9. Strawberries

Products registered for greenhouse strawberry insect and mite pests are listed in Table 9–1.
Products registered for greenhouse strawberry diseases are listed in Table 9–2.

Table 9–1. Products registered for greenhouse strawberry 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.

IRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
APHIDS					
29	flonicamid	Beleaf 50 SG	0.3 g/L water	0	Apply when pests first appear and before populations reach high levels. Do not exceed 1 application per crop cycle. Thorough spray coverage of plant foliage is essential for optimum control. Use a maximum spray volume of 650 L. Do not apply using fogging or ultra low-volume equipment. Do not apply using handheld mistblowers or handheld airblast equipment. This product will stop pest feeding rapidly but it may take several days to see a reduction in pest numbers. **REI: 12 hr**
UNF	*Beauveria bassiana* strain GHA	BotaniGard 22WP	250–500 g/400 L water	0	Spray to wet but not to the point of 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. **REI: 4 hr**
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. Do not use when temperatures are high. **REI: NS**
	potassium salts of fatty acids	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**

[1] See Appendix F for IRAC group definitions.

Table 9–1. Products registered for greenhouse strawberry 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.

IRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
EARWIGS					
NC	potassium salts of fatty acids	Safer's Insecticidal Soap Concentrate*	1 part concentrate: 50 parts water	0	Insects must be sprayed directly to achieve proper control. **REI: NS**
LEAFROLLERS					
11A	*Bacillus thuringiensis* subsp. *kurstaki* strain ABTS-351	DiPel 2X DF*	525–1,125 g/600 L water/ha	0	**Fruittree leafroller, European leafroller, Obliquebanded leafroller, Three-lined leafroller** Apply at egg hatch to target young larvae (early instars). Repeat applications every 3–14 days. **REI: NS**
	Bacillus thuringiensis subsp. *kurstaki* strain EVB113-19	Bioprotec CAF*	1.4–2.8 L/ha	0	**Fruittree leafroller, European leafroller, Obliquebanded leafroller** Begin applications when larvae are young (early instar) before crop is damaged. Apply in sufficient volume to provide thorough coverage. Repeat applications every 3–14 days.
LYGUS BUGS					
29	flonicamid	Beleaf 50 SG	0.3 g/L water	0	**Tarnished plant bug (*Lygus lineolaris*)** Apply when pests first appear and before populations reach high levels. Do not exceed 1 application per crop cycle. Thorough spray coverage of plant foliage is essential for optimum control. Use a maximum spray volume of 650 L. Do not apply using fogging or ultra low-volume equipment. Do not apply using handheld mistblowers or handheld airblast equipment. This product will stop pest feeding rapidly but it may take several days to see a reduction in pest numbers. **REI: 12 hr**
MEALYBUGS					
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. Do not use when temperatures are high. **REI: NS**
	potassium salts of fatty acids	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**

[1] See Appendix F for IRAC group definitions.

Table 9–1. Products registered for greenhouse strawberry 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

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IRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
MITES					
UNF	*Metarhizium anisopliae* 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. Spray to wet all foliage, but not to the point of run-off. Do not apply through a thermal pulse fogger. **REI: Re-enter into treated areas only after spray is dried.**
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. Do not use when temperatures are high. **REI: NS**
	potassium salts of fatty acids	Safer's Insecticidal Soap Concentrate*	1 part concentrate: 50 parts water	0	**Two-spotted spider mite (*Tetranychus urticae*)** Insects must be sprayed directly to achieve proper control. Repeat application every week for 2–3 weeks. **REI: NS**
PSYLLIDS					
NC	potassium salts of fatty acids	Safer's Insecticidal Soap Concentrate*	1 part concentrate: 50 parts water	0	Insects must be sprayed directly to achieve proper control. **REI: NS**
SCALES					
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. Do not use when temperatures are high. **REI: NS**
THRIPS					
UNF	*Beauveria bassiana* strain GHA	BotaniGard 22WP	500–1,000 g/400 L water	0	Spray to wet but not to the point of 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. **REI: 4 hr**
	Metarhizium anisopliae 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-enter into treated areas only after spray has dried.**

[1] See Appendix F for IRAC group definitions.

Table 9–1. Products registered for greenhouse strawberry 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

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IRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
WHITEFLIES					
UNF	*Beauveria bassiana* strain GHA	BotaniGard 22WP	250–500 g/400 L water	0	Spray to wet but not to the point of 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. **REI: 4 hr**
	Metarhizium anisopliae 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. Spray to wet all foliage but not to the point of run-off. Do not apply through a thermal pulse fogger. **REI: Re-enter into treated areas only after spray has dried.**
NC	potassium salts of fatty acids	Safer's Insecticidal Soap Concentrate*	1 part concentrate: 100 parts water	0	Insects must be sprayed directly to achieve proper control. Spray all plant surfaces thoroughly at 2-week intervals. **REI: NS**

[1] See Appendix F for IRAC group definitions.

Table 9–2. Products registered for greenhouse strawberry diseases

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

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FRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ANTHRACNOSE (*Colletotrichum acutatum*)					
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	463–926 mL/ha (25–50 g a.i./ha)	0	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 control. Do not apply more than 150 g a.i. per hectare per year. **REI: Re-enter into treated areas only after spray has dried.**
NC	*Aureobasidium pullulans* 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 6 applications per year. **REI: 4 hr**
GREY MOULD (BOTRYTIS BLIGHT) (*Botrytis cinerea*)					
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	259–926 mL/ha (14–50 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-enter into treated areas only after spray has dried.**
44	*Bacillus amyloliquefaciens* strain D747	Double Nickel 55*	**Foliar:** 1–2.5 kg/ha **Low disease pressure:** 0.6–1 kg/ha	0	For suppression. Apply at or just before flowering until 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-enter into treated areas only after spray has dried.**
		Double Nickel LC*	**Foliar:** 5–12.5 L/ha **Low disease pressure:** 3–5 L/ha		
BM 01	BLAD polypeptide	Fracture Problad Plus	1.5–3.3 L/ha	0	Begin applications at early bloom. Repeat applications every 7–10 days if conditions favour disease development. 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	*Streptomyces lydicus* strain WYEC 108	Actinovate SP	425 g/1,100 L water/ha	NS	For suppression. Make the first application when conditions are conducive to disease development. Apply to foliage and blossoms. Repeat application every 7–14 days. Use the shorter application interval under high disease pressure. **REI: Re-enter into treated areas only after spray has dried.**
	Trichoderma harzianum Rifai strain KRL-AG2	Bora HC* RootShield HC*	10 g/L water	NS	For suppression. Repeat application every 7–14 days as needed. **REI: 4 hr**

[1] See Appendix G for FRAC group definitions.

Table 9–2. Products registered for greenhouse strawberry diseases

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

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FRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
GREY MOULD (BOTRYTIS BLIGHT) (*Botrytis cinerea*) (cont'd)					
P 05	*Reynoutria sachalinensis* extract	Regalia Maxx*	0.25% v/v in 500–1,000 L water/ha	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. 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-enter into treated areas only after spray has dried.**
NC	*Aureobasidium pullulans* 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 6 applications per year. **REI: 4 hr**
LEATHER ROT					
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 cactorum*** For suppression. Begin applications at 10% bloom and early fruit set. 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	Rampart	**Foliar:** 3–8 L/1,000 L water/ha **Drench:** 5–7 L in a minimum of 1000 L water	0	***Phytophthora cactorum*** 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.**
PHOMOPSIS LEAF BLIGHT (PHOMOPSIS OBSCURANS)					
NC	*Aureobasidium pullulans* DSM 14940 and DSM 14941	Botector*	1 kg/ha in 500–2,000 L water	0	For partial suppression. 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 6 applications per year. **REI: 4 hr**

[1] See Appendix G for FRAC group definitions.

Table 9–2. Products registered for greenhouse strawberry diseases

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FRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
POWDERY MILDEW					
19	polyoxin D zinc salt	Polyoxin D Zinc Salt 5SC	259–926 mL/ha (14–50 g a.i./ha)	0	***Podosphaera aphanis*** 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-enter into treated areas only after spray has dried.**
44	*Bacillus amyloliquefaciens* strain D747	Double Nickel 55*	**Foliar:** 1–2.5 kg/ha **Low disease pressure:** 0.5–1 kg/ha	0	***Sphaerotheca macularis*** For suppression. Apply at or just before flowering until fruit maturity. Repeat application every 7–10 days (or 3–7 days under high disease pressure) for as long as conditions favour disease development. **REI: Re-enter into treated areas only after spray has dried.**
		Double Nickel LC*	**Foliar:** 5–12.5 L/ha **Low disease pressure:** 2.5–5 L/ha		
BM 01	BLAD polypeptide	Problad Plus Fracture	1.5–3.3 L/ha	0	***Sphaerotheca aphanis (syn. S. macularis)*** For suppression. Begin applications at early bloom. Repeat applications every 7–10 days if conditions favour disease development. 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	*Streptomyces lydicus* strain WYEC 108	Actinovate SP	425 g/1,100 L water/ha	NS	***Sphaerotheca macularis*** For suppression. Make the first application when conditions are conducive to disease development. Apply to foliage and blossoms. Repeat application every 7–14 days. Use the shorter application interval under high disease pressure. **REI: Re-enter into treated areas only after spray has dried.**
M 02	sulphur	Agrotek Vaporized Sulphur	0.4–3.2 g/1,000 m^2	NS	***Sphaerotheca macularis*** Use 1 vaporizer per 1,000 m^2. Start using before plants show signs of infection. Use for 1–8 hr per night, 2–7 days per 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**
P 05	*Reynoutria sachalinensis* extract	Regalia Maxx*	0.125%–0.25% v/v in 500–1,000 L water/ha	0	***Sphaerotheca macularis*** 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-enter into treated areas only after spray has dried.**
NC	potassium bicarbonate	Sirocco*	2.8–5.6 kg/ha	0	***Sphaerotheca macularis*** For suppression. Begin applications at the first sign of disease or when conditions are conducive to disease development. Label recommended spray volume is 1,000 L per hectare. Repeat application every 7–14 days. **REI: 4 hr**

[1] See Appendix G for FRAC group definitions.

Table 9–2. Products registered for greenhouse strawberry diseases

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FRAC Group[1]	Common Name/ Active Ingredient	Trade Name/ Formulation	Rate	PHI	Remarks
ROOT DISEASE					
ROOT ROTS (DAMPING OFF)					
BM 02	*Trichoderma harzianum* Rifai strain KRL-AG2 and *Trichoderma virens* 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 planting. Repeat application after 8–10 weeks if the disease is expected. 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**
ROOT ROTS (CROWN AND ROOT ROT, ROOT AND STEM ROT, ROOT AND STEM WILT)					
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 at 10% bloom and early fruit set. 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	4–5 L/ha in a minimum of 100 L water	1	***Phytophthora* spp., *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, 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	canola oil	Vegol Crop Oil*	1 part concentrate: 50 parts water (2% solution)	0	Begin applications when conditions are favourable for disease development or when disease first appears. Do not exceed 4 applications per year. Minimum interval between applications is 7 days. Toxic to beneficial insects. Do not use when temperatures are high. **REI: NS**

[1] See Appendix G for FRAC group definitions.