

4. Tomatoes

Products registered for greenhouse tomato insect and mite pests are listed in Table 4–1.

Products registered for greenhouse tomato diseases are listed in Table 4–2.

Table 4–1. Products registered for greenhouse tomato insect and mite pests

For more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”

LEGEND: PHI = pre-harvest interval (in days) NS = no information was provided on the product label REI = re-entry interval					
* = product is potentially acceptable for organic production. Organic growers must always check with their certifying bodies to verify the acceptability of any product prior to using it.					
IRAC¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
APHIDS					
1B	dichlorvos	DDVP 20% EC	6 mL/1 L water	7	Spray foliage to the point of run-off (approximately 5 L/100 m ²). REI: 24 hr (must be fully ventilated before re-entry)
	naled	Dibrom	9.6 mL/100 m ³	2	Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paintbrush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants, as injury may result. REI: 48 hr (must be fully ventilated before re-entry)
4A	imidacloprid	Intercept 60 WP	16 g/60 L water/ 1,000 mature plants	1	For use as a soil drench using micro-irrigation, drip irrigation, overhead irrigation, or hand-held or motorized calibrated irrigation equipment. Do not apply as a foliar application. Do not exceed 1 application per season. Applications should be made when infestation pressure surpasses threshold and beneficials are not able to maintain pest populations below damage thresholds. May harm pollinators and certain beneficial insects. REI: NS
4D	flupyradifurone	Altus	Foliar: 500–750 mL/ha Drench: 750–1,000 mL/ha (7.5–10 mL/100 m ²)	1	Thorough, uniform coverage of the crop is required for optimum control. Use the higher rate for higher pest infestation levels. Minimum application volume is 500 L per hectare. Foliar: Use appropriate spray volume for adequate crop foliage spray coverage. Spray crop to wet but not to the point of run-off. Drench: Application to soil or soilless media should be made with sufficient water to ensure incorporation into the root zone. Follow with moderate irrigation. Irrigate carefully within the next 10 days to avoid loss of active ingredient due to leaching. Minimum interval between applications is 7 days. Do not exceed 2,000 mL per hectare per crop cycle. REI: 12 hr
9B	pymetrozine	Endeavor 50 WG	100–200 g in a minimum of 1,000 L water/ha	3	Green peach aphid (<i>Myzus persicae</i>), melon aphid (<i>Aphis gossypii</i>) Do not exceed 200 g in 1,000 L water per application. Do not exceed 2 applications per crop cycle or 3 applications per year in greenhouses with multiple crop cycles. Apply as a foliar spray. Minimum interval between applications is 7 days. On hard-to-wet plants, label recommends adding a non-ionic or organosilicone-based surfactant to improve coverage. REI: 12 hr

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APHIDS (cont'd)					
23	spirotetramat	Kontos	30–42 mL/100 L water Maximum use rate per single application: 300 mL/ha (72 g a.i./ha)	3	Spray crop to wet but not to the point of run-off. Do not exceed a spray volume of 712–1,000 L per hectare (30–42 mL concentration). Use the higher concentration for higher pest infestation levels. Minimum interval between applications is 7–14 days. Do not exceed 900 mL per hectare (216 g a.i./ha) per crop cycle. Do not exceed 3 applications per crop cycle. Not acutely toxic to adult bees. Residues in/on pollen and nectar may harm bee brood. This product is toxic to certain beneficial insects. REI: 12 hr
UNF	<i>Beauveria bassiana</i> strain ANT-03	Bio-Ceres G WB*	2–4 g/L water	0	Reduces pest numbers. Begin treatment of crops at the first appearance of the pest. Application rates, frequency, spray coverage and insect numbers impact the speed at which acceptable control is achieved. Depending on crop treated, 500–1,000 L per hectare of spray volume will typically be required. This product is most effective when used early, before high insect populations develop. Repeat applications within 7 days as needed. This product may be toxic to bees exposed to direct treatment or drift. Do not apply this product while bees are actively foraging. REI: Do not re-enter treated areas until the spray has dried.
		Bio-Ceres G WP*			
	<i>Beauveria bassiana</i> strain GHA	BotaniGard 22WP	250–500 g/400 L water		
<i>Beauveria bassiana</i> PPRI 5339	Velifer	450–900 mL/1,000 L water	0	Apply in sufficient water volume for uniform coverage, but not to the point of runoff. Repeat application every 3–10 days. Use the higher concentration and shorter application intervals when pest population densities are high. May be harmful to beneficial insects and bees. REI: 4 hr	

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks	
APHIDS (cont'd)						
NC	canola oil	Vegol Crop Oil*	1-part concentrate: 50 parts water (2% solution)	0	Apply at first sign of insect presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Insects, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS	
	mineral oil	Purespray Green Spray Oil 13E*	10 L/1,000 L water (1% solution)/ha	NS	Deters feeding. Apply when pests appear. Repeat applications every 7–14 days. For effective control, thorough coverage is essential. Do not exceed label rate, otherwise phytotoxicity may result. REI: 12 hr	
	potassium salts of fatty acids	Kopa Insecticidal Soap*	8 L/400 L water	1 part concentrate: 50 parts water	0	Spray early in morning or evening or when overcast. Combining this product with sulphur or applying this product within 3 days of sulphur application may increase the plant damage caused by sulphur on sensitive plants. Do not tank mix with sulphur when temperatures are higher than 32°C. REI: NS
		Neudosan Commercial*				
		Opal Insecticidal Soap*				
Opal2 Insecticidal Soap*						
Safer's Insecticidal Soap Concentrate*	Insects must be sprayed directly to achieve proper control. Repeat applications as required. REI: NS					
BANANA MOTH (<i>Opogona sacchari</i>)						
11A	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain EVB113-19	Bioprotec 3P DF*	0.8 kg/1,000 L water	0	Foliar application. Make application just prior to egg hatch. Apply the product such that it flows along the stem, coating it well. Thorough coverage of foliage and stems is necessary (minimum of 300 L water per hectare). Repeat application every 7 days as needed. REI: NS	
		Bioprotec CAF*	1.6 L/1,000 L water			
BEE T ARMYWORM (<i>Spodoptera exigua</i>)						
11A	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> strain ABTS-1857	XenTari WG*	500–1,000 g/ha	0	Treat when larvae are young (early instars), before the crop is damaged. Use sufficient spray volume to ensure thorough coverage but not to the point of run-off. Best results are obtained if applications are made in the evening or on a cloudy day. Repeat applications every 3–14 days as needed. This product is toxic to bees and certain beneficial insects. REI: Do not re-enter treated areas until the spray has dried.	

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CORN EARWORM (TOMATO FRUITWORM) (<i>Helicoverpa (=Heliothis) zea</i>)					
11A	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> strain ABTS-1857	XenTari WG*	500–1,000 g/ha	0	Treat when larvae are young (early instars), before the crop is damaged. Use sufficient spray volume to ensure thorough coverage but not to the point of run-off. Best results are obtained if applications are made in the evening or on a cloudy day. Repeat applications every 3–14 days as needed. This product is toxic to bees and certain beneficial insects. REI: Do not re-enter treated areas until the spray has dried.
DUPONCHELIA FOVEALIS					
11A	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain ABTS-351	DiPel 2X DF*	625 g/1,000 L water	0	Make applications when egg hatch is essentially complete, when larvae are small, but before crop damage occurs. Apply the product such that it flows along the stem, coating it well. Thorough coverage of foliage and stem is necessary. Repeat applications every 7 days as needed. REI: NS
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain EVB113-19	Bioprotec 3P DF* Bioprotec CAF*	0.8 kg/1,000 L water 1.6 L/1,000 L water	0	Foliar and drench application. Make application when egg hatch is essentially complete, but before crop damage occurs. Apply the product such that it flows along the stem, coating it well, and into the top layer of the soil around the base of the plant. Thorough coverage of foliage and stems is necessary. Repeat applications every 7 days as needed. REI: NS
EARWIGS					
NC	potassium salts of fatty acids	Opal2 Insecticidal Soap Safer's Insecticidal Soap Concentrate	1 part concentrate: 50 parts water	0	Insects must be sprayed directly to achieve proper control. REI: NS
EUROPEAN CORN BORER (<i>Ostrinia nubilalis</i>)					
5	spinetoram	Delegate WG	92–132 g/1,000 L water	2	Use the higher rate when insect populations are high and/or insects are large. Apply when eggs hatch and first instar larvae are present. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. Do not apply by a fogger or mister. REI: 12 hr
	spinosad	Entrust 80 WG*	30 g/1,000 L water	2	Do not exceed application volume of 2,000 L per hectare. Apply when eggs hatch and first instar larvae are present. Do not apply by a fogger or mister. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. REI: 12 hr
		Entrust SC*	100 mL/1,000 L water		
Success	50 mL/1,000 L water				

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FUNGUS GNATS					
11A	<i>Bacillus thuringiensis</i> subsp. <i>israelensis</i> , serotype H-14, strain AM 65-52	VectoBac 600L	Light to moderate infestation: 2–4 L/1,000 L water Heavy infestation: 4–8 L/1,000 L water	NS	Apply weekly as a soil drench or when pest monitoring indicates the need. This product is a larvicide and will not control adult gnats. REI: NS
LEAFHOPPERS					
4D	flupyradifurone	Altus	Foliar: 500–750 mL/ha Drench: 750–1,000 mL/ha (7.5–10 mL/100 m ²)	1	Thorough, uniform coverage of the crop is required for optimum control. Use the higher rate for higher pest infestation levels. Minimum application volume is 500 L per hectare. Foliar: Use appropriate spray volume for adequate crop foliage spray coverage. Spray crop to wet but not to the point of run-off. Drench: Application to soil or soilless media should be made with sufficient water to ensure incorporation into the root zone. Follow with moderate irrigation. Irrigate carefully within the next 10 days to avoid loss of active ingredient due to leaching. Minimum interval between applications is 7 days. Do not exceed 2,000 mL per hectare per crop cycle. REI: 12 hr
LEAFMINERS					
1B	naled	Dibrom	9.6 mL/100 m ³	2	Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paintbrush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants as injury may result. REI: 48 hr (must be fully ventilated before re-entry)
6	abamectin	Avid 1.9% EC	30 mL/100 L water	1	Liriomyza spp. Application should be made, preferably in 2,000–4,000 L water per hectare. Do not exceed 1,200 mL or apply less than 600 mL product per hectare per application. Use sufficient water to obtain uniform coverage. Do not exceed 3,600 mL product per hectare per crop cycle. Do not apply through any type of irrigation system. REI: Re-entry only after residues have dried.

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LEAFMINERS (cont'd)					
11A	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> strain ABTS-1857	XenTari WG*	500–1,000 g/ha	0	Tomato leafminer (<i>Tuta absoluta</i>) Treat when larvae are young (early instars), before the crop is damaged. Use sufficient spray volume to ensure thorough coverage but not to the point of run-off. Best results are obtained if applications are made in the evening or on a cloudy day. Repeat applications every 3–14 days as needed. This product is toxic to bees and certain beneficial insects. REI: Re-entry only after treated areas have dried.
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain ABTS-351	DiPel 2X DF*	500–1,000 g/ 1,000 L water	0	Lepidopteran leafminers Apply at egg hatch. Thorough coverage of foliage and stems is necessary. Repeat application every 7–10 days as needed. REI: NS
18	tebufenozide	Confirm 240F	0.6 L/ha	2	Lepidopteran leafminers For suppression. Foliar application only. Use a high-volume sprayer. Apply at first egg hatch. Do not exceed 4 applications per crop cycle, if monitoring indicates it is required. Minimum interval between applications is 10 days. Effective against larval Lepidoptera, however, it is essentially non-toxic to adult bees and does not adversely affect beneficial insects such as predatory mites, beetles, wasps and spiders. Do not use tebufenozide-treated tomatoes for processing. REI: 12 hr
28	chlorantraniliprole	Coragen	200 mL/1,000 L water	1	Lepidopteran leafminers Apply at egg hatch. Re-apply if monitoring indicates it is necessary. Thorough coverage is important to obtain optimum control. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. Do not exceed a total of 750 mL product per hectare per crop cycle. Apply in a maximum finished spray volume of 1,250 L per hectare. REI: 12 hr
LEAFROLLERS					
1B	naled	Dibrom	9.6 mL/100 m ³	2	Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paintbrush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants, as injury may result. REI: 48 hr (must be fully ventilated before re-entry)
LOOPERS					
5	spinetoram	Delegate WG	92–132 g/1,000 L water	2	Cabbage looper (<i>Trichoplusia ni</i>) Use the higher rate when insect populations are high and/or insects are large. Apply when eggs hatch and first instar larvae are present. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. Do not apply by a fogger or mister. REI: 12 hr
	spinosad	Entrust 80 WG*	72 g/1,000 L water	2	Cabbage looper (<i>Trichoplusia ni</i>) Maximum application volume that can be used is 1,000 L per hectare. Apply when eggs hatch and first instar larvae are present. Do not apply by a fogger or mister. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. REI: 12 hr
		Entrust SC*	240 mL/1,000 L water		
		Success	120 mL/1,000 L water		

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LOOPERS (cont'd)					
11A	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> strain ABTS-1857	XenTari WG*	500–1,000 g/ha	0	Cabbage looper (<i>Trichoplusia ni</i>), tomato looper (<i>Chrysodeixis chalcites</i>) Treat when larvae are young (early instars), before the crop is damaged. Use sufficient spray volume to ensure thorough coverage but not to the point of run-off. Best results are obtained if applications are made in the evening or on a cloudy day. Repeat applications every 3–14 days as needed. This product is toxic to bees and certain beneficial insects. REI: Re-enter only after spray is dried.
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain ABTS-351	DiPel 2X DF*	75–150 g/250 L water	0	Cabbage looper (<i>Trichoplusia ni</i>) Apply at egg hatch to target young larvae (early instars). For best control, thorough coverage is required. Under heavy population pressure, or for larger larvae, shorten the spray interval or use the higher rate range. Repeat applications every 3–14 days as needed. Do not exceed 4 applications per season. REI: NS
		DiPel WP*	150–300 g/ 250 L water/4,000 m ²	NS	Cabbage looper (<i>Trichoplusia ni</i>) Apply to upper and lower portions of the leaves to run-off. Repeat applications will be necessary if a new hatch occurs. REI: NS
		Foray 48BA	0.6–1.8 L/ 500–1,000 L water/ha (60–180 mL/1,000 m ²)	NS	Cabbage looper (<i>Trichoplusia ni</i>) Apply using a high-volume spray. Repeat applications every 10 days when loopers first appear. In general, larvae should be treated when they are newly hatched. REI: NS
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain EVB113-19	Bioprotec 3P DF*	0.92 kg/1,000 L water	0	Cabbage looper (<i>Trichoplusia ni</i>) Apply to young larvae at first signs of infestation. Repeat applications as necessary to maintain control of young larvae. The timing and number of applications will depend on foliage development and larval activity, including egg hatch, stage of larval development and population pressure. Best results are obtained if applications are made in the evening or on a cloudy day. REI: NS
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain SA-12	Thuricide HPC	5 L/1,000 L water	0	Cabbage looper (<i>Trichoplusia ni</i>) Apply at first sign of infestation when larvae are small. Repeat applications every 7–10 days as needed. REI: NS
13	chlorfenapyr	Pylon	30 mL/100 L water	0	Alfalfa looper (<i>Autographa californica</i>), Cabbage looper (<i>Trichoplusia ni</i>) For suppression. Do not exceed 1 application per crop cycle. Do not apply using a spray volume greater than 1,000 L per hectare. Do not apply as an ultra-low-volume (ULV) spray. Do not apply through any type of irrigation equipment. Do not use on tomato varieties with a diameter of less than 2.5 cm when mature. This product is toxic to bees and certain beneficial insects. REI: 12 hr
18	tebufenozide	Confirm 240F	0.6 L (144 g a.i.)/ha	2	Cabbage looper (<i>Trichoplusia ni</i>) Foliar application only. Do not exceed 4 applications per crop cycle. Minimum interval between applications is 10 days. Effective against larval Lepidoptera, however, it is essentially non-toxic to adult bees and does not adversely affect beneficial insects such as predatory mites, beetles, wasps and spiders. Do not use tebufenozide-treated tomatoes for processing. REI: 12 hr

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LOOPERS (cont'd)					
28	chlorantraniliprole	Coragen	125 mL/1,000 L water	1	Cabbage looper (<i>Trichoplusia ni</i>) Begin applications when treatment thresholds have been reached. Thorough coverage is required to obtain optimum control. Repeat applications if monitoring indicates it is necessary. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. Do not exceed a total of 750 mL product per hectare per crop cycle. The maximum finished spray volume is 1,400 L per hectare. REI: 12 hr
28	cyantraniliprole	Exirel	250 mL/ha	1	Cabbage looper (<i>Trichoplusia ni</i>) Thorough coverage is required to obtain optimum control. Select a spray volume appropriate for the size of plants and density of foliage. Do not apply in irrigation water. Use of mist blowers, thermal foggers, ultra-low volume (ULV) and electrostatic sprayers is not permitted. Do not exceed 4 applications per crop cycle. Minimum interval between applications is 7 days. Toxic to bees and certain beneficial insects. REI: 12 hr
NC	<i>Autographa californica</i> <i>Nucleopolyhedrovirus</i> FV11	Loopex*	50–200 mL/400 L water	0	Application timing should target small larvae and be applied using high-volume spray systems (minimum 400 L per hectare). Uniform spray deposit coverage of the foliage is essential for optimum control. Repeat applications every 7–14 days as needed. REI: Re-entry into treated areas only after mists have settled.
MEALYBUGS					
1B	naled	Dibrom	9.6 mL/100 m ³	2	Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paint brush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants, as injury may result. REI: 48 hr (must be fully ventilated before re-entry)
NC	canola oil	Vegol Crop Oil*	1 part concentrate: 50 parts water (2% solution)	0	Apply at first sign of insect presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Insects, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS
	potassium salts of fatty acids	Opal2 Insecticidal Soap Safer's Insecticidal Soap Concentrate	1 part concentrate: 50 parts water	0	Insects must be sprayed directly to achieve proper control. Repeat applications as required. REI: NS

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MITES					
1B	naled	Dibrom	9.6 mL/100 m ³	2	Two-spotted spider mite (<i>Tetranychus urticae</i>) Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paint brush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants, as injury may result. REI: 48 hr (must be fully ventilated before re-entry)
6	abamectin	Avid 1.9% EC	30 mL/100 L water	1	Two-spotted spider mite (<i>Tetranychus urticae</i>) Application should be made preferably in 2,000–4,000 L water per hectare. Do not exceed 1,200 mL or apply less than 600 mL product per hectare per application. Use in sufficient water to obtain uniform coverage. Do not exceed 3,600 mL product per hectare per crop cycle. Do not apply through any type of irrigation system. REI: Re-entry into treated areas only after spray has dried.
10B	etoxazole	TetraSan 5 WDG	226.8–453.6 g (4–8 packets)/ 378.5 L water	1	Two-spotted and carmine spider mite (<i>Tetranychus urticae</i>) Apply sufficient spray volume to ensure thorough coverage, to a maximum of 1,870 L per hectare. Kills mite eggs and nymphs, but not adult mites. Apply at first sign of infestation and before large numbers of adult mites are present. Two applications may be made only if each application falls below a rate of 95 g a.i./ha. Make a second application if necessary, but no sooner than 21 days after the first application. Do not exceed 2 applications per crop cycle or within a 6-month period. This product is transovarial, therefore treated adult female mites will produce significantly fewer viable eggs. Use higher rates for moderate-to-heavy infestations, especially in dense plant canopies. REI: 12 hr
12B	fenbutatin oxide	Vendex 50W Vendex 50WP	50 g/100 L water	5	Two-spotted spider mite (<i>Tetranychus urticae</i>) Begin applications when mites appear and repeat as necessary to maintain control. Thorough coverage of all foliage, especially the under surface of leaves, is essential. The addition of a suitable spreader-sticker will usually result in superior mite control. Not highly injurious to beneficial mites and is non-toxic to honeybees. Do not spray when the temperature in the greenhouse is over 32°C. REI: 12 hr; 48 hr for high foliar-contact activities
13	chlorfenapyr	Pylon	20–30 mL/100 L water	0	Two-spotted spider mite (<i>Tetranychus urticae</i>) For suppression. Do not exceed 1 application per crop cycle. Do not apply using a spray volume greater than 1,000 L per hectare. Do not apply as an ultra-low-volume (ULV) spray. Do not apply through any type of irrigation equipment. Do not use on tomato varieties with a diameter of less than 2.5 cm when mature. This product is toxic to bees and certain beneficial insects. REI: 12 hr

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
MITES (cont'd)					
20B	acequinocyl	Shuttle 15 SC	0.21–0.46 L/500 L water (0.07–0.15 g a.i./L of solution)	1	Two-spotted spider mite (<i>Tetranychus urticae</i>) Apply as a full coverage spray to the foliage. Thorough coverage is essential for effective control. Actual spray volume will vary depending on the size of the plants being sprayed. Application should be made as soon as the mite population reaches economic infestation levels. Apply the higher concentration for heavy pest infestations. Minimum interval between applications is 21 days. Do not exceed 2 applications per crop cycle (0.69 kg a.i./ha). REI: 12 hr
20D	bifenazate	Floramite SC	125 mL (30 g a.i.)/ 400 L water	0	Two-spotted spider mite (<i>Tetranychus urticae</i>) Apply as a full coverage spray to the foliage to obtain uniform coverage. Actual spray volume will vary depending on the size of the plants being treated. Application should be made as soon as mites appear and will provide residual control for up to 28 days. Do not exceed 2 applications per crop cycle. Make only 1 application of this product before rotating to products of an alternate chemical class. This product is primarily active on the motile stages of mites. It is not effective against rust mites, broad mites and flat mites. REI: 12 hr
21A	pyridaben	Dyno-Mite WP SanMite WP	284 g/1,000 L water/ha	2	Two-spotted spider mite (<i>Tetranychus urticae</i>) Do not exceed 2 applications per crop cycle. Minimum interval between applications is 28 days. Do not apply this product through any type of irrigation system. Do not apply as a fog. Do not use pyridaben-treated tomatoes for processing. REI: 12 hr
	fenpyroximate	FujiMite		2.5 L/ha	1
23	spiromesifen	Forbid 240 SC	30–50 mL/100 L water (0.03%–0.05% solution)	3	Two-spotted spider mite (<i>Tetranychus urticae</i>) Repeat applications every 10–14 days as needed. Do not exceed 2 applications per crop cycle. Avoid applying during the warmest part of the day. Mite juvenile stages are often more susceptible than adults. Toxic to certain beneficial insects. Residues on pollen and nectar may harm bee brood. REI: 12 hr

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Table 4–1. Products registered for greenhouse tomato insect and mite pestsFor more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”**LEGEND:** PHI = pre-harvest interval (in days)

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REI = re-entry interval

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
MITES (cont'd)					
UNF	<i>Beauveria bassiana</i> PPRI 5339	Velifer	450–900 mL/1,000 L water	0	Two-spotted spider mite (<i>Tetranychus urticae</i>) Apply in sufficient water volume for uniform coverage, but not to the point of runoff. Repeat applications every 3–10 days. Use the higher concentration and shorter application intervals when pest population densities are high. May be harmful to beneficial insects and bees. REI: 4 hr
	<i>Metarhizium anisopliae</i> strain F52	Met52 EC	0.5–5 L/1,000 L water	0	Foliar application method: Reduces pest numbers. Use the higher application concentration when pest pressure is high. Repeat application every 5–10 days as needed. Spray to wet all foliage but not to the point of run-off. Do not apply through a thermal pulse fogger. REI: Re-entry only after the spray has dried.
	potassium salts of fatty acids	Kopa Insecticidal Soap*	8 L/400 L water	0	Spray early in the morning, in the evening or when overcast. Combining this product with sulphur or applying this product within 3 days of sulphur application may increase the plant damage caused by sulphur on sensitive plants. Do not tank mix with sulphur when temperatures are higher than 32°C. REI: NS
		Neudosan Commercial*			
		Opal Insecticidal Soap*			
Opal2 Insecticidal Soap*	1 part concentrate: 50 parts water	0	Two-spotted spider mite (<i>Tetranychus urticae</i>) Insects must be sprayed directly to achieve proper control. Repeat application once per week for 2–3 weeks. REI: NS		
Safer's Insecticidal Soap Concentrate					

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks	
MITES (cont'd)						
NC	canola oil	Vegol Crop Oil*	1 part concentrate: 50 parts water (2% solution)	0	Apply at first sign of mite presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Mites, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS	
	mineral oil	Purespray Green Spray Oil 13E*	10 L/1,000 L water (1% solution)/ha	NS	For suppression. Apply when pest first appears. Repeat application every 7–14 days. For effective control, thorough coverage is essential. Do not exceed label rate, otherwise phytotoxicity may result. REI: 12 hr	
	potassium salts of fatty acids	Kopa Insecticidal Soap*	8 L/400 L water	1 part concentrate: 50 parts water	0	Spray early in morning or evening or when overcast. Combining this product with sulphur or applying this product within 3 days of sulphur application may increase the plant damage caused by sulphur on sensitive plants. Do not tank mix with sulphur when temperatures are higher than 32°C. REI: NS
		Neudosan Commercial*				
		Opal Insecticidal Soap*				
Opal2 Insecticidal Soap*						
Safer's Insecticidal Soap Concentrate*						
NC + 3A	potassium salts of fatty acids + pyrethrins	Safer's Trounce Insecticidal Soap*	5 L/100 L water	1	Two-spotted spider mite (<i>Tetranychus urticae</i>) Spray all plant parts once weekly for 2–3 weeks, and thereafter as required. If possible, foliage should be misted daily with water until mite control is achieved. REI: NS	
PSYLLIDS						
6	abamectin	Avid 1.9% EC	30 mL/100 L water	1	Tomato psyllid (<i>Bactericera cockerelli</i>) Application should be made in 2,000–4,000 L water per hectare/ha. Do not exceed 1,200 mL or apply less than 600 mL product per hectare per application. Use in sufficient water to obtain uniform coverage. Apply no more than 3,600 mL product per hectare per crop cycle. Do not apply through any type of irrigation system. REI: Re-entry into treated areas only after the spray has dried.	

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
PSYLLIDS (cont'd)					
NC	canola oil	Vegol Crop Oil*	1 part concentrate: 50 parts water (2% solution)	0	Apply at first sign of insect presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Insects, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS
	potassium salts of fatty acids	Opal2 Insecticidal Soap*	1 part concentrate: 50 parts water	0	Insects must be sprayed directly to achieve proper control. REI: NS
Safer's Insecticidal Soap Concentrate*					
SCALE					
NC	canola oil	Vegol Crop Oil	1 part concentrate: 50 parts water (2% solution)	0	Apply at first sign of insect presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Insects, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS
THRIPS					
5	spinetoram	Delegate WG	92–132 g/1,000 L water	2	Western flower thrips (<i>Frankliniella occidentalis</i>) For suppression. Use the higher rate when insect populations are high and/or insects are large. Apply when western flower thrips first appear. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. Do not apply by a fogger or mister. REI: 12 hr
	spinosad	Entrust 80 WG*	30 g/1,000 L water	2	Western flower thrips (<i>Frankliniella occidentalis</i>) For suppression. Maximum application volume that can be used is 2,000 L per hectare. Apply when western flower thrips first appear. Do not apply by a fogger or mister. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 7 days. REI: 12 hr
		Entrust SC*	100 mL/1,000 L water		
		Success	50 mL/1,000 L water		
28	cyantraniliprole	Exirel	500–1,000 mL/ha	1	For suppression. Use the higher listed rate and higher spray volumes for large plants or dense foliage. If thrips populations are above thresholds, use a registered knockdown product before application. Do not apply in irrigation water. Use of mist blowers, thermal foggers, ultra-low volume (ULV) and electrostatic sprayers is not permitted. Do not exceed 4 applications per crop cycle. Minimum interval between applications is 7 days. Toxic to bees and certain beneficial insects. REI: 12 hr

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IRAC ¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
THRIPS (cont'd)					
UNF	<i>Beauveria bassiana</i> strain ANT-03	Bio-Ceres G WB*	2–4 g/L water	0	Reduces pest numbers. Begin treatment of crops at the first appearance of the pest. Application rates, frequency, spray coverage and insect numbers impact the speed at which acceptable control is achieved. Depending on crop treated, 500–1,000 L per hectare of spray volume will typically be required. This product is most effective when used early, before high insect populations develop. Repeat applications within 7-days as needed. This product may be toxic to bees exposed to direct treatment or drift. Do not apply this product while bees are actively foraging. REI: Re-entry into treated areas only after the spray has dried.
		Bio-Ceres G WP*			
	<i>Beauveria bassiana</i> strain GHA	BotaniGard 22WP	500–1,000 g/400 L water	0	Foliar application method: Spray to wet but avoid run-off. Repeat applications every 5–10-days. High populations may require 2–5-day intervals. Repeat applications for as long as pest pressure persists. Product use, especially at higher rates, may result in commercially unacceptable visible residues. Fungicides, some insecticide formulations, and some wetting agents and spreaders may kill the spores. Pollinator application method: For suppression. Uses a microbial inoculum dispenser that is attached to the front of the bumble bee hive. When used as directed, the impact on bees is minimal and is compatible with the release of some biological control agents, including <i>Aphidius colemani</i> , <i>Amblyseius swirskii</i> , <i>Encarsia formosa</i> , and <i>Eretmocerus eremicus</i> . Do not release <i>Orius insidiosus</i> in the presence of bee vectored BotaniGard 22WP. See label for more details. REI: Foliar: 4 hr; Bee-vectored: 0
	<i>Beauveria bassiana</i> PPRI 5339	Velifer	450–900 mL/ 1,000 L water	0	Apply in sufficient water volume for uniform coverage, but not to the point of runoff. Repeat applications every 3–10 days. Use the higher concentration and shorter application intervals when pest population densities are high. May be harmful to beneficial insects and bees. REI: 4 hr
	<i>Metarhizium anisopliae</i> strain F52	Met52 EC	Foliar: 0.5–5 L/1,000 L water Drench: 108 mL/10 L water	0	Foliar application method: Reduces pest numbers. Use the higher application concentration when pest pressure is high. Repeat applications every 5–10 days as needed. Spray to wet all foliage but not to the point of run-off. Do not apply through a thermal pulse fogger. Drench application method: May reduce pest numbers. Drench application should be thoroughly watered-in without causing water to come out of the bottom of the pots/grow bags. Depending on the growing media type and moisture, this will be around 250 mL per 4-L pot or grow bag. Repeat applications as needed. Do not apply via drip irrigation. REI: Re-entry into treated areas only after the spray has dried.
NC	mineral oil	Purespray Green Spray Oil 13E*	10 L/1,000 L water (1% solution)/ha	NS	For suppression. Apply when pests appear. Repeat applications every 7–14 days. For effective control, thorough coverage is essential. Do not exceed label rate, otherwise phytotoxicity may result. REI: 12 hr

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IRAC¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
TOBACCO BUDWORM (<i>Heliothis virescens</i>)					
11A	<i>Bacillus thuringiensis</i> subsp. <i>aizawai</i> strain ABTS-1857	XenTari WG*	500–1,000 g/ha	0	Treat when larvae are young (early instars) before the crop is damaged. Use sufficient spray volume to ensure thorough coverage but not to the point of run-off. Best results are obtained if applications are made in the evening or on a cloudy day. Repeat applications every 3–14 days as needed. This product is toxic to bees and certain beneficial insects. REI: Re-entry into treated areas only after the spray has dried.
13	chlorfenapyr	Pylon	30 mL/100 L water	0	For suppression. Do not exceed 1 application per crop cycle. Do not apply using a spray volume greater than 1,000 L per hectare. Do not apply as an ultra-low-volume (ULV) spray. Do not apply through any type of irrigation equipment. Do not use on tomato varieties with a diameter of less than 2.5 cm when mature. This product is toxic to bees and certain beneficial insects. REI: 12 hr
TOMATO HORNWORM (<i>Manduca quinquemaculata</i>)					
11A	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain EVB113-19	Bioprotec 3P DF*	0.46–0.92 kg/ 1,000 L water	0	Apply to young larvae at first signs of infestation. Repeat applications as necessary to maintain control of young larvae. The timing and number of applications will depend on foliage development and larval activity, including egg hatch, stage of larval development and population pressure. Best results are obtained if applications are made in the evening or on a cloudy day. REI: NS
	<i>Bacillus thuringiensis</i> subsp. <i>kurstaki</i> strain SA-12	Thuricide HPC	2.5–5 L/1,000 L water	0	Apply at first sign of infestation when larvae are small and repeat at 7–10-day intervals when needed to maintain control. REI: NS
13	chlorfenapyr	Pylon	30 mL/100 L water	0	For suppression. Do not exceed 1 application per crop cycle. Do not apply using a spray volume greater than 1,000 L per hectare. Do not apply as an ultra-low-volume (ULV) spray. Do not apply through any type of irrigation equipment. Do not use on tomato varieties with a diameter of less than 2.5 cm when mature. This product is toxic to bees and other beneficial insects. REI: 12 hr
WHITEFLIES					
1B	dichlorvos	DDVP 20% EC	6 mL/1 L water	7	Spray foliage to the point of run-off (approximately 5 L per 100 m ²). Thoroughly ventilate premises before re-entering on the day following treatment. REI: 24 hr
	naled	Dibrom	9.6 mL/100 m ³	2	Vapour treatment. Do not exceed 3 applications per crop cycle (including one postharvest). Minimum interval between applications is 7 days. Apply to cold pipes using a plastic squeeze bottle when plants are dry. Do not apply using a paint brush or any other method. Do not apply to hot pipes. Avoid over-treatment and direct application to plants, as injury may result. REI: 48 hr (must be fully ventilated before re-entry)

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IRAC¹ Group No.	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
WHITEFLIES (cont'd)					
3A	permethrin	Ambush 50 EC	20 mL/100 L water	1	Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>) Apply to cover all foliage thoroughly. Repeat application as necessary to maintain control. REI: NS
		Bio-environmental permethrin	185 mL/L water	1	Spray for thorough coverage of upper and lower leaf surfaces or treated area. Apply when insects or damage first appears and then as necessary. Do not use when air temperature is less than 12°C or greater than 30°C. REI: NS
		Pounce 384 EC	260 mL/1,000 L water	1	Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>) Apply to thoroughly cover all foliage. Repeat as necessary. REI: Re-entry into treated areas is permissible as soon as the spray deposit has dried.
4A	acetamiprid	Tristar 70 WSP	15 packs/2 ha (1 pack/1,333 m ²)	1	Do not exceed 2 applications per year. Apply through drip irrigation to the growing media. Alternate applications with an insecticide with a different mode of action. Repeat applications every 21 days as needed. REI: 12 hr
	imidacloprid	Intercept 60 WP	16 g/60 L water/ 1,000 mature plants	1	For use as a soil drench using micro-irrigation, drip irrigation, overhead irrigation, or hand-held or motorized calibrated irrigation equipment. Do not apply as a foliar application. Do not exceed one application per season. Applications should be made when infestation pressure surpasses threshold and beneficials are not able to maintain pest populations below damage thresholds. May harm pollinators and certain beneficial insects. REI: NS
4D	flupyradifurone	Altus	Foliar: 750–1,000 mL/ha Drench: 1,500–2,000 mL/ha (15–20 mL/100 m ²)	1	Thorough, uniform coverage of the crop is required for optimum control. Use the higher rate for higher pest infestation levels. Minimum application volume is 500 L per hectare. Foliar: Use appropriate spray volume for adequate crop foliage spray coverage. Spray crop to wet but not to the point of run-off. Drench: Application to soil or soilless media should be made with sufficient water to ensure incorporation into the root zone. Follow with moderate Irrigation. Irrigate carefully within the next 10 days to avoid loss of active ingredient due to leaching. Minimum interval between applications is 7 days. Do not exceed 2,000 mL per hectare per crop cycle. REI: 12 hr
7C	pyriproxyfen	Distance	45 mL/100 L water	3	Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>), silverleaf whitefly (<i>Bemisia tabaci B biotype</i>) and sweet potato whitefly (<i>Bemisia tabaci</i>) Apply as a foliar spray mixture uniformly to all plant surfaces and to the point of run-off. Make first application when adult insects begin to appear. Repeat application after 14–28 days as needed. Use longer interval when plants are not growing rapidly. Do not exceed 2 applications per crop cycle. If the cropping cycle is less than 6 months, do not exceed 2 applications per 6 months. REI: 12 hr

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WHITEFLIES (cont'd)					
15	novaluron	Rimon 10 EC	650–835 mL/ha	2	For suppression. Apply in sufficient water volume to ensure thorough coverage. Apply in a maximum spray volume of 935 L water per hectare. Use the higher application rate when pest pressure is high, or foliage is mature. Repeat applications every 7–10 days as needed. Do not exceed 3 applications per crop cycle. Toxic to certain beneficial insects (e.g. predatory mites, parasitoid wasps) and may be toxic to bee colonies exposed to direct treatment, drift, or residues on flowering crops or weeds. REI: 12 hr
16	buprofezin	Talus	36–43 g/100 L	2	Apply when adults first appear. Use the higher application rate when pest pressure is high. Minimum interval between applications is 21 days. Do not exceed 2 applications per crop cycle. When using 36 g per 100 L, apply no more than 870 L spray solution per hectare. When using 43 g per 100 L, apply no more than 730 L of spray solution per hectare. REI: 48 hr
21A	fenpyroximate	FujiMite	2.5 L/ha	1	For suppression. Apply when pests are in immature stages or when populations reach economic thresholds. Apply in a minimum spray volume of 1000 L per hectare to ensure thorough coverage of the foliage. Do not exceed 1 application per crop cycle. Toxic to certain beneficial insects. REI: 12 hr
23	spiromesifen	Forbid 240 SC	30–50 mL/100 L water (0.03%–0.05% solution)	3	Greenhouse whitefly (<i>Trialeurodes vaporariorum</i>), silverleaf whitefly (<i>Bemisia tabaci B biotype</i>) and sweet potato whitefly (<i>Bemisia tabaci</i>) Repeat application every 10–14 days as needed. Do not exceed 2 applications per crop cycle. Avoid applying during the warmest part of the day. Effective against nymphs and has some effect on the pupal stage. Will not reduce adult whitefly populations. Toxic to certain beneficial insects. Residues on pollen and nectar may harm bee brood. REI: 12 hr
	spirotriamat	Kontos	30–42 mL/100 L water Maximum use rate/ single application: 300 mL/ha (72 g a.i./ha)	3	Use appropriate spray volume for adequate crop foliage spray coverage. Spray crop to wet but not to the point of run-off. Do not exceed a spray volume of 712–1,000 L per hectare (42–30 mL concentration). Use the higher concentration for higher pest infestation levels. Minimum interval between applications is 7–14 days. Do not exceed 900 mL (216 g a.i./ha) per hectare per crop cycle. Do not exceed 3 applications per crop cycle. Not acutely toxic to adult bees. Residues in/on pollen and nectar may harm bee brood. This product is toxic to certain beneficial insects. REI: 12 hr
28	cyantraniliprole	Exirel	750–1,000 mL/ha	1	Thorough coverage is required to obtain optimum control. Use the higher listed rate and higher spray volumes for large plants or dense foliage. Do not apply in irrigation water. Use of mist blowers, thermal foggers, ultra-low volume (ULV) and electrostatic sprayers is not permitted. Do not exceed 4 applications per crop cycle. Minimum interval between applications is 7 days. Toxic to bees and certain beneficial insects. REI: 12 hr

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WHITEFLIES (cont'd)					
29	flonicamid	Beleaf 50 SG	0.2 g/L water	0	Foliar application. Apply before populations reach economic thresholds or as populations begin to increase, but before damaging populations become established. Minimum interval between applications is 7 days. Do not exceed 2 applications per crop cycle. Apply sufficient volume to ensure good coverage. The spray volume can vary from 500–1,000 L per hectare, depending on the size of the plants. The maximum volume should be used when plant foliage is dense. REI: 12 hr
UNF	<i>Beauveria bassiana</i> strain ANT-03	Bio-Ceres G WB*	2–4 g/L water	0	Reduces pest numbers. Begin treatment of crops at the first appearance of the pest. Application rates, frequency, spray coverage and insect numbers impact the speed at which acceptable control is achieved. Depending on crop treated, 500–1,000 L per hectare of spray volume will typically be required. This product is most effective when applied before high insect populations develop. Repeat application within 7 days. This product may be toxic to bees exposed to direct treatment or drift. Do not apply this product while bees are actively foraging. REI: Re-entry into treated areas only after the spray has dried.
		Bio-Ceres G WP*			
	<i>Beauveria bassiana</i> strain GHA	BotaniGard 22WP	250–500 g/400 L water	0	Foliar application method: Spray to wet but avoid run-off. Repeat application every 5–10 days. High populations may require 2–5-day intervals. Repeat applications for as long as pest pressure persists. Product use, especially at higher rates, may result in commercially unacceptable visible residues. Fungicides, some insecticide formulations, and some wetting agents and spreaders may kill the spores. Pollinator application method: For suppression. Uses a microbial inoculum dispenser that is attached to the front of the bumble bee hive. When used as directed, the impact on bees is minimal and is compatible with the release of some biological control agents, including <i>Aphidius colemani</i> , <i>Amblyseius swirskii</i> , <i>Encarsia formosa</i> and <i>Eretmocerus eremicus</i> . Do not release <i>Orius insidiosus</i> in the presence of bee-vectored BotaniGard 22WP. See label for more details. REI: Foliar: 4 hr; Bee-vectored: 0
	<i>Beauveria bassiana</i> PPRI 5339	Velifer	450–900 mL/ 1,000 L water	0	Apply in sufficient water volume for uniform coverage, but not to the point of runoff. Repeat application every 3–10 days. Use the higher concentration and shorter application intervals when pest population densities are high. May be harmful to beneficial insects and bees. REI: 4 hr
	<i>Metarhizium anisopliae</i> strain F52	Met52 EC	Foliar: 0.5–5 L/1,000 L water	0	Foliar application method: Reduces pest numbers. Use the higher application concentration when pest pressure is high. Repeat application every 5–10 days as needed. Spray to wet all foliage but not to the point of run-off. Do not apply through a thermal pulse fogger. REI: Re-entry into treated areas only after the spray has dried.

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WHITEFLIES (cont'd)						
NC	canola oil	Vegol Crop Oil*	1 part concentrate: 50 parts water (2% solution)	0	Apply at first sign of insect presence. Thoroughly spray plants until the plant parts are wet, including underside of leaves. Insects, including eggs, must be contacted with spray. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. REI: NS	
	mineral oil	Purespray Green Spray Oil 13E*	10 L/1,000 L water (1% solution)/ha	NS	Deters feeding. Apply when pest first appears. Repeat application every 7–14 days. For effective control, thorough coverage is essential. Do not exceed label rate, otherwise phytotoxicity may result. REI: 12 hr	
	potassium salts of fatty acids	Kopa Insecticidal Soap*	8 L/400 L water	1 part concentrate: 100 parts water	0	Spray early in morning or evening or when overcast. Combining this product with sulphur or applying this product within 3 days of sulphur application may increase the plant damage caused by sulphur on sensitive plants. Do not tank mix with sulphur when temperatures are higher than 32°C. REI: NS
		Neudosan Commercial*				
		Opal Insecticidal Soap*				
Opal2 Insecticidal Soap*						
Safer's Insecticidal Soap*						
NC + 3A	potassium salts of fatty acids + pyrethrins	Safer's Trounce Insecticidal Soap*	5 L/100 L water	1	Spray all plant surfaces as required by pest pressure at 2-week intervals. REI: NS	

¹ See Appendix F for IRAC group definitions.

Table 4–2. Products registered for greenhouse tomato diseasesFor more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”

FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
LEGEND: PHI = pre-harvest interval (in days) NS = no information was provided on the product label REI = re-entry interval					
* = product is potentially acceptable for organic production. Organic growers must always check with their certifying bodies to verify the acceptability of any product prior to using it.					
BACTERIAL CANKER (BACTERIAL STEM CANKER) (<i>Clavibacter michiganensis</i> subsp. <i>michiganensis</i>)					
24	kasugamycin	Kasumin 2L	1.2 L/240 L water/ha (100 ppm)	1	For suppression. Do not exceed 3 applications per season. Minimum interval between applications is 7 days. Do not exceed 2 sequential applications before switching to a product with a different mode of action. REI: 12 hr
M 01	copper hydroxide	Kocide 3000 DF*	1.86 kg (558 g a.i.)/ha	1	For suppression. Repeat applications to propagation house tomatoes every 5 days. Do not exceed 5 applications over a 4-week period. Repeat applications to production house tomatoes every 7–10 days. REI: 24 hr
	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	Repeat applications every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
	copper oxychloride	Copper Spray Fungicide WP*	3 kg/1,000 L water/ha	2	Apply early in the growing season. Repeat applications every 7–10 days. Do not exceed 10 applications per year. REI: 24 hr
NC	bacteriophage of <i>Clavibacter michiganensis</i> subsp. <i>michiganensis</i>	Agriphage — CMM*	Seedling treatment: 12 mL/100 m ² Production treatment: 40 mL/100 m ²	0	For suppression. Begin applications to seedlings (at the 4-leaf stage), immediately after planting or grafting. Repeat applications every 3–4 days. Apply prior to or at the early onset of disease development, or when conditions are conducive to heavy disease pressure, and continue throughout the growing season. Thorough coverage and wetting of all foliage is essential for effective disease control. REI: NS
	citric and lactic acid	Cyclone*	2.4% dilution in water solution	0	For suppression. Apply prior to, or at the early stages of disease development. Apply as foliar spray until runoff. Repeat applications every 5–10 days. Can leave white hydrosoluble residues on treated crop. Label recommends using a surfactant to achieve better coverage of leaves and better efficacy. REI: 4 hr
BACTERIAL SPECK (BACTERIAL BLIGHT) (<i>Pseudomonas syringae</i> pv. <i>tomato</i>)					
44	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	Taegro 2 WP*	187.5–375 g/ha in minimum of 187 L water	0	For partial suppression. Apply after emergence as a foliar spray. Repeat applications every 7–14 days when conditions are conducive to disease development. REI: 0
	<i>Bacillus subtilis</i> strain QST 713	Cease* Rhapsody ASO*	1–2 L/100 L water	0	For suppression. Begin application when environmental conditions are conducive to disease development. Repeat applications every 7–10 days as needed. REI: NS
M 01	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	Repeat applications every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
P 05	<i>Reynoutria sachalinensis</i> extract	Regalia Maxx*	1.25–2.5 mL/L water (0.125%–0.25% v/v)	0	For suppression. Begin applications at the first sign of disease or when conditions become conducive for disease development. Repeat applications every 7–10 days as needed. Use the shorter spray interval under high disease pressure. Spray to achieve complete coverage but not runoff. Do not apply in a spray volume of more than 1,500 L per hectare. REI: Re-entry into treated areas only after the spray has dried.

¹ See Appendix G for FRAC group definitions.

Table 4–2. Products registered for greenhouse tomato diseases

For more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”

FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
LEGEND: PHI = pre-harvest interval (in days) NS = no information was provided on the product label REI = re-entry interval					
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BACTERIAL SPECK (BACTERIAL BLIGHT) (<i>Pseudomonas syringae</i> pv. <i>tomato</i>) (cont'd)					
P 06	<i>Bacillus mycoides</i> isolate J	LifeGard WG*	0.33 g/L water	0	For partial suppression. Apply in sufficient volume to provide uniform coverage. Do not apply less than 70 g per hectare. Repeat applications every 7–14 days. REI: 4 hr
BACTERIAL SPOT (BACTERIAL BLIGHT, BACTERIAL LEAF SPOT) (<i>Xanthomonas campestris</i> pv. <i>vesicatoria</i>)					
24	kasugamycin	Kasumin 2L	1.2 L/240 L water/ha (100 ppm)	1	For suppression. Do not exceed 3 applications per season. Minimum interval between applications is 7 days. Do not exceed 2 sequential applications before switching to a product with a different mode of action. REI: 12 hr
44	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	Taegro 2 WP*	187.5–375 g/ha in minimum of 187 L water	0	For partial suppression. Apply after emergence as a foliar spray. Repeat applications every 7–14 days when conditions are conducive to disease development. REI: 0
M 01	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	Repeat applications every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
P 05	<i>Reynoutria sachalinensis</i> extract	Regalia Maxx*	1.25–2.5 mL/L water (0.125%–0.25% v/v)	0	For suppression. Begin applications at the first sign of disease or when conditions become conducive for disease development. Repeat applications every 7–10 days as needed. Use the shorter spray interval under high disease pressure. Spray to achieve complete coverage but not runoff. Do not apply in a spray volume of more than 1,500 L per hectare. REI: Re-entry into treated areas only after the spray has dried.
P 06	<i>Bacillus mycoides</i> isolate J	LifeGard WG*	0.33 g/L water	0	For suppression. Apply in sufficient volume to provide uniform coverage. Do not apply less than 70 g per hectare. Repeat applications every 7 days. REI: 4 hr
EARLY BLIGHT (<i>Alternaria solani</i>)					
7	fluopyram	Luna Privilege	150–300 mL/ha	0	Begin fungicide applications preventatively. Use sufficient water volume and spray pressure to provide thorough and uniform coverage. Use a higher rate when disease pressure is high or when conditions are favourable for disease development. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 6 weeks. Do not apply under low light conditions as crop injury may occur. Suggested spray volumes by crop height: 1.2 m: 1,000 L/ha 2.7 m: 1,000–1,500 L/ha REI: 12 hr
	penthiopyrad	Fontelis	1.25–1.75 L/ha	0	For suppression. Begin applications prior to disease development. Repeat application after 7–10 days. Use higher rate and shorter interval when disease pressure is high. Do not exceed 5.25 L per hectare per season. Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. REI: 12 hr

¹ See Appendix G for FRAC group definitions.

Table 4–2. Products registered for greenhouse tomato diseasesFor more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”

FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
LEGEND: PHI = pre-harvest interval (in days) NS = no information was provided on the product label REI = re-entry interval					
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EARLY BLIGHT (<i>Alternaria solani</i>) (cont'd)					
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	537–926 mL/ha (29–50 g a.i./ha)	0	For suppression. Apply as a foliar spray in sufficient water to provide thorough coverage of foliage (and fruit when present). Begin as preventative application when conditions favour disease development. Repeat application every 7–14 days as needed to maintain suppression. Do not apply more than 150 g a.i. per hectare per year. REI: Re-entry into treated areas only after the spray has dried.
44	<i>Bacillus amyloliquefaciens</i> strain D747	Double Nickel 55*	0.5–2 kg/ha	0	Apply from flowering to fruiting. Repeat application every 3–10 days (or 3–7 days under high disease pressure) for as long as conditions favour disease development. REI: Re-entry into treated areas only after the spray has dried.
		Double Nickel LC*	2.5–10 L/ha		
	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	Taegro 2 WP*	187.5–375 g/ha in minimum of 187 L water	0	For partial suppression. Apply after emergence as a foliar spray. Repeat applications every 7–14 days when conditions are conducive to disease development. REI: 0
46	tea tree oil	Timorex Gold*	1.5–1.88 L/ 400–1,200 L water/ha	2	For suppression. Do not spray during the warm hours of the day and in hot seasons with temperatures above 35°C. Do not apply through any type of irrigation system. Good coverage and wetting of foliage are required. For preventative treatments, repeat application every 7–14 days, depending on disease level. Use shorter application intervals under conditions that promote rapid disease development. Do not apply with captan or sulphur, which could cause phytotoxicity. REI: 24 hr
M 01	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	Repeat application every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
M 03	mancozeb	Manzate 200 WP	2.25 kg/ha	7	Repeat application every 7–12 days to keep new growth covered. REI: NS
		Manzate DF	2.4 kg/ha		Repeat application every 7–12 days to keep new growth covered. REI: 24 hr
		Manzate Pro-Stick			
P 06	<i>Bacillus mycoides</i> isolate J	LifeGard WG*	0.33 g/L water	0	For suppression. Apply in sufficient volume to provide uniform coverage. Do not apply less than 70 g per hectare. Repeat applications every 7 days. REI: 4 hr

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
GREY MOULD (BOTRYTIS BLIGHT, STEM CANKER) (<i>Botrytis cinerea</i>)					
2	iprodione	Rovral WP Rovral WDG	100 g/100 L water	2	Spray to run-off ensuring good coverage of the plants, particularly stem nodes, immediately following any pruning. Begin application at the first sign of disease. REI: 12 hr
7	fluopyram	Luna Privilege	Foliar: 500 mL/ha Drench: 40 mL/1,000 plants	0	Begin fungicide applications preventatively. Use sufficient water volume and spray pressure to provide thorough and uniform coverage. Do not exceed 2 applications per crop cycle. Minimum interval between applications is 6 weeks. Do not apply under low light conditions as crop injury may occur. Suggested spray volumes by crop height: 1.2 m: 1,000 L/ha 2.7 m: 1,000–1,500 L/ha Drench: Do not apply prior to flowering on the 9th truss or before March 1st. Apply as part of a normal irrigation cycle, late in the day on last watering. Avoid applications when conditions favour rapid growth. REI: 12 hr
	penthiopyrad	Fontelis	1.25–1.75 L/ha	0	Begin applications prior to disease development. Repeat application every 7–10 days. Use higher rate and shorter interval when disease pressure is high. Do not exceed 5.25 L per hectare per season. Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. REI: 12 hr
9	pyrimethanil	Scala SC	2 L/ha (800 g a.i./ha)	1	Apply at first sign of disease. Use a minimum spray volume of 250–600 L per hectare. Do not exceed 2 applications per growing season. Do not apply more than 1 application before alternating with a fungicide with a different mode of action. Ventilate for at least 2 hr after application. Proper ventilation after spraying is essential to avoid brown or necrotic spots that can be caused by the vapour activity of Scala SC. REI: 24 hr
17	fenhexamid	Decree 50 WDG	1.5 kg/ha (0.75 kg a.i./ha)	1	Begin application when conditions favour disease development. Do not exceed 3 applications per crop cycle. Fenhexamid-treated greenhouse tomatoes cannot be used for processing. REI: 4 hr
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	463–926 mL/ha (25-50 g a.i./ha)	0	For suppression. Apply as a foliar spray in sufficient water to provide thorough coverage of foliage (and fruit when present). Begin as a preventative application when conditions favour disease development. Repeat application every 7–10 days as needed to maintain suppression. Do not apply more than 150 g a.i. per hectare per year. REI: Re-entry into treated areas only after the spray has dried.

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Table 4–2. Products registered for greenhouse tomato diseasesFor more information on pesticide application, visit www.sprayers101.com — search keywords “greenhouse” or “airblast 101.”**LEGEND:** PHI = pre-harvest interval (in days)

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
GREY MOULD (BOTRYTIS BLIGHT, STEM CANKER) (<i>Botrytis cinerea</i>) (cont'd)					
44	<i>Bacillus amyloliquefaciens</i> strain D747	Double Nickel 55*	Foliar: 1.25–3.6 kg/ha Low disease pressure: 0.9–1 kg/ha	0	For suppression. Apply from flowering to fruit maturity. Repeat application every 3–10 days (or 3–7 days under high disease pressure) for as long as conditions favour disease development. REI: Re-entry into treated areas only after the spray has dried.
		Double Nickel LC*	Foliar: 6.25–18 L/ha Low disease pressure: 4.5–5 L/ha		
	<i>Bacillus subtilis</i> strain QST 713	Cease* Rhapsody ASO*	1–2 L/100 L water	0	For suppression. Begin application when environmental conditions are conducive to disease development. Repeat application every 7–10 days as needed. REI: NS
46	tea tree oil	Timorex Gold*	1.5–2 L/ 400–1,200 L water/ha	2	Do not spray during the warm hours of the day and in hot seasons with temperatures above 35°C. Do not apply through any type of irrigation system. Good coverage and wetting of foliage is required. For preventative treatments, repeat applications every 7–14 days as needed. Use shorter application intervals under conditions that promote rapid disease development. Do not apply with captan or sulphur, which could cause phytotoxicity. REI: 24 hr
7 + 11	boscalid + pyraclostrobin	Pristine WG	1.6 kg in a minimum of 250 L water/ha	0	One application will provide control for a period of 10–14 days, depending on disease pressure. Do not apply using any type of foggers or misters. Do not exceed 1 application per crop cycle. Do not use on plants that will be transplanted. REI: Re-entry into treated areas only after the spray has dried.
9 + 12	cyprodinil + fludioxonil	Palladium WG	775 g/ha in a minimum of 200–3,000 L water	1	First application should be made when disease first appears. Repeat application after 7–10 days. Do not exceed 2 applications per crop cycle. Test product on a small portion of the crop to ensure that a phytotoxic response will not occur. REI: 24 hr
BM 01	BLAD polypeptide	Fracture Problad Plus	1.5–3.3 L/ha in a minimum of 200 L water/ha	0	Begin applications prior to onset of disease development. Repeat applications every 7–10 days. Use a higher rate and shorter interval when disease pressure is moderate to high. Do not exceed 5 applications per crop cycle. REI: NS
BM 02	<i>Gliocladium catenulatum</i> strain J1446	Prestop*	0.5% aqueous suspension (25 g/5 L water)	NS	For suppression. Apply as a foliar spray treatment to plant stems and leaves. Spray to wet but not to run-off. Most effective when applied preventively, before disease starts. Repeat applications every 3–4 weeks, with shorter intervals used under conditions of moderate to high disease pressure. REI: 4 hr
	<i>Trichoderma harzianum</i> Rifai strain KRL-AG2	Bora HC* RootShield HC*	3.75–7.5 g/L water	NS	For suppression. Repeat application every 7–14 days as needed. REI: 4 hr For suppression. Use a quantity of spray solution to thoroughly cover foliage. Spray to wet but avoid run-off. Use higher rates when conditions favour disease development or high disease pressure is anticipated. REI: 4 hr

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
GREY MOULD (BOTRYTIS BLIGHT, STEM CANKER) (<i>Botrytis cinerea</i>) (cont'd)					
M3	ferbam	Ferbam 76 WDG	2 kg/1,000 L water	1	Apply at weekly intervals. REI: NS
P 05	<i>Reynoutria sachalinensis</i> extract	Regalia Maxx*	2.5 mL/L (0.25% v/v)	0	For suppression. Begin applications at the first sign of disease, or when conditions become conducive for disease development. Repeat application every 7–10 days as needed. Use the shorter spray interval under high disease pressure. Spray to achieve complete coverage but not runoff. Do not apply in a spray volume of more than 1,500 L per hectare. REI: Re-entry into treated areas only after the spray has dried.
NC	<i>Aureobasidium pullulans</i> DSM 14940 and DSM 14941	Botector*	1 kg/ha in 500–2,000 L water	0	Apply preventatively if climatic conditions are favourable for infection or at first sign of disease onset. Repeat application every 7–10 days as needed. Do not exceed 5 applications per year. REI: 4 hr
	hydrogen peroxide	StorOx*	Dilute 100 mL in 10 L water Apply 300–950 L of diluted product/ha	0	For suppression. Spray when disease first appears or when conditions are favourable for disease development. Good coverage and wetting of the foliage is required. Under severe disease conditions, reduce spray intervals and use stronger dilution rates. REI: Re-entry into treated areas only after the spray has dried.
	hydrogen peroxide and peroxyacetic acid	OxiDate* OxiDate 2.0*	100 mL/10 L water (1.0% v/v)	0	For suppression. Begin applications preventatively, at the first sign of disease, or when conditions are favourable for disease development. Repeat application every 7 days. Under severe disease conditions, repeat application every 5 days. Do not exceed 8 applications. REI: 4 hr
LEAF MOULD (<i>Cladosporium fulvum</i> (=Fulvia fulva))					
NC	hydrogen peroxide and peroxyacetic acid	OxiDate*	100 mL/10 L water (1.0% v/v)	0	For partial suppression. Begin applications preventatively or at the first sign of disease and/or when conditions are favourable for disease development. Repeat application every 7 days. Under severe disease conditions, repeat application every 5 days. Do not exceed 8 applications. REI: 4 hr
		OxiDate 2.0*			

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
PHYTOPHTHORA BLIGHTS (LATE BLIGHT, PHYTOPHTHORA FOLIAR BLIGHT)					
40	mandipropamid	Micora	400–600 mL/ha (100–150 g a.i./ha)	1	<i>Phytophthora infestans</i> Begin applications prior to disease development. Repeat applications every 7–10 days. Use of a non-ionic adjuvant (0.25% v/v) is recommended on the label. Do not exceed 4 applications per crop cycle. Water volumes guidelines: small crop (0.6 m), use 285 L/ha; medium crop (1.2 m), use 627 L/ha; large crop (2.7 m), use 1,200–1,400 L/ha
		Revus	400–600 mL/ha (100–150 g a.i./ha)	1	<i>Phytophthora capsici</i> (foliar phase), <i>Phytophthora infestans</i> Water volume guidelines: small crop (0.6 m), use 285 L/ha; medium crop (1.2 m), use 627 L/ha; large crop (2.7 m), use 1,200–1,400 L/ha. Applications should begin prior to disease development. Do not exceed 4 applications per season. REI: 12 hr
44	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	Taegro 2 WP*	375 g/935 L water/ha	0	<i>Phytophthora infestans</i> For suppression. Apply after emergence as a foliar spray. Repeat applications every 7 days when conditions are conducive to disease development. REI: 0
		Taegro WP*			
46	tea tree oil	Timorex Gold*	2–12 L/ 400–1,200 L water/ha	2	<i>Phytophthora infestans</i> For suppression. Do not spray during the warm hours of the day and in hot seasons with temperatures above 35°C. Do not apply through any type of irrigation system. Good coverage and wetting of foliage is required. For preventive treatments, repeat applications every 7–14 days, depending on disease level. Use shorter application intervals under conditions that promote rapid disease development. Do not apply with captan or sulphur, which could cause phytotoxicity. REI: 24 hr
49	oxathiapiprolin	Orondis	0.175–0.35 L/ha	0	<i>Phytophthora infestans</i>, <i>Phytophthora capsici</i> Foliar application only. Begin applications prior to disease development. Repeat applications every 5–14 days. Use the higher rate and shorter interval when disease pressure is high. Do not exceed 4 applications per crop cycle per year. Where multiple crop cycles are produced in the same year do not exceed 6 foliar applications or 1.4 L per hectare per year. Make no more than 2 sequential applications before switching to a fungicide with a different mode of action. REI: 12 hr
		Orondis Ultra B			
		Zorvec Enicade			
M 01	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	<i>Phytophthora infestans</i> Repeat application every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
M 03	mancozeb	Manzate 200 WP	2.25 kg/ha	7	Repeat applications every 7–12 days to keep new growth covered. REI: NS
		Manzate DF	2.4 kg/ha	7	Repeat applications every 7–12 days to keep new growth covered. REI: 24 hr
		Manzate Pro-Stick			
P 06	<i>Bacillus mycoides</i> isolate J	LifeGard WG*	0.33 g/L water	0	For suppression. Apply in sufficient volume to provide uniform coverage. Do not apply less than 70 g per hectare. Repeat applications every 7 days. REI: 4 hr

¹ See Appendix G for FRAC group definitions.

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
PHYTOPHTHORA BLIGHTS (LATE BLIGHT, PHYTOPHTHORA FOLIAR BLIGHT) (cont'd)					
P 07	mono- and dibasic sodium, potassium, and ammonium phosphites	Phostrol	2.9–5.8 L/ha in a minimum of 225 L water/ha	0	<i>Phytophthora capsici</i> For suppression. Begin applications when conditions favour disease development. Repeat applications every 7–14 days. Use the higher rate and shorter application interval when disease pressure is high. Do not exceed 4 applications per year. REI: Allow entry only after thorough ventilation, spray mist has cleared and the treated surface has dried.
	mono- and di-potassium salts of phosphorous acid	Confine Extra	5–10 L/ha in a minimum of 100 L water	1	<i>Phytophthora spp., Phytophthora infestans</i> For suppression. Do not exceed 5 foliar and/or chemigation applications per growing season. Begin applications when conditions are favourable for disease development. REI: Allow entry only after thorough ventilation, spray mist has cleared and the treated surface has dried.
		Rampart	Foliar: 3–8 L/1,000 L water/ha Drench: 5–7 L in a minimum of 1,000 L water	0	<i>Phytophthora capsici</i> For suppression. Use the higher rate and shorter application interval when disease pressure is high. Foliar: Apply lower rate every 2–4 weeks after plants become established. Drench: Apply with normal irrigation schedule. REI: 4 hr. After REI, re-entry into treated areas is only permitted after thorough ventilation, spray mist has cleared and the treated surface has dried.
NC	garlic powder	Influence WP*	6.9 kg/1,000 L water/ha	0	<i>Phytophthora infestans</i> May inhibit symptoms when used in conjunction with integrated pest management strategies. Apply preventively at first signs of disease. May be applied to crop foliage or to the substrate surface, depending on the targeted disease. Repeat applications every 7–14 days. REI: Re-entry into treated areas only after the spray has dried.
POWDERY MILDEW					
3	myclobutanil	Nova WSP	340 g/1,000 L water/ha	3	Do not exceed 1 application per crop cycle. Apply as soon as possible after initial infection. REI: 12 hr
7	fluopyram	Luna Privilege	100 mL/ha	0	<i>Leveillula taurica</i> Begin fungicide applications preventatively. Use sufficient water volume and spray pressure to provide thorough and uniform coverage. Do not exceed 3 applications per crop cycle. Minimum interval between applications is 6 weeks. Do not apply under low light conditions as crop injury may occur. Suggested spray volumes by crop height: 1.2 m: 1,000 L/ha 2.7 m: 1,000–1,500 L/ha REI: 12 hr

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
POWDERY MILDEW (cont'd)					
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	278–926 mL/ha (15–50 g a.i./ha)	0	<i>Oidium neolycopersici</i> Apply as a foliar spray in sufficient water to provide thorough coverage of foliage (and fruit when present). Begin as preventative application when conditions favour disease development. Repeat application every 7–14 days as needed to maintain suppression. Use a higher rate under conditions of high disease pressure. Do not exceed 150 g a.i. per hectare per year. REI: Re-entry into treated areas only after the spray has dried.
44	<i>Bacillus subtilis</i> var. <i>amyloliquefaciens</i> strain FZB24	Taegro 2 WP*	187.5–375 g/ha in minimum of 187 L water	0	<i>Leveillula taurica</i>, <i>Oidium neolycopersici</i> For partial suppression. Apply after emergence as a foliar spray. Repeat applications every 7–14 days when conditions are conducive to disease development. REI: 0
46	tea tree oil	Timorex Gold*	2–12 L/ 400–1,200 L water/ha	2	<i>Leveillula taurica</i>, <i>Oidium lycopersici</i>, <i>O. neolycopersici</i> Do not spray during the warm hours of the day and in hot seasons with temperatures above 35°C. Do not apply through any type of irrigation system. Good coverage and wetting of foliage is required. For preventive treatments, repeat applications every 7–14 days, depending on disease level. Use shorter application intervals under conditions that promote rapid disease development. Do not apply with captan or sulphur, which could cause phytotoxicity. REI: 24 hr
7 + 11	boscalid + pyraclostrobin	Pristine WG	1.6 kg in a minimum of 250 L water/ha	0	<i>Erysiphe polygoni</i>, <i>Leveillula taurica</i>, <i>Oidium lycopersici</i> For suppression. Do not apply using any type of foggers or misters. Do not exceed 1 application per crop cycle. Do not use on plants that will be transplanted. REI: Re-entry into treated areas only after the spray has dried.
9 + 12	cyprodinil + fludioxonil	Palladium WG	775 g/ 200–3,000 L water/ha	1	<i>Oidium lycopersici</i>, <i>O. neolycopersici</i> First application should be made when disease first appears. Repeat application every 7–10 days. The shorter interval should be used when disease pressure is expected to be high. Make no more than 2 sequential applications before alternating with a treatment with another mode of action. Do not exceed 3 applications per crop cycle. REI: 24 hr
M 02	sulphur	Agrotek Vaporized Sulphur*	0.4–3.2 g/1,000 m ²	NS	<i>Oidium lycopersici</i> Use 1 vaporizer/1,000 m ² . Start using before plants show signs of infection. Use for 1–8 hr per night, 2–7 days/week. Do not apply if temperature is above 24°C and high humidity prevails. Certain species of beneficial insects are sensitive to sulphur. REI: 2 hr
		Bartlett Microscopic Wettable Sulphur*	750 g/1,000 L water/ha	1	Do not exceed 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. May cause slight foliar phytotoxicity. REI: 24 hr

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
POWDERY MILDEW (cont'd)					
P 05	<i>Reynoutria sachalinensis</i> extract	Regalia Maxx*	1.25–2.5 mL/L water (0.125%–0.25% v/v)	0	<i>Erysiphe cichoracearum, Leveillula taurica, Oidium neolycopersici</i> For suppression. Begin applications at the first sign of disease, or when conditions become conducive for disease development. Repeat application every 7–10 days as needed. Use the shorter spray interval under high disease pressure. Spray to achieve complete coverage but not runoff. Do not apply in a spray volume of more than 1,500 L per hectare. REI: Re-entry into treated areas only after the spray has dried.
NC	garlic powder	Influence LC*	1.8% with high volume sprayer	0	<i>Oidium neolycopersici</i> For suppression. Apply preventively or at first signs of disease. Repeat applications every 7–10 days. Ensure thorough coverage of foliage. Do not exceed 18 L per hectare. Do not use with ultra-low-volume sprayers. REI: Re-entry into treated areas only after the spray has dried.
		Influence WP*	6.9 kg/1,000 L water/ha	0	<i>Oidium neolycopersici</i> For suppression. Apply preventively at first signs of disease. May be applied to crop foliage or to the substrate surface, depending on the targeted disease. Repeat applications every 7–14 days. REI: Re-entry into treated areas only after the spray has dried.
	mineral oil	Purespray Green Spray Oil 13E*	10 L/1,000 L water (1% solution)/ha	NS	<i>Leveillula taurica</i> For suppression. Apply when conditions are favourable for disease development and/or when first symptoms appear. Repeat applications every 7–14 days. For effective control, thorough coverage is essential. Do not exceed label rate, otherwise phytotoxicity may result. REI: 12 hr
	potassium bicarbonate	MilStop*	5.6 kg/2,000 L water/ha	0	<i>Leveillula taurica, Oidium lycopersici</i> Start application at first sign of disease. Uniform and complete coverage of the foliage is essential for the most effective results. Number of applications will depend on disease pressure. Repeat application every 7 days. Do not exceed 10 applications per season. Do not apply through any type of irrigation system. REI: 4 hr
		Sirocco*	5.6 kg/ha	0	<i>Leveillula taurica, Oidium lycopersicum</i> Begin applications at the first sign of disease or when conditions are conducive to disease development. Label recommended spray volume is 1,000–2,000 L per hectare. Repeat application every 7 days. Do not exceed 10 applications per year. REI: 4 hr
	<i>Streptomyces lydicus</i> strain WYEC 108	Actinovate SP	425–840 g/ 700 L water/ha	NS	<i>Leveillula taurica, Oidium lycopersici</i> For suppression. Make the first application when conditions are conducive to disease development. Repeat application every 7–14 days. Use the shorter application interval under high disease pressure. Spray to wet but not to the point of run-off. REI: Re-entry into treated areas only after the spray has dried.

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
SEPTORIA LEAF SPOT					
M 01	copper octanoate	Cueva Commercial*	0.5%–2% solution applied at 470–940 L/ha	1	Septoria lycopersici Repeat application every 5–10 days. Do not exceed 15 applications per year. If concerned about sensitivity of plants, apply to individual plants or small areas to determine if plant damage occurs. REI: 4 hr
M 03	mancozeb	Manzate 200 WP	2.25 kg/ha	7	Repeat application every 7–12 days to keep new growth covered. REI: NS
		Manzate DF	2.4 kg/ha		Repeat application every 7–12 days to keep new growth covered. REI: 24 hr
		Manzate Pro-Stick			
ROOT DISEASES					
ROOT ROTS (DAMPING OFF)					
21	cyazofamid	Torrent 400SC	30 mL/100 L water	60	Pythium spp. Apply as a soil drench to thoroughly wet the growing medium immediately after seeding. Do not exceed 1 application. Do not use any surfactant. REI: 12 hr
28	propamocarb hydrochloride	Previcur N	10 mL/10 L water Apply solution at a rate of 100–200 mL/plant	1	Pythium spp. Do not mix with other products. Prevent intense sunlight after application. Do not exceed 4 applications per crop cycle. Do not exceed 2 seeding/seedling applications per crop cycle. Do not exceed 2 after-transplanting applications per crop cycle. The higher rate should be used for second and third application. REI: 12 hr
44	<i>Bacillus subtilis</i> strain MBI 600	Serifel*	50 g/12.5 L water/ 21.9 m ³ growing media	NS	Fusarium spp., Pythium spp., Rhizoctonia solani For suppression. Prior to planting, apply as a spray while suspended onto 21.9 m ³ of plant growing media (potting soil, peat moss or peat-based mixtures). Mix thoroughly to ensure adequate distribution of the product. REI: NS

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ROOT ROTS (DAMPING OFF) (cont'd)					
BM 02	<i>Gliocladium catenulatum</i> strain J1446	Prestop*	0.5% aqueous suspension (25 g/5 L water) See Remarks.	NS	Pythium spp., Rhizoctonia solani For suppression. Apply as a growing media treatment or as a drench treatment. Most effective when applied preventively, before disease starts. Treat the growing media prior to seeding, transplanting or potting, or else make a drench application immediately after seeding, transplanting or potting. Additional applications can be made as a drench. Repeat applications every 3–6 weeks, with shorter intervals used under conditions of moderate-to-high disease pressure. REI: 4 hr Growing media: 125–250 mL of suspension/10 L growing media Soil drench: 20 L suspension/10 m ² growing media
	<i>Streptomyces lydicus</i> strain WYEC 108	Actinovate SP	See Remarks.	NS	Pythium spp. For suppression. Apply as a seed treatment through mist-type commercial seed treatment equipment, slurry or other comparable methods that provide thorough coverage of treated seeds. Prior to planting, dissolve product in water and spray directly on seed. For hydroponic systems, apply solution to the growing media or apply as a soil drench. Repeat application every 7–14 days. REI: Re-entry into treated areas only after the spray has dried. Seed treatment: 7.5–42 g/300 mL water/kg of seed Hydroponic systems: 420–840 g/ha Soil drench: 42–84 g/100 L water/m ³ of growing media
	<i>Streptomyces</i> strain K61	Mycostop WP*	See Remarks.	NS	Fusarium spp. For suppression. Apply immediately after transplanting. Repeat applications every 3–6 weeks. For seedling production, apply first spray after emergence using lower rate. REI: NS Rockwool: 5–10 mg/plant (for spraying and drenching, use 10–20 mL/plant of 0.05% suspension) Beds: 5–10 g/100 m ² (for spraying and drenching, use 0.1–0.2 L/m ² of 0.05% suspension)
	<i>Trichoderma harzianum</i> Rifai strain KRL-AG2 and <i>Trichoderma virens</i> strain G-41	BW240 WP	30–60 g/100 L water/m ² of soil/potting mixture surface	0	Fusarium spp., Phytophthora spp., Pythium spp., Rhizoctonia spp. For suppression. Apply immediately after sowing seed or planting. Repeat application after 8–10 weeks if conditions are favourable for disease development. Do not use overhead boom chemigation for second application or after the four-leaf stage. Use a higher rate and shorter interval when disease pressure is high. REI: 4 hr

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ROOT ROTTS (DAMPING OFF) (cont'd)					
M 04	captan	Captan 50 WP	2.5 kg/1,000 L water applied at rates of 50–85 L/100 m ²	NS	Use as a soil treatment. Work into the upper 7.5–19 cm of soil before planting. REI: 48 hr
		Captan 80 WP	1.5 kg/1,000 L water applied at rates of 50–85 L/100 m ²	NS	Use as a soil treatment. Work into the upper 7.5–10 cm of soil before planting. REI: 48 hr
		Maestro 80 DF	1.25 kg/1,000 L water applied at rates of 50–85 L/100 m ²		
		Supra Captan 80 WP			
NC	garlic powder	Influence WP*	10–20 kg/ 1,000 L water/300 m ²	0	Pythium spp., Rhizoctonia solani For partial suppression. Apply as a drench to the substrate surface at seeding. Use the higher rate under high disease pressure or when conditions are conducive to disease development. REI: Do not enter treated area until spray is dried.
ROOT ROTTS (CROWN AND ROOT ROT, ROOT AND STEM ROT, ROOT AND STEM WILT)					
28	propamocarb hydrochloride	Previcur N	10 mL/10 L water Apply solution at a rate of 100–200 mL/plant.	1	Pythium spp. Do not mix with other products. Prevent intense sunlight after application. Do not exceed 4 applications per crop cycle. Do not exceed 2 seeding/seedling applications per crop cycle. Do not exceed 2 after-transplanting applications per crop cycle. The higher rate should be used for second and third application. REI: 12 hr
40	mandipropamid	Revus	600 mL/ha (150 g a.i./ha)	1	Phytophthora capsici (soil phase) Applications should begin prior to disease development. Do not exceed 4 applications per season. REI: 12 hr
44	<i>Bacillus subtilis</i> strain MBI 600	Serifel*	50 g/12.5 L water/ 21.9 m ³ growing media	NS	Fusarium spp., Pythium spp., Rhizoctonia solani For suppression. Prior to planting, apply as a spray while suspended onto 21.9 m ³ of plant growing media (potting soil, peat moss or peat-based mixtures). Mix thoroughly to ensure adequate distribution of the product. REI: NS

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ROOT ROTS (CROWN AND ROOT ROT, ROOT AND STEM ROT, ROOT AND STEM WILT) (cont'd)					
BM 02	<i>Gliocladium catenulatum</i> strain J1446	Prestop*	0.5% aqueous suspension (25 g/5 L water) See Remarks.	NS	Pythium spp. For suppression. Apply as a growing media treatment or as a drench treatment. Most effective when applied preventively, before disease starts. Treat the growing media prior to seeding, transplanting or potting, or make a drench application immediately after seeding, transplanting or potting. Additional applications can be made as a drench. Repeat applications every 3–6 weeks, with shorter intervals used under conditions of moderate-to-high disease pressure. REI: 4 hr Rates: Growing media: 125–250 mL of suspension/10 L growing media Soil drench: 20 L suspension/10 m ² growing media
	<i>Streptomyces lydicus</i> strain WYEC 108	Actinovate SP	See Remarks.	NS	For suppression. Apply as a seed treatment through mist-type commercial seed treatment equipment, slurry or other comparable methods that provide thorough coverage of treated seeds. Prior to planting, dissolve product in water and spray directly on seed. For hydroponic systems, apply solution to the growing media or apply as a soil drench. Repeat application every 7–14 days. REI: Re-entry into treated areas only after the spray has dried. Rates: Seed treatment: 7.5–42 g/300 mL water/kg of seed Hydroponic systems: 420–840 g/ha Soil drench: 42–84 g/100 L water/m ³ of growing media
	<i>Streptomyces</i> strain K61	Mycostop WP*	See Remarks.	NS	Fusarium spp., Phytophthora spp. For suppression. Apply immediately after transplanting. Repeat application every 3–6 weeks. For seedling production, apply first spray after emergence using lower rate. REI: NS Rates: Rockwool: 5–10 mg/plant (for spraying and drenching, use 10–20 mL/plant of 0.05% suspension) Beds: 5–10 g/100 m ² (for spraying and drenching, use 0.1–0.2 L/m ² of 0.05% suspension)
	<i>Trichoderma harzianum</i> Rifai strain KRL-AG2	RootShield Granules*	600–750 g/m ³ (loose) planting mix or soil	NS	Fusarium spp., Pythium spp., Rhizoctonia spp. For suppression. For best results, thoroughly incorporate granules during mix preparation or pot filling, or incorporate into planting beds by raking or tilling. REI: 4 hr
		Bora HC*	Drench: 55–110 g/m ³	NS	Fusarium spp., Pythium spp., Rhizoctonia spp. For suppression. Can be applied through low-pressure watering nozzles such as fan nozzles or other watering systems. REI: 4 hr
		Bora WP*			
		RootShield HC*			
	RootShield WP*				

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FRAC ¹ Group	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ROOT ROTTS (CROWN AND ROOT ROT, ROOT AND STEM ROT, ROOT AND STEM WILT) (cont'd)					
BM 02 (cont'd)	<i>Trichoderma harzianum</i> Rifai strain T-22	Trianium G*	See Remarks.	NS	<i>Fusarium oxysporum</i> For suppression. For the best results, begin use from propagation onwards, before occurrence of disease. Mix evenly in growing medium before filling seed trays at propagation and transplanting. REI: NS Rates: Before filling seed trays or containers: 750 g/m ³ Subsequent applications at transplanting or repotting: 375 g/m ³ Crops on substrate, when transplanting: 1 g/planting hole
		Trianium P*	See Remarks.	NS	<i>Fusarium oxysporum</i> For suppression. Sowing application method: For the best results, begin use from propagation onwards, before occurrence of disease. Transplanting high crop density: Use a water volume equivalent to 10% of the substrate volume or 2–5 L/m ² . Low crop density: Use a water volume equivalent to 10% of the substrate volume or 100 L/1,000 plants. REI: NS Rates: Sowing: 1.5 g/m ² of cultivated area, suspended in 2.5–5 L water Transplanting high crop density: 3 g/m ² of cultivated area (1.5 g/m ² if plants have been treated previously) Transplanting low crop density: 30 g/1,000 plants (15 g/1,000 plants if plants have been treated previously).
M 04	captan	Captan 50 WP	2.5 kg/1,000 L water applied at rates of 50–85 L/100 m ²	NS	Use as a soil treatment. Work into the upper 7.5–19 cm of soil before planting. REI: 48 hr
		Captan 80 WP	1.5 kg/1,000 L water applied at rates of 50–85 L/100 m ²	NS	Use as a soil treatment. Work into the upper 7.5–10 cm of soil before planting. REI: 48 hr
		Maestro 80 DF	1.25 kg/1,000 L water applied at rates of 50–85 L/100 m ²		
		Supra Captan 80 WP			

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ROOT ROTS (CROWN AND ROOT ROT, ROOT AND STEM ROT, ROOT AND STEM WILT) (cont'd)					
P 07	mono- and dibasic sodium, potassium, and ammonium phosphites	Phostrol	2.9–5.8 L/ha in a minimum of 225 L water/ha	0	Phytophthora spp., Pythium spp. For suppression. Begin applications when conditions favour disease development. Repeat applications every 7–14 days. Use the higher rate and shorter application interval when disease pressure is high. Do not exceed 4 applications per year. REI: Allow entry only after thorough ventilation and spray mist has cleared and the treated surface has dried.
	mono- and di-potassium salts of phosphorous acid	Confine Extra	5–10 L/ha in a minimum of 100 L water	1	Pythium spp. For suppression. Do not exceed 5 foliar and/or chemigation applications per growing season. Begin applications when conditions are favourable for disease. REI: Allow entry only after thorough ventilation and spray mist has cleared and the treated surface has dried.
		Rampart	Foliar: 3–8 L/1,000 L water/ha Drench: 5–7 L in a minimum of 1,000 L water	0	Phytophthora spp., Pythium spp. For suppression. Use the higher rate and shorter application interval when disease pressure is high. Foliar: Apply lower rate every 2–4 weeks after plants become established. Drench: Apply with normal Irrigation schedule. REI: 4 hr. After REI, re-entry into treated areas is only permitted after thorough ventilation, spray mist has cleared and the treated surface has dried.
NC	garlic powder	Influence WP*	10–20 kg/ 1,000 L water/300 m ²	0	Pythium spp., Rhizoctonia solani For partial suppression. Apply as a drench to the substrate surface at seeding. Use the higher rate under high disease pressure or when conditions are conducive to disease development. REI: Re-entry into treated areas only after the spray has dried.

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