



BIOLOGICAL SERVICES



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Whiteflies

Whiteflies are not true flies, but are members of the order Hemiptera (true bugs), along with other insects with piercing/sucking mouthparts such as leaf hoppers, aphids, and scales. Whitefly can cause damage plants in 3 main ways, 1) via direct feeding on the plant, 2) via virus transmission and 3) by depositing honey dew on leaves which then provides an excellent growth media for sooty moulds. These sooty moulds reduce the plants ability to photosynthesise, resulting in thin spindly growth. Sooty moulds can also make produce unsightly and reduce fruit quality.

Whiteflies look like miniature white moths and are just over 1mm in length. Males are slightly smaller than females. Adult whitefly are covered with a white waxy substance which gives them their white appearance, and which offers some protection against sprays as water tends to “run” off them. Whitefly go through 4 true larval stages, and then the pupal stage before emerging as an adult. Larvae range in size from 0.3mm up to 0.7mm.

Whiteflies are not strong fliers and tend to only move 1-2 m away from where they hatch. Because of this, new populations tend to develop in isolated hotspots which then grow and adults will disperse from there. However due to their small size, they are easily transported on wind currents and growers can find that they can go from relatively low numbers of adults to very high numbers in a short period of time at certain times of the year, due to adults being blown into the greenhouse or crop.

There are 2 main species of pest whitefly in Australia that attack horticultural crops, the greenhouse whitefly (*Trialeurodes vaporariorum*) and silverleaf whitefly (or sweet potato/tobacco whitefly), (*Bemisia tabaci*).

Greenhouse Whitefly

Greenhouse whitefly were first observed in tomatoes in America in 1870, and since then have been found to be major pests in a wide variety of vegetable and ornamental crops around the world.

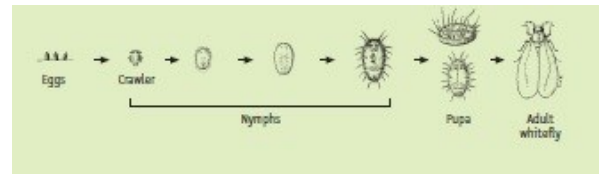
Life-cycle and appearance

Adult whitefly tend to lay their eggs onto the soft young plant growth at the top of the plant. When eggs are first laid, they are white in colour but then turn black prior to hatching. Once hatched, the whitefly larva is able to move around on the leaf for about 1 day. After moving away from the egg, the larva attaches itself to the leaf and remains sedentary, feeding from the plant until it finally moults into a pupa. The nymphal stage starts off as a flattened oval disc on the leaf. Later the developing whitefly stops feeding but swells and develops a distinct vertical body wall with fine spikes over its body, giving a “crown like” appearance. Whitefly adults begin feeding soon after hatching and continue to feed from plants until they die.

Females will start laying eggs about 2 days after hatching as adults. Unmated females lay male eggs, while mated females lay both female and male eggs. The two most important factors affecting whitefly population growth are temperatures and the plant host. Greenhouse whitefly will continue to breed throughout the year in temperate climates. Whitefly eggs can survive more than 15 days at -3°C . The number of eggs laid by a single female varies greatly and will depend on the host plant species, and can even vary between varieties of plants within a species. For example, whitefly females will lay more eggs on beefsteak tomatoes than on many other tomato varieties. Whiteflies that have



Adults and eggs of the greenhouse whitefly



Life cycle of greenhouse whitefly



Greenhouse whitefly scale— pupal stage

originated on a capsicum crop will lay more eggs on another capsicum crop than whiteflies that have been reared on a different plant species. At 22° C a whitefly female can lay on average around 350 eggs in her life time on eggplants (aubergines), 160 eggs on cucumbers and only 20-30 on capsicums.

Silverleaf whitefly (sweet potato, tobacco or cotton whitefly)

Silverleaf whitefly or *Bemisia tabaci* was first found in Australia in the mid 90's. Overseas it is a serious pest of a wide range of tropical and subtropical fruit, vegetable, ornamental and flower crops. There are several strains of this species found around the world, each one differing slightly in its preferred host range, in the range of damage symptoms displayed, and the ability to transmit various viruses. The predominant biotype found in Australia is Biotype B which in many countries overseas is considered a separate species, *Bemisia argentifolii*. Biotype B infests tomatoes, brassicas and cucurbits such as pumpkin, melons, squash and cucumbers. In cucurbits, this whitefly causes silver leaf symptoms, hence the name silverleaf whitefly. Silverleaf whitefly can be found in conjunction with greenhouse whitefly.

Lifecycle and appearance

Silverleaf whitefly eggs are a light yellow/green when laid turning light brown prior to hatching. The pupae are broad and flat and do not have the distinct raised sides that greenhouse whitefly pupae show. The pupae are more pointed at one end and have fewer spikey hairs than that of the greenhouse whitefly. Adult silverleaf whitefly are slightly smaller and have a yellowish body compared with greenhouse whitefly. They also carry their wings more parallel to the sides of their bodies (abdomen is more visible from above) than greenhouse whitefly. Adult greenhouse whitefly carry their wings in a more tent shaped fashion over their bodies.

Silverleaf whitefly lay their eggs over the whole plant so it is not uncommon to find all life stages on one leaf.

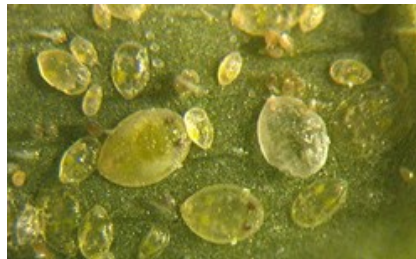
Silverleaf whitefly tend to prefer slightly warmer temperatures than greenhouse whitefly. Development occurs in the range of 14-35°C. At 14-19°C development is very slow with the full life cycle taking up to 140 days at 16°C. Adults can survive several weeks without a host plant in winter. On tomatoes (at 25°C) a female can produce around 195 eggs in her lifetime.

Silverleaf whitefly have a higher tolerance to many insecticides and tend to be much harder to control than greenhouse whitefly.

Silverleaf whitefly are controlled by Encarsia, Nesidiocoris and yellow sticky traps.



Adult Silverleaf whitefly



Eggs, scale and pupae of the silverleaf whitefly



Adult silverleaf whitefly (top view)