



Silverleaf Whitefly Management

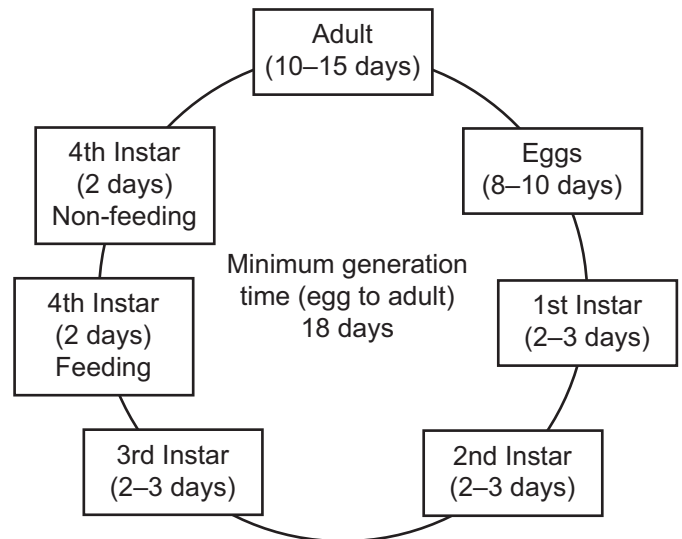
Silverleaf Whitefly (SLW) (*Bemisia tabaci* biotype B) is a major worldwide pest of cotton, vegetables and soybeans. It arrived in Australia in 1994 and is now causing severe problems in Queensland, northern New South Wales and parts of Western Australia. It is still spreading.



Silverleaf Whitefly adult and nymphs.

SLW has a similar life cycle to that of the common greenhouse whitefly (GHW) but favours warmer and drier environments, has the capacity to breed more quickly on a wider range of hosts and can develop resistance to insecticides rapidly. In warmer, more humid areas of Australia, SLW survives on native vegetation and roadside weeds, while in cooler areas it is more likely to be restricted to greenhouses.

Due to its ability to develop resistance to insecticides quickly, chemical control of SLW can no longer be taken for granted. Pest management overseas and experience from Australia has shown that effective management of SLW depends on the use of multiple management strategies.



SLW management strategies

There are a number of useful strategies for managing SLW, including cleaning up your property, adopting a crop-free summer break and using yellow sticky traps for early warning.

Clean up your property

Get rid of broadleaf weeds and the remnants of harvested crops. If you are serious about controlling SLW you cannot tolerate the presence of alternate hosts. Weedy areas and crop residues are often neglected and provide a perfect area in which SLW can breed.

The Bottom Line

- Silverleaf Whitefly (SLW) favours warmer and drier environments and has the capacity to breed more quickly
- SLW can develop resistance to insecticides quickly, so a reliance on chemical control alone is unlikely to succeed in the long term
- To help manage SLW, clear weeds and crop residues from your property, adopt a crop-free summer break and use yellow sticky traps for early warning

The weeds to watch out for in particular are milkweeds (*Euphorbia*), sow thistle, bell or cow vine, jute, bladder-ketmia, wild sunflower and burr-gerkin. Grasses are not hosts for SLW and, if managed carefully and kept short, can be used to exclude broad-leaved weeds. You will find that not only do SLW numbers fall with good weed management, but so do a number of other pests such as aphids and thrips.



Milkweed (Euphorbia).

Adopt a crop-free summer break

Adopting a susceptible crop-free summer break (early December to early February) will prevent the continuous availability of host plants for SLW. If adopted on a large enough scale (preferably whole districts), such a gap in production reduces SLW numbers and lowers the risk of widespread insecticide resistance development.

Ensure that seedlings are free of the pest

Seedlings are a major means for spreading SLW into new plantings. Young plants are generally more susceptible to damage and so early infestations need to be avoided. Clean seedlings should be your first line of defence against this damaging pest and others such as western flower thrips. Inspect seedlings carefully on arrival, look carefully under the top leaves of a minimum of 4–5 plants per tray. If more than 25% of those inspected have one large nymph or 2–3 adults then treat with insecticide.

There are no resistant cultivars available but some are less susceptible to SLW infestation. Check with your seed or seedling supplier for information on more tolerant varieties.

Prevent movement from older crops

Movement of adults from older crops is a primary source of infestation of young crops. Destruction of heavily infested crops often causes mass migration of adults into nearby crops. You should aim to control adults in crop remnants before destruction. Application of appropriate pyrethroid insecticides, either alone or in combination with an organophosphate insecticide, should give good control for up to three days. This will allow time for the residues to be thoroughly ploughed into the ground.



A pumpkin crop with Silverleaf Whitefly damage. Picture supplied by Paul De Barro, CSIRO Entomology, QLD.

Use yellow sticky traps

Yellow sticky traps can be used to detect and monitor whitefly activity, but should not be used to make spray application decisions. Around 3–5 traps should be placed in a block of 2–3ha, level with the tops of the plants since SLW are most attracted to young foliage.

Traps should be changed each week and the total flies counted. However, if numbers on the trap are very high, randomly select ten 1cm² areas, then multiply the count by 15. Whitefly numbers are recorded as the number of adults per trap per week. In young crops the warning threshold is 10 adults per trap per week.

Table 1. Guide to locating whitefly nymphs and adults within a plant.

Crops	Location of pest stage		
	Adults	Small nymphs	Large nymphs
Zucchini (young crop)	2–4 leaves FYL	4–6 leaves FYL	8–10 leaves FYL
Watermelon (mature)	2–4 leaves FYL	9–13 leaves FYL	17–24 leaves FYL
Tomato (determinate)	2–3 leaves FYL	2–3 leaves FYL	4–5 leaves FYL
Tomato (trellis)	2–5 leaves FYL	7–10 leaves FYL	11–14 leaves FYL

FYL - From Youngest Leaf.

Field sampling

SLW adults and eggs are mostly found on the underside of young leaves whilst larger nymphs are most obvious on older leaves. A 10 X hand lens is used when looking for eggs or small nymphs. The presence of large numbers of red-eyed nymphs indicates that adult numbers have the potential to increase rapidly within the next 2–3 days.

Adults should be sampled in the early morning (6–8am) and the edges of the field are usually infested first if the adults are moving from infested areas. Inspect at least 30–40 plants per 3–4ha block, walking through the block in a zig-zag or U-shaped pattern, randomly selecting plants every 8–10m. Also look for visual symptoms such as leaf silvering on zucchini, pumpkin and squash. Check each block at least twice weekly during the warmer months (key period is from August to December). Less frequent checking should be adequate at other times.

When to use insecticides

When whitefly numbers reach a point where insecticides must be used in order to avoid significant damage this is known as the 'action threshold'.



Close-up of Silverleaf Whitefly nymphs.

The secret to effective SLW management is to apply controls immediately when numbers reach this level. Monitor, act promptly and check on effectiveness. Thresholds will also help you decide the type of insecticide to use and the best timing.

In sensitive crops such as cucurbits, SLW populations should not be allowed to exceed three adults per leaf from seedling to fruit initiation. If 50% or more of leaves have three or more adults then apply an insecticide to prevent development of unmanageable numbers by harvest.

Table 2 (over the page) shows thresholds developed for a range of crops.

Insecticide choices

It is a legal requirement for you to check the registration status of any insecticide before use.

Overseas populations of SLW have developed resistance to nearly all available chemicals. Fully resistant whiteflies will be extremely difficult to manage. Few of the currently available insecticides provide excellent control, so a reliance on insecticides alone for control is unlikely to succeed.

Because SLW spend much of their time on the underside of leaves, correct spray equipment selection and use is critical to the success of many foliar insecticides. So-called 'soft insecticides' such as petroleum oils and soap formulations can be effective if SLW numbers are low.

Their use can help reduce the likelihood of insecticide resistance but take care as they can cause phyto toxicity in some crops in some situations.

Table 2. Action thresholds for Silverleaf Whitefly nymphs.

Crops	Threshold based on total nymph counts	Threshold based on large nymphs
Tomato (indeterminate gourmet)	5–8 nymphs/leaflet	2–3 nymphs/leaflet
Tomato (determinate round)	8–10 nymphs/leaflet	3–4 nymphs/leaflet
Zucchini (young crop)	3–4 nymphs/leaf	1 nymph/leaf
Zucchini (mature crop)	6–8 nymphs/leaf	2–3 nymphs/leaf

Synthetic pyrethroid insecticides applied as foliar sprays are used to control for SLW in vegetables. However, they are contact insecticides so small droplet sizes, high volumes and good crop penetration are necessary for good coverage of the underside of leaves, especially in older crops. Organophosphate insecticides give poor control and can lead to rapid increases in SLW numbers, probably due to suppression of natural enemies. However, tank mixtures of pyrethroid and organophosphate insecticides can be useful in some situations.

The neo-nicotinoid insecticide ‘Confidor’ can be used to control whitefly in some vegetable crops. It has systemic action, if applied around the root zone of the crops, and is mainly effective against feeding adults and nymphs. It has a short life in sunlight, so should be used quickly after mixing. Don’t use it more frequently than every 3–4 weeks and be aware that resistance seems to be developing.

Resistance management

The keys to resistance management are:

- Identify your pests before spraying. Do not assume SLW until it has been positively identified.
- Minimise chemical use. Spray only infested areas and only as needed. Routine ‘calendar’ sprays applied as a precaution against infestation are a recipe for disaster.
- Use sticky cards and scouting to locate the population before it spreads.
- Spray an infestation thoroughly, then stop and monitor to assess the impact.
- If possible, rotate to a new chemical group every month to preserve the effectiveness of

each chemical used.

- Apply chemicals only at the recommended rate.
- Maximise spray coverage. Calibrate sprayers, use the finest droplet size possible and make sure the under-surface of all leaves in the target crop is thoroughly covered. Hand pump knapsack type sprayers are totally inadequate. Poor spray coverage will necessitate repeat spraying and speed the development of resistance.

Biological control

In late 2004, CSIRO Entomology was granted permission by the Australian Government to release a very tiny, stingless parasitic wasp. *Eretmocerus hayati*, originally from Pakistan, is being used successfully against SLW in the Lower Rio Grande in south Texas (USA). With a similar climate to coastal and central highland areas of Queensland, this area was an ideal source for the wasp. Stringent testing in quarantine in Brisbane showed it would attack only SLW once released in Australia.

Further reading

The Nursery Papers
 Issue no 1997/009, ISSN:1326-1495
www2.dpi.qld.gov.au/horticultureresearch/18362.html

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