

2022



EXTENSION AND ADVISORY TEAM

GUIDE TO PEST MANAGEMENT IN CANNABIS

Nova Scotia Cannabis Guide to Pest Management 2022



GUIDE TO PEST MANAGEMENT IN CANNABIS

Nova Scotia Cannabis Guide to Pest Management 2022

Updated March 2022 by

Talia Plaskett, Protected Crop Specialist, Perennia

Jill MacDonald, Research Associate, Perennia

LIABILITY STATEMENT

Recommendations in this guide are given for general information only and do not give the user the right to use a product in a manner not in accordance with the pesticide label or Pest Control Products Act. Perennia, by funding and printing this publication, and the editors/authors, do not offer any warranty or guarantee and do not assume any liability for crop loss, animal loss, health, safety, or environmental hazard caused by the use of any pesticide, advice, or recommendation in this schedule. Pesticides used in this schedule are products labeled for the target and crop. This information was retrieved from the Pest Management Regulatory online of Registered Products Database. The list of products presented in this schedule is intended to be complete, based on products known to be available in the region, but in no way is guaranteed to be complete. Some of the products listed may not be available. Trade names are given as a convenience to producers and are neither an endorsement of the product nor a suggestion that similar products are not available or effective.

CONTENTS

LIABILITY STATEMENT.....	1
PESTICIDE EMERGENCY CONTACT INFORMATION	3
ABBREVIATIONS AND CONVERSIONS	3
GUIDE TO WEED MANAGEMENT	4
GUIDE TO DISEASE MANAGEMENT	5
GUIDE TO INSECT MANAGEMENT.....	23

PESTICIDE EMERGENCY CONTACT INFORMATION

Poison Control Centres		
Nova Scotia	800.565.8161 or 902.470.8161	IWK, Halifax, NS
New Brunswick	911	Ask for Poison Information
Prince Edward Island	800.565.8161 or 902.470.8161	IWK, Halifax, NS
Newfoundland	709.722.1110	Dr. Charles A. Janeway Child Health Care Centre, St. John's, NF

Environmental Emergencies (Pesticide Spills)		
Transport Canada Regional Operations Centre (24 hours)		
Nova Scotia		800.565.1633
New Brunswick		800.565.1633
Prince Edward Island		800.565.1633
Newfoundland		800.563.9089

ABBREVIATIONS & CONVERSIONS

Formulation and Measurement Abbreviations			
FORMULATIONS		MEASUREMENTS	
DF	Dry flowable	mL	millilitre
EC, E	Emulsifiable concentrate	kPa	kilopascal
L	Liquid	kg	kilogram
Sn / Su	Suspension	g	gram
WP/W	Wettable powder	L	litre
		BIU	Billions of International Units
		ppm	parts per million (1000 ppb)
		ppb	parts per billion (1/1000 ppm)

Helpful Conversions ¹	
kPa X 0.14 = pounds per square inch (psi)	millilitres X 0.035 = fluid ounces
hectares X 2.47 = acres	litres X 35 = fluid ounces
kilograms X 2.2 = pounds	litres X 0.22 = imperial gallons
kilograms per hectare X 0.89 = pounds per acre	litres per hectare X 14.17 = fluid ounces per acre
kilograms per hectare X 0.40 = kilograms per acre	litres per hectare X 0.40 = litres per acre
	degree-days C X 1.8 = degree-days F

¹ Pesticide Units of Measurement

It is not recommended to convert label rates to imperial units because there is a high probability of mathematical and rounding errors. Present day pesticides are formulated to be more effective in smaller amounts. Therefore, even small conversion errors can lead to the use of incorrect rates (either too high or too low). Use metric – you will be glad you did!

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
WEEDS							
Grass and Broadleaf		Ammonium salt of Fatty Acid 36.0%	AXXE Broad Spectrum Herbicide	0-3 cm tall: 45 L/280L water per ha 3-6 cm tall: 87 L/538L water per ha 6cm or taller: 106 L/659L water per ha	-	-	Non- selective, contact herbicide. Use an application volume depending on the size of the weeds: 325L/ha for weeds <3cm, 625L/ha for weeds 3-6 cm tall 765L/ha for larger weeds (>6cm) See label for specific directions on application equipment and methods. Do not allow it to contact your crop. Do not apply to tissue that is wet from dew/rain/irrigation. Do not apply within 2 hours (before/after) a rain event.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
DISEASES							
Botrytis		<i>Gliocladium catenulatum</i> Strain J1446 1.0 x 10 ⁹ CFU/g	Prestop WG	0.05% - 0.1% solution	4 hours	-	For indoor production. Suppresses stem canker caused by <i>B. cinerea</i> . Most effective when used preventatively. Apply to the stems and foliage but stop before the point of run-off. Re-apply every 3-4 weeks for optimum control. Also effective against Pythium spp. (See application instructions below).
		<i>Gliocladium catenulatum</i> Strain J1446 2 x 10 ⁸ CFU/g	Prestop	0.5% solution	4 hours	-	For indoor production. Suppresses stem canker caused by <i>B. cinerea</i> . Most effective when used preventatively. Apply to the stems and foliage but stop before the point of run-off. Re-apply every 3-4 weeks for optimum control. Also effective against Pythium spp. (See application instructions below).
		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum 1 x 10 ⁷ CFU/g dry weight	Rootshield HC	3.75 – 10g/L water	4 hours	0 days	For indoor and field production. Suppression of botrytis blight. Most effective when used preventatively. Apply to foliage every 7-14 days depending on disease pressure. Also effective against Pythium, Rhizoctonia, and Fusarium (see application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Botrytis, Powdery Mildew	P5	Extract of <i>Reynoutria sachalinensis</i> 20%	Regalia Maxx	0.25% v/v	Do not enter until dry and area thoroughly ventilated	0 days	For indoor and outdoor production. Suppression of powdery mildew and partial suppression of gray mold. Begin applications at the first sign of disease, or when conditions become conducive for disease development. Repeat as necessary on a 7–10-day interval. Spray until just prior to runoff. Do not apply in a spray volume of more than 1500 L/ha. New for 2022 – can be used for outdoor production.
		<i>Streptomyces lydicus</i> strain WYEC 108, contains minimum of 1.0×10^7 CFU/g	Actinovate SP Fungicide	425 g/1100L water per ha	4 hours	2-3 weeks for foliar spray	For indoor and field production. Suppression of grey mold and powdery mildew. Apply as a foliar spray, spray to wet but avoid run-off. First application when conditions are conducive to disease and repeat every 7-14 days. Also effective against Pythium spp (see application instructions below).
		<i>Streptomyces lydicus</i> strain WYEC 108, contains minimum of 1.0×10^7 CFU/g	CannaPM	425g/1100L per ha	4 hours, or until sprays have dried	2-3 weeks for foliar spray	For indoor and field production. Suppression of powdery mildew and botrytis. Apply foliar spray to leaves and blossoms. Spray to wet but avoid run-off. First application should happen when conditions favour disease development and should be repeated every 7-14 days. Also effective against Pythium spp. (see application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Botrytis, Powdery Mildew <i>(cont.)</i>		Hydrogen Peroxide 27%	ZeroTol	Young foliage – low disease pressure: 33 mL per 10 L water. Dense foliage – high disease pressure: 100 mL per 10 L water.	Do not enter until dry	-	For indoor production. Suppression of grey mold and powdery mildew. Toxic to bees and other beneficial insects. Use 11 – 19 Litres of mixed solution per 100m ² depending on canopy age and disease pressure. Begin applications when conditions conducive to disease development. Spray diluted solution to achieve full and even coverage of foliage. Apply at a minimum 7-day interval.
Botrytis, Sclerotinia, Powdery mildew	BM01	Tea Tree Oil 23.8%	Timorex Gold	2.0L/ha	4 hours, or until sprays have dried	2 days	For protected and field production. Control of grey mould, Suppression of powdery mildew and white mould. Apply preventatively, or in the early stages of disease for best results. Good coverage and wetting of foliage required. Use enough spray solution to completely penetrate the leaf canopy, covering tops and bottoms of leaves until runoff. Re-apply every 7-14 days. Recommended spray volume of 400-1000L/ha/ Do not apply when temperatures are above 35°C (95F) New product for 2022

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Botrytis, Sclerotinia, Powdery mildew (cont.)	BM02	<i>Bacillus amyloliquefaciens</i> strain D747, contains minimum 1×10^{10} spores/mL	Double Nickel LC	2.5 – 5.0 L/ha	-	0 days	For indoor and field production. Partial suppression of white mold, grey mould and powdery mildew, suppression of botrytis via foliar spray. Begin applications preventatively when conditions favour disease and ensure full spray coverage. Use a higher label rate and more frequent applications when high risk for disease. White mould and powdery mildew: repeat applications every 3-14 days if conditions favour disease Grey mould (botrytis): repeat application every 3-11 days if conditions favour disease
	BM02	<i>Bacillus amyloliquefaciens</i> strain D747, contains minimum 5×10^{10} spores/g	Double Nickel 55	0.5-1 kg/ha	-	0 days	For indoor and field production. Partial suppression of white mold, grey mold and powdery mildew, suppression of botrytis via foliar application. Begin applications preventatively when conditions favour disease and ensure full spray coverage. Use a higher label rate and more frequent applications when high risk of disease. <u>White mold and powdery mildew</u> : repeat application every 3-14 days depending on conditions. <u>Grey mold</u> : repeat application every 3-11 days depending on conditions.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Powdery Mildew	M	Sulphur 99.9%	Agrotek Vaporized Sulphur	0.4 – 3.2 g sulphur per 1,000 m ²	2 hours	0 days	For indoor production. Prevent and control of powdery mildew. Use one (1) vaporizer per 250 - 1,000 m ² in the growing area. Run the vaporizer for 1 - 8 hours per night, repeating 2 - 7 times per week depending on crop susceptibility, temperature and ventilation, and disease pressure. Do not apply if temperature is >24°C and high humidity prevails.
		Sulphur 92%	Bartlett Microscopic Wettable Sulphur	750 g/ 1000L water per ha	24 hours	0 days	For indoor production. Control of powdery mildew. Maximum of 10 applications per crop cycle. Apply weekly from onset of first symptoms and during conditions favouring disease; two applications may be sufficient to control each incidence of disease.
		Canola Oil 96%	Doktor Doom Formula 420 Professional use 3- in-1 Crop and Plant Rescue Concentrate	2% solution	-	-	For indoor production. Suppresses powdery mildew. Begin when mildew appears and continue every 7-14 days, depending on disease pressure. Use spray volumes of 700 – 1900 L/ha. Do not use within 30 days (before or after) of using sulphur. Do not apply when temperatures are high (>32°C). Combat aphids, mites, and whitefly as well (see application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Powdery Mildew (cont.)			General Hydroponics SuffoCoat	2% solution	-	-	For indoor production. Suppression of powdery mildew. Initiate sprays when disease first appears. Continue sprays every 7- 14 days, depending on disease pressure. Spray volumes of 700-1900 L/ha are recommended. Do not use within 30 days (before or after) of using sulphur. Do not apply when temperatures are high (>32°C). Combat aphids, mites, and whitefly as well (see application instructions below).
			Vegol Crop Oil	2% solution	-	0 days	Indoor production. Suppresses powdery mildew. Initiate sprays when disease first appears. Spray until plant parts are wet. Continue sprays every 7-14 days, with shorter intervals for periods of high disease pressure. Spray volumes of 700-1900 L/ha are recommended. Do not use within 30 days (before/after) a sulphur application. Do not apply when the temperature exceeds 32°C. Toxic to beneficial insects. Effective against aphids, mites, and whitefly as well (see application instructions below).
		Citric Acid 10.73 g/L Lactic Acid 21.37 g/L	Cyclone	1.2% solution	4 hours	0 days	For indoor and outdoor production. Spray at 7–10-day intervals. Apply in sufficient spray volume to ensure thorough coverage. Surfactant can help achieve better coverage of leaves and better product efficacy. Begin applications when conditions are conducive to disease development.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Powdery Mildew (cont.)			Lacto-San	1.2% solution	4 hours, or until the spray has dried	0 days	For indoor and outdoor production. Apply in sufficient spray volume to ensure thorough coverage. Start applying prior to/in the early stages of disease development. Re-apply at 7–10-day intervals.
		Garlic Powder 15%	Influence LC	1.8% solution	Do not enter until dry	0 days	For indoor production. Suppression of powdery mildew. Should be applied preventatively or at first signs of disease, ensuring thorough coverage of the plant tissue. Repeat applications in 7–10-day intervals. Do not exceed 18L/ha. Best when applied with a high-volume sprayer (do not use with ultra-low volume sprayers)
		Mineral Oil 80%	SuffOil-X	10-20L/1000L	12 hours	0 days	For indoor production. Suppression of powdery mildew. Begin applications when conditions are favourable for disease. Maximum 6 applications during lifespan of plant (lifespan is 12-14 weeks from cutting to harvest). Use lower application rate (1%) during budding/flowering. Fully cover foliage while reducing run-off. Re-application interval is 14 days. Do not apply on new seedlings or clones less than 2 weeks old without sensitivity (phytotoxicity) test. Minimum spray solution of 50 L/ha, maximum of 1000 L/ha. Do not apply to plants experiencing moisture stress or high temperatures (>33°C). Do not use in combination with or directly before/after sulphur containing products. Works against spider mites, scales, thrips, aphids, and whitefly as well (see insect application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Powdery Mildew (cont.)		Mineral Oil 99%	PureSpray-FX	1-2% solution	12 hours	-	For indoor production. Suppresses powdery mildew. Begin applications when conditions are favourable for disease, and limit applications to a maximum 6 during lifespan of plant (12-14 weeks from cutting to harvest). Only use lower application rate (1%) during budding/flowering. Re-application interval is 7- 14 days. Use sufficient spray volume (1000-3000 L/ha) for thorough crop coverage. Do not apply on new seedlings or clones less than 2 weeks old without having determined sensitivity (phytotoxicity). Do not apply when temperatures are >30°C, or when the plants are experiencing drought stress. Check label for sulphur compatibility. Combats mites and aphids as well (see application instructions below).
		Potassium bicarbonate 85%	Milstop	Greenhouse/ Indoor: 0.28-0.56 kg/1000m ² Field: 2.8 – 5.6 kg/ha	4 hours	0 days	For indoor and field production. Control or suppression of powdery mildew. Maximum of 10 applications per season. Start application at first signs of disease, ensuring full plant coverage. Use a spray volume of 1000 L/ha, with a re-application interval of 7- 14 days: depends on disease pressure and environmental conditions. For indoor commercial facilities treated using an ultra-low volume method of application must be well ventilated prior to entry or re-entry. New to 2022 – Distinction between greenhouse/indoor application rate and field rate

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Powdery Mildew (cont.)			Sirocco	2.8 – 5.6 kg/ha	4 hours	0 days	For indoor and field production. Suppression of powdery mildew. Maximum of 10 applications per season. Start application at first sign of disease or when conditions are conducive for disease development. Apply at 7 – 14-day intervals. Use a spray volume of 1000 L/ha. Do not apply via irrigation system
Pythium spp.		<i>Streptomyces lydicus</i> strain WYEC 108, contains minimum of 1.0×10^7 CFU/g	Actinovate SP Fungicide	Hydroponic systems: 420 – 840 g/ha Soil drench: 42 – 84 g / 100L per m ³ growing media	4 hours	0 days	For indoor production. Suppression of seed rot, pre/post emergence damping off and root rot. Can be applied as a drench or through irrigation system until growing media is thoroughly wetted but before run-off. First preventative application after seeding/transplanting, or in conducive conditions. Repeat application every 7-14 days. Can be applied using low pressure watering nozzles, overhead boom type sprayers/sprinklers, hydroponic systems, injectors, flood benches, or other drench watering systems. Effective against Botrytis and powdery mildew as well (see above).
		<i>Streptomyces lydicus</i> strain WYEC 108, contains minimum of 1.0×10^7 CFU/g	CannaPM	Hydroponic systems: 420-840 g/ha Soil drench: 42 -84 g/100 L water per m ³ growing media	-	0 days	For indoor production. Suppression of Seed rot, pre- and post- emergence damping off, and root rot. Apply to the growing media until the pot is fully wet while preventing additional run-off. First preventative application should take place immediately after seeding/transplanting and repeat every 7-14 days as needed. Also effective against Botrytis and powdery mildew as well (see application instructions above).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium spp. (cont.)		<i>Gliocladium catenulatum</i> strain J1446, contains 2 x 10 ⁸ CFU/g	Prestop	0.5% solution	4 hours	-	For indoor production. Suppresses crown and root rot caused by Pythium spp. Start by treating media prior to seeding/transplanting or immediately after transplant. When applying via drench, always adjust the volume of water according to the moisture content of the growing media. Repeat applications every 3-6 weeks, with shorter intervals under conditions conducive of moderate to high disease pressure. Also effective against Botrytis (see application instructions above).
		<i>Gliocladium catenulatum</i> strain J1446, minimum of 1.0 x 10 ⁹ CFU/g	Prestop WG	0.5% solution	4 hours	-	For indoor production. Suppression of crown and root rot caused by Pythium spp. Start by treating media prior to seeding/transplanting or apply as a drench immediately after transplant. When applying via drench, always adjust the volume of water according to the moisture content of the growing media. Repeat applications every 3-6 weeks, with shorter intervals under conditions conducive of moderate to high disease pressure. Also suppresses Botrytis (see application instructions above).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Rhizoctonia, Fusarium	BM02	<i>Trichoderma harzianum</i> Rifai strain T22, contains minimum of 1.0×10^9 CFU/g dry weight	Trianum P Biological Fungicide	Indoors: <u>High crop density:</u> Apply 3g/m², use water volume equivalent to 10% of substrate volume, or 2-5L/m². Use half-rate dose (1.5 g/m²) if plants have been treated previously. <u>Low crop density:</u> Apply 30g/1000 plants, using water volume equivalent to 10% of substrate, or 100L/1000 plants. Half-rate dose is 15g/1000 plants Field: <u>After sowing:</u> 1.5 g/m² of cultivated area in 1.33L of water <u>After transplanting:</u> 6g in 1L of water, apply 500L/ha of suspension	-	-	For indoor and field direction. Disease suppression of Rhizoctonia, Pythium and Fusarium on indoor cannabis. Suppression of Rhizoctonia in field-grown cannabis. For indoor cannabis, use half-rate dose if plants have been treated previously, and repeat the lower dose every 10 weeks. For best results, use from propagation onwards. Active from 10-34 °C and at a pH between 4 and 8.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Rhizoctonia, Fusarium (cont.)		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1.0×10^7 CFU/g dry weight	Rootshield Granules Biological Fungicide	600- 750 g per m ³ (loose) planting mix or soil	-	0 days	For indoor production. Suppression of root diseases caused by the listed agents. For best results thoroughly incorporate during mix preparation or pot filling, or rake/till into planting beds.
		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1×10^7 CFU/g dry weight	Rootshield HC Biological Fungicide	55-110g/ m ³ of loose potting mix	4 hours	0 days	For indoor and field production. Suppresses root rot caused by the listed agents. Most effective when used preventatively. Applied via drench to your soil or potting mix before planting (can be applied through low pressure watering nozzles or other watering systems). Spray volume of 30-45g/100L is sufficient. Effective against Botrytis as well (see application notes above).
		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1.0×10^7 CFU/g dry weight	Rootshield WP Biological Fungicide	55-110 g per m ³ of (loose) potting mix	-	0 days	For indoor production. Suppression of Pythium, Rhizoctonia and Fusarium. Apply to potting mix or soil as a drench prior to planting. Within a crop cycle, one re-application can be made after 8-12 weeks, as needed. Number of applications per crop cycle is 1-2. Maximum of 6 applications per year. Live spores become active when soil temperatures are above 10°C, and soil is neutral/acidic – control is not effective in cold temperatures. Use a spray volume of 30 - 45g/100L.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Fusarium, Phytophthora, Didymella bryoniae	BM02	<i>Trichoderma asperellum</i> strain T34, contains minimum of 1.0×10^9 CFU/g dry weight	Asperello T34 Biocontrol	Incorporation into growing media: 10g/m³ growing media. If mixing with water for application, use 50-100L water per m³ growing media Spray/drench: 0.5g/m² in sufficient water (5L/m²) Chemigation after planting: 5-10g/50-100L water per m³ of growing media (higher rate for higher disease pressure)	4 hours, or until sprays have dried	0 days	For indoor production. Use preventatively for suppression of fusarium wilt, partial suppression of diseases caused by <i>Pythium</i>, <i>Phytophthora</i> and <i>Didymella bryoniae</i> (gummy stem blight). For best results against soil-borne pathogens, start at plant propagation, follow-up at transplant and apply regularly for 2-3 months afterwards. For gummy stem blight, start spraying at early growth stage, apply at regular intervals of 7-10 days during disease period. Optimum performance at pH of 6-8 and temperatures of 20-30°C.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Rhizoctonia, Fusarium, Phytophthora, Didymella bryoniae (cont.)		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1.0×10^7 CFU/g dry weight <i>Trichoderma virens</i> strain G-41, contains minimum of 5.3×10^6 CFU/g dry weight	BW240 Biological Fungicide	30-60 g/100 L applied to 10 m ² of soil/potting mixture surface	4 hours	0 days	For indoor production. Suppression of root rot caused by the listed agents. Apply immediately after sowing seed or planting. A second application may be made after 8-10 weeks if the disease is expected. DO NOT use overhead boom chemigation for second application or after the four-leaf stage. When disease pressure is high, use the highest rate and shortest interval.
		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1.0×10^7 CFU/g <i>Trichoderma virens</i> strain G-41, contains minimum of 5.3×10^6 CFU/g	Rootshield Plus G Biological Fungicide	Pre-planting media incorporation: 600-1200g/m ³ media Pre-planting broadcast application: 1.25-5g/m ² potting mix if grown in indoor planting beds.	0 hours	0 days	For indoor production. Suppresses root rot and damping off caused by the listed agents. Apply immediately before planting, incorporate well into the planting media. Apply immediately before planting. Broadcast uniformly over containers or planting beds. Sufficient irrigation of at least 5 mm should occur within 24 hours after application to integrate active ingredients into the root zone. Re-applications can be made every 6-10 weeks at the same rate.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Rhizoctonia, Fusarium, Phytophthora, Didymella bryoniae (cont.)		<i>Trichoderma harzianum</i> Rifai strain KRL-AG2, contains minimum of 1×10^7 CFU/g dry weight <i>Trichoderma virens</i> strain G-41, contains minimum 5.3×10^6 CFU/g of dry weight	Rootshield Plus WP Biological Fungicide	30-60 g in 100 L of water applied to 10 m ² of soil/potting mixture surface	4 hours, or until sprays have dried	0 days	For indoor production. Disease suppression . Apply immediately after sowing seed or planting. A second application may be made after 8-10 weeks if the disease is expected. DO NOT use overhead boom chemigation for second application or after the four-leaf stage. When disease pressure is high, use the highest rate and shortest interval.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Pythium, Fusarium, Verticillium dahlia		Oriental Mustard Seed Meal 100%	MUSTGROW Crop Biofumigant	Field Application: 2240 kg/ha	24 hours	-	For protected and field production. Suppression of soil-borne Pythium, Fusarium and Verticillium wilt. Field application: apply product directly to dry soil surface 14 days prior to seeding/transplanting. Incorporate into planting beds to a depth of 10 cm. Immediately after application, apply water uniformly to treated area so that soil is well moistened to a depth of 10-15cm. Greenhouse/Tunnel/Indoors: in isolated outdoor area, mix product with loose planting mix/soil. Thoroughly incorporate and activate by thoroughly watering the treated soil until moistened. Restrict access for 14 days before soil is moved into production space. Also registered for use against root knot nematode (see application instructions below). New Product for 2022

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Sclerotinia, Botrytis	P06	<i>Bacillus mycoides</i> isolate J, contains minimum of 3.0×10^{10} viable spores/g	LifeGard WG	0.33g/L	4 hours, or until sprays have dried	0 days	For indoor and field production. Provides partial suppression against white and grey mold. Apply in sufficient volume for uniform coverage Do not apply <70g or >333g per ha. Begin as a preventative spray. Apply every 7–14 days when LifeGard is applied on its own. Use a shorter interval when anticipating a high disease pressure. When used as a part of a rotational program, repeat every 7-21 days. Foliar applications should stop 3-4 weeks before harvest.
Thielaviopsis spp., Pythium spp., Fusarium spp., Phytophthora		Chloropicrin 99%	Chloropicrin 100 Liquid Soil Fumigant	Banded application: 93L / ha Broadcast application: Equivalent rate must be calculated to determine buffer zone – see label	Non-tarped: 5 days after application Tarped: See label for specific time frame	-	For field production. Control of soil-borne illnesses caused by the listed agents. Early season, pre-planting soil fumigant. Prior to application, make sure the soil is in planting condition and has sufficient moisture to support seed germination. After application, leave the soil undisturbed for 10-14 days. Wet soil will slow the diffusion of the fumigant, therefore will require a longer exposure time. Once the exposure time ends, aerate the soil. If heavy rains and cool temperatures occur during exposure period, work the soil several times for thorough aeration. Aerate for at least 5 days after opening row. For broadcast application: Apply by means of chisels spaced no more than 30cm apart. Also effective against root-knot and root lesion nematode (see application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Thielaviopsis spp., Pythium spp., Fusarium spp., Phytopthera <i>(cont.)</i>		Chloropicrin 85.1%	<u>PIC Plus</u> <u>Fumigant</u>	Banded application: 108L / ha Broadcast application: Equivalent rate must be calculated to determine buffer zone – see label	Minimum of 5 days – see label for specific instructions	-	For field production. Early season soil treatment (pre-plant soil fumigation). Control of soil-borne illnesses caused by the listed agents. Prior to application: soil should be in condition for planting with sufficient moisture to support seed germination. After application, leave soil undisturbed for 10-14 days. Wet soil slows diffusion of the fumigant and requires a longer exposure period. At the end of exposure period, aerate the soil. If heavy rains and lower temperatures occur during exposure period, work the soil several times for thorough aeration. Aerate for at least 5 days after opening row. For broadcast application: For broadcast, apply by means of chisels spaced no more than 30cm apart. Also effective against root knot and root lesion nematode (see application instructions below).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
INSECTS							
Aphids, Mites, Whitefly		Canola Oil 96%	Doktor Doom Formula 420 Professional use 3-in-1 Crop & Plant Rescue Concentrate	2% solution	-	-	For indoor production. Kills aphids, mites and whitefly. Apply at first sign of insect presence and repeat every 7 to 14 days as needed. Use spray volumes of 700 – 1900 L/ha. Do not use within 30 days (before or after) of using sulphur. Do not apply when temperatures are high (>32 °C). Suppresses powdery mildew as well (see application instructions above).
			General Hydroponics SuffoCoat	2% solution	-	0 days	For indoor production. Kills aphids, mites, and whitefly. Toxic to beneficial insects. Begin when pests appear and repeat every 7 to 14 days as needed. Thoroughly spray plant parts until they are wet, including the underside of leaves. Spray volumes of 700-1900 L/ha are recommended. Do not apply when temperatures are high (>32°C). Do not use 30 days (before/after) the application of sulphur. Also effective against powdery mildew (see application instructions above).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Aphids, Mites, Whitefly <i>(cont.)</i>			Vegol Crop Oil	2% solution	-	0 days	For indoor production. Kills aphids, mites, and whitefly. Thoroughly spray plants until plant parts are wet. Toxic to beneficial insects. Spray volumes of 700-1900 L/ha are recommended. Begin when pests appear - repeat every 7 to 14 days as needed. Do not apply when temperatures are high (>32°C). Do not use 30 days (before/after) the application of sulphur. Effective at suppressing powdery mildew as well (see application instructions above).
Aphids, Spider mites, Whitefly		Potassium salts of fatty acids 47%	General Hydroponics Exile	2% solution	-	-	For indoor production. Control of aphids, spider mites, and whitefly. Be careful when applying on a young crop: test phytotoxicity reaction before widespread use. Begin when pests appear. Using a spray volume of 700-1900 L/ha, wet the foliage well but minimize run-off. Repeat application every 1-2 weeks. Apply a maximum of 3 consecutive applications. Additional applications possible if previous experience with repeat applications of the product (under the same conditions) have not produced plant injury.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Aphids, Spider mites, Whitefly (cont.)			Kopa Insecticidal Soap	2% solution	-	0 days	For indoor production. Control of aphids, spider mites and whitefly. Be careful when applying on a young crop: test phytotoxicity reaction before widespread use. Avoid spraying during full sun. Begin when pests appear. Wet the foliage well but minimize run-off. Repeat application every 1-2 weeks. Apply a maximum of 3 consecutive applications. Additional applications possible if previous experience with repeat applications of the product (under the same conditions) have not produced plant injury.
			Neudosan Commercial	2% solution	-	0 days	For indoor production. Control of aphids, spider mites and whitefly. Be careful when applying on a young crop: test phytotoxicity reaction before widespread use. Begin when pests appear. Wet the foliage well but minimize run-off. Repeat application every 1-2 weeks. Apply a maximum of 3 consecutive applications. Additional applications possible if previous experience with repeat applications have not produced plant injury.
			Opal	2% solution	-	0 days	For indoor production. Control of aphids, spider mites and whitefly. Be careful when applying on a young crop: test phytotoxicity reaction before widespread use. Begin when pests appear. Wet the foliage well but minimize run-off. Repeat application every 1-2 weeks. Apply a maximum of 3 consecutive applications. Additional applications possible if previous experience with repeat applications of the product (under the same conditions) have not produced plant injury.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Cabbage Looper	11	<i>Bacillus thuringiensis</i> subspecies <i>kurstaki</i> , strain EVB113-19, contains 17500 cabbage looper units (CLU)/mg product	Bioprotec CAF	1.8L/1000L water	4 hours, or until sprays have dried	0 days	For indoor production. Maximum of 8 applications per year with a 7-day interval between applications. Begin application just prior to egg hatch and continue as indicated by monitoring. Apply in sufficient water volume to ensure thorough coverage of the leaves. A minimum spray volume of 300L/ha (hydraulic sprayer) is recommended.
		<i>Autographa californica</i> Nucleopolyhedrovirus FV11, minimum of 5×10^8 polyhedral inclusion bodies (PIBs) / mL	Loopex	50 – 200 mL/ 400 L of water	Do not enter until mist has settled	0 days	For indoor production. Application timing should target small larvae and be applied using high volume spray systems (minimum 400 L/ha). Uniform spray deposit coverage of the foliage is essential for optimum control. Repeat application every 7 to 14 days if monitoring indicates that it is necessary
Corn Earworm		<i>Helicoverpa armigera</i> Nucleopolyhedrovirus, isolate BV-0003, minimum of 7.5×10^{12} occlusion bodies (OBs)/L	Helicovexpure	50-200mL/ha	4 hours, or until sprays have dried	0 days	For field production. Suppression of corn earworm. Mortality typically occurs within 5-7 days. Application timing should target eggs or 1 st instar larvae. Apply in sufficient water volume to ensure thorough coverage. Repeat application every 3-5 days if monitoring indicates necessary. 3-5 applications may be required. The use of pheromone traps is recommended to determine when adults arrive to lay eggs. Avoid application when heavy rain is forecast

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Mites		Silicon dioxide (present as 100% diatomaceous earth) 6.56%	DX13 Industrial	-	4 hours, or until spray has dried	Do not apply past vegetative phase (plant or surrounding soil)	For indoor production. Kills spider mites. Apply at first sign of infestation. Hold aerosol can no less than 30cm away from plant surface and apply even coating to all plant surfaces. Obtain near drip coverage. Monitor the hazy white film of dust on treated surfaces. Spray surrounding areas (tables, pots, stem supports, soil) as well to increase control. Re-apply 7-14 days. Do not apply to cannabis, or surrounding soil past the vegetative phase.
		Silicon dioxide (present as 100% diatomaceous earth) 82%	DX13 Dust	-	Wait until dusts have settled and the area cleaned	Do not apply past vegetative phase (plant or surrounding soil)	For indoor production. Kills spider mites. May harm bees and other beneficial arthropods. Apply an even layer onto all plant surfaces (incl. underside of leaves and stems). Use sufficient product to obtain good coverage. Dust surrounding areas (tables, pots, shelving, soil etc). Hold the dust blower no less than 30cm away from plant surface during dusting. Re-apply after 7-14 days as needed to maintain good film coverage. Do not apply to cannabis, or surrounding soil, past the vegetative phase.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Mites (cont.)		Mineral oil 99%	Purespray FX	1-2% solution	12 hours	-	For indoor production. Deters feeding in aphids, suppresses mites. Maximum 6 applications during lifespan of plant (lifespan is 12-14 weeks from cutting to harvest). Only use lower application rate (1%) during budding/flowering. Re-application interval is 7- 14 days. Use sufficient spray volume, 1000-3000 L/ha, to ensure thorough crop coverage. Do not apply on new seedlings or clones less than 2 weeks old without having determined sensitivity (phytotoxicity). Do not apply during periods of moisture stress or when temperatures >30°C. Check label for compatibility with sulphur products. Registered for use against powdery mildew as well (see application instructions above).
Mites, Thrips, Whitefly		<i>Metarhizium anisopliae</i> Strain F52, contains 2.0×10^9 CFU/mL	Met52 EC Bio-insecticide	Foliar: 0.5 – 5.0 L per 1000 L water Drench: 108mL/10 L	4 hours, or until spray has dried	0 days	For indoor production. Reduces number of mites, thrips, and whitefly. <u>Foliar:</u> Wet the foliage but avoid run-off. Use a higher rate when disease pressure is high. Re-apply every 5-10 days as needed. Do not apply at pressures higher than 200 PSI/1380 KPa. Do not apply via thermal pulse fogger. <u>Drench:</u> Drench application should be thoroughly watered-in but stopped before it drains out of the bottom of the pot/grow bag (approx. 250mL per 4L grow bag/pot depending on growing media and moisture content). Re-apply as needed. Do not apply via drip irrigation.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Nematode		Chloropicrin 99%	Chloropicrin 100 Liquid Soil Fumigant	Banded application: 93L / ha Broadcast application: Equivalent rate must be calculated to determine buffer zone – see label	Non-tarped: 5 days after application Tarped: See label for specific time frame	-	For field production. Control of root knot, and root lesion nematodes. Early season, pre-planting soil fumigant. Prior to application, make sure the soil is in planting condition and has sufficient moisture to support seed germination. After application, leave the soil undisturbed for 10-14 days. Wet soil will slow the diffusion of the fumigant, therefore will require a longer exposure time. Once the exposure time ends, aerate the soil. If heavy rains and cool temperatures occur during exposure period, work the soil several times for thorough aeration. Aerate for at least 5 days after opening row. For broadcast application: Apply by means of chisels spaced no more than 30cm apart. Also effective against Thielaviopsis spp, Pythium spp, Fusarium spp, and Phytophthora spp (see application instructions above).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Nematode (cont.)		Chloropicrin 85.1%	PIC Plus Fumigant	Banded application: 108L / ha Broadcast application: Equivalent rate must be calculated to determine buffer zone – see label	Minimum of 5 days – see label for specific instructions	-	For field production. Early season soil treatment (pre-plant soil fumigation). Control of root knot and root lesion nematodes. Prior to application: soil should be in condition for planting with sufficient moisture to support seed germination. After application, leave soil undisturbed for 10-14 days. Wet soil slows diffusion of the fumigant and requires a longer exposure period. At the end of exposure period, aerate the soil. If heavy rains and lower temperatures occur during exposure period, work the soil several times for thorough aeration. Aerate for at least 5 days after opening row. For broadcast application: For broadcast, apply by means of chisels spaced no more than 30cm apart. Also effective against Thielaviopsis spp, Pythium spp, Fusarium Spp and Phytophthora spp. (see application instructions above).

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Nematode (cont.)		Oriental Mustard Seed Meal 100%	MUST GROW Crop Biofumigant	Field Application: 1121-2240 kg/ha Protected Production: 2.21-4.42 kg/m³ loose potting mix/soil	14 days		For protected or field use. Suppression of root knot nematode. Field production: Apply product using a calibrated spreader to distribute evenly to dry soil surface 14 days prior to seeding or transplanting. Incorporate to a depth of 10 cm by raking/tilling. Apply water immediately after product application so that the treated soil is well moistened to a depth of 10-15cm. Protected Production: mix product with loose planting mix/soil. Thoroughly incorporate. Activate pesticide by thoroughly watering the treated soil and restrict access for 14 days before moving into growing structure. Also effective against Pythium, Fusarium and Verticillium dahlia (see application instructions above). New Product for 2022

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Spider Mites, Scales, Thrips, Aphids, Whitefly		Mineral Oil 80%	Suffoil-X	Spider Mites, Scales, Thrips, Aphids: 10-20 L/1000 L water Whiteflies: 20 L/1000 L water	12 hours	0 days	For indoor production. Deters feeding by aphids, control of spider mites, scales, thrips, and whitefly. Maximum 6 applications during lifespan of plant (lifespan is 12-14 weeks from cutting to harvest). Begin applications when conditions are favourable for disease. Only use lower application rate (1%) during budding/flowering. Fully cover foliage while reducing run-off. Re-application interval is 14 days. Do not apply on new seedlings or clones less than 2 weeks old without having determined sensitivity (phytotoxicity). Minimum spray solution of 50 L/ha, maximum of 1000 L/ha. Do not apply on plants experiencing moisture stress or high temperatures (>32°C). Do not use in combination with products containing sulphur. Works against powdery mildew (see application instructions above).
Whitefly, Aphids, Thrips, Two-spotted spider mites		<i>Beauveria bassiana</i> strain ANT-03, contains at least 1 x10 ¹⁰ spores (conidia)/g	Bioceres EC	Whitefly, Aphids, Thrips: 2-4 mL/L Spider mites: 4mL/L	4 hours, or until the spray dries	0 days	For indoor production. Reduces number of whiteflies, aphids, and thrips. May be harmful for beneficial insects. Most effective when used before high insect populations develop. Begin treatment at the first appearance of the pest, and re-apply within a 7 day interval. Can be applied every 3-5 days to combat an outbreak. 500 -1000 L/1 ha spray volume should be sufficient. It takes 5-7 days after the first application to observe control. New 2022 – also for control of two spotted spider mites.

Pest	Group	Active Ingredient	Pesticide Product Name	Rate	Restricted Entry Interval (REI)	Pre-harvest Interval (PHI)	Remarks
Whitefly, Aphids, Thrips		<i>Beauveria bassiana</i> strain ANT-03 contains at least 1×10^{10} spores (conidia)/g	Bioceres G WP	2-4 g/L	4 hours, or until the spray dries	0 days	For indoor production. Reduces number of whiteflies, aphids, and thrips. May be harmful for beneficial insects. Begin treatment at the first appearance of the insect pest. Most effective when used before high insect populations develop. It takes 5-7 days after the first application to observe control. 500 to 1000 L of spray volume will typically be required for 1 ha.
		<i>Beauveria bassiana</i> strain GHA, contains 4.4×10^{13} conidia/kg	Botanigard 22WP	Whiteflies, Aphids: 250 – 500 g per 400 L spray volume Thrips: 0.5 – 1 Kg per 400 L spray volume	4 hours	0 days	For indoor production. Controls whiteflies, aphids and thrips. Avoid direct contact to beneficial insects. Apply at 5–10-day intervals. High insect populations, especially whitefly and aphids, may require application at 2–5-day intervals.
		<i>Beauveria bassiana</i> Strain GHA, contains 2.2×10^{13} conidia/kg	Botanigard ES	Whiteflies, Aphids: 0.5-1L per 400L spray volume Thrips: 2L/400L spray volume	4 hours	0 days	For indoor production. Controls whiteflies, aphids, and thrips. Avoid direct contact to beneficial insects. Apply at 5-10 day intervals. High insect populations, especially whitefly and aphids, may require application at 2–5-day intervals. Repeat applications for as long as pest pressure persists.

Use the following web link to search for any pesticide label mentioned in this guide, or any other pesticide registered in Canada: <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng>