



# AGRONOMIC SPOTLIGHT



## MANAGING WHITEFLIES IN VEGETABLE CROPS

- » The greenhouse whitefly, sweetpotato whitefly, and bandedwinged whitefly are the most damaging species of whitefly on vegetable crops in North America.
- » Successful control of whiteflies may require an integration of cultural, chemical, and biological control strategies.
- » It is important to follow a plan for managing the development of insecticide resistance.

### IDENTIFICATION AND SPECIES

Over 1000 species of whiteflies are known worldwide, and proper species identification is important because not all whiteflies cause damage on vegetable crops.<sup>1,2</sup> The three main species that cause problems on vegetables in North America and Hawaii are the sweetpotato whitefly (*Bemisia tabaci*), the greenhouse whitefly (*Trialeurodes vaporariorum*), and the bandedwinged whitefly (*Trialeurodes abutilonia*).<sup>3</sup> Of these, the sweetpotato whitefly and the greenhouse whitefly are the most common on vegetables in North America and Hawaii.<sup>4,5,6</sup>



Figure 1. Sweetpotato whitefly adults and nymphs on a tomato leaf.

These three species are small (0.06 inches long) with yellowish bodies and two sets of wings that are covered in a white, waxy powder.<sup>3</sup> Sweetpotato whiteflies hold their wings tilted (roof-like) over their backs, and the wings do not meet over the back (Figure 1). Greenhouse whiteflies hold their wings flat, and the wings do meet over the back. Bandedwinged whiteflies have grayish or brownish bands across their wings. Nymphs are oval, wingless, and lack visible legs (Figure 1).

The sweetpotato whitefly has become the predominant species damaging vegetable crops across the southern U. S., Mexico, and Hawaii.<sup>1,7</sup> Twenty-six different biotypes of the sweetpotato whitefly have been identified, and the B-biotype (also called the silverleaf whitefly) is currently the most commonly occurring biotype, especially in the field.<sup>7</sup> The Q-biotype of the sweetpotato whitefly is also present in the U. S., mostly on ornamentals growing in greenhouses.

The Q-biotype shows high levels of resistance to several insecticides used to manage whiteflies, and there is a concern that the Q-biotype will become a major pest of vegetable crops in the United States in the near future.<sup>7</sup>

### BIOLOGY AND LIFE CYCLE

Whiteflies develop rapidly during periods of warm weather and breed year-round in areas with warm climates and mild winters.<sup>2,7</sup> Adults, eggs, and nymph stages are found mostly on the undersides of leaves, where the adults and nymphs feed. Adults emerge from the last nymph stage and fly to different locations on the same plant or to neighboring plants in short-distance flights of 15 feet or less. If conditions become unfavorable, migrating adults are produced that are capable of longer-distance flights (several hundred feet to several miles).<sup>1</sup>

Whiteflies do not overwinter in the field in regions that freeze in the winter, but they can survive in greenhouses. Sweetpotato whiteflies develop at temperatures between 50°F and 98°F.<sup>8</sup> Development from egg to adult takes 20 days at 95°F and 56 days at 63°F. Development drops off sharply at temperatures above 98°F and below 50°F.<sup>8,9</sup>

### DAMAGE

Greenhouse and sweetpotato whiteflies feed on over 500 species of plants. Some of the vegetable crops most affected by whiteflies include beans, broccoli, cabbage, cauliflower, cucumber, eggplant, melon, peppers, squash, tomato, and watermelon. They also colonize crops such as alfalfa, cotton, peanut, and soybean, as well as ornamental plants such as poinsettia, hibiscus, and chrysanthemum, all of which can serve as sources of whiteflies for vegetable plantings.<sup>4,5,6,7</sup>

Whiteflies suck the sap from the leaves, and heavy infestations can remove large amounts of sap resulting in stunted growth, leaf yellowing, defoliation, and reduced yields.<sup>2,4</sup> The sweetpotato whitefly B-biotype causes the leaf epidermis to separate from underlying tissues, resulting in silvering of the leaves. Feeding of the sweetpotato whitefly can also cause uneven fruit ripening in tomato, and the internal fruit tissue can become white and hard.<sup>3,5</sup>

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Feeding whiteflies also excrete honeydew, a sticky liquid that covers the leaves and fruit and promotes the growth of dark-brown fungi called sooty molds. Honeydew and sooty mold growth are difficult to remove, and they can reduce the quality and marketability of vegetable crops.<sup>4,7</sup>

The main threat from whitefly feeding may be the transmission of plant viruses. More than 100 plant viruses are known to be transmitted by whiteflies, including Tomato yellow leaf curl virus, Tomato mottle virus, and Bean golden mosaic virus.<sup>5,7,10</sup>

## SCOUTING

Whiteflies are not always a problem, and their presence can be inconsistent. So scouting can be very important to prevent damage or virus transmission. Field margins should be checked weekly, especially when neighboring host crops are declining. Twice weekly scouting may be needed during critical periods, such as flowering or head formation.<sup>3,4,7</sup> Examine the undersides of leaves using a hand lens to look for adults, nymphs, and eggs. Use local extension recommendations by crop to determine treatment thresholds and follow IPM recommendations. Yellow sticky traps can also be used to monitor whitefly activity.<sup>2,3</sup> Not all species of whiteflies cause damage, so it is important that scouting is done by those who can identify species correctly.

## MANAGEMENT

Outbreaks of whiteflies can occur when populations of natural enemies have been disrupted by the application of insecticides or the presence of excessive dust.<sup>2</sup> Because of the wide host range of whiteflies, organized, area-wide management efforts may be needed to combat whitefly problems.<sup>7</sup>

Cultural management practices include planting upwind or at least one-half mile away from host crops, controlling weed hosts, using barriers such as row covers, and using reflective mulches. Crop residues should be destroyed promptly after the last harvest, and the time between harvest and planting of subsequent host crops should be maximized.<sup>1,3,4,5,6</sup>

Natural enemies, including predators (lacewings, bigeyed bugs, lady beetles), parasites (species of *Encarsia*) and fungal entomopathogens help keep whiteflies under control during the season. Releasing these biocontrol agents can be useful in greenhouse production, but effectiveness in the field has been less reliable.<sup>2,3,7</sup>

When whitefly populations exceed treatment thresholds, chemical insecticides are a key element of management. In many cases, the highest populations develop in field margins, and treating only the field margins can lower application costs and help protect the natural enemies in the field interior. When selecting an insecticide, look at its selectivity for your pest of interest to ensure it does not harm beneficial insects that may be limiting pest population increases.<sup>3,4,5,6</sup>

Insecticidal soaps and oils can provide some control of whiteflies. These products are not systemic or translaminar, so to be effective, applications need to cover the undersides of leaves where the insects hide.<sup>2,3</sup> Several insecticides are registered for use against whiteflies on vegetable crops, but not all are adequately effective. Consult regional production or pest management guides to for specific recommendations for your area and specific crops.

A systems approach to insecticide resistance management should be used.<sup>7</sup> Inspecting seedlings for the presence of whiteflies before transplanting can help prevent or delay whitefly infestations in the field. Collecting and biotyping any whiteflies present can help in the selection of insecticides that will be most effective. If purchasing transplants, talk to the supplier about the insecticides used during production.

Identify all pesticides registered for whitefly control on the crops of interest and determine the safety (phytotoxicity) and efficacy of each product on each crop. Organize the treatments to rotate mode-of-action classes and avoid label restriction issues. If fruit will be exported, check to see if maximum residue limits exist in the target export markets; this is especially relevant for newly registered products that may not have global registrations. Evaluate the efficacy of applications by follow-up scouting several days after treatment. Integrate insecticide applications with cultural control strategies.<sup>7</sup>

### Sources:

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### For additional agronomic information, please contact your local seed representative.

Performance may vary from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about insect pests and vegetable crops. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, entomologist and similar professional dealing with this specific issue.

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