

Greenhouse Insect Management

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Starting clean

Do not carry-over insects from one crop to another. Keep thrips numbers down to less than 10/card/week in the fall and winter on poinsettias and cordyline (*Dracaena*). Avoid keeping houseplants or allowing weeds to grow in the greenhouse. When each batch of media arrives for a new crop, check it for fungus gnats by filling a 1 gal Zip-lock bag 1/2-full with moist soil. If fungus gnat adults emerge within 3 weeks, consider applying a fungus gnat treatment at planting time. Check incoming plant material carefully. If insects are found treat them with an appropriate product listed below to start as clean as possible.

Scouting

Monitor thrips and whiteflies with yellow sticky cards. Change cards once per week. Use at least one card per house or one per 2,000 ft². Check the first plants to flower for thrips. For spider mites and aphids, check susceptible plants like marigold (mites) and pepper (aphids), weekly. Potato wedges can be stuck in soil and checked 24 hours later for fungus gnat larvae.

Systemic insecticides

Neonicotinoid insecticides are listed in *italics*. Kontos, Mainspring, *Imidacloprid*, *Flagship*, and *Safari* can all be applied to the soil surface as a drench for uptake by plant roots and systemic movement throughout the plant. The only soil systemic insecticides available at this time that are NOT neonicotinoids are Kontos and Mainspring. Kontos¹ is labeled for spider mites, aphids, mealybugs, and whitefly. Mainspring is labeled for thrips, aphids, whiteflies and mealybugs.

Which products are neonicotinoids?

Technically, according to the IRAC classification system based on mode of action, neonicotinoids are all insecticides in category 4A. This includes *acetamiprid* (*Tristar*), *dinotefuran* (*Safari*, *Dinotefuran*, *Sagacity*), *thiomethoxam* (*Flagship*) and *imidacloprid* (*Marathon*, *Benefit*, *Discus*, *Imigold*, *Bounty*). Flonicamid (*Aria*) has a related chemical structure but a different mode of action (category 9C). However, I have seen some news articles that incorrectly include flonicamid with the neonicotinoids. Xxpire³ is no longer available because of its controversial classification as a neonicotinoid, and EPA's decision not to approve continued sales. Neonicotinoid products are listed in *italics* at the end of each pest section.

Pyrethroid insecticide products

Pyrethroids have been excluded from this list because of documented resistance problems with thrips and some whiteflies and aphids. However, they are still very effective for susceptible populations of whiteflies, aphids, mealybugs, caterpillars, scale crawlers and most other insects. Some pyrethroid insecticide products available for greenhouse use are: Astro, Attain, Bifenthrin, Talstar, Decathlon, Decathlon, Tame, Scimitar, and Mavrick.

Preventing outbreaks

If yellow sticky cards or scouting indicates an increase in aphids, mites, thrips, fungus gnats or whiteflies, apply one of the following insecticide products once per week as a foliar spray, unless a soil drench application is mentioned:

- **Thrips:** *Aria*, Mainspring, Mesuro, Orthene 97, Overture, Pedestal, Pylon. Also, if Distance is applied as a soil drench it will reduce the number of thrips adults emerging from pupae in the soil.

- **Aphids:** Aria, azadarachtin (Aza-Direct, AzaGuard, Azatin O), BotaniGard, Distance, Endeavor, Enstar II, Kontos¹, Ornazin, Orthene 97.
 - Neonicotinoids: *Imidacloprid*, *Safari*, or *Flagship* applied as a soil drench or as a spray. *Tristar* as a spray.
- **Whiteflies:** Azadarachtin (Aza-Direct, AzaGuard, Azatin O), BotaniGard, Distance (not for Q biotype), Endeavor, Enstar (not for Q biotype), Judo² (see phytotox footnote), Kontos¹ (see phytotox footnote), Ornazin, Orthene 97, Pedestal (do not use on poinsettias), pyriproxyfen (Distance, Pyranica or Engulf), Rycar, Sanmite, and Talus (not for Q biotype). Insecticidal soap⁴ (M-pede) and horticultural oils⁴ (SuffOil-X, Ultra-Pure Oil, SunSpray Ultra-Fine Oil, Triact70, Saf-T-Side) can be used if care is taken not to exceed label rates and not to spray open flowers, to avoid phytotoxicity.
 - Neonicotinoids: *Imidacloprid*, *Safari*, or *Flagship* applied as a soil drench or as a spray. *Tristar* as a spray.
- **Spider mites:** Akari, Avid, Floramite, Hexygon, Judo² (see phytotox footnote), Kontos, Magus, Ovation, ProMite, Pylon, Sanmite, Shuttle-O, Sultan⁵, Tetrasan, Ultiflora
- **Broad mites and cyclamen mites:** Avid, Akari, Judo², Pylon, SanMite, 2 % horticultural oil. Reduce humidity to below 80% if possible.
- **Fungus gnats:** Azadarachtin (Aza-Direct, AzaGuard, Azatin O), Adept (not on poinsettias), Citation, or pyriproxyfen (Distance Pyranica or Engulf) as a soil drench. Allow growing media to dry between waterings, as soon as is possible.
 - Neonicotinoids: *Imidacloprid*, *Safari* or *Flagship* applied as a soil drench.
- **Mealybugs:** Aria, Duraguard ME, Kontos, Orthene 97, Talus and Xxpire.
 - Neonicotinoids: *Imidacloprid*, *Safari*, or *Flagship* applied as a soil drench or as a spray. *Tristar* applied as a spray.
- **Florida fern caterpillar:** Because these caterpillars are usually resistant to pyrethroid insecticides try using Adept, Bt, Pedestal, Orthene, Mesurol or Duraguard ME.

- ¹ On the Kontos label: Not recommended for use on geraniums, orchids, hoya, *Dracaena*, *Cordyline*, *Schefflera*, neanthebella palm, and ferns. Do not make more than one application per season to *Hydrangea*, *Impatiens spp.*, crotons, *Fuschia* hybrids, *Petunia*, *Peperomia*, stock, or cyclamens.
- ² On the Judo label: Do not use on geraniums, *Peperomia*, *Dracaena*, and ‘Classy’, ‘Attache’ or ‘Vogue’ roses. It is not recommended to use Judo on *Alstromoeria*, *Agyranthemum*, *Bacopa*, *Matthiola*, *Lobelia*, New Guinea impatiens, ferns, phoz, English ivy, cyclamen, hydrangea, schefflera, fuschia, crocin, neanthebella palm and *Primula*.
- ³XXpire contains spinoteram and sulfoxoflor. It is no longer available due to a recent decision by EPA.
- ⁴In phytotoxicity testing, insecticidal soap and horticultural oil products have been at the top of the list for being the most phytotoxic to greenhouse plants (assuming that plants listed on the label as being sensitive are not included in the test). Do not exceed labeled rates which are usually a 1% concentration of oil or a 2% concentration soap.
- ⁵The active ingredient in Sultan is cyflumetofen.

NOTE: More phytotoxicity and additional information is available on the Wall Chart, 'Insect Controls for the Greenhouse Industry', MSU Extension Bulletin E-2696, also available at the website: <http://flor.hrt.msu.edu/IWC/index.html>, and as a phone app.

Practices that contribute to growing Bee-Friendly plants:

- **Do not spray flowers in the last 2 – 3 weeks before shipping.**
- **Do not apply soil drenches of imidacloprid or other neonicotinoids to types of plants that are attractive to bees. Very few annuals are attractive to bees. However the following annuals are: ageratum, snap dragons, calendula, cosmos, dahlia, and zinnia. Many perennials are attractive to bees, and a list of them will be made available to you soon.**
- **Do not use imidacloprid soil drenches on flowering trees and shrubs that are attractive to bees**
- **Read bee warning information on pesticide labels and avoid practices that are harmful to bees.**