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ENY-689

# Pesticide Options for Insect, Mite, and Mollusk Management in Commercial Strawberry Production in Florida[1]

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Florida growers produce primarily fresh market strawberries that were valued at $366.3 million in 2010–11, harvested from 9,900 acres (Florida Agriculture Statistical Bulletin 2011). More than 95% of the crop is produced near Plant City, with smaller production areas in north Florida and around Homestead, FL.

Major early-season arthropod pests include lepidopterous larvae, twospotted spider mites, and aphids, some of which may accompany the transplants from their origin. By mid-season and later, major concerns are with twospotted spider mites, thrips, fruit (vinegar) flies and sap beetles. Pameras (seed bugs) add to the concern and may evoke complaints when they accompany berries to markets. Now spotted wing drosophila flies can be present to damage fruit or to reproduce and damage the blueberry crop that follows strawberries. Widow spiders sometimes are problems in fields where broad spectrum insecticides are infrequently used.

Effective management of arthropod and gastropod pests of strawberry is critical to the profitability of the industry and requires that pests be detected in a timely manner through systematic scouting. Appropriate control measures should be applied as conditions warrant.

Biological control measures have been developed for management of twospotted spider mites and are practiced by a portion of the industry. Information on biological control of insects and mites in strawberry production is available at http://edis.ifas.ufl.edu/HS180. Toxicity information for many pesticides used in Florida strawberry production to commercially available predators of spider mites is summarized at http://side-effects.koppert.nl/.

The tables in this document list pesticides that are presently available to commercial strawberry producers in Florida and are organized alphabetically by the following major pest groups:

Ants

Aphids

Armyworms

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Beetles and weevils

Caterpillars (including budworms, earworms, leafrollers, leaftiers, lesser cornstalk borer and loopers)

Crickets

Fruit flies (vinegar flies) and spotted wing drosophila

Grubs

Mites

Mole crickets

Pameras

Plant (*Lygus*) bugs

Snails and slugs

Spiders

Thrips

Available pesticides for strawberry include beneficial nematode and microbial insecticides, which are components of biological control. For each pest group listed, products available for control are presented by the active ingredient's common name. Usually only one or a few examples of each formulation are given; however, there may be other products as effective as those listed. Notes taken from labels are provided to qualify some uses. More information about pesticide products can be found on electronic versions of specimen labels which are usually available at the websites of CDMS (http://www.cdms.net/manuf/default.asp), C&P Press (http://www.greenbook.net/) or the affiliated manufacturer. The product label communicates the lawful use of the product and must be read, understood and followed. A label may contain important limitations that are not presented here, and it remains the pesticide applicator's legal responsibility to read and follow all label instructions on the container of the specific pesticide being used.

Many pesticides decompose in the spray tank when mixed with water above pH 7. Growers should test the pH of their water and, when above 7, should add a buffering solution to maintain pH between 6.5 and 7. When using a pesticide for the first time, it is important to test the product first on a small portion of the crop and check for any possible detrimental effects over time, such as leaf distortion and plant stunting.

This summary is only a guide to aid in the proper selection of pesticides. Care has been given to provide accurate and up-to-date information, but it is possible that, through label changes, error, etc., improper uses may be indicated.

As an additional precaution, keep the telephone number and address of the nearest county poison control center in a convenient location in case of an accidental poisoning. Also, keep clean copies of labels of all pesticides on the farm premises. In the event of a poisoning, the label of the pesticide involved should be taken to the poison control center or hospital.

## Reference

Florida Agriculture Statistical Bulletin 2011. 2012. http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Annual_Statistical_Bulletin/fasb12/E1thru-18Veg-2012.pdf , NASS, USDA.

Table 1. Ant pesticidal control measures available for commercial strawberry production in Florida.

| **Common Name** | **Trade Name/ Formulation** | **Production Site**[1] | **Notes from labels**[2] |
|---|---|---|---|
| *Beauveria bassiana* ATCC 74040 | Naturalis L | F, G, N | At least 3–5 applications may be necessary before pests are adequately under control. Do not tank mix with fungicides. Wait a minimum of 48 hours after application before applying fungicides. |
| Carbaryl | 10% Sevin Granules Cutworm & Cricket Bait | F, N | Repeat applications up to a total of four times per year, but not more often than once every 7 days. Long, 7-day pre-harvest interval (PHI). |
| Methyl bromide & Chloropicrin | MBC 98-2[3] | F, G, N | Pre-plant treatment only. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[4] PyGanic EC 5.0[4] | F, G, N | |
| Pyrethrin & piperonyl butoxide | Evergreen EC 60-6 Pyreth-It Pyrenone Crop Spray | F, G, N | |
| Pyriproxyfen | Esteem Ant Bait | F, G, N | For 7 to 10 days after treatment, do not apply any other fire ant pesticide. Do not exceed more than 0.134 lb. of pyriproxyfen per acre per season. |
| S-methoprene | Extinguish Pro Fire Ant Bait | F, G, N | Fire ants. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product is a restricted-use pesticide.
[4] Product label indicates use in organic production.

Table 2. Aphid pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Abamectin | Temprano[3] | F | Suppression. |
| Acetamiprid | Assail 30SG | F, G, N | Do not make more than two applications per growing season. |
| Azadirachtin | Aza-Direct[4]<br>Azatin XL<br>Neemix 4.5[4]<br>Ecozin Plus 1.2% ME[4] | F, G, N | Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* | Naturalis L<br>BotaniGard ES<br>BotaniGard 22 WP<br>Mycotrol O[4] | F, G, N | Typically it takes 7–10 days after the first spray to see control. At least 3–5 applications may be necessary before pests are adequately under control. See labels for precautions about use with fungicides. |
| Bifenthrin | Brigade WSB[3] | F, N | Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[3] | F | Do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| Bifenthrin & imidacloprid | Brigadier[3] | F, N | Do not apply during or within 10 days after bloom or when bees are actively foraging. Long, 7-day pre-harvest interval (PHI). Plant back restrictions: Plants that have tolerances for both bifenthrin and imidacloprid may be rotated at any time. Crops that have tolerances for bifenthrin and not imidacloprid can be rotated 12 months after the final application of Brigadier insecticide. Crops that have tolerances for imidacloprid and not bifenthrin may be rotated 30 days after the final application [label has list of crops]. |
| Diazinon | Diazinon AG 500[3]<br>Diazinon 50W[3]<br>Diazinon AG600 WBC[3] | F, N | Make a maximum of one foliar application per crop and a maximum of one soil application per crop. Long, 5-day pre-harvest interval (PHI). |
| Edible fish oil & sesame oil | Organocide 3-in-1 Garden Spray[4] | F, G, N | |
| Flonicamid | Beleaf 50 SG | F, N | |
| Imidacloprid | Admire Pro<br>Couraze 2F<br>Provado 1.6 Flowable | F, N | Do not apply during bloom or within 10 days before bloom or when bees are actively foraging. |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal<br>PFR-97 20% WDG[4] | F, G, N | Most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | |
| Naled | Dibrom 8 Emulsive[3] | F, N | Do not apply when temperature is over 90°F. |
| Neem oil | Trilogy | F, N | Avoid tank mixes with captan, sulfur or other chemically similar products because unpredictable results or leaf burn may occur. |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Oil (mineral, paraffinic, petroleum, vegetable, etc.) | Saf-T-Side Spray Oil<br>Ultra-Fine Oil | F, N | See labels for phytotoxicity precautions. |
| Potassium Salts of Fatty Acids (insecticidal soap) | AllPro Insecticidal Soap 40%<br>M-Pede[4] | F, G, N | Do not mix with sulfur. See labels for phytotoxicity precautions. |
| Potassium silicate | Sil-MATRIX | F, G, N | Suppression. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[4]<br>PyGanic EC 5.0[4] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II Multipurpose | F, G, N | |
| Sodium tetraborohydrate decahydrate | Prev-AM | F, N | Do not mix with chemicals containing sulfur or oils. Do not add adjuvants to Prev-Am. |
| Sorbitol octanoate | SorbiShield 90 | F, G, N | A contact insecticide with limited residual activity. |
| Sucrose octanoate | SucraShield | F, G, N | A contact insecticide with limited residual activity. |
| Thiamethoxam | Actara | F | |
| Thiamethoxam & chlorantraniliprole | Voliam Flexi | F | |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product is a restricted-use pesticide.
[4] Product label indicates use in organic production.

Table 3. Armyworm pesticidal control measures available for commercial strawberry production in Florida. See also caterpillars (Table 5).

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Azadirachtin | Aza-Direct[3]<br>Azatin XL<br>Neemix 4.5[3] | F, G, N | Will not control adult insects. Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Bacillus thuringiensis aizawai* | Agree WG[3]<br>XenTari Dry Flowable[3] | F, G, N | For best results apply full coverage sprays when 1st or 2nd instar larvae are present. Where 4th or 5th instar larvae are present, a contact insecticide should be used in combination to enhance control. |
| *Bacillus thuringiensis kurstaki* | Deliver LC[3]<br>Javelin WG[3]<br>Biobit HP[3]<br>Dipel DF[3]<br>Dipel ES<br>Lepinox WDG<br>Crymax Bioinsecticide | F, G, N | May be used to control armyworms or podworms (1st and 2nd instar) when populations are light and full coverage sprays are applied. If mature worms or heavy populations are present, a contact insecticide should be used to enhance control. |
| *Beauveria bassiana* ATCC 74040 | Naturalis L | F, G, N | At least 3–5 applications may be necessary before pests are adequately under control. Do not tank mix with fungicides. Wait a minimum of 48 hours after application before applying fungicides. |
| Bifenthrin | Brigade WSB[4] | F, N | Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[4] | F | Not for beet armyworm. Do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| Bifenthrin & imidacloprid | Brigadier[4] | F, N | Not for beet armyworm. Do not apply during or within 10 days after bloom or when bees are actively foraging. Long, 7-day pre-harvest interval (PHI). Plant back restrictions: Plants that have tolerances for both bifenthrin and imidacloprid may be rotated at any time. Crops that have tolerances for bifenthrin and not imidacloprid can be rotated 12 months after the final application of Brigadier insecticide. Crops that have tolerances for imidacloprid and not bifenthrin may be rotated 30 days after the final application [label has list of crops]. |
| Carbaryl | Cutworm & Cricket Bait<br>Sevin Brand 4F<br>Sevin Brand XLR Plus | F, N | Do not apply more than a total of 10 quarts per acre per crop. Repeat applications as necessary up to a total of five times but not more often than once every 7 days. Plant back: Do not plant rotational food and feed crops not listed on this or other carbaryl labels in carbaryl-treated soil. Long, 7-day pre-harvest interval (PHI). |
| Chlorantraniliprole | Coragen | F | Beet armyworm; make no more than four applications per acre per crop. |
| *Chromobacterium subtsugae* | MBI-203 EP[3] | F, G, N | |
| Fenpropathrin | Danitol 2.4EC[4] | F, N | Fall & yellowstriped armyworm; do not exceed more than two applications totaling 2–2/3 pts. (0.8 lb. a.i.) per acre to the same planting in 12 consecutive months. |
| Flubendiamide | Synapse WG | F, N | |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Methoxyfenozide | Intrepid 2F | F, N | Do not use more than 12 fl oz per acre per application or 64 fl oz of Intrepid 2F (1 lb a.i.) per acre per season. Rotational crop restrictions (plant back): Crops with registered uses may be replanted at any time. All other crops grown for food or feed may be replanted after 7 days. |
| Novaluron | Rimon 0.83EC | F, N | Does not kill adult insects. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II Multipurpose | F, G, N | |
| Spinosad | Entrust[3]<br>SpinTor 2SC | F, N | Resistance management: Rotate to a different class of insect control products after two successive applications. Do not make more than five applications per year. |
| Spinetoram | Radiant SC | F, N | Resistance Management: Do not make more than two consecutive applications of group 5 insecticides (spinetoram and spinosad). Do not make more than five applications per calendar year. |
| *Steinernema carpocapsae* | Millenium | F, G, N | Ground dwelling insects and borers |
| Thiamethoxam & chlorantraniliprole | Voliam Flexi | F | Beet armyworm. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.

Table 4. Beetle and weevil pesticidal control measures available for commercial strawberry production in Florida. See also grubs (Table 8).

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Acetamiprid | Assail 30SG | F, G, N | Flea beetle, sap beetles; do not make more than two applications per growing season. |
| Azadirachtin | Aza-Direct[3]<br>Azatin XL<br>Neemix 4.5[3]<br>Ecozin Plus 1.2% ME[3] | F, G, N | Will not control adult insects. Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* | Naturalis L<br>BotaniGard ES<br>Mycotrol O[3] | F, G, N | Typically it takes 7–10 days after the first spray to see control. At least 3–5 applications may be necessary before pests are adequately under control. See labels for precautions about use with fungicides. |
| Bifenthrin | Brigade WSB[4] | F, N | Flea beetles; strawberry sap beetle. Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[4] | F | Flea beetles, strawberry sap beetles, strawberry root weevil, strawberry clipper; do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| Bifenthrin & imidacloprid | Brigadier[4] | F, N | Flea beetle spp.; do not apply during or within 10 days after bloom or when bees are actively foraging. Long, 7-day pre-harvest interval (PHI). Plant back restrictions: Plants that have tolerances for both bifenthrin and imidacloprid may be rotated at any time. Crops that have tolerances for bifenthrin and not imidacloprid can be rotated 12 months after the final application of Brigadier insecticide. Crops that have tolerances for imidacloprid and not bifenthrin may be rotated 30 days after the final application [label has list of crops]. |
| Carbaryl | Carbaryl 4L<br>Sevin Brand 4F<br>Sevin Brand 80S<br>Sevin XLR Plus | F, N | Sap beetles[5]; flea beetles; June beetles. Plant back: Do not plant rotational food and feed crops not listed on this or other carbaryl labels in carbaryl-treated soil. Long, 7-day pre-harvest interval (PHI). |
| Chlorantraniliprole | Coragen | F | Japanese beetle adult; make no more than four applications per acre per crop. |
| Chlorpyrifos | Govern 4E[4]<br>Lorsban Advanced[4] | F, N | Strawberry bud weevil; pre-bloom use only. Do not make more than two applications (foliar) per year. |
| Fenpropathrin | Danitol 2.4EC[4] | F, N | Strawberry sap beetle, strawberry bud weevil (strawberry clipper); do not exceed more than two applications totaling 2–2/3 pts. (0.8 lbs. a.i.) per acre to the same planting in 12 consecutive months. |
| Imidacloprid | Admire Pro<br>Couraze 2F | F, N | Post-harvest use on perennial strawberry: White grub complex (grubs of Asiatic garden beetle, European chafer, masked chafer, Japanese beetle, Oriental beetle). Long, 14-day pre-harvest interval (PHI). |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal<br>PFR-97 20% WDG[3] | F, G, N | Coleoptera grubs and larvae; most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | Strawberry root weevil. |
| Novaluron | Rimon 0.83EC | F, N | Sap beetle larvae; does not kill adult insects. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Pyrethrin & Piperonyl Butoxide | Evergreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | Cucumber beetles, flea beetles, corn sap beetle. |
| Pyrethrin, rotenone & associated resins | Pyrellin E.C. | F, G, N | Strawberry root worms. |
| *Steinernema carpocapsae* | Millenium | F, G, N | Ground-dwelling insects and borers: Blackvine weevil, strawberry root weevil. |
| Thiamethoxam | Actara | F | Weevil (adult). |
| Thiamethoxam & chlorantraniliprole | Voliam Flexi | F | Japanese beetle (adult), weevil (adult). |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.
[5] These products, while not labeled for sap beetle control in strawberry, are labeled for sap beetle control in corn.

Table 5. Caterpillar pesticidal control measures available for commercial strawberry production in Florida. (Includes budworms, earworms, leafrollers, leaftiers, lesser cornstalk borer and looper.) Also see armyworms (Table 3).

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Acetamiprid | Assail 30SG | F, G, N | Obliquebanded leafroller; do not make more than two applications per growing season. |
| Azadirachtin | Aza-Direct[3]<br>Azatin XL<br>Ecozin Plus 1.2% ME[3]<br>Neemix 4.5[3] | F, G, N | Will not control adult insects. Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Bacillus thuringiensis aizawai* strain ABTS-1857 | XenTari Dry Flowable | F, G, N | Loopers, obliquebanded leafroller, omnivorous leafroller, saltmarsh caterpillar, tobacco budworm. |
| *Bacillus thuringiensis kurstaki* | Javelin WG[3]<br>Deliver LC[3]<br>Biobit HP[3]<br>Dipel DF[3]<br>Dipel ES<br>Dipel Pro DF[3] | F, G, N | Bollworm, *Helicoverpa* spp., *Heliothis* spp., tobacco budworm, tomato fruitworm, looper, black cutworm, obliquebanded leafroller, omnivorous leafroller, omnivorous leaftier, saltmarsh caterpillar. |
| *Beauveria bassiana* | Naturalis L<br>Mycotrol O[3] | F, G, N | Eggs of lepidopteran pests, leafrollers, lesser cornstalk borer, loopers, tomato fruitworm; at least 3–5 applications may be necessary before pests are adequately under control. See labels for precautions about use with fungicides. |
| Bifenthrin | Brigade WSB[4] | F, N | *Heliothis* spp., leafrollers; Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[4] | F | Corn earworm, leafroller, looper, orange tortrix; do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| Bifenthrin & imidacloprid | Brigadier[4] | F, N | Corn earworm; do not apply during or within 10 days after bloom or when bees are actively foraging. Long, 7-day pre-harvest interval (PHI). Plant back restrictions: Plants that have tolerances for both bifenthrin and imidacloprid may be rotated at any time. Crops that have tolerances for bifenthrin and not imidacloprid can be rotated 12 months after the final application of Brigadier insecticide. Crops that have tolerances for imidacloprid and not bifenthrin may be rotated 30 days after the final application [label has list of crops]. |
| Carbaryl | Carbaryl 4L<br>Sevin Brand 4F<br>Sevin Brand XLR Plus | F, N | Omnivorous leafroller, omnivorous leaftier, strawberry fruitworm, strawberry leafroller, saltmarsh caterpillar; do not plant rotational food crops not listed on this or other carbaryl labels in carbaryl-treated soil. Long, 7-day pre-harvest interval (PHI). |
| Chlorantraniliprole | Coragen | F | Cabbage looper, corn earworm; make no more than four applications per acre per crop. |
| Diazinon | Diazinon AG 500[4]<br>Diazinon 50W[4]<br>Diazinon AG600 WBC[4] | F, N | Strawberry leafroller; make a maximum of one foliar application per crop and a maximum of one soil application per crop. Long, 5-day pre-harvest interval (PHI). |
| Edible fish oil & sesame oil | Organocide 3-in-1 Garden Spray[3] | F, G, N | Leafrollers. |
| Flubendiamide | Synapse WG | F, N | Corn earworm, cutworm, lesser cornstalk borer, omnivorous leaftier, strawberry leafroller. |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal PFR-97 20% WDG[3] | F, G, N | Lepidoptera caterpillars and larvae; most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | Strawberry leafrollers. |
| Methoxyfenozide | Intrepid 2F | F, N | Armyworms; corn earworm suppression. |
| Naled | Dibrom 8 Emulsive[4] | F, N | Leafrollers, omnivorous leaftiers; do not apply when temperature is over 90°F. |
| Novaluron | Rimon 0.83EC | F, N | Corn earworm, loopers, webworms; does not kill adult insects. |
| Oil (mineral, paraffinic, petroleum, vegetable, etc.) | Ultra-Fine Oil | F, N | Eggs of certain caterpillars; see labels for phytotoxicity precautions. |
| Polyhedral occlusion bodies of the nuclear polyhedrosis virus of *Helicoverpa zea* | Gemstar LC[3] | F, N | Corn earworm, *Helicoverpa zea*, cotton bollworm, tomato fruitworm, tobacco budworm, *Heliothis virescens*. |
| Pyrethrin | PyGanic Crop Protection EC-1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | Budworms, loopers. |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | Budworms, loopers, leafrollers, leaftiers, lesser cornstalk borer. |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II Multipurpose | F, G, N | Cabbage looper, strawberry leafrollers. |
| Pyrethrin, rotenone & associated resins | Pyrellin E.C. | F, G, N | Strawberry leafrollers. |
| Sorbitol octanoate | SorbiShield 90 | F, G, N | A contact insecticide with limited residual activity. |
| Spinosad | Entrust[3]<br>SpinTor 2SC | F, G, N | Leafrollers. |
| *Steinernema carpocapsae* | Millenium | F, G, N | Ground-dwelling insects and borers; Armyworms. |
| Thiamethoxam & chlorantraniliprole | Voliam Flexi | F | Cabbage looper, corn earworm. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.

Table 6. Cricket pesticidal control measures available for commercial strawberry production in Florida. See also mole cricket (Table 10).

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Carbaryl | Cutworm & Cricket Bait | F, N | Field crickets. Long, 7-day pre-harvest interval (PHI). |
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | Field crickets. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.

Table 7. Fruit fly (vinegar fly) and spotted wing drosophila pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Azadirachtin | Aza-Direct[3]<br>Azatin XL<br>Ecozin Plus 1.2% ME[3]<br>Neemix 4.5[3] | F, G, N | Will not control adult insects. Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| Bifenthrin[4] | Brigade WSB[5] | F, N | Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Fenpropathrin[4] | Danitol 2.4EC[5] | F, N | Do not exceed more than two applications to the same planting in 12 consecutive months. |
| Malathion[4] | Gowan Malathion 8F<br>Malathion 5EC | F, N | |
| Naled[4] | Dibrom 8 Emulsive[5] | F, N | Do not apply when temperature is over 90°F. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | Vinegar flies. |
| Pyrethrin & piperonyl butoxide | Pyreth-It<br>EverGreen EC 60-6<br>Pyrenone Crop Spray | F, G, N | Fruit flies; vinegar flies; for use on harvested fruits and vegetables: To control *Drosophila* spp. fruit flies. |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II Multipurpose | F, G, N | Fruit flies. |
| Spinetoram[4] | Radiant SC | F, N | Resistance Management: Do not make more than two consecutive applications of group 5 insecticides (spinetoram and spinosad). Do not make more than five applications per calendar year. |
| Spinosad[4] | GF-120 NF Naturalyte Fruit Fly Bait[3] | F, N | Tephritid fruit flies. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] These products do not make a label claim for drosophila control but have been shown to be useful to manage spotted wing drosophila.
[5] Product is a restricted-use pesticide.

Table 8. Grub pesticidal control measures available for commercial strawberry production in Florida. See also beetles (Table 4).

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Azadirachtin | Azatin XL<br>Neemix 4.5[3] | F, G, N | Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* strain GHA | BotaniGard ES<br>Mycotrol O[3] | F, G, N | Typically it takes 7–10 days after the first spray to see control. See labels for precautions about use with fungicides. |
| Chlorpyrifos | Govern 4E[4]<br>Lorsban 75WG | F, N | Grub; do not make more than one (pre-plant) application per year. |
| *Heterorhabditis bacteriophora* | Nemasys G | F, G, N | European chafer, oriental beetle & Japanese beetle grubs. |
| Methyl bromide & chloropicrin | MBC 98-2[4] | F, G, N | Pre-plant. |
| *Steinernema carpocapsae* | Millenium | F, G, N | Ground-dwelling insects and borers: Strawberry root weevil. |
| Thiamethoxam | Platinum | F | Pre-harvest interval is 50 days. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.

Table 9. Mite pesticidal control measures available for commercial strawberry production in Florida. (Includes spider mites, cyclamen mites, and rust mites.)

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Abamectin | Agri-Mek 0.15 EC[3]<br>Temprano[3] | F | Twospotted spider mite, strawberry spider mite, suppression of cyclamen mite. |
| Acequinocyl | Kanemite 15 SC | F, N | Twospotted spider mite (*Tetranychus urticae*). |
| Azadirachtin | Aza-Direct[4]<br>Azahar[4] | F, G, N | Will not control adults. |
| *Beauveria bassiana* ATCC 74040 | Naturalis L | F, G, N | At least 3–5 applications may be necessary before pests are adequately under control. Do not tank mix with fungicides. Wait a minimum of 48 hours after application before applying fungicides. |
| Bifenazate | Acramite 50WS | F, N | Twospotted spider mite; strawberry mite; two sprays is the total number of sprays per season. Nursery use must be on plants that will not bear fruit within 1 year of application. |
| Bifenthrin | Brigade WSB[3] | F, N | Spider mites; plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[3] | F | Cyclamen mite, strawberry mite, twospotted spider mite; do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| *Chromobacterium subtsugae* | MBI-203 EP[4] | F, G, N | |
| Diazinon | Diazinon AG-500[3]<br>Diazinon AG600 WBC[3]<br>Diazinon 50W[3] | F, N | For cyclamen mites, direct spray to plant crowns. Make a maximum of one foliar application per crop and a maximum of one soil application per crop. Long, 5-day pre-harvest interval (PHI). |
| Edible fish oil & sesame oil | Organocide 3-in-1 Garden Spray[4] | F, G, N | Spider mites. |
| Etoxazole | Zeal Miticide | F, N | Twospotted spider mite; do not make more than one Zeal application per growing season. |
| Fenbutatin-oxide | Vendex 50WP[3] | F, N | Twospotted spider mite; make no more than two applications per season. |
| Fenpropathrin | Danitol 2.4EC[3] | F, N | Twospotted spider mite; do not exceed more than two applications to the same planting in 12 consecutive months. |
| Fenpyroximate | Portal | F, N | Broad mite, citrus rust mite, cyclamen mite, twospotted spider mite; do not make more than two applications per season. |
| Hexythiazox | Savey 50 DF | F | Twospotted spider mite; do not make more than one application per year. |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal PFR-97 20% WDG[4] | F, G, N | Spider mites, broad mites, rust mites; most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |
| Naled | Dibrom 8 Emulsive[3] | F, N | Spider mites; do not apply when temperature is over 90°F. |
| Neem oil | Trilogy[4] | F, N | Spider mites; avoid tank mixes with captan, sulfur, or other chemically similar products because unpredictable results or leaf burn may occur. |
| Oil (mineral, paraffinic, petroleum, vegetable, etc.) | Mite-E-Oil<br>Ultra-Pure Oil | F, N | See labels for phytotoxicity precautions. |
| Potassium salts of fatty acids (insecticidal soap) | AllPro Insecticidal Soap 40%<br>M-Pede[4] | F, G, N | Twospotted mites; do not mix with sulfur. See labels for phytotoxicity precautions. |
| Potassium silicate | Sil-MATRIX | F, G, N | Spider mites suppression. |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Pyrethrin | PyGanic Crop Protection EC 1.4[4]<br>PyGanic EC 5.0[4] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6 Pyrenone Crop Spray | F, G, N | Strawberry mites. |
| Pyrethrin, rotenone & associated resins | Pyrellin EC | F, G, N | |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II Multipurpose | F, G, N | |
| Sodium tetraborohydrate decahydrate | Prev-Am | F, N | Do not mix with chemicals containing sulfur or oils. Do not add adjuvants to Prev-Am. |
| Sorbitol octanoate | SorbiShield 90 | F, G, N | A contact insecticide with limited residual activity. |
| Spiromesifen | Oberon 2 SC | F, N | Twospotted spider mite; maximum number of applications per crop season is three. |
| Sucrose octanoate | SucraShield | F, G, N | A contact insecticide with limited residual activity. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product is a restricted-use pesticide.
[4] Product label indicates use in organic production.

Table 10. Mole cricket pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Azadirachtin | AzaGuard | F, G, N | Spray nymphs soon after egg hatch. |
| *Beauveria bassiana* strain GHA | Mycotrol O[3] | F, G, N | Typically it takes 7–10 days after the first spray to see control. See label for precautions about use with fungicides. |
| Carbaryl | Cutworm & Cricket Bait | F, N | Long, 7-day pre-harvest interval (PHI). |
| Diazinon | Diazinon AG 500[4]<br>Diazinon 50W[4]<br>Diazinon AG600 WBC[4] | F, N | Make a maximum of one foliar application per crop and a maximum of one soil application per crop. Long, 5-day pre-harvest interval (PHI). |
| Pyrethrin | PyGanic EC 5.0[3] | F, G, N | |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.

Table 11. Pamera bug pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Azadirachtin | Aza-Direct[3]<br>Azatrol EC[3]<br>Ecozin Plus 1.2% ME[3] | F, G, N | True bugs; will not control adult insects. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* strain GHA | BotaniGard ES<br>Mycotrol O[3] | F, G, N | Typically it takes 7–10 days after the first spray to see control. See labels for precautions about use with fungicides. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | Label does not list the insect but does not limit use to listed insects. |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyrenone Crop Spray | F, G, N | Label does not list this insect but does not limit use to listed insects. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.

Table 12. Plant (*Lygus*) bug pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Acetamiprid | Assail 30SG | F, G, N | Do not make more than two applications per growing season. |
| Azadirachtin | Azatrol EC[3]<br>Neemix 4.5[3] | F, G, N | Lygus bug; will not control adult insects. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* | Naturalis L<br>BotaniGard ES<br>Mycotrol O[3] | F, G, N | Typically it takes 7–10 days after the first spray to see control. At least 3–5 applications may be necessary before pests are adequately under control. See labels for precautions about use with fungicides. |
| Bifenthrin | Brigade WSB[4] | F, N | Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Bifenthrin & avermectin B1 | Athena[4] | F | *Lygus* spp.; do not make more than two consecutive applications and four applications per growing season. Plant back restrictions: For crops that have bifenthrin and avermectin tolerances, the plant back is immediate. All other crops may be rotated 30 days after the final application. |
| Bifenthrin & imidacloprid | Brigadier[4] | F, N | *Lygus* spp.; do not apply during or within 10 days after bloom or when bees are actively foraging. Long, 7-day pre-harvest interval (PHI). Plant back restrictions: Plants that have tolerances for both bifenthrin and imidacloprid may be rotated at any time. Crops that have tolerances for bifenthrin and not imidacloprid can be rotated 12 months after the final application of Brigadier insecticide. Crops that have tolerances for imidacloprid and not bifenthrin may be rotated 30 days after the final application [label has list of crops]. |
| Carbaryl | Carbaryl 4L<br>Sevin Brand 4F<br>Sevin Brand 80S<br>Sevin Brand XLR Plus | F, N | Tarnished plant bug; do not plant rotational food and feed crops not listed on this or other carbaryl labels in carbaryl-treated soil. Long, 7-day pre-harvest interval (PHI). |
| Etoxazole | Zeal | F, N | Do not make more than one Zeal application per growing season. For lygus, spittlebug, tarnished plant bug or twospotted spider mite, use in combination with Danitol 2.4EC. |
| Fenpropathrin | Danitol 2.4EC[4] | F, N | Lygus, tarnished plant bug; do not exceed more than two applications totaling 2–2/3 pts. (0.8 lbs. A.I.) per acre to the same planting in 12 consecutive months. |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal<br>PFR-97 20% WDG[3] | F, G, N | Most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | |
| Naled | Dibrom 8 Emulsive[4] | F, N | Do not apply when temperature is over 90°F. |
| Novaluron | Rimon 0.83EC | F, N | Lygus; does not kill adult insects. |
| Oil (mineral, paraffinic, petroleum, vegetable, etc.) | Ultra-fine Oil | F, N | See label for phytotoxicity precautions. |
| Potassium salts of fatty acids (insecticidal soap) | DES-X[3] | F, N | Do not mix with sulfur. See label for phytotoxicity precautions. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[3]<br>PyGanic EC 5.0[3] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyrenone Crop Spray | F, G, N | |
| Sodium tetraborohydrate decahydrate | Prev-Am | F, N | Do not mix with chemicals containing sulfur or oils. Do not add adjuvants to Prev-Am. |

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Sorbitol octanoate | SorbiShield 90 | F, G, N | A contact insecticide with limited residual activity. |
| Thiamethoxam | Actara | F | Lygus bug suppression. |
| Thiamethoxam & chlorantraniliprole | Voliam Flexi | F | Lygus bug suppression. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product label indicates use in organic production.
[4] Product is a restricted-use pesticide.

Table 13. Slug and Snail pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Iron phosphate | Sluggo-AG | F, G, N | |
| Metaldehyde | Durham Metaldehyde Granules 3.5, 7.5<br>OR-CAL Slug & Snail Bait<br>Slug-Fest | F, N | |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.

Table 14. Spider (widow spiders: Black widow and other widow spiders) pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Bifenthrin[3] | Brigade WSB[4] | F, N | Plant back restrictions: Plants for which bifenthrin tolerances exist may be rotated at any time. All other crops may be rotated 30 days after the final application of bifenthrin. |
| Malathion[3] | Ortho Malathion Plus Insect Spray | F, N | Spiders; spot treatment to areas such as irrigation valves and other equipment; apply as a course spray. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[5]<br>PyGanic EC 5.0[5] | F, G, N | Spiders. |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyrenone Crop Spray | F, G, N | Spiders. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Bifenthrin and malathion are labeled for spider control in outdoor ornamentals and turf, but no claim is made for spider control in strawberry crops.
[4] Product is a restricted-use pesticide.
[5] Product label indicates use in organic production.

Table 15. Thrips pesticidal control measures available for commercial strawberry production in Florida.

| Common Name | Trade Name/ Formulation | Production Site[1] | Notes from labels[2] |
|---|---|---|---|
| Abamectin | Temprano[3] | F | Suppression |
| Acetamiprid | Assail 30SG | F, G, N | Do not make more than two applications per growing season. |
| Azadirachtin | Aza-Direct[4]<br>Azatin XL<br>Azatrol EC[4]<br>Ecozin Plus 1.2% ME[4]<br>Neemix 4.5[4] | F, G, N | Will not control adult insects. Effective on all larval stages and pupae. Reduces damage by repelling and deterring feeding of all stages of insect. |
| *Beauveria bassiana* | Naturalis L<br>BotaniGard 22WP<br>BotaniGard ES<br>Mycotrol O[4] | F, G, N | Typically it takes 7–10 days after the first spray to see control. At least 3–5 applications may be necessary before pests are adequately under control. See labels for precautions about use with fungicides. |
| Edible fish oil & sesame oil | Organocide 3-in-1 Garden Spray[4] | F, G, N | |
| Fenpyroximate | Portal | F, N | Citrus thrips suppression; do not make more than two applications per season. |
| *Isaria fumosorosea* (formerly *Paecilomyces fumosoroseus*) | Preferal<br>PFR-97 20% WDG[4] | F, G, N | Thrips pupae; most effective when relative humidity is 80% or higher for 8–10 hours. Can be mixed with copper-based fungicides; do not mix with other fungicides or apply within 5 days of fungicide applications other than copper. |
| Malathion | Gowan Malathion 8F<br>Malathion 5EC | F, N | |
| Naled | Dibrom 8 Emulsive[3] | F, N | Do not apply when temperature is over 90°F. |
| Neem oil | Trilogy[4] | F, N | Suppression; avoid tank mixes with captan, sulfur or other chemically similar products because unpredictable results or leaf burn may occur. |
| Novaluron | Rimon 0.83EC | F, N | Does not kill adult insects. |
| Oil (mineral, paraffinic, petroleum, vegetable, etc.) | Ultra-Fine Oil | F, N | See label for phytotoxicity precautions. |
| Pyrethrin | PyGanic Crop Protection EC 1.4[4]<br>PyGanic EC 5.0[4] | F, G, N | |
| Pyrethrin & piperonyl butoxide | EverGreen EC 60-6<br>Pyreth-It<br>Pyrenone Crop Spray | F, G, N | |
| Pyrethrin, piperonyl butoxide & silicon dioxide | Diatect II<br>Multipurpose | F, G, N | |
| Pyrethrin, rotenone & associated resins | Pyrellin EC | F, G, N | |
| Sorbitol octanoate | SorbiShield 90 | F, G, N | A contact insecticide with limited residual activity. |
| Spinetoram | Radiant SC | F, N | Resistance Management: Do not make more than two consecutive applications of group 5 insecticides (spinetoram and spinosad). Do not make more than five applications per calendar year. |
| Spinosad | Entrust[4]<br>SpinTor 2SC | F, N | Resistance management: Rotate to a different class of insect control products after two successive applications. Do not make more than five applications per year. |
| *Steinernema feltiae* | Nemasys | G | Western flower thrips. |
| Sucrose octanoate | SucraShield | F, G, N | A contact insecticide with limited residual activity. |

Footnotes:
[1] "F" indicates field production. "G" indicates greenhouse production. "N" indicates nursery production.
[2] Notes are taken from product labels and restrict use to the condition indicated (suppression, beet armyworm, exposed thrips, etc.), limit number and patterns of applications, provide phytotoxicity precautions, etc.
[3] Product is a restricted-use pesticide.
[4] Product label indicates use in organic production.