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Farmnote

Monitoring and Control of Thrips in Citrus

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Thrips damage

Thrips are small, slender, soft-bodied insects, just visible to the naked eye. In citrus, thrips can injure the developing flowers or fruit. Feeding damage to fruit is recognisable as a ring of brownish tissue or 'halo' at the stem end, or as russet or grey scarring between touching fruit. Damage tends to occur in sheltered areas, as thrips feed in protected regions. Since fruit scarring downgrades fruit quality and reduces the packout of local and export quality fruit, growers may be tempted to spray for thrips.

Wind damage

Growers should determine whether thrips are a problem in the orchard before unnecessary spraying. A study by the Department of Agriculture WA has shown that growers often confuse wind damage with thrips damage. Examples of wind damage, thrips damage and damage caused by other insects is provided in this Farmnote, so that growers can recognise the different types of damage and take the appropriate action.

What does thrips damage look like?

In Western Australia, two economically important species of thrips and their damage have been found to date: damage caused by Kelly's citrus thrips (*Pezothrips kellyanus*), and damage caused by greenhouse thrips (*Heliothrips haemorrhoidalis*).

Kelly's citrus thrips (KCT). Damage is recognisable as a ring of tissue around the stem end of the fruit (Figure 1). This damage usually occurs in sheltered areas such as under the calyx, between touching fruit, or where a leaf or twig touches the fruit. If infestations are heavy, the damage can spread downwards along the sides of the fruit (Figure 3).

Greenhouse thrips (GT). Thrips feed between touching fruit, causing grey scarring and silvering of leaves and fruits (Figure 2). Spots of black excrement are characteristic in silvered areas. When infestations are heavy, damage can occur over the entire surface of the fruit.

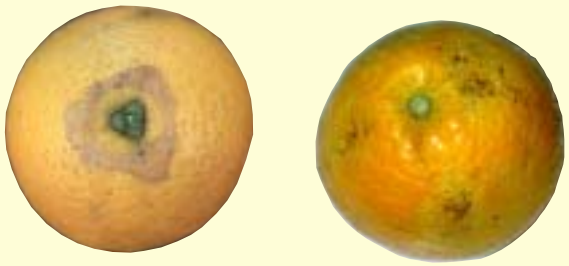


Figure 1.(left) Characteristic ring scarring to the stem end of an Imperial mandarin, typical of KCT.

Figure 2.(right) Damage to Valencia orange by greenhouse thrips.

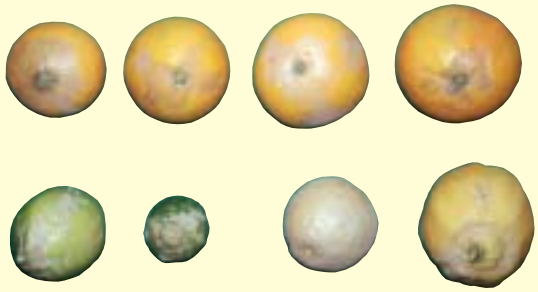


Figure 3. Severe KCT damage to oranges and lemons.

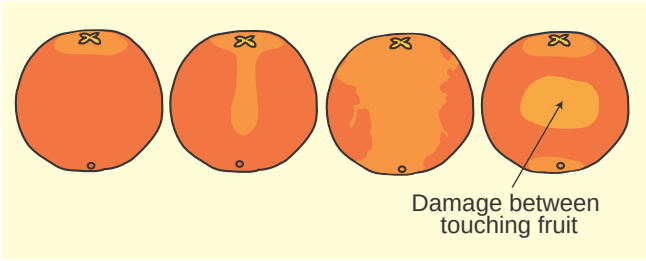
What does wind damage look like?

Wind tends to cause single or multiple transverse or diagonal scars across the face of the fruit. Fruit are most susceptible to early wind marking when they are about 8 mm in diameter that is, for about 12 weeks after petal fall. Older leaves being blown to and fro across the surface of the young fruit often cause early wind marking. This damage results in the formation of a protective layer of underlying cells (Figure 4).

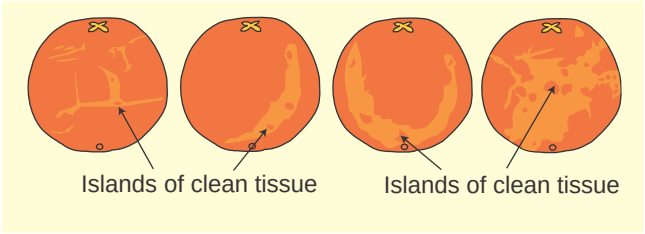
Once fruit is about 3 cm in size, the skin has hardened and is unlikely to be damaged by leaves. Damage at this stage is more likely to be caused through scratching of the fruit by dry twigs (Figure 5). Late wind markings are usually diagonal or transverse. Scars tend to be sunken and may be silver to black.

Recognising the difference between thrips damage and wind damage

Thrips damage: thrips marks tend to be longitudinal, with damage extending from the calyx (see diagrams below).



Diagrams showing thrips damage. Note that the damage normally extends from the calyx. There are usually no islands of clean tissue.



Diagrams showing wind damage. Note the islands of clean tissue.

Wind damage: wind marks do not normally extend from the calyx and can be longitudinal or arc-shaped (see diagrams above) Small circular areas or islands of clean tissue are usually visible on wind-damaged fruit. The edges of the scars also tend to be irregular.

Minimising wind damage

The planting of wind breaks, or the use of artificial windbreaks is recommended to minimise wind damage. Pruning out dead wood after picking the fruit can further reduce damage by wind.

Other types of fruit damage

Fruit can also be damaged by other species of insect, mites, fungi and bacteria. Some examples are provided in Figures 6 – 9. Insects such as mealybugs and scale can infest fruit and also promote the formation of sooty mould.

Physiological disorders such as rind creasing, corrugations and so on can affect the appearance of fruit. Physical blemishes to fruit can also occur through damage by hail, spray burn, water burn and external blemishes through picking and packing.

Monitoring for thrips

Native and introduced species of thrips are found in citrus in Western Australia. Most of these species do not cause economic damage to citrus and only two economically important species of thrips have been found. For these reasons, accurate identification of thrips is important.

What do I sample?

We recommend that growers sample the fruit using either a hand lens, or by collecting thrips into a container of water or 30 per cent ethanol. If using a hand lens, look under the calyx for thrips. The use of sticky traps for monitoring is not recommended because thrips collected from sticky traps easily lose hairs and other body parts that are essential for identification.

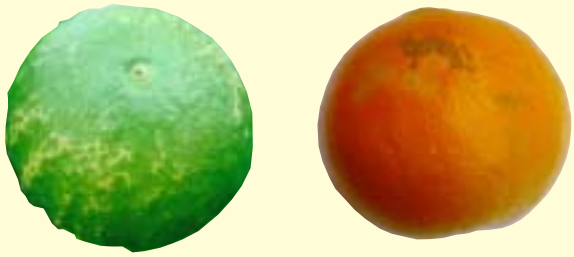


Figure 4.(left) Early wind marking to an Ellendale mandarin.
Figure 5. (right) Late wind marking on Imperial mandarin. Mediterranean fruit fly sting marks are also visible.

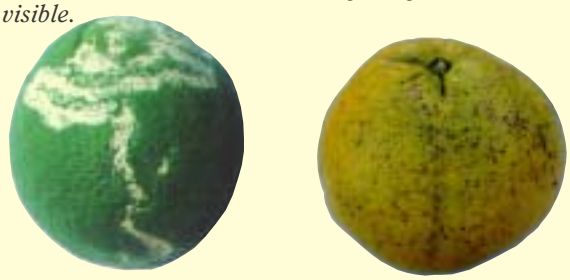


Figure 6. (left) Citrus leafminer (Phyllocnistis citrella) *damage to Valencia orange caused by larval mining. This type of damage is uncommon.*
Figure 7. (right) Red Scale (Aonidiella aurantii) *damage to grapefruit.*

Figure 8. (left) Distortion of lemons caused by citrus bud mite (Eriophyes sheldoni).
Figure 9.(right) Citrus broad mite (Polyphagotarsonemus latus) *damage to the lemon rind.*

How many fruit do I sample?

This depends on the size of the block and the amount of time that you have available for sampling. As a guide, sample at least 50 fruit for thrips (total 10 trees). Use a hand-held counter so you don't lose count of how many fruit you have looked at.

If you have had problems with greenhouse thrips before, you may want to sample where they were previously a problem. Greenhouse thrips tend to occur within the most moderate microclimatic areas of the orchard, which are consistent from year to year.

Select a terminal shoot from each side of the tree. You do not need to count the total number of thrips found per fruit, but you do need to know if the thrips that you find are an economic pest or not.

How often should I monitor?

Kelly's citrus thrips: monitor every week from petal fall to calyx closure. Check between touching fruit late in the season.

Greenhouse thrips: monitor every week from fruit set.

How do I work out the infestation level?

To determine the percentage of fruit that are infested: (1) count the total number of fruit on which you have found thrips; (2) divide this total by the total number of fruit sampled; (3) multiply this result by one hundred.

Worked example:

25 Valencia trees (125 fruit) were sampled on October 19. Of these, 20 fruit were infested with thrips.

% infested fruit = (# infested/# sampled) x 100
= (20/125) x 100
= 16%

The action level is 5-10%. However, all thrips found were plague thrips (Thrips imaginis), which will not damage fruit. therefore , no action was taken.

How many thrips can I find before I need to take action?

The total number of thrips found is not significant, it is the percentage of fruit that is infested with thrips that is important.

Kelly's citrus thrips: action is required if five per cent or more fruit is infested.

Greenhouse thrips: action is required if 10 per cent or more of the fruit is infested.

Action required

Chemical control

Petroleum spray oils can be used to control thrips and are compatible with IPM programs. Thorough coverage is very important. Spray for greenhouse thrips before young fruit come into contact with each other. Early harvest of Valencias will also help reduce damage from greenhouse thrips, since they will also damage ripe fruit.

Biological control

Predatory thrips such as the native *Haplothrips* spp., attack Kelly's citrus thrips. The wasps *Thripobious semiluteus*, *Megaphragma mymaripenne* and *Ceranisus* sp. parasitise greenhouse thrips in eastern Australia. It is not known whether these parasites are present in Western Australia. Predatory mites, bugs and spiders will also attack thrips.

Identification of thrips

Of the five life stages – egg, nymph, prepupa, pupa and adult - you are most likely to find nymphs and adults. Adults have fringed wings that are often folded back over the body. The nymphs (first and second instars) resemble the adults but do not have wings. The prepupa and pupa of greenhouse thrips drop to the ground and are present in the leaf litter or soil.

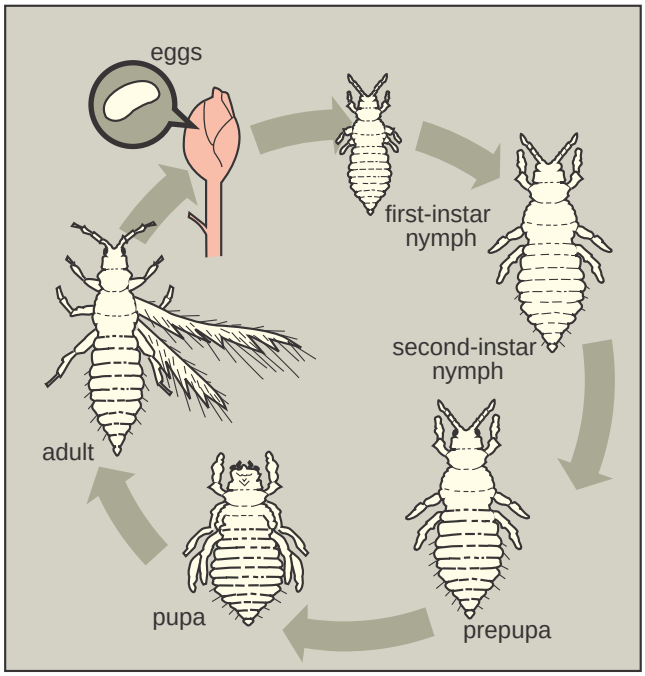


Figure 9. Typical thrips life cycle.

Thrips commonly found in citrus are shown on page 4. Because thrips are tiny, identification using a hand lens may be very difficult. The two important species (Kelly's citrus thrips and greenhouse thrips) have black adults. Tomato thrips are also black, but there are differences that will allow you to separate them (page 4).

If in doubt of your identification, or if you think you have found a different species of thrips to that depicted here, have the specimens identified. Contact your local Department of Agriculture WA office for further details.

Pest species

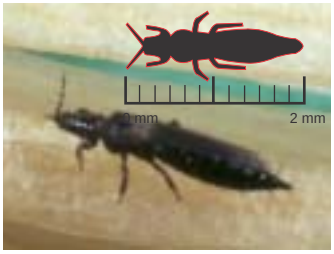
Greenhouse thrips *(Heliothrips haemorrhoidalis)*
Greenhouse thrips are an introduced species. Adults are black, 1.5 mm long, with yellow legs. The wings are white to translucent and are folded back over the body. The nymphs are white or pale yellow and produce a globule of faecal fluid at the tip of their abdomen (see photo).

Similar to: tomato thrips, predatory thrips. However, wings of the tomato thrips are much longer, extending the length of the body.

Habitat: area between touching leaves or fruit, under spider webbing.

Hosts: avocado, mango, other subtropical fruits and ornamentals. Common in glasshouses.

Damage: grey scarring and silvering of leaves and fruit (see Figure 3). Spots of black excrement are characteristic in silvered areas.



Kelly's citrus thrips *(Pezothrips kellyanus)*

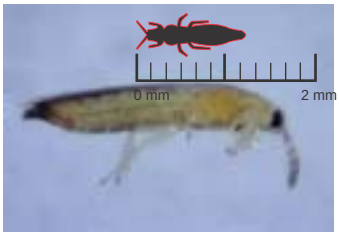
Kelly's citrus thrips are an introduced species. Adults are black, 2 - 3 mm long, with black legs. The wings are dark with a small clear band at the top. Nymphs are pale yellow.

Similar to: tomato thrips, greenhouse thrips and predatory thrips. However, *P. kellyanus* have black wings and black legs.

Habitat: under the calyx and between touching fruit.

Hosts: citrus.

Damage: ring scarring, rind discolouration between touching fruit (see Figure 1).



Onion Thrips *(Thrips tabaci)*

Onion thrips are introduced. Adults are pale yellow to light brown, 1.2 mm long. Males are smaller. The nymphs are white or yellow, 0.5 mm - 1.2 mm.

Similar to: plague thrips, except that ocelli (three simple eyes in the middle of the head) of onion thrips are grey, yellow or brown.

Habitat: found in citrus canopy. Onion thrips infest citrus from other hosts but rarely cause economic damage.

Hosts: wide host range including onions, garlic, beans, cabbage, cotton, celery, tobacco, tomatoes, beans, cucumber, pineapple and weeds.

Non-pest species

Plague thrips (*Thrips imaginis*)

Plague thrips are native to Australia. The female is light brown or grey, 1.2 mm long, with light brown legs. Males are smaller and yellow. The wings are yellow to light brown and are folded back over the body. The nymphs are white or yellow.

Similar to: onion thrips, except that the ocelli of plague thrips are red.

Habitat: found in citrus canopy. Plague thrips infest citrus from other hosts but do not cause economic damage.

Hosts: other fruit trees such as apples, ornamentals, grasses and weeds.

Tomato thrips ***(Frankliniella schultzei)***

Tomato thrips are an introduced species. Tomato thrips are sometime also referred to as flower thrips. Adults vary in colour from yellow to dark brown or black, 1 mm long, with black legs.

Similar to: Kelly's citrus thrips, greenhouse thrips, predatory thrips, except that the wings of tomato thrips are parallel and clear, creating two silver lines along body.

Habitat: found in citrus canopy. Tomato thrips infest citrus from other hosts but do not cause economic damage.

Hosts: infests a wide range of host plants including cucurbits, onions, pepper, tomatoes, ornamentals and weeds.

Acknowledgments

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Some of the information used in this Farmnote has been obtained from other sources including *Citrus pests and their natural enemies: integrated pest management in Australia* edited by D. Smith, G. A. Beattie and R. H Broadley, published by Queensland Department of Primary Industries, 1997. Also Thrips, wind and other blemishes by E. C. G. Bedford. In: *Citrus Pests in the Republic of South Africa,* 2nd Ed. Edited by E. C. G. Bedford, M.A. van den Berg, and E. A. de Villiers, published by the Institute for Tropical and Subtropical Crops, Nelspruit, RSA, 1998.

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