

Whiteflies

Dr. Joseph Doherty and Dr. Juang Chong
Clemson University

Species & Identification

Whiteflies are common pests of over 500 ornamental plant species in greenhouses. Adult whiteflies are moth-like and covered in a white, waxy powder. Adult females are around 1/16 inch long. Nymphs are flattened and look like a miniature scale insect.

The greenhouse whitefly was the primary species until the mid-1980s; since then, the sweetpotato whitefly has become the primary species. There are two biotypes of the sweetpotato whitefly. The B-biotype (also known as the Middle East-Asia Minor 1 or MEAM1 biotype) is more common and formerly classified as the silverleaf whitefly. The Q-biotype (or the Mediterranean or MED biotype) was introduced to the United States in 2004 and is resistant to many insecticides. Bandedwinged and citrus whiteflies are occasionally found in greenhouses, but seldom become damaging. Citrus whitefly can be quite numerous on gardenias in landscape.

The primary way to distinguish between the sweetpotato and greenhouse whiteflies is the appearance of the pupa, or final stage nymph. A sweetpotato whitefly pupa has sloped sides when viewed laterally and no fringe of waxy filaments around the edge. The greenhouse whitefly pupa has straight sides when viewed laterally and has a fringe of wax filaments along the edge that completely encircles the top surface. Adult sweetpotato whitefly is smaller than greenhouse whitefly and holds its wings tight against the body in a “roof-like” manner. Greenhouse whitefly adults hold the wings almost parallel to the leaf surface. There is no way to morphologically distinguish between the B- and Q-biotypes of sweetpotato whiteflies. If you suspect the presence of Q-biotypes, samples should be collected and sent for genetic analysis to confirm biotype.

Damage & Symptoms

Whiteflies feed by injecting enzymes into plant tissue and removing sap from the phloem, which reduce plant vigor. Feeding occurs exclusively on the underside of leaves. They also produce honeydew, which encourages the growth of sooty molds. The most common symptoms of whitefly feeding are stem blanching, chlorotic spots, leaf yellowing, and shedding. At high enough populations, plants can die.

Life Cycle

Whitefly life cycle is completed in 2.5 to 3 weeks under normal greenhouse conditions but can reach 2 months when cooler. Each female produces about 50 eggs in cool conditions and up to 400 eggs at higher temperatures. Eggs are deposited on the underside of leaves. New eggs are white to light beige but darken just prior to hatching. Newly hatched immature whiteflies move around for a few hours before attaching to the plant and feeding. The rest of the immature stage is immobile.

Scouting

Yellow sticky cards, placed near doors and new plants, can provide information on the presence and movement of whiteflies. Randomly select 10 plants per 1000 square feet of greenhouse space to thoroughly inspect for the presence of whiteflies on the underside of leaves. Honeydew and sooty mold can alert a scout to plants that may be infested by sucking insects, such as whiteflies. Using a 10x hand lens will aid in observing all life stages of whiteflies on plant leaves.



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Cultural Control

Use screens with mesh size < 0.19 mm to exclude whitefly adults from entering greenhouses. Maintain a constant weed management program and remove unsold plants to reduce alternative hosts and refuge sites for whiteflies. Do not keep personal plants in the greenhouse. Keep stock plants clean with a persistent pest management program to produce whitefly-free cuttings. Always inspect all plugs and liners for whitefly nymphs and eggs. Reject infested seedlings and liners from propagators. Plant liners and seedlings can be treated with spray or dip of biopesticides or insecticides prior to planting.

Biological Control

Several biological control methods have been successful in controlling whitefly populations. Any biological control measure should be started preventatively to achieve success. Several parasitoids are available. *Encarsia formosa* can control the greenhouse whitefly, *Eretmocerus mundus* can control the sweetpotato whitefly, and *Eretmocerus eremicus* can attack both. Predatory mites (*Amblyseius swirskii*), predatory bug (*Dicyphus hesperus*), lacewings, and a beetle (*Delphastus catalinae*) can attack both whitefly species as well. The biopesticides *Beauveria bassiana*, *Isaria fumosorosea*, and *Chromobacterium subtsugae* are available as well. In poinsettias, dipping cuttings in horticultural oil or a mix of insecticidal soap and *Beauveria bassiana* has reduced whitefly populations for up to 8 weeks after planting.

Chemical Control

The most effective long-term option for controlling whitefly population has been a medium drench or foliar spray with neonicotinoids. However, insecticide resistance has been developing due to over-reliance on neonicotinoids, especially in the sweetpotato whitefly Q-biotype. Medium drenches with flupyradifurone, spirotetramat, and cyantraniliprole are effective alternatives to neonicotinoids. Foliar insecticide applications can be made to control adults and young immatures. Foliar applications should be repeated weekly until whitefly populations are reduced. Insecticide resistance is highly likely to develop in whitefly populations. As such, one should rotate insecticide modes of action between each application. If Q-biotype sweetpotato whiteflies are suspected, do not apply acephate, bupofezin, neonicotinoids, novaluron and pyriproxyfen.



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Table 1. Selected insecticides for whitefly control

Active Ingredient(s)	Trade Name(s)[1]	REI (h)[2]	Use Site(s)[3]	IRAC Code(s)[4]
Abamectin	Avid; Lucid; Minx 2	12	G N L	6
Abamectin + bifenazate	Sirocco	12	G N L I	6 + 20D
Acephate	1300 Orthene TR	12/24	G	1B
	Orthene T&O	24	G N L	
Acephate + imidacloprid	Avatar PLX	24	G N L	1B + 4A
Acetamiprid	TriStar 8.5 SL	12	G N L	4A
Afidopyropen	Ventigra	12	G N L I	9D
Alpha-cypermethrin	Fendona CS	N/A	L	3A
Azadirachtin	Azatin O; Azatrol EC; Molt-X	4	G N L I	Unknown
	Azatin XL	4	G N I	
	Ornazin 3% EC	12	G N L I	
Beauveria bassiana	BotaniGard ES; BotaniGard 22 WP	4	G N L I	UNF
	Naturalis-L	4	G N L I	
Beauveria bassiana GHA + pyrethrins	BotaniGard MAXX	12	G N L I	UNF + 3A
Beta-cyfluthrin	Tempo Ultra WP; Tempo SC Ultra	N/A	L I	3A
Bifenthrin	Ascertain TR	12	G	3A
	OnyxPro	12	N L I	
	Talstar S Select	12	G N	
Bifenthrin + clothianidin	Aloft GC SC; LC SC	12	L	3A + 4A
	Aloft LC G	N/A	L	
Bifenthrin + novaluron + pyriproxyfen	DuraFlex CS	12	G L I	3A + 15 + 7C

[1] Trade names are provided as examples; mention of specific products does not constitute endorsement. Read label carefully for target scale insect groups, application rates, use sites, and other use restrictions and precautions.
[2] Restricted Entry Interval
[3] Use sites: G = Greenhouse; N = Nursery; L = Landscape; I = Interiorscape or interior plantscape.
[4] Insecticide Resistance Action Committee group number. UC = unclassified. Products sharing a IRAC number contain active ingredients with the same mode of action. Always rotate among products of different IRAC numbers to avoid the development of pesticide resistance.



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Buprofezin	Talus 70DF	12	G N L	16
Carbaryl	Sevin SL	12	N L	1A
Chromobacterium subtsugae	Grandevo PTO	4	G N L	UNB
Clothianidin	Arena 0.25G; Arena 50 WDG	N/A	L I	4A
Cyantraniliprole	Mainspring GNL	4	G N L I	28
Cyclaniliprole	Sarisa	4	G N	28
Cyclaniliprole + flonicamid	Pradia	12	G N	28 + 29
Cyfluthrin	Decathlon 20 WP	12	G N L I	3A
Cyfluthrin + imidacloprid	Discus L	12	G N	3A
Diflubenzuron	Adept	12	G I	15
Dimethoate	Dimethoate 400 EC	10-14 d	N	1B
Dinotefuran	Safari 20 SG	12	G N L I	4A
	Transtect; Transtect Infusible; Zylam Liquid	N/A	L	
	Mauget Dinocide	N/A	L I	
Etoxazole	Beethoven TR	24	G	10B
Fenazaquin	Magus	12	G N L I	21A
Fenpropathrin	Tame 2.4 EC	24	G N L I	3A
Fenpyroximate	Akari 5SC	12	G N I	21A

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Flonicamid	Aria	12	G N L	29
Flupyradifurone	Altus	4	G N L I	4D
Gamma-cyhalothrin	Scion	N/A	L	3A
Horticultural oil	Ultra-Pure Oil; TriTek	4	G N L I	UC
Imidacloprid	Lada 75WSP	12	G N L I	4A
	Marathon 1% G; Marathon II; Benefit 60WP	12	G N I	
	Merit; CoreTect	N/A	L I	
Insecticidal soap	M-Pede	12	G N L I	UC
Isaria formosorosea	NoFly	12	G	UNF
	Preferal	4	G N L	
Kaolin clay	Surround WP	N/A	G N L I	UC
Lambda-cyhalothrin	Scimitar GC	24	G N L	3A
Lambda-cyhalothrin + novaluron + pyriproxyfen	Proflex	N/A	L	3A + 15 + 7C
Lambda-cyhalothrin + thiamethoxam	Tandem	N/A	L	3A + 4A
Malathion	Malathion 5	12	N L	1B
	Malathion 8 Aquamul	12	N	
Neem oil	Trilogy	4	N L	UNE
	Triact 70	4	G N L I	
Novaluron	Pedestal	12	G N	15
Permethrin	Astro	12	G L I	3A
	Martin's Permethrin SFR	N/A	L I	
	Perm-Up 3.2 EC	12	G N L I	

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Pymetrozine	Endeavor	12	G N L I	9B
Pyrethrins	Pyganic 1.4 EC; Pyrethrum TR	12	G N	3A
Pyrethrins + azadirachtin	Azera Gardening	N/A	L	3A + unknown
Pyrethrins + canola oil	Pycana	12	G N	3A + UC
Pyridaben	Sanmite SC	12	G N	21A
Pyrifluquinazon	Rycar	12	G	9B
Pyriproxifen	Distance IGR; Fulcrum	12	G N L I	7C
S-kinoprene	Enstar AQ	4	G I	7A
Sodium tetraborohydrate decahydrate	PREV-AM	12	G N	8D
Spiromesifen	Forbid 4F	N/A	L	23
	Savate	12	G N	
Spirotetramat	Kontos	24	G N I	23
Sulfoxaflor + spinetoram	XXpire	12	G N	4C + 5
Tau-fluvalinate	Mavrik Aquaflow	12	G N L I	3A
Thiamethoxam	Flagship 25WG	12	G N I	4A
	Meridian 0.33G; 25WG	N/A	L I	
Tolfenpyrad	Hachi-Hachi SC	12	G N L	21A
Zeta-cypermethrin + bifenthrin + imidacloprid	Triple Crown Golf	N/A	L I	3A + 4A
	Triple Crown T&O	N/A	L	

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