Western Flower Thrips Resistance and Success*[2] Naturalyte* Insect Control.

Recently, there has been a growing concern that the performance of Success*[2] Naturalyte* is starting to decline on some populations of Western Flower Thrips (WFT). There have been some confirmed cases in the Sydney basin of WFT populations in 'closed' systems (glasshouses, hydroponic systems, etc.) developing resistance to spinosad (the active ingredient in Success[2]). Dow AgroSciences has compiled the following information to help growers and advisors best use Success[2] as a WFT management tool and to prolong the useful life of the product against this pest.

Resistance Definition

Resistance may be defined as 'a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species'. Cross-resistance occurs when resistance to one insecticide confers resistance to another insecticide, even where the insect has not been exposed to the latter product. Clearly, because pest insect populations are usually large in size and they breed quickly, there is always a risk that insecticide resistance may evolve, especially when insecticides are misused or over-used[1].

Background

Following the introduction of synthetic organic insecticides, such as DDT, in the 1940s it was not long before the first cases of resistance were detected and by 1947 resistance to DDT was confirmed in houseflies. Thereafter, with every new insecticide introduction, cyclodienes, organophosphates, carbamates, formamidines, pyrethroids, Bacillus thuringiensis, spinosyns and neonicotinoids, cases of resistance appeared some 2 to 20 years after their introduction in a number of key pest species. This phenomenon has been described as the 'pesticide treadmill', and the sequence is familiar. As a result of continued applications over time the pest evolves resistance to the insecticide and the resistant strain(s) becomes increasingly difficult to control at the labeled rate and frequency. This in turn has often led to more frequent applications of the insecticide. The intensity of the resistance and the frequency of insecticide-resistant individuals in the population both increase still further and problems of control continue to worsen as yet more product is applied. Eventually users switch to another pesticide if one is available. The genetics of the heritable resistance traits and the intensive repeated application of pesticides together are responsible for the rapid build-up of resistance in most insects and mites[1].

Resistance Development

Natural selection by an insecticide allows some initially very rare, naturally occurring, pre-adapted insects with resistance genes to survive and pass the resistance trait on to their offspring. Through continued application of insecticides with the same mode of action, selection for the resistant individuals continues so that the proportion of resistant insects in the population increases, while susceptible individuals are eliminated by the insecticide. Under permanent selection pressure, resistant insects outnumber susceptible ones and the insecticide is no longer effective. The speed with which resistance develops depends on several factors, including how fast the insects reproduce, the migration and host range of the pest, the availability of nearby susceptible populations, the persistence and specificity of the crop protection product, and the rate, timing and number of applications made. Resistance increases fastest in situations such as greenhouses, where insects or mites reproduce quickly, where there is little or no immigration of susceptible individuals and where the user may spray frequently[1].

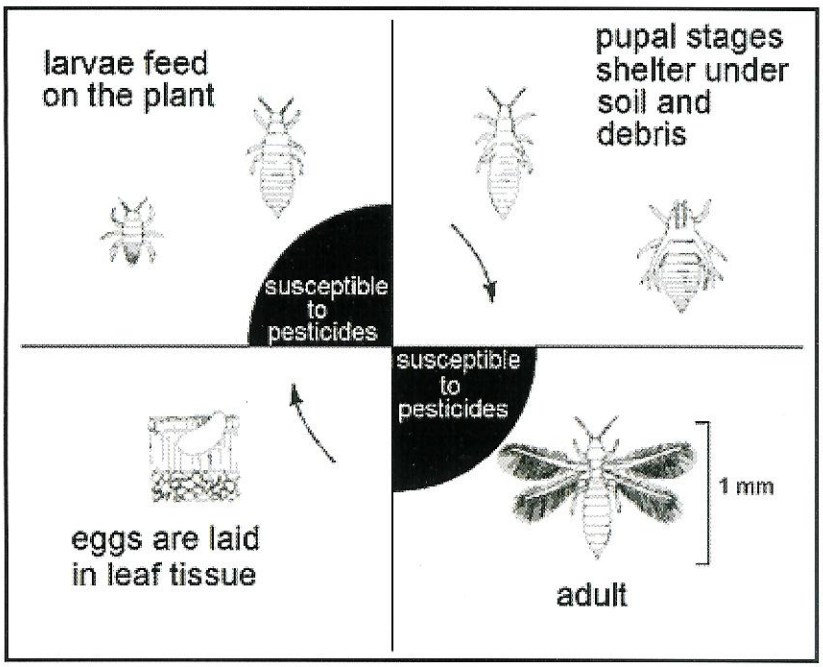
Western flower thrips

Western flower thrips (WFT) (*Frankliniella occidentalis*) is a native of western USA and was accidentally introduced into Australia in 1993. It was found around the Sydney region in 1994 and most damage has been to cut flower and vegetable crops. In most instances the spread of WFT has been attributed to the movement of plants and plant material but the thrips can also be carried short distances by wind[2]. It causes direct damage to fruit through feeding and is a vector of tospoviruses, such as Tomato Spotted Wilt Virus (TSWV). WFT is a pest that readily acquires resistance to insecticides. ***For this reason, it is important to avoid dependence on any single chemical[3]. Growers MUST rotate between chemicals with different modes of action if they are to ensure that their cropping practices are sustainable.***

Life cycle

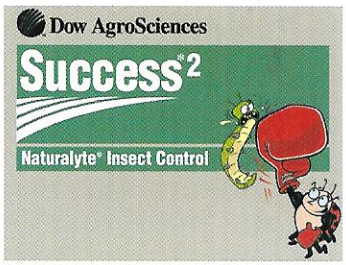
The life cycle of WFT is similar to that of other thrips species in the Suborder Terebrantia. Adult females lay their eggs inside plant tissue and when the first stage larva emerges it feeds on the surrounding plant and flower tissue. A second stage larva develops that then drops to the ground where it pupates in the soil or leaf litter until it emerges as an adult. At 30°C the lifecycle takes around 15 days but as temperatures decline the life cycle takes longer; at 15°C it can take up to 45 days. In warmer areas of Australia, all stages of WFT are present throughout the year. The pest is attracted to flowers, where it feeds on pollen. Thrips have been found on a wide range of crops (cut flowers, fruit and vegetables), broad-leaf weeds and white clover (a favored host). It does not survive on grasses. Female thrips fly close to ground level when they move into the orchard in spring, but the higher the temperature the higher they fly and the faster they spread[2].

Figure 1. Western Flower Thrips Life Cycle[3]



WFT are more susceptible to pesticide sprays at certain times of their life cycle (Figure 1.). It is very important to ensure that pesticide applications are timed to the correct thrips growth stage to ensure maximum control. Thorough scouting of the crop will assist in ensuring that this timing is correct.

Using Success[2] Naturalyte Insect Control for WFT



People started using spinosad in crops for WFT control before either registrations or permits were in place for Success* Naturalyte*. There was nothing else as effective as Success and, even then, rotating to other chemistry was difficult, especially when the results with Success were so outstanding. More recently, loss of access to some effective products, when permits ran out or products were not re-registered, led to Success (and more recently Success*[2] Naturalyte* Insect Control) being relied on more often than was recommended.

There are several populations of WFT in the Sydney basin which have developed resistance to spinosad. Putting on more Success[2], or using it more frequently than the label states, will only worsen the problem and make it harder to bring the population back to a susceptible status. What is required is an emphasis on cultural control techniques being used (netting, better hygiene, removal of weed host plants) and other chemical controls (BUT NOT SUCCESS[2]) until such time that the resistance levels have fallen back to a more normal level.

Only then can Success[2] be used again, but sparingly and in rotation with other chemicals and in conjunction with cultural techniques.

WFT management – more than chemicals

Key management elements for managing western flower thrips.[2]

- Keep ground covers mown short throughout the year to prevent flowering
- Reduce alternative hosts of WFT by removing broad leaf weeds and white clover
- Monitor for the presence of WFT in the crop using sticky traps
- Choose pesticides less harmful to beneficial insects to encourage their presence and survival
- If chemical control is required, spray at the right time
- Use only approved products according to the label or permit directions to reduce the chance of resistance.

Keep your farm clean![3]

- Remove or control weeds within and nearby your crop/orchard, because weeds harbour WFT that will re-infest your crop/trees.
- Plough in or burn old crop debris.
- Remove unwanted flowers or plants affected with TSWV, and burn or bury them.
- Monitor for WFT in your crop/orchard and packing sheds with sticky traps.
- Only buy WFT and TSWV-free seedlings/cuttings/runners from a reliable or accredited supplier, otherwise large losses can occur.
- Don't bring any plant material onto your property unless necessary, because you may bring WFT with it. Keep any deliveries to one side and inspect for WFT. If found to be present, return the affected plant material to the supplier, or burn or bury it.
- Try to control WFT when plants are young, to prevent high levels of TSWV in your crops/orchard.
- Try to manage WFT well before harvest.
- Use insect-proof screening on your greenhouse if your crop is grown under cover.
- Avoid carryover crops if possible, as they may be more severely affected by WFT/TSWV.
- **Important:** Once harvesting has commenced, it may be difficult to follow the insecticide usage plan recommended in this information, and also observe withholding periods.
- Be familiar with the natural enemies of WFT present on your farm, and where possible choose pesticides with the least impact on them.

Frequently Asked Questions

Q. What products other than Success[2] Naturalyte can I use for WFT control?
A. This will depend on the crop you are growing. There are registered products and also products which have APVMA-approved use permits (but you can't tell this by reading their label). The best option is to ask your local department (NSW DPI, QDPI, DAFWA, etc.) adviser, or check on the APVMA website for products registered in your state in your crop for WFT control, or for products with a permit for WFT control.

Q. I have WFT resistance. How long before Success[2] will be useful again?
A. This is impossible to say, but if you stopped using Success[2] today and other control measures gave good control for 12 months, the Success[2] resistance level would probably drop markedly BUT will rise again even more quickly should Success[2] be over-used again.

Q. I don't have a WFT resistance problem yet – what should I be doing to stay that way?
A. Concentrate on using as much cultural control as possible. When using chemicals don't cut rates and rotate to as many different mode of action products as possible. Closely adhere to recommendations made in labels and literature.

Q. I've had a spray failure. What do I do if I think I have WFT resistance?
A. Eliminate other possible causes for the failure first because that is the easiest and fastest thing to do.
First, make sure that your sprayer is working properly and your spraying technique is good.
Was the correct rate of product used and the label followed?
Could the thrips have been blown in after spraying?

Q. There is no other chemical option for controlling WFT for the crop that I grow. What do I do?
A. Use the cultural techniques outlined above to minimize the population of WFT in your crop or grow an alternative crop for a period of time if practical.

When you are sure everything else has been checked out, check for resistance. Collect samples of thrips and contact your local agriculture department district agronomist (NSW DPI, QDPI, etc.) and they will provide you with details of who to send them to and what details you need to provide.

References & Other sources of information

[1] - http://www.irac-online.org/Resistance/Overview.asp
[2] - Western flower thrips in stone fruit – http://www.dpi.nsw.gov.au/agriculture
[3] - Western flower thrips (WFT) insecticide resistance management plan - http://www.dpi.nsw.gov.au/agriculture

More information can be found at:
http://www.agric.nsw.gov.au/reader/thrips
www.dpi.qld.gov.au