairs 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 directions.**

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 merit and 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. Conditional Registration

Conditional registration may be granted for a specified, limited time period, where the registrant agrees to produce additional scientific or technical information.

3. Emergency Registration

An emergency registration is a temporary, time-limited registration of no more than 1 year, approved to deal with serious pest outbreaks that have limited control options.

Maximum Residue Limits

The PMRA has established maximum residue limits (MRLs) for pesticides. 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 Labels

You **MUST** obtain a supplemental label and follow all the label directions when PMRA approves new uses for a registered pesticide that do not appear on the current label.

Examples of when you must use a supplemental label include:

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

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

For more information on the federal registration status, search Pest Management Regulatory Agency at www.canada.ca or call 1-800-267-6315.

Regulation of Pesticides in Ontario

The MOECC 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/e-laws or by calling the ServiceOntario Publications Toll-Free number: 1-800-668-9938 or 416-326-5300.

Classification of Pesticides

The Ontario Pesticides Advisory Committee (OPAC) is responsible for reviewing and recommending to the MOECC, the classification of pesticide products before they can be sold or used in Ontario. Once approved by the MOECC, classified products are posted on the MOECC website: ontario.ca/pesticides.

Certification and Licensing

Growers and Their Assistants

For information about certification for growers and training for assistants, check the Ontario Pesticide Education Program website: www.o pep.ca or call 1-800-652-8573.

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/index.cfm/home-page or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.hort-trades.com or call 1-800-265-5656 or e-mail pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

Cette publication est aussi disponible en français.

Appendices

Appendix A. Accredited Soil Testing Laboratories in Ontario

Laboratory Name	Address	Telephone/Fax/E-mail	Contact
A & L Canada Laboratories Inc. www.alcanada.com	2136 Jetstream Rd. London, ON N5V 3P5	Tel 519-457-2575 Fax 519-457-2664 E-mail aginfo@alcanada.com	Greg Patterson Ian McLachlin
Eurofins Environment Testing Canada Inc. www.exova.com	8-146 Colonnade Rd., Ottawa, ON K2E 7Y1	Tel 613-727-5692 Fax 613-727-5222	Scott Clark
SGS Agri-Food Laboratories www.agtest.com	503 Imperial Rd. Unit #1 Guelph, ON N1H 6T9	Tel 519-837-1600 1-800-265-7175 Fax 519-837-1242 E-mail ca.agri.guelph.lab@sgs.com	Jack Legg Dr. David Boyle
Brookside Laboratories, Inc. www.blinc.com	200 White Mountain Dr. New Bremen, OH 45869	Tel 419-753-2448 Fax 419-753-2949 E-mail jbrackman@blinc.com	Jackie Brackman Mark Flock
University of Guelph Laboratory Services www.afl.uoguelph.ca	University of Guelph P.O. Box 3650 95 Stone Rd. W. Guelph, ON N1H 8J7	Tel 519-767-6299 Fax 519-767-6240 E-mail 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 E-mail info@stratfordagri.ca	Keith Lemp Mark Aikman
Activation Laboratories Ltd.	41 Bittern St. Ancaster, ON L9G 4V5	Tel 905-648-9611 1-888-228-5227 Fax 905-648-9613 E-mail victoriapechorina@actlabs.com	Rob Deakin Victoria Pechorina

These labs are accredited to perform soil tests for pH, buffer pH, P, K and Mg Ontario soils. 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 B. Diagnostic Services

Weed identification

Pest Diagnostic Clinic

Laboratory Services Division

University of Guelph

95 Stone Rd. W.

Guelph, ON N1H 8J7

Tel 519-767-6256

Fax 519-767-6240

www.afl.uoguelph.ca

Turf disease and insect diagnosis and nematode counts

GTI Diagnostics

The Guelph Turfgrass Institute

328 Victoria Rd. S.

Guelph, ON N1H 6H8

Tel 519-824-4120, x 58873

Fax 519-766-1704

E-mail: diagnostics@guelph-turfgrass.ca

Sample submission forms can be obtained at
www.guelph-turfgrass.ca.

Appendix C. Collecting and Submitting Samples for Disease, Weed or Plant Identification

Disease diagnosis

Choose a 10–15 cm square piece of turfgrass (a cup changer plug works well), including thatch, and 5 cm of soil.

Take a sample from the outside edge of a ring or patch and include healthy and unhealthy turf as well as the interface between. If symptoms are general, collect the sample from an area where they are of intermediate severity.

Plant identification

The entire plant (including root) is preferable. It should include lateral buds, leaves, and flowers or fruits.

Please specify where the plant came from, i.e., cultivated field, waste area, yard, etc. Also include the county of origin, if available.

Shipping plant material

Do not add moisture when packing turf samples, plants or plant parts. Wrap in newspaper, tying roots and soil off separately to reduce contamination, and put in a plastic container. Avoid shipping over the weekend.

Insect specimens

Send dead, hard-bodied insects cushioned in a sturdy container. Preserve soft-bodied insects such as caterpillars in alcohol.

Hints for shipping insects

- Do not send insects in water.
- Do not tape insects to paper or send them loose in an envelope.
- Live insects should have enough food to survive until arrival. Clearly label the package with “live insects.”

Sampling for nematodes

Only living nematodes can be counted. Accurate counts depend on proper handling of samples.

When to sample

Take soil and root samples at any time when the soil is not frozen. In Ontario, nematode soil population levels are generally highest in May–June and again in September–October.

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 dripline).

Problem areas

Take soil and root samples from the margins of the problem area where the plants are still living. If possible, also take soil and root samples from healthy areas in the same field.

Sampling soil

Take samples using a soil-sampling tube, trowel or narrow-bladed shovel. Sample soil to a depth of 20–25 cm. If the soil is bare, remove the top 2 cm before sampling. Combine 10 or more subsamples in a clean pail or plastic bag. Mix them well. Take 0.5–1 L from this to create a sample. No one sample should represent more than 2.5 ha (6.5 acres).

Number of subsamples

The number of subsamples is based on the total area samples:

- for 500 m² (5,400 ft²), take 10 subsamples
- for 500–5,000 m² (5,400 ft²–0.5 ha), take 25
- for 0.5–2.5 ha (1.25–6.25 acres), take 50

Sampling roots

From small plants, take the entire root system plus adhering soil. For large plants, dig 10–20 g fresh weight from the feeder root zone and submit it.

Handling soil samples

Place in plastic bags as soon as possible after collecting.

Handling root samples

Place in plastic bags and cover with moist soil from the sample area.

Storage

Store samples at 5°C–10°C and do not expose them to direct sun or extreme heat or cold.

Appendix D. Ontario Ministry of Agriculture, Food and Rural Affairs Contacts

Agricultural Information Contact Centre

1 Stone Rd. W., Guelph ON N1G 4Y2

Tel: 1-877-424-1300 or 519-826-4047

Fax: 519-826-7610

ag.info.omafra@ontario.ca

Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.

A complete list of Ontario Ministry of Agriculture, Food and Rural Affairs Agriculture Development Branch Staff is available on the OMAFRA website at ontario.ca/omafra.

Appendix E. Ontario Ministry of 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, City of Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark (Township of South Algonquin)	1259 Gardiners Rd., Unit 3 P.O. 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., 2nd Floor 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., Suite 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., Suite 331, 3rd Floor Thunder Bay, ON P7E 6S7	Tel 807-475-1205 Toll-free 1-800-875-7772 Fax 705-475-1754
Standards Development Branch	Pesticides Section 40 St. Clair Ave. W., 7th Floor Toronto, ON M4V 1M2	Tel 416-327-5519 Fax 416-327-2936
Environmental 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 F. The Metric System

Metric units

Linear measures (length)

10 millimetres (mm) = 1 centimetre (cm)

100 centimetres (cm) = 1 metre (m)

1,000 metres (m) = 1 kilometre (km)

Square measures (area)

100 m × 100 m = 10,000 m² = 1 hectare (ha)

100 ha = 1 square kilometre (km²)

Cubic measures (volume)

Dry measure

1,000 cubic millimetres (mm³) = 1 cubic centimetre (cm³)

1,000,000 cm³ = 1 cubic metre (m³)

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)

(0.50 kg) 500 g = 500 mL (0.50 L)

(0.10 kg) 100 g = 100 mL (0.10 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 cm³ = 1 mL

1 m³ = 1,000 L

Metric conversions (Approximate)

5 mL = 1 tsp

15 mL = 1 tbsp

28.5 mL = 1 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

<i>litres/hectare</i>	<i>approximate gallons/acre</i>
50 = 5	100 = 10
100 = 10	150 = 15
150 = 15	200 = 20
200 = 20	250 = 25
250 = 25	300 = 30
300 = 30	

Dry weight conversions (Approximate)

<i>grams/hectare</i>	<i>ounces/acre</i>
100 grams = 1½ ounces	200 grams = 3 ounces
200 grams = 3 ounces	300 grams = 4¼ ounces
300 grams = 4¼ ounces	500 grams = 7 ounces
500 grams = 7 ounces	700 grams = 10 ounces
700 grams = 10 ounces	

<i>kilograms/hectare</i>	<i>pounds/acre</i>
1.10 kilograms = 1 pound	1.50 kilograms = 1¾ pounds
1.50 kilograms = 1¾ pounds	2.00 kilograms = 1¾ pounds
2.00 kilograms = 1¾ pounds	2.50 kilograms = 2¼ pounds
2.50 kilograms = 2¼ pounds	3.25 kilograms = 3 pounds
3.25 kilograms = 3 pounds	4.00 kilograms = 3½ pounds
4.00 kilograms = 3½ pounds	5.00 kilograms = 4½ pounds
5.00 kilograms = 4½ pounds	6.00 kilograms = 5¼ pounds
6.00 kilograms = 5¼ pounds	7.50 kilograms = 6¾ pounds
7.50 kilograms = 6¾ pounds	9.00 kilograms = 8 pounds
9.00 kilograms = 8 pounds	11.00 kilograms = 10 pounds
11.00 kilograms = 10 pounds	13.00 kilograms = 11½ pounds
13.00 kilograms = 11½ pounds	15.00 kilograms = 13½ pounds
15.00 kilograms = 13½ pounds	

Conversion Tables — Metric to Imperial (Approximate)

Length	
1 millimetre (mm)	= 0.04 inch
1 centimetre (cm)	= 0.40 inch
1 metre (m)	= 39.40 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)	= 1.20 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
1 litre (L)	= 1.76 pints
1 litre (L)	= 0.88 quart
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)	= 1.10 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	= 0.30 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	= 0.40 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	
°C	= (°F – 32) × 5/9

Abbreviations

% = per cent (by weight)	km/h = kilometres per hour
ai = active ingredient	kPa = kilopascal
AP = agricultural powder	L = litre
cm = centimetre	m = metre
cm ² = square centimetre	m/s = metres per second
DG = dispersible granular	m ² = square metre
DP = dispersible powder	mL = millilitre
E = emulsifiable	mm = millimetre
e.g. = for example	SC = suspension concentrate
EC = emulsifiable concentrate	SP = soluble pack
F = flowable	t = tonne
g = gram	W = wettable
Gr = granules, granular	WDG = water dispersible granular
ha = hectare	WP = wettable powder
kg = kilogram	

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Poison Information 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 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.

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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**.

To obtain copies of other OMAFRA publications, 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
 - 1-800-668-9938, toll-free across Canada
 - 1-800-268-7095 (TTY), toll-free across Ontario

Agricultural Information Contact Centre

1-877-424-1300
1-855-696-2811 (TTY)
E-mail: ag.info.omafra@ontario.ca
ontario.ca/omafra

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.

