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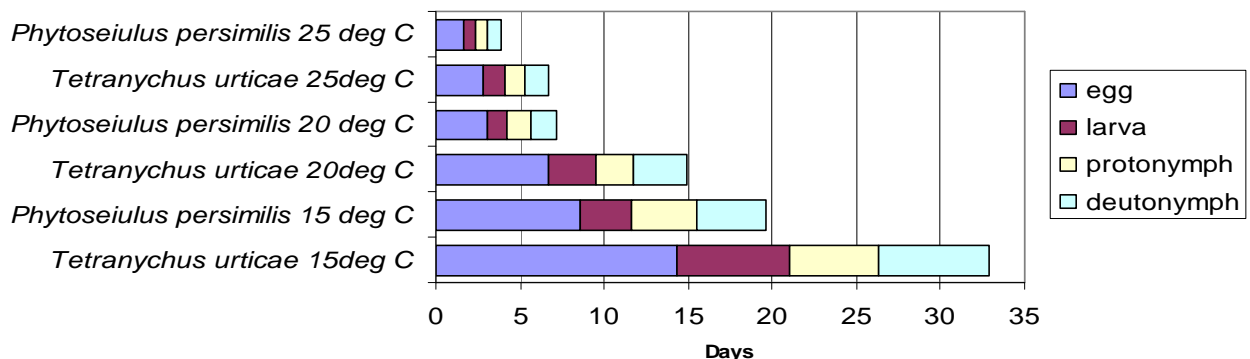
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## Information

### Biological Control - SPIDER MITES

Two-spotted mite or glasshouse spider mite (*Tetranychus urticae*) is one of the most damaging pests that attack horticultural crops. A wide range of crops is affected, both protected and field grown. The mites feed by sucking sap from the under surface of the leaf (this can lead to the introduction of toxins into the plant). This pest can proliferate very quickly from quite small numbers in a short space of time. The symptoms of an infestation are groups of small white specks, which are clearly seen on the upper surface of the leaf. When mite numbers become high these spots join together, giving a whitish appearance to the leaves. From a distance a bronze hue can be seen on the foliage, which eventually dies if it is left unchecked.

**Pest and Predator life cycles**



### LIFE CYCLES OF MITES AND PREDATORS

Adult female spider mites hibernate through the winter in the glasshouse structure or in crop debris etc. Hibernation is induced by decreasing day length, temperature and, sometimes, poor plant condition (lack of food). Mites generally hibernate close to where they were feeding, and therefore outbreaks in the new crop almost always occur in the same area as in the previous year.

Spider mites usually emerge when the temperature and day length increase. In protected crops, mites will appear as soon as the temperature rises but damage is often missed until it is too late and foliage is damaged.

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There are 5 developmental stages: egg, larva, two nymphal stages and the adult. Fertilised eggs produce females unfertilised eggs produce males. The duration of the life cycle is very dependent on temperature and varies between 14 and 30 days. At 18°C it is 21 days and at 21°C it is 15 days.

Hot, dry periods encourage infestation. Monitor crops coming onto the nursery to reduce introduction of infection from external sources. Preventing a crop from becoming stressed (high levels of nitrogen are associated with a mite attack) is very important to prevent a range of problems from developing. Watering at the correct times of the day and using an appropriate irrigation system for the crop will significantly reduce the risk. If you know you have an infested crop, look at it at the end of a nursery crop check to reduce its spread into other areas. Mites can be carried on wind currents, on infested plant material relocated onto other benches during propagation or on staff. Tetranychid mites are easy to dislodge from a leaf when a branch is vigorously shaken onto a white sheet of paper.

When a population is high, pregnant females generally gravitate towards the plant tips to try and disperse along a chain of mites or using physical methods such as crawling along crop wires into a new area.

## **BIOLOGICAL CONTROL AGENTS**

*Phytoseiulus persimilis* is used to control spider mites in many parts of the world. Although it was first developed for use on cucumbers it is now used on a range of vegetables, fruit and ornamental crops. The predatory mite feeds only on spider mites (larva and egg stage) and is capable of devouring large numbers. *Phytoseiulus* are quite mobile but they will not move from areas where spider mites are present to search for new outbreaks.

This means that predators must be added to each new outbreak of spider as it occurs and on large individual pots some means of bridging the gaps for the mites to roam such as white fleece is necessary. *Phytoseiulus* can multiply faster than spider mite, but only at higher temperatures.

At low humidity levels, *Phytoseiulus* will tend to move down into the crop canopy, especially during midday. Often tall crops can be damaged with mites at the top but kept clean on the lower foliage. *Phytoseiulus* work well in 75% relative humidity and temperatures around 20°C.

*Feltiella acarisuga* is a naturally occurring predatory midge. It is capable of locating patches of spider mite from a single release site. This has a significant benefit over *Phytoseiulus*, which although a good predator, is less mobile. The adult female midges lay their eggs amongst the spider mite colonies and the resulting larvae prey on all stages of the spider mite. *Feltiella* form white cocoons when they pupate providing an easy assessment of how well they are establishing. The pupa is formed inside a white cocoon 1 to 1.5 mm long. The cocoon is spun onto a leaf often on the lower surface near to a vein. The pupa itself is pinky white but becomes yellow and darker as it develops.

In optimum conditions, when fully grown, they are 1.7 - 1.9 mm in length and 0.4 mm in diameter. *Feltiella* take 2 weeks to complete a generation. Only the larval stages are predacious with a single larva able to suck out an egg of a spider mite in 2 - 3 minutes and an adult in 30 - 60 minutes. Up to 30 individuals (eggs, larvae and adults) may be consumed in a day.

*Amblyseius californicus* is a predatory mite that works well at higher temperatures. It can persist for longer than *Phytoseiulus* in hot, dry atmospheres and where spider mite densities are low but does not lay as many eggs or hunt as actively for prey. These mites can move to the top of an infested plant thus giving a good combination of control with the *Phytoseiulus*. *Amblyseius* work well in high temperatures and low humidities.

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## APPLICATION RATES

### *Phytoseiulus*;

A bottle containing *Phytoseiulus* and vermiculite carrier makes the application a convenient and effective dosing system, which ensures that each shot of vermiculite has predators in it. The volume of carrier means that predators come into contact with the leaf surface very quickly and are unlikely to be knocked off with the vermiculite if the leaf moves.

As a guide, use between one and two predators as a general treatment and 20 per m<sup>2</sup> or more, in areas where severe outbreaks of spider occur. Higher rates of introduction are needed in crops where damage thresholds are low, such as ornamentals.

### *Feltiella*;

To establish, there must be sufficient food for the predator and ornamental crops with very low damage may not be suitable. *Feltiella* will build up on localised hotspots of spider and from there, spread to lower infestations. It has been used successfully on protected strawberries, roses, stock plants and in large ornamental displays. Introduce 1 tub weekly into hotspots.

The presence of cocoons in the crop provides an easy assessment of how well the predator is established. Some types of ornamentals may not be suitable where the spider mite damage thresholds are so low that the levels of spider necessary to establish the predator cannot be tolerated. However, it is ideal for stock plants and large ornamental displays.

### *Amblyseius*;

This predator has an application rate per m<sup>2</sup> similar to *Phytoseiulus*.

Examples of side-effects of commonly used pesticides can be seen in the following tables:

Fungicide	<i>Phytoseiulus</i>			<i>Feltiella</i>		
	Pupa	Nymph/adult	Persistence (wks)	Pupa	Nymph/adult	Persistence (wks)
Amistar*	S	S	0			
Fubol Gold WG*	S	S	0			
Nimrod	S	SH	0			
Reflect*	S	S	0			
Switch		SH	0			

Insecticide	<i>Phytoseiulus</i>			<i>Feltiella</i>		
	Pupa	Nymph/adult	Persistence (wks)	Pupa	Nymph/adult	Persistence (wks)
Apollo 50SC*	S	S	0	S	S	0
Borneo*	H		4-8			
Cythrins 500EC/Max	H	H	8-12	H	H	8-12
Decis	H	H	8-12	H	H	8-12
Dynamec	H	H	2	H	H	2
Floramite 240 SC*		SH	1	S		0
Hallmark WZT*	H	H	8-12	H	H	8-12
Nealta	SH	SH				
Nissorun SC*	S	S	0	S	S	0
Spruzit*	VH	VH	1			

MH = moderately harmful      H = harmful      S= safe      SH = slightly harmful

\* Extension of Authorisation for Minor Use (EAMU) required.

A blank space in the tables indicates that no work has been carried out on these products.

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