FRESH NOTES
A TECHNICAL UPDATE PUBLISHED BY HORTGRO SCIENCE

MITES IN A HOT AND DRY 2018/19

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The mites

There are three tetranychid mite species that infest deciduous fruit in the Western Cape, particularly apples and pears. They are the European red mite (ERM), *Panonychus ulmi*, bryobia mite, *Bryobia rubrioculus,* and the two-spotted mite (also known as red spider mite, *Tetranychus urticae*). Some taxonomists differentiate between *Tetranychus urticae* (two-spotted mite) and *Tetranychus cinnabarinus* (red spider mite). However, in South Africa we lump them together as one species, as they are regarded as two colour forms of the same species (the red form and the two-spotted form). In South Africa both forms can be found in the same orchard, with the whole range of intermediate colour forms. In addition, they interbreed and produce viable offspring. Two-spotted mite (TSM) is a problem in both Ceres and EGVV, while, at present, ERM is a problem in EGVV and bryobia is a problem in Ceres.

A

B

C

(A) Red spider mite. On the right an adult female and on the left an adult male, which differs from the immature stages by its roughly triangular abdomen – the abdomen of the immature stages is rounded.

(B) Bryobia female, there are no males: note the long front legs.

(C) European red mite adult female: note the 6 white spots on the back.

The predators

Predatory mites

Neoseiulus californicus, commonly called californicus. It is a shiny, almost transparent predatory mite and is the most important predator. It is resistant to many of the chemicals applied for the control of other pests and diseases, although its tolerance to the more recent chemicals is not known. However, although many of the pyrethroids do not kill it, they cause the pest mites to disperse, which compromises the ability of the predator to locate the colonies of pest mites, severely reducing the predatory success. It is about as heat tolerant as the pest mites, including TSM. It survives the winter in the organic layer on the orchard floor, where it preys on small insects and saprophytic mites. There is also an indigenous predatory mite, *Euseius rubicolus* (or just rubicolus). It looks so similar to californicus that they can only be distinguished from each other by preparing them for examination using a compound microscope and then examining them under high magnification. Rubicolus is much more sensitive to chemicals than californicus. The prey preferences of californicus are TSM, ERM and then bryobia (Pringle & Heunis 2006).

Predator Californicus in the centre of the picture. The dark “blob” at the top is a red spider that has been sucked dry by the californicus.

Phytoseiulus persimilis, commonly called persimilis, is a shiny, bright red predatory mite that only feeds on TSM. The local strain is also resistant to a number of chemicals, but not as many as californicus. It is sensitive to the pyrethroids. In order to survive the winter it has to have access to active TSM, which is very seldom the case locally (Pringle 2001).

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Persimilis – often referred to as the glass house predatory mite in literature from Europe.

Tydeus grabouwi, commonly called grabouwi, is a small white-pinkish predator. It can only feed on quiescent mites that are going through the moulting process, so it does not control mites on its own, but can make a small contribution.

Agistemus africanus, or africanus, is a specialist egg predator. The immature stages are yellow and the adults are bright red. They feed on a wide variety of eggs. However, they are fairly rare and not much is known about their biology. We assume that they are sensitive to chemicals.

Agistemus adult. The eggs and immature stages are bright yellow.

Predatory insects

All these predatory insects appear at fairly high mite population levels, but can bring a high population under control in a short time. All of them are sensitive to chemicals.

Oligota fageli, or oligota, is small elongated, black predatory beetle. It feeds on all stages

of TSM, but ignores ERM eggs. Its predatory behaviour on bryobia is not known.

Oligota: unlike other beetles, characteristically the wings only cover part of the abdomen.

Scolothrips is a genus of predatory thrips. We do not know what the local species is/are. It has black spots on the light brown background of the wings. It tends to feed mainly on TSM eggs. Its predation on the other mites is not known.

Stethorus aethiops, or stethorus, is a small, round, black ladybird beetle. It was numerous in orchards prior to the introduction of the pyrethroids, but disappeared in a very short time after their introduction. They feed on all stages of TSM, but ignore ERM eggs. It is not known whether or not it preys on bryobia.

Stethorus adult at the top and below is the larva.

General

In general the predatory mites have been more successful biological control agents than the predatory insects locally.

- The predatory mites can establish at low to very low mite population levels, particularly californicus and rubicolus, while the predatory insects need fairly high to high mite populations to establish.
- The predatory mites are generally resident in orchards throughout the year, whereas the predatory insects leave the orchards in the absence of mites.
- Californicus and persimilis are resistant to a number of chemicals used to control other pests and diseases, and the predatory insects are much more sensitive to these chemicals.

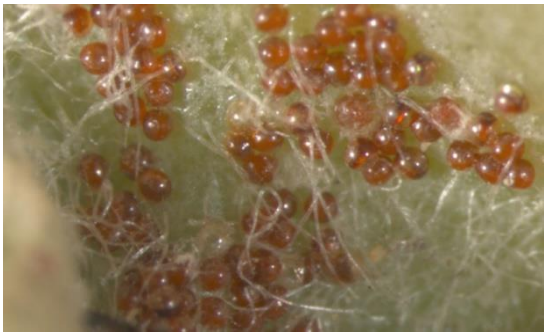
Damage

Feeding on the leaves of apples by TSM causes bronzing, often with a lot of webbing. Severe infestations result in leaf drop. On pears TSM leaf infestation causes the leaves to go black (leaf scorching) and eventually drop. In general, pears are more sensitive to TSM than apples and some cultivars are more sensitive than others. The sensitive pear cultivars in South Africa appear to be, in order of sensitivity, Comice, Bosc, Early Bon Chretien, Packham's Triumph, with Forelle being the most tolerant (Bekker Wessels and Dr Juanita Heunis, personal communication). ERM and bryobia feeding on apple and pear leaves causes yellow, chlorotic spots. They are not as damaging as TSM.

Phytosanitary

Phytosanitary problems occur when the mites congregate on the fruit and enter their overwintering form. This can also be stimulated by a decrease in the nutritional quality of the leaves, due to feeding by the mites or other arthropods, drought or heat damage, leaf senescence at the end of the season etc. Because this can be stimulated by factors other

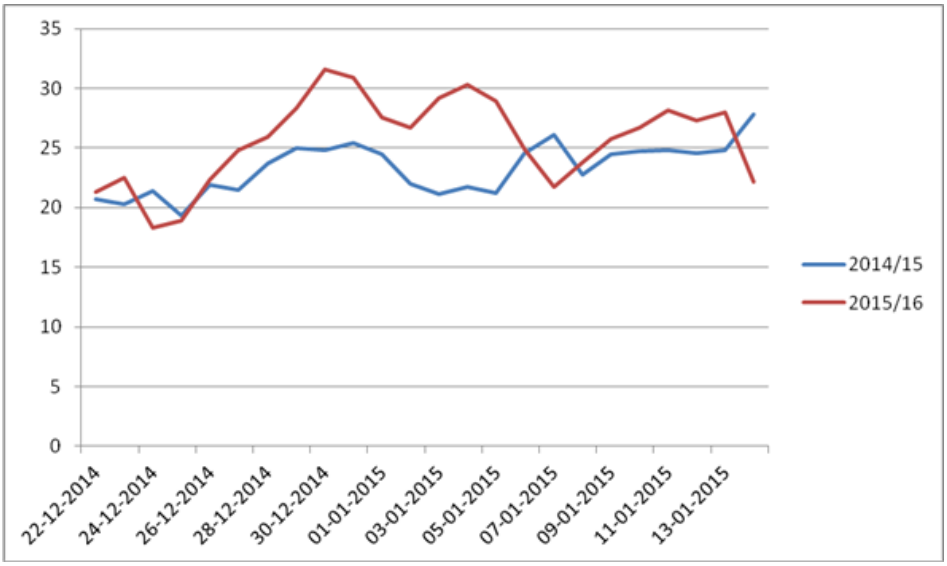
than the onset of autumn or winter, it can occur as early as mid-summer. In the case of TSM the overwintering form is bright red adult females, while in the case of ERM and bryobia it is bright red eggs. The overwintering eggs of bryobia are round, while those of ERM have a stalk on top giving them the appearance of a small, red onion.



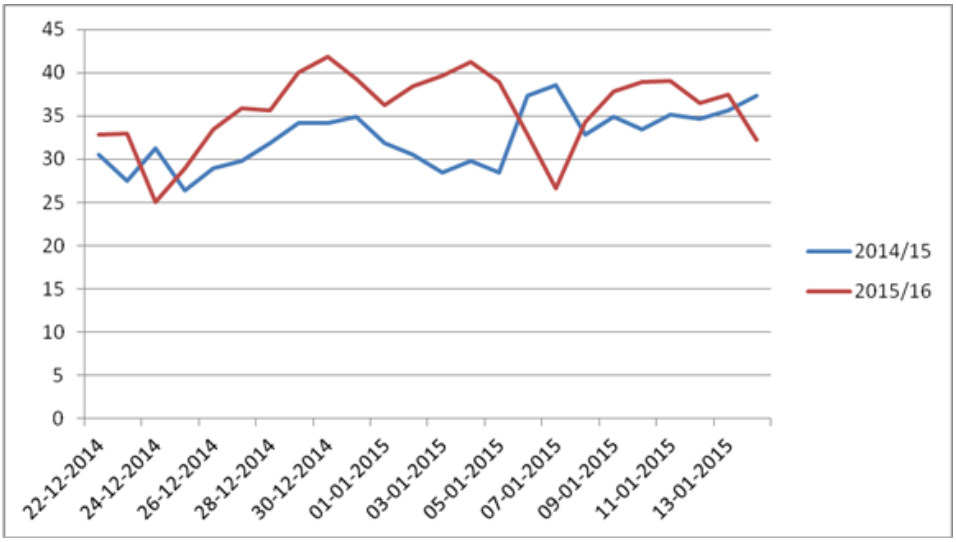
Round bryobia over wintering eggs (left), and onion-shaped European red mite over wintering eggs (right).

Mite outbreak 2016

The 2015/16 season was exceptionally hot as shown in the graphs below (supplied by Bekker Wessels).



Average temperatures for 2014/15 and 2015/16 for Ceres.



Maximum temperatures for 2014/15 and 2015/16 for Ceres.

These hot conditions can place the trees under stress, particularly if there are other stress factors, such as drought. When trees are stressed, they close their stomata to reduce water loss (Mattson & Haack 1987, Belczewski & Harmsen 2000). In addition, the nutrient levels in the leaves increases. The increase in nutrient levels results in an increase in the reproductive rate of the mites (Mattson & Haack 1987). However, there is not a corresponding rate of increase in the reproductive rate of the predators. Therefore, the mite population, to a certain extent escapes predation. To rectify this, a spray should be applied to suppress the mites in order to give the predators a “chance to catch up”. This spray should be applied early and may even be repeated within a week. This is contrary to the recommendation during normal seasons.

Under these stress conditions the margin of error is greatly reduced, which means that everything must be done correctly. This includes:

- Diligent monitoring using the correct, recommended procedure (Brown & Pringle 2006) so as to optimise chemical intervention.

- Not applying pyrethroids after petal fall and not using more than two pyrethroid applications
- Applying herbicides before green tip so that the mites are not forced into the trees when there is foliage for them to feed on.
- Maintaining an organic layer on the orchard floor for the survival of predators during winter by encouraging plants on the orchard floor.

REFERENCES

BELCZEWSKI, R. & HARMSEN, R., 2000. The effect of non-pathogenic fungi on life-history traits of urticae (Acari: Tetranychidae). *Experimental and Applied Acarology* 24, 257–270.

BROWN, L. & PRINGLE, K.L. 2006. Monitoring system for pests on pome fruit. *Deciduous Pamphlet Series.* DFPT Research, 3pp.

MATTSON, W.J. & HAACK, R.A., 1987. The role of drought in outbreaks of plant-eating insects. *Bioscience* 37, 110–118.

PRINGLE, K.L., 2001. Biological control of tetranychi mites in South African Apple orchards. *Acarology: Proceedings of the 10th International Congress*. RB Haliday, DE Walter, HC Proctor, RA Norton and MJ Colloff (Editors). CSIRO Publishing, 429-435.

PRINGLE, K.L. & HEUNIS, J.M., 2006. Biological control of phytophagous mites in apple orchards in the Elgin area of, South Africa using the predatory mite, *Neoseiulus californicus* (McGregor) (Mesostigmata: Phytoseiidae): a benefit–cost analysis. *African Entomology* 14: 113-121.

PRINGLE, K.L. & HEUNIS, J.M., 2017. Mites with special reference to pears: General considerations. *South African Fruit Journal Dec16/Jan17:* 58-59.

PRINGLE, K.L. & HEUNIS, J.M., 2017. Mites with special reference to pears: Results from Ceres. *South African Fruit Journal Dec16/Jan17:* 60-63.