



Bug-Wise

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Office: 1-662-325-2085

Whiteflies on Home Vegetables and Landscape Plants: Whiteflies belong to the insect order homoptera, which means they are related to aphids, scales, leafhoppers, and cicadas. They are important pests in the home vegetable garden and on certain ornamental landscape plants. Whiteflies are also the most important insect pest in commercial ornamental greenhouses, but this newsletter focuses only on whiteflies in the home landscape and vegetable garden. There are several species of whiteflies (see page 3). Although most are similar in size and appearance, some, such as silverleaf whitefly, are more difficult to control than others.

Heavy infestations of whiteflies result in clouds of small white insects that fly out from the undersides of the leaves when plants are disturbed. These are the adults. Adult whiteflies are about 1/16 inch long with white, powdery wings that they hold tent-like over their body when at rest. Immature whiteflies are flat, oval-shaped, scale-like creatures that are immobile for most of the immature period. Only the newly hatched crawlers are able to move about, but they quickly select a feeding site on the underside of a leaf, insert their mouthparts and begin to feed by sucking sap from the plant. See page 3 for more detailed information on whitefly life history.

Because plant sap is rich in sugars but low in protein, whiteflies excrete most of the sugars in the sap they consume without digesting them. This results in accumulations of sticky 'honeydew' on the leaf surfaces which soon results in the growth of black 'sooty mold'. Although the fungi responsible for sooty mold are not pathogenic (they do not attack or invade the plant itself), accumulations of sooty mold are unsightly and interfere with photosynthesis.

In addition to causing accumulations of honeydew and sooty mold, whiteflies damage plants in several other ways. The sap that causes the honeydew is the life blood of the plant, and it is supposed to be inside the plant, supplying energy and performing other important functions. Reduced plant vigor due to loss of sap is one major adverse effect of whiteflies. In some cases, the saliva whiteflies inject into the plant while feeding contains toxins that adversely affect plant growth. Whiteflies can also spread serious virus diseases, like tomato yellow leaf curl virus.

Whitefly Control, General Comments: When it comes to white fly control the most important point to keep in mind is that spraying with the wrong insecticide can make whitefly problems worse—much like pouring gasoline on a fire. This is because spraying with the wrong insecticide will kill the predatory insects and tiny parasitic wasps that help control whiteflies, but will not control the whiteflies. Insecticides like carbaryl (Sevin) and pyrethroids, such as permethrin or cyfluthrin, are examples of products that can 'flare' whitefly outbreaks. Malathion can also flare whiteflies, especially silverleaf whiteflies, even though it is sometimes recommended for control of some species of whiteflies. The key point here is that naturally-occurring beneficial insects are the easiest and best way to control whiteflies, and whitefly outbreaks are most likely to occur when this natural control is disrupted. Preserve beneficials by avoiding unnecessary insecticide treatments.

Another important point is that you can't control whiteflies by only controlling the adults. Whitefly control must focus on the immature stages, which are on the undersides of the leaves where they are difficult to reach with insecticide sprays. The fact that the immatures are immobile and covered with a protective shell makes them even more difficult to control. It is critical to direct sprays to the undersides of the leaves to get control with contact insecticides.

When using contact insecticides it is also important to retreat at five to seven day intervals. This is because the eggs are difficult to control and whiteflies also have a non-feeding 'pupal' stage. The follow-up treatments are to control newly hatched crawlers and to control newly emerged adults before they begin laying eggs. Apply at least two, and preferably three, successive sprays.

Whitefly Control in Home Vegetables: Whiteflies can occur on most garden vegetables, but they are most common on plants like tomatoes, eggplant, peppers, and okra. During the past two summers we have received a number of calls from distressed vegetable gardeners who have whiteflies "taking over the garden, even though I'm spraying two or three times per week!" This is usually due to infestations of silverleaf whiteflies that have been 'flared' by repeated sprays with sevin, malathion, or other ineffective treatments. Only a few insecticides are recommended for whitefly control in home vegetable gardens. The products listed in the following table are all effective against whiteflies, but because they rely on contact activity, they must be applied to the undersides of the leaves. A single treatment will rarely give effective control. It usually takes a series of two or three sprays. Unless the label specifies a longer spray interval, retreat at five to seven day intervals. See the trial results on page 4 for an example of the efficacy of these products.

Insecticides for Whitefly Control in Home Vegetable Gardens

Active Ingredient	Brand Name (1 example)
Azadirachtin	Azatrol (by PBI Gordon) *
Neem Oil	Fertilome Triple Action Plus *
Parafinnic oil	Ortho Volck Oil **

* Azatrol and neem oil are approved organic insecticides.

** Be sure to read and follow the phytotoxicity cautions when using parafinnic oils.

Whitefly Control in Home Ornamentals: Gardenia or cape jasmine is the landscape plant most often infested with whiteflies; usually these are citrus whiteflies. Whitefly infestations can also occur on hibiscus, confederate rose, lantana, ligustrum, azalea, and viburnum, as well as other landscape plants. The contact insecticides listed in the table above for use on home vegetables can also be used on ornamental plants. Homeowners can also use insecticides containing acephate (Ortho Systemic Insect Control is one example) to control whiteflies on ornamental plants, but do not use acephate on edible plants. Direct sprays to the undersides of leaves and repeat applications in five to seven days, unless the label specifies a longer spray interval.

There are also a couple of soil-applied systemic insecticides that are very useful for whitefly control on ornamental plants. These products are applied by diluting in water and pouring around the roots of the plant. Application rate depends on shrub height or total stem circumference. Imidacloprid is one such product (Bayer Tree and Shrub Insect Control is one brand name) that is readily available to homeowners. Dinotefuran (Spectracide Systemic Tree & Shrub Insect Control + Fertilizer) is another soil-applied systemic that provides good control of whiteflies. Although this is a 'homeowner product', it is difficult to find on store shelves. Safari is a commercial formulation of dinotefuran that is only approved for use by licensed commercial applicators. However, there are situations where it may be worth hiring a commercial applicator to apply Safari to control especially troublesome whitefly infestations. These soil-applied systemic products are slow-acting, but they usually provide long-term preventive control.

Common Whitefly Species: There are many different species of whiteflies. Most look superficially similar as adults, having white, powdery wings that are held tent-like over the body. Adult whiteflies are sometimes described as having a ‘moth-like’ appearance. There are differences in the appearance of adults and immatures of the different species that can be seen under magnification. The six species listed below are some of the most common whiteflies encountered in Mississippi.

Sweetpotato whitefly, *Bemesia tabaci* (Biotype A) – occurs on a large number of greenhouse and vegetable crops and is a vector of several important virus diseases.

Silverleaf whitefly, *Bemesia tabaci* (Biotype B) – Similar to sweetpotato whitefly but more difficult to control because of insecticide resistance. There is also a Biotype Q that is even more difficult to control. Silverleaf whiteflies are especially problematic in commercial greenhouses, and on home vegetables and ornamentals growing near commercial greenhouses.

Citrus whitefly, *Dialeurodes citri* – This is the species usually seen on gardenias. As the name suggests, citrus whiteflies also occur on citrus trees.

Greenhouse whitefly, *Trialeurodes vaporariorum* – This is a common pest of greenhouse plants and house plants, but also occurs outside on vegetables and ornamental plants during the summer months.

Bandedwinged whitefly, *Trialeurodes abutilonea* – Adults have two gray bands across each front wing. They are most often seen on malvaceous plants, such as okra, hibiscus, Confederate rose, and cotton.

Azalea whitefly, *Pealius azaleae* – Occurs on azaleas and rhodendrons, but serious infestations are uncommon in Mississippi.

Whitefly Life Cycle: The following table gives an example of the whitefly life cycle and development rates. Development rates vary significantly, depending on temperature, host plant, and species of whitefly. At normal growing temperatures it takes around 25 to 35 days for most whitefly species to complete a generation. Females lay eggs by attaching them to the undersides of leaves. Eggs hatch into mobile crawlers which select a feeding site and molt into immobile nymphs. These nymphs develop into a non-feeding ‘pupal’ stage. Adult whiteflies emerge through a T-shaped slit in the back of the pupal skin. Newly emerged females are not able to lay eggs until they have fed, mated and had time for the fertilized eggs to mature. The time that elapses between the emergence of an adult female and her first egg lay is known as the pre-ovipositional period. Adult whiteflies may live from 10 to 50 days, depending on environmental conditions. Average number of eggs produced per female can range from 10 to 100 or more, again depending on species, host, and environment.

Life Cycle of Silverleaf Whitefly

Life Stage	Number of Days
Egg	6.7 days
Crawler (mobile stage)	4.3 days
2 nd instar (immobile stage)	2.4 days
3 rd instar (immobile stage)	3.1 days
4 th instar (immobile stage)	2.9 days
Pupa (non-feeding stage)	4.3 days
Total—egg to adult	24.1 days

From: Liu and Stansly, 1998, at 80 degrees F, on *Hibiscus rosa-sinensis*

Whitefly Efficacy Trial Results: The following table shows results of a trial conducted this summer to evaluate the effectiveness of some common ‘homeowner insecticides’ against silverleaf whitefly. The Azatin, Insect Killing Soap, and neem oil treatments were applied three times, at weekly intervals (T1, 7DAT1, and 14DAT1) while the Volk oil treatment was applied only twice (T1 and 14DAT1). [DAT = Days After Treatment]

Azatin XL is actually a commercial product containing 3% azadirachtin, but homeowners can use Azatrol, which contains 1.2% azadirachtin and is approved for use by organic gardeners. Azadirachtin is a natural growth regulator extracted from seed of the neem tree. The unusually high number of whiteflies in the Azatin treatment at 10 DAT1 was due to this growth regulator effect causing arrested development of early stage immatures. These insects had already ceased feeding, and most were probably already dead.

Note that the Safer Insect Killing Soap caused significant leaf burn in this trial. The two applications of Volck oil provided the highest level of control and did not cause any leaf burn. However, oil sprays can also cause leaf burn, depending on environmental conditions and plant species. Be sure to read, and heed, the phytotoxicity cautions when using oil sprays. Although neem oil and azadirachtin are both derived from the same plant/seed, they are not the same chemical and have very different modes of action. Neem oil is an oil and works through contact activity, similar to other oils.

Silverleaf Whitefly (Bemesia tabaci, biotype B) Control on Poinsettia, 2008 (Layton & Gu)

Treatment	Rate	Avg. No. Immature Whiteflies/2 leaves		
		10 DAT1	20DAT1	30DAT1
Azatin XL**	0.16 fl. Oz/gal	524.8 a	33.2 b	15.6 c
Safer Insect Killing Soap	2.5 fl. Oz./gal	2.4 b	8.0 bc	157.8 b
Ortho Volck Oil Spray	2.5 fl. Oz/gal	13.8 b	0.2 c	1.6 d
Fertilome Triple Action Plus, 70% neem oil	1 fl. Oz/gal	32.6 ab	5.4 bc	39.6 bc
Untreated	-----	179.2 a	527.4 a	969.6 a

- Means not followed by the same letter differ significantly (Tukeys P=0.1)

Blake Layton, Extension Entomology Specialist

This information is for educational and preliminary planning purposes only. Brand names mentioned in this publication are used as examples only. No endorsement of these products is intended. Other appropriately labeled products containing similar active ingredients should provide similar levels of control. Always read and follow the insecticide label.