

Appendices

Appendix A. Ontario Ministry of Agriculture, Food and Rural Affairs Greenhouse Vegetable Staff

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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

Toll-free: 1-877-424-1300

E-mail: ag.info.omafra@ontario.ca

Appendix B. Diagnostic Service

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

E-mail: afinfo@uoguelph.ca

www.guelphlabservices.com

Payment must accompany samples at the time of submission. Submission forms are available at: <http://afinfo.uoguelph.ca/submitting-samples#forms>

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. If the soil is bare, remove the top 2 cm prior to sampling. A sample should consist of 10 or more subsamples combined. Mix well in a clean pail or plastic bag. Then take a sample of 0.5–1 L from this. No one sample should represent more than 2.5 ha.

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	10 subsamples
500 m ² –0.5 ha	25 subsamples
0.5 ha–2.5 ha	50 subsamples

Roots

For small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g, 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.

Sample Handling

Soil samples

Place soil samples 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°C–10°C 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 the Laboratory Services website at www.guelphlabservices.com. 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 3 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 prevent it from drying out and to prevent the soil from contaminating the leaves. Do **not** add moisture, as this encourages decay in transit. Cushion specimens and pack them 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 Agriculture & Food Laboratory as soon as possible by first class mail or 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 plants for them to feed on during transit. Be sure to write “live” on the outside of the container.

Appendix C. Other Contacts

**Agriculture & Agri-Food
Canada Research Centres**

www.agr.gc.ca/index_e.php

Harrow Research and Development Centre

2585 County Road 20
Harrow, ON NOR 1G0
Tel: 519-738-2251

London Research and Development Centre

1391 Sandford St.
London, ON N5V 4T3
Tel: 519-457-1470

Vineland Research Farm

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

**Vineland Research and
Innovation Centre**

www.vinelandontario.ca

4890 Victoria Ave. N.
Vineland Station, ON LOR 2E0
Tel: 905-562-0320
Fax: 905-562-0084

**Canadian Food Inspection Agency Area
and Regional Offices (Plant Protection)**

www.inspection.gc.ca/english/toce.shtml

Ontario Area

174 Stone Rd. W.
Guelph, ON N1G 4S9
Tel: 226-217-8555 (General line)

Ontario Regional Offices

Central
259 Woodlawn Rd. W.
Suite A
Guelph, ON N1H 8J1
Tel: 226-217-1200 (51200)

South West

1200 Commissioners Rd. E.
Unit 19
London, ON N5Z 4R3
Tel: 519-691-1300

North East

500 Huronia Rd.
Unit 103
Barrie, ON L4N 8X3
Tel: 705-739-0008

Toronto

1124 Finch Av. W.
Unit 2
Toronto, ON M3J 2E2
Tel: 647-790-1100

University of Guelph
Main Campus

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

Ridgetown Campus

Ridgetown, ON NOP 2C0
Tel: 519-674-1500
www.ridgetownc.on.ca

Department of Plant Agriculture

www.plant.uoguelph.ca

Department of Plant Agriculture, Guelph

50 Stone Rd. E.
Guelph, ON N1G 2W1
Tel: 519-824-4120, ext. 56083
Fax: 519-763-8933

Department of Plant Agriculture, Simcoe

1283 Blueline Rd., Box 587
Simcoe, ON N3Y 4N5
Tel: 519-426-7127
Fax: 519-426-1225

Department of Plant Agriculture, Vineland

Box 7000, 4890 Victoria Ave. N.
Vineland Station, ON LOR 2E0
Tel: 905-562-4141
Fax: 905-562-3413

Lab Services Division

www.uoguelph.ca/labserv

P.O. Box 3650, 95 Stone Rd. W.
Guelph, ON N1H 8J7
Tel: 519-767-6299
Fax: 519-767-6240

Trace Organic and Pesticide Contaminants

Tel: 519-767-6485
Fax: 519-767-6240

Agriculture & Food Laboratory

Tel: 519-767-6256

Appendix D. Pesticide Groups Based on Sites of Action – Insecticides and Miticides

The classification scheme listed below is adapted from information developed by the Insecticide Resistance Action Committee Mode of Action Working Group. Products with the same group number have a similar mode of action. For details on this classification system, see www.irac-online.org/eClassification/.

Group #	Primary Site of Action	Sub-group or Exemplifying Active Ingredient	Product Name(s)
1B	Acetylcholinesterase (AChE) inhibitors Nerve action	organophosphate	DDVP 20% EC, Dibrom, Malathion 25 W, Malathion 85 E
3A	Sodium channel modulators Nerve action	pyrethroids, pyrethrins	Ambush 50 EC, Matador 120 EC, Pounce 384 EC, Bio-environmental Permethrin, Safer's Trounce Insecticidal Soap (pyrethrins = 3A + potassium salts of fatty acids = NC)
4A	Nicotinic acetylcholine receptor (nAChR) competitive modulators Nerve action	neonicotinoids	Flagship, Intercept 60 WP, Tristar 70 WSP
4D		butenolides	Altus
5	Nicotinic acetylcholine receptor (nAChR) allosteric modulators – Site I Nerve action	spinosyns	Delegate WG, Entrust, Entrust 80 W, Success
6	Glutamate-gated chloride channel (GluCl) allosteric modulators Nerve and muscle action	avermectins, milbemycins	Avid 1.9% EC
7C	Juvenile hormone mimics Growth regulation	pyriproxyfen	Distance
9B	Chordotonal organ TRPV channel modulators Nerve action	pyridine azomethine derivatives	Endeavor 50 WG
10B	Mite growth inhibitors affecting CHS1 Growth regulation	etoxazole	TetraSan 5 WDG
11A	Microbial disruptors of insect midgut membranes	<i>Bacillus thuringiensis</i> and the insecticidal proteins they produce	Bioprotec 3P, Bioprotec CAF, DiPel 2X DF, DiPel WP, Foray 48BA, Thuricide HPC, VectoBac 600 L, Xentari
12B	Inhibitors of mitochondrial ATP synthase Energy metabolism	organotin miticides	Vendex 50 WP
13	Uncouplers of oxidative phosphorylation via disruption of the proton gradient Energy metabolism	pyrroles dinitrophenols sulfuramid	Pylon
15	Inhibitors of chitin biosynthesis affecting CHS1 Growth regulation	benzoylureas	Rimon 10 EC
16	Inhibitors of chitin biosynthesis, type 1 Growth regulation	buprofezin	Talus

¹ A compound with an unknown mode of action or where consensus does not exist on mode of action or an unknown mode of toxicity will be held in category “un” until evidence becomes available to enable that compound to be assigned to a more appropriate mode of action class.

Appendix D. Pesticide Groups Based on Sites of Action – Insecticides and Miticides

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Group #	Primary Site of Action	Sub-group or Exemplifying Active Ingredient	Product Name(s)
17	Moulting disruptors, Dipteran Growth regulation	cyromazine	Citation 75 WP
18	Ecdysone receptor agonists Growth regulation	diacylhydrazine	Confirm 240 F
20B	Mitochondrial complex III electron transport inhibitors Energy metabolism	acequinocyl	Shuttle 15 SC
20D		bifenazate	Floramite SC
21A	Mitochondrial complex I electron transport inhibitors (METI) Energy metabolism	METI insecticides and acaricides	DynoMite 75 WP, FujiMite, SanMite
23	Inhibitors of acetyl CoA carboxylase Lipid synthesis, growth regulation	tetronic and tetramic acid derivatives	Forbid 240 SC, Kontos
28	Ryanodine receptor modulator Nerve and muscle action	diamides	Coragen, Exirel
29	Chordotonal organ modulators – undefined target site Nerve action	flonicamid	Beleaf 50 SG
31	Baculoviruses Host-specific occluded pathogen viruses	Granuloviruses (GVs) Nucleopolyhedroviruses (NPVs)	Loopex
UNF	Fungal agents of unknown or uncertain mode of action (MoA)¹	<i>Beauveria bassiana</i> strains, <i>Metarhizium anisopliae</i> strain F52, <i>Paecilomyces fumosoroseus</i> Apopka strain 97	Bio-Ceres G WB, Bio-Ceres G WP, BotaniGard 22WP, Met52 EC, Velifer
NC	Not classified	canola oil, mineral oil, potassium salts of fatty acids, <i>Autographa californica</i> Nucleopolyhedrovirus FV	Purespray Green Spray Oil, Vegol Crop Oil, Kopa Insecticidal Soap, Neudosan Commercial, Opal Insecticidal Soap, Opal2 Insecticidal Soap, Safer's Insecticidal Soap Concentrate, Safer's Trounce Insecticidal Soap (pyrethrins = 3A + potassium salts of fatty acids = NC)

¹ A compound with an unknown mode of action or where consensus does not exist on mode of action or an unknown mode of toxicity will be held in category "un" until evidence becomes available to enable that compound to be assigned to a more appropriate mode of action class.

Appendix E. Pesticide Groups Based on Sites of Action — Fungicides

This classification scheme is adapted from information developed by the Fungicide Resistance Action Committee to distinguish fungicide groups according to their cross-resistance behaviour. For further details on this classification system, see <https://www.frac.info/publications/accept>.

LEGEND: M = multi-site inhibitor U = unknown mode of action and unknown resistance risk NC = not classified				
Group #	Mode of Action and Target Site	Group Name	Product Name(s)	Risk of Developing Resistance
2	Signal transduction MAP/Histidine-Kinase In osmotic signal transduction (<i>os-1, Daf1</i>)	dicarboximides	Rovral WP, Rovral WDG	medium to high
3	Sterol biosynthesis in membranes C14-demethylase in sterol biosynthesis (<i>erg11/cyp51</i>)	DMI-fungicides(DeMethylation Inhibitors) (SBI: Class I)	Nova WSP	medium
4	Nucleic acids metabolism RNA polymerase I	PA-fungicides (PhenylAmides)	Ridomil Gold 480 EC or Ridomil Gold 480 SL, Subdue Maxx	high
7	Respiration Complex II: succinate-dehydrogenase	SDHI (Succinate-dehydrogenase inhibitors)	Fontelis, Luna Privilege, Pristine WG (boscalid = 7 + pyraclostrobin = 11)	medium to high
9	Amino acids and protein synthesis Methionine biosynthesis (proposed) (<i>cgs gene</i>)	AP-fungicides (Anilino-pyrimidines)	Scala SC, Palladium (cyprodinil = 9, fludioxonil = 12)	medium
11	Respiration Complex III: cytochrome bc1 (ubiquinol oxidase) at Qo site (<i>cyt b gene</i>)	QoI-fungicides (Quinone outside Inhibitor)	Pristine WG (boscalid = 7 + pyraclostrobin = 11)	high
12	Signal transduction MAP/Histidine-Kinase in osmotic signal transduction (<i>os-2, HOG1</i>)	PP-fungicides (PhenylPyrrole)	Medallion, Palladium (cyprodinil = 9, fludioxonil = 12)	low to medium
17	Sterol biosynthesis In membranes 3-keto reductase, C4-de-methylation (<i>erg1</i>)	hydroxylanilides	Decree 50 WDG	low to medium
19	Cell wall biosynthesis Chitin synthase	polyoxins	Polyoxin D Zinc Salt 5SC	medium
21	Respiration Complex II: cytochrome bc1 (ubiquinone reductase) at Qi site	QiI-fungicides (Quinone inside Inhibitor)	Torrent 400 SC	unknown but assumed to be medium to high
24	Amino acids and protein synthesis Protein synthesis (ribosome, initiation step)	hexopyranosyl antibiotic	Kasumin 2L	resistance known in fungal and bacterial (<i>P. glumae</i>) pathogens. medium
28	Lipid synthesis or transport/membrane integrity or function Cell membrane permeability, fatty acids (proposed)	carbamates	Previcur N	low to medium
40	Cell wall biosynthesis cellulose synthase	CAA-fungicides (Carboxylic Acid Amides)	Micora, Revus, Zampro (ametoctradin = 40, dimethomorph = 45)	resistance known In <i>Plasmopara viticola</i> but not In <i>Phytophthora infestans</i> . low to medium

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LEGEND: M = multi-site inhibitor				
U = unknown mode of action and unknown resistance risk				
NC = not classified				
Group #	Mode of Action and Target Site	Group Name	Product Name(s)	Risk of Developing Resistance
44	Lipid synthesis transport/membrane Integrity or function Microbial disrupters of pathogen cell membranes	microbial (<i>Bacillus</i> sp.)	Cease, Double Nickel 55, Double Nickel LC, Rhapsody ASO, Serifel, Taegro 2 WP, Taegro WP	resistance not known
45	Respiration Complex III: cytochrome bc1 (ubiquinone reductase) at Qo site, stigmatellin binding sub-site	QoSI fungicides (Quinone outside Inhibitor, stigmatellin binding type)	Zampro (ametoctradin = 40, dimethomorph = 45)	resistance risk assumed to be medium to high
46	Lipid synthesis transport/membrane Integrity or function Cell membrane disruption	Plant extract	Timorex Gold	resistance not known
49	Lipid synthesis transport/membrane Integrity or function Lipid homeostasis and transfer/storage	OSBPI oxysterol binding protein homologue inhibition	Orondis, Orondis Ultra B, Zorvec Enicade	resistance risk assumed to be medium to high
BM 01	Biologicals with multiple modes of action Multiple effects on cell wall, ion membrane transporters; chelating effects	Plant extract	Fracture, Problad Plus	resistance not known
BM 02	Biologicals with multiple modes of action	microbial (living microbes or extract, metabolites)	Actinovate, Bora HC, Bora WP, BW240 WP, Mycostop, Prestop, Rootshield Granules, Rootshield HCm, Rootshield WP, Trianum G, Trianum P	resistance not known
M 01	Chemicals with multi-site activity Multi-site contact activity	inorganic (electrophiles)	Copper Spray Fungicide, Cueva Commercial, Kocide 3000	low
M 02	Chemicals with multi-site activity Multi-site contact activity	inorganic (electrophiles)	Cosavet DF Edge, Kumulus DF, Microthiol Disperss, Sulphur (Bartlett's Microscopic Sulphur 92%), Agrotek Ascend Vaporized Sulphur	low
M 03	Chemicals with multi-site activity Multi-site contact activity	dithiocarbamates and relatives (electrophiles)	Ferbam 76 WG, Manzate 200 WP	low
M 04	Chemicals with multi-site activity Multi-site contact activity	pthalilimides (electrophiles)	Maestro 80 DF, Supra Captan 80 WDG	low
P 05	Host plant defence induction Anthraquinone elicitors	plant extract	Regalia Maxx	resistance not known
P 07	Host plant defence induction Phosphonates	phosphonates	Confine Extra, Phostrol, Rampart	low
NC	Unknown	diverse	Agriphage-CMM, Cyclone, Influence, MilStop, OxiDate, OxiDate 2,0, Phostrol, Purespray Green Spray Oil, Sirocco, StorOx, Vegol Crop Oil	unknown

Appendix F. IRAC (Insecticide Resistance Action Committee)

Chemical Sub-group or Exemplifying Active Ingredient

To reduce the risk of a pest developing resistance, rotate between chemical groups and/or families within the same crop cycle or year.

1B	organophosphates
3A	pyrethroids, pyrethrins
4A	neonicotinoids
4D	butenolides
5	spinosyns
6	avermectins, mibemycins
7C	pyriproxyfen
9B	pyridine azomethine derivatives
10B	etoxazole
11A	<i>Bacillus thuringiensis</i> and the insecticidal proteins they produce
12B	organotin miticides
13	pyrroles, dinitrophenols, sulfuramid
15	benzoylureas
16	buprofezin
17	cyromazine
18	diacylhydrazines
20B	acequinocyl
20D	bifenazate
21A	METI acaricides and insecticides
23	tetronic and tetramic acid derivatives
28	diamides
29	flonicamid
31	Granuloviruses (GVs) Nucleopolyhedroviruses (NPVs)
UNF	<i>Beauveria bassiana</i> strains, <i>Metarhizium anisopliae</i> strain F52, <i>Paecilomyces fumosoroseus</i> Apopka strain 97
NC	not classified

Appendix G. FRAC (Fungicide Resistance Action Committee)

Chemical or Biological Groups

To reduce the risk of a pathogen developing resistance, rotate between chemical groups and/or families within the same crop cycle or year.

2	dicarboximides
3	triazoles
4	acylalanines
7	pyridinyl-ethyl-benzamides; pyrazole-4-carboxamides; pyridine-carboxamides
9	anilino-pyrimidines
11	methoxy-acetamide
12	phenylpyrroles
17	hydroxylanilides
19	peptidyl pyrimidine nucleoside
21	cyano-imidazole
24	hexopyranosyl antibiotic
28	carbamates
40	cinnamic acid amides; mandelic acid amides
44	<i>Bacillus</i> sp. and the fungicidal lipopeptides produced
45	triazolo-pyrimidylamine
46	terpene hydrocarbons, terpene alcohols and terpene phenols
49	piperidinyl-thiazole-isoxazolines
BM 01	polypeptide (lectin)
BM 02	fungal <i>Trichoderma</i> spp., fungal <i>Gliocladium</i> spp., bacterial <i>Streptomyces</i> spp.
M 01	inorganic
M 02	inorganic
M 03	dithio-carbamates and relatives
M 04	phthalimides
P 05	complex mixture, ethanol extract (anthraquinones, resveratrol)
P 07	ethyl phosphonates
NC	not classified/unknown

Appendix H. 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)
(0.50 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 cm ³ = 1 mL
1 m ³ = 1,000 L

Dry weight conversions (approximate)	
Metric	Imperial
grams or kilograms/hectare	ounces or pounds/acre
100 g/ha = 1½ oz/acre	
200 g/ha = 3 oz/acre	
300 g/ha = 4¼ oz/acre	
500 g/ha = 7 oz/acre	
700 g/ha = 10 oz/acre	
1.10 kg/ha = 1 lb/acre	
1.50 kg/ha = 1¼ lb/acre	
2.00 kg/ha = 1¾ lb/acre	
2.50 kg/ha = 2¼ lb/acre	
3.25 kg/ha = 3 lb/acre	
4.00 kg/ha = 3½ lb/acre	
5.00 kg/ha = 4½ lb/acre	
6.00 kg/ha = 5¼ lb/acre	
7.50 kg/ha = 6¾ lb/acre	
9.00 kg/ha = 8 lb/acre	
11.00 kg/ha = 10 lb/acre	
13.00 kg/ha = 11½ lb/acre	
15.00 kg/ha = 13½ lb/acre	

Liquid equivalents (approximate)		
50 L/ha =	4.45 gal/acre	(5.35 US gal/acre)
100 L/ha =	8.90 gal/acre	(10.70 US gal/acre)
150 L/ha =	13.35 gal/acre	(16.05 US gal/acre)
200 L/ha =	17.80 gal/acre	(21.40 US gal/acre)
250 L/ha =	22.25 gal/acre	(26.75 US gal/acre)
300 L/ha =	26.70 gal/acre	(32.10 US gal/acre)

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)

Metric conversions
5 mL = 1 tsp
15 mL = 1 tbsp
28.5 mL = 1 imp. fl. oz.

Conversion tables – metric to imperial (approximate)

Length
1 millimetre (mm) = 0.04 inches
1 centimetre (cm) = 0.40 inches
1 metre (m) = 39.40 inches
1 metre (m) = 3.28 feet
1 metre (m) = 1.09 yards
1 kilometre (km) = 0.62 miles
Area
1 square centimetre (cm ²) = 0.16 square inches
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 miles
1 hectare (ha) = 107,636 square feet
1 hectare (ha) = 2.5 acres
Volume (dry)
1 cubic centimetre (cm ³) = 0.061 cubic inches
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-feet
1 hectolitre (hL) = 2.8 bushels
Volume (liquid)
1 millilitre (mL) = 0.035 fluid ounces (Imp.)
1 litre (L) = 1.76 pints (Imp.)
1 litre (L) = 0.88 quarts (Imp.)
1 litre (L) = 0.22 gallons (Imp.)
1 litre (L) = 0.26 gallons (U.S.)
Weight
1 gram (g) = 0.035 ounces
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 miles 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

Handy Approximate Metric Conversion Factor
 litres per hectare × 0.4 = litres per acre
 kilograms per hectare × 0.4 = kilograms per acre

Abbreviations

%	=	per cent
a.i.	=	active ingredient
AP	=	agricultural powder
cm	=	centimetre
cm ²	=	square centimetre
CS	=	capsule suspension
DF	=	dry flowable
DG	=	dispersible granular
DP	=	dispersible powder
E	=	emulsifiable
EC	=	electrical conductivity
e.g.	=	for example
F	=	flowable
g	=	gram
Gr	=	granules, granular
ha	=	hectare
kg	=	kilogram
km/h	=	kilometres per hour
kPa	=	kilopascal
L	=	litre
m	=	metre
m ²	=	square metre
mL	=	millilitre
mm	=	millimetre
m/s	=	metres per second
SC	=	sprayable concentrate
SP	=	soluble powder
t	=	tonne
v/v	=	volume/volume
W	=	wettable (powder)
WDG	=	water dispersible granular
WG	=	wettable granule
WP	=	wettable powder

Calculating Parts per Million (ppm)

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