IPM Notes: Chilli Thrips

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Chilli thrips have quickly jumped onto the radar of many horticulturalists in Western Australia despite having been present in northern Australia for around 20 years. The first complaints from home gardeners in the Perth metro area were received in approximately 2020. This was followed by table grape growers the following year and by berry growers in 2021/22. This highly polyphagous pest, with a wide host range of 225 plant species, is known around the world to be notoriously difficult to manage and can cause significant economic damage to horticulture.

Distribution

Chilli thrips (S. *dorsalis*) are native to Asia. They were first recorded in Florida in 1991, became established in Florida in the USA in around 2005 and since then have become a major pest of many horticultural crops. They have been reported in various parts of Africa and are also established in Israel, the Solomon Islands, the Caribbean and South America. They were first reported in northern Australia approximately 20 years ago.

Description

S. *dorsalis* are sap-sucking insects that can cause deformities in flowers, leaves, stems, and shoots and are a known vector of several viruses including tomato spotted wilt virus and tobacco streak virus.

Also known as strawberry and/or yellow tea thrips, S. *dorsalis* has an extensive host range. In WA, it has been reported on table grapes, strawberries, blueberries, blackberries, capsicums, chillis, roses and tomatoes, but there are many other hosts reported including a wide range of fruit and vegetable crops. Nightshades and Acacia are also listed as hosts and may be responsible for overwintering.

Thrips are most active during spring, summer, and autumn. In Western Australia, dryness and higher temperatures create conditions that are conducive to S. *dorsalis* feeding, spread and reproduction. Like most thrips, S. *dorsalis* feeds on tender plant parts, which results in undesirable feeding scars, distortion of leaves, and discoloration of buds, flowers, and young fruits. The pest is not reported to feed on mature host tissues.

Identification and key characteristics

Chilli thrips are pale yellow in colour. They are very small (0.5–1.2mm long) and hard to distinguish from other thrips species without a microscope. Key distinguishing features are shown in Figure 1.

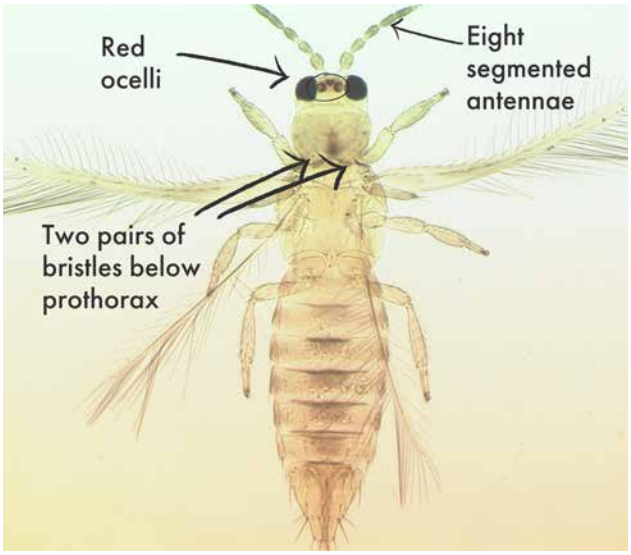

Figure 1. Distinguishing features of Chilli thrips.

Life Cycle

The thrips life cycle, comprising egg, larva, pre-pupa, pupa, and adult (Figure 2), lasts from 15–40 days depending on temperature and host plant. For example, it takes 11 days to become an adult from first instar larva on capsicum plants and 13 days on squash at 28°C. Adults can survive for 15 days on eggplant, but 13 days on tomato plants and roses. They can survive at minimum temperatures as low as 9.7°C and maximum temperatures as high as 33.0°C.

S. *dorsalis* can have many generations in a single year and populations can build up quickly over a relatively short time. In the Perth region, up to 13 generations may be possible (Figure 3). This would likely be higher for those under high tunnels and in greenhouses. Understanding the lifecycle of the pest will help with management options and schedules.

Monitoring

- Yellow sticky traps are the most commonly used and are effective in attracting the thrips; other research shows that blue can also be effective (Figure 4).
- Crop scouting includes direct methods such as counting thrips on any part of a host plant (e.g. leaf, flower and fruit) using a (10x) hand lens, microscope or the naked eye.
- Tapping flowers or branches into a white paper board will dislodge adults which can then be counted.
- Sampling methods must take account of the distribution of the thrips within the crop as the pest is often quite unevenly distributed.

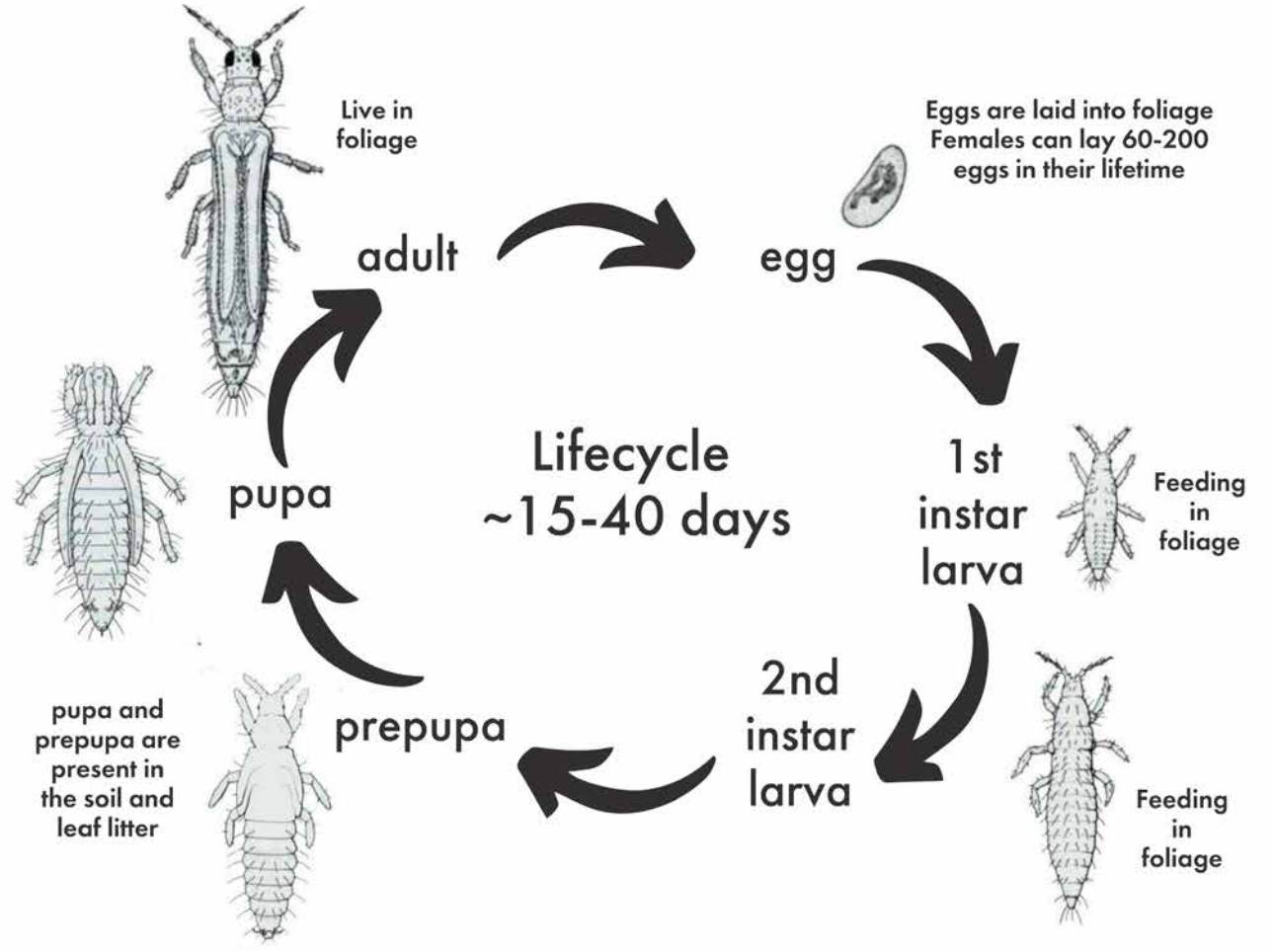

Figure 2. Chilli thrips life cycle lasts from 15-40 days depending on temperature and host plant.
Illustrations by J.R. Baker, NC State University.

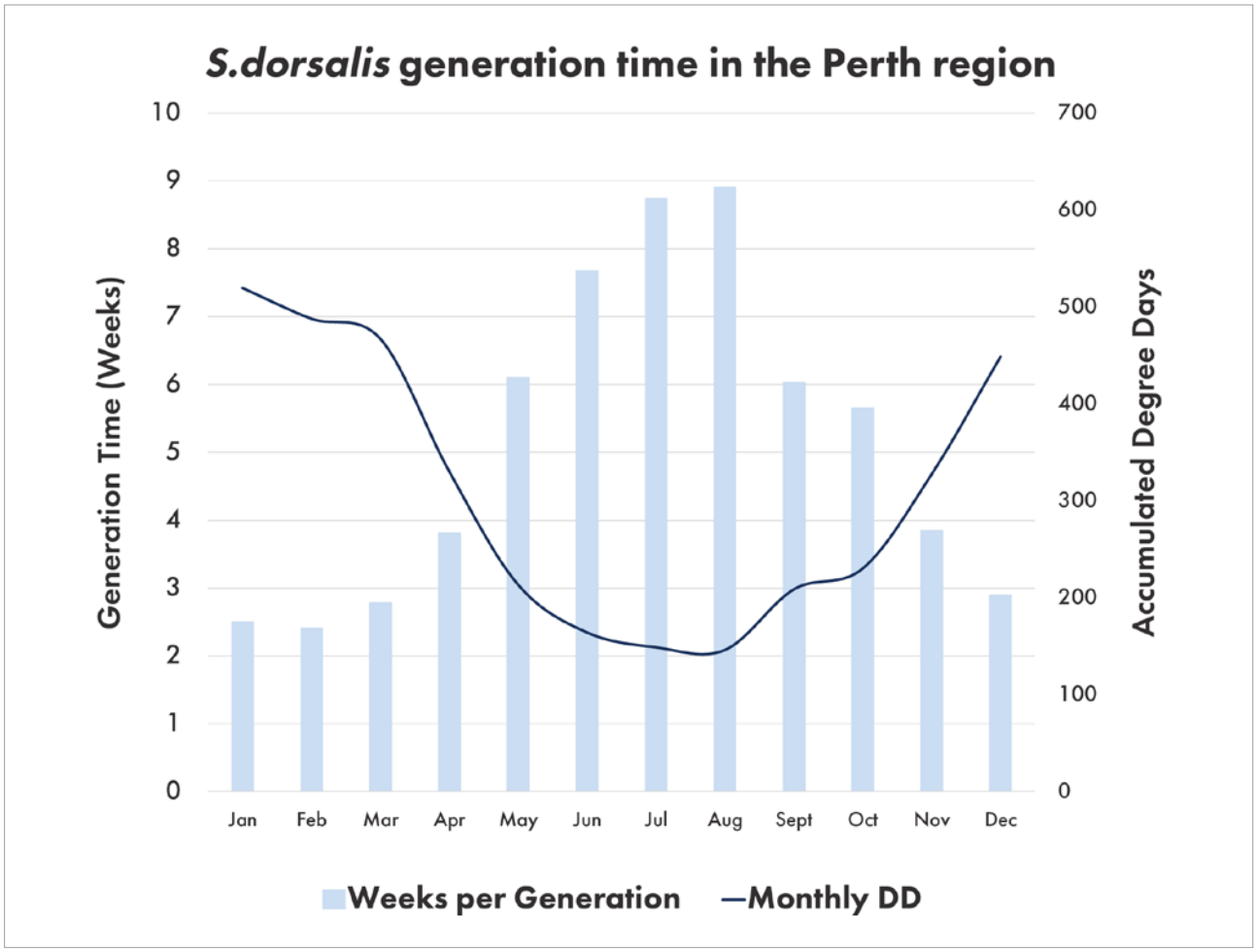

Figure 3. The number of weeks it takes for a generation of Chilli thrip to complete a life cycle in the Perth region is shown with the monthly accumulated degree days. Source: Elliot Howse, DPIRD

Figure 4. Sticky traps used in monitoring and management trials: (L) yellow trap placed above a Rubus crop to attract thrips away from fresh tips; (R) blue traps used in blueberry trials. Photo credit: Cezar Moraes, Biological Services

Symptoms of Damage

Strawberries

Heavy feeding causes reddening and darkening of leaf veins and petioles (Figure 5A). With severe infestations, the entire leaf turns dark, crinkled, and deformed (Figure 5B). Fruit damage shows as bronzing, and cracking of fruits, ultimately reducing crop yields (Figure 5C).

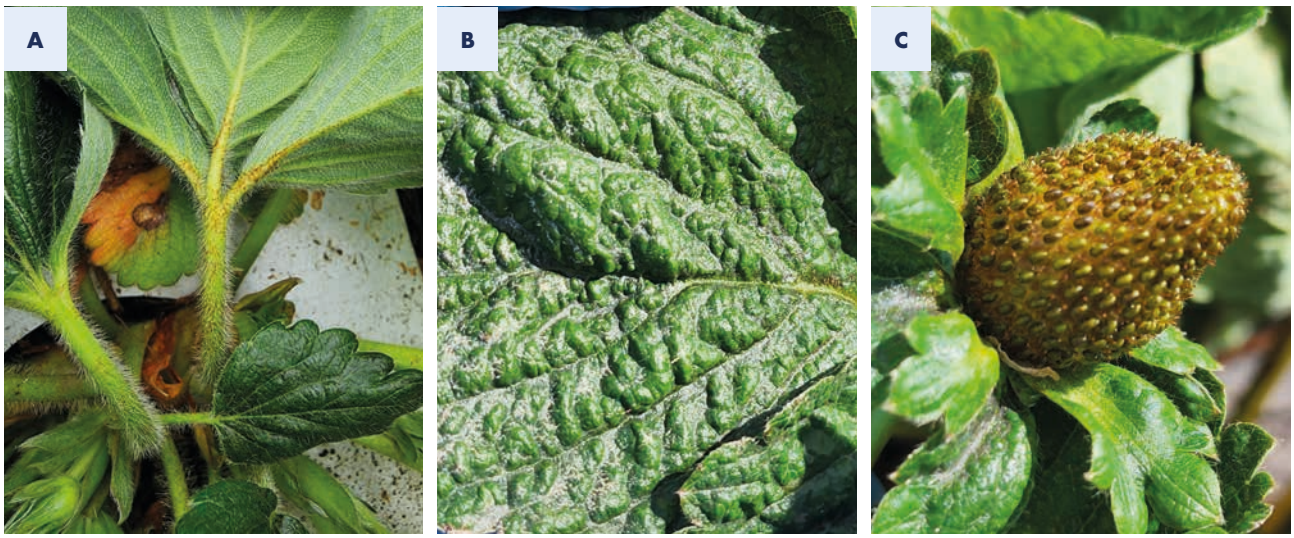

Figure 5. Symptoms of Chilli thrip damage in strawberry. Photo credit: Cezar Moraes, Biological Services

Blueberries

The appearance of bronzing on new flush may be the first indication of the Chilli thrips presence in blueberries (Figure 6A). Chilli thrips feed primarily on young blueberry foliage during summer and early autumn. Adults and larvae punch holes through the epidermis inserting a stylet to remove the contents, leading to necrosis and death of tissues (Figure 6B). Injury symptoms first appear as bronzing along leaf veins and petioles, then leaves start to curl and distort (Figure 6C). Heavy infestations cause flower abortion and leaf defoliation with extensive curling of leaves.

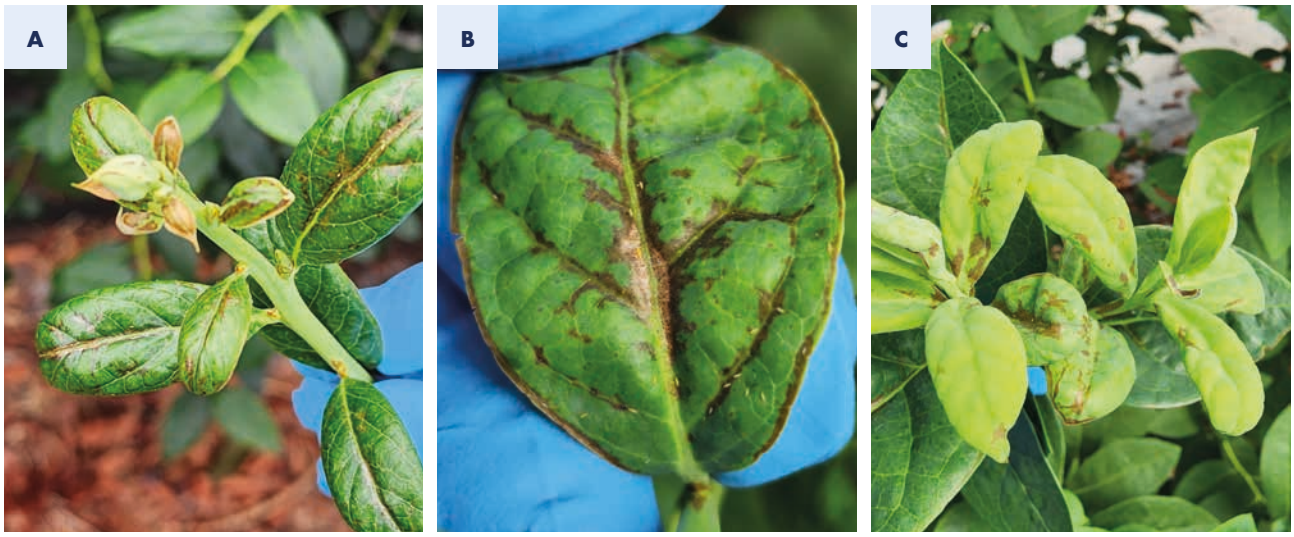

Figure 6. Symptoms of Chilli thrip damage in blueberry. Photo credit: Cezar Moraes, Biological Services

Blackberries

Early signs of Chilli thrips damage are browning and dehydration of the leaf margins (Figure 7A, 7B). With heavy infestations leaf margins start to curl upwards (Figure 7C). Fruit may be distorted with individual drupelets appearing dehydrated.

Figure 7. Symptoms of Chilli thrip damage in blackberry. Photo credit: Elliot Howse, DPIRD

Biological control

Biological controls are important in a Chilli thrip control strategy due the ability of the thrips to quickly develop resistance to chemicals.

Below is a description of the strategies Biological Services used to manage the pest in 2022 and 2023.

Strawberries

Chilli thrips were present in most of the second-year plants in the Wanneroo-Gingin area in 2022 and 2023.

The control strategy involved a rotation of Success Neo™ (spinetoram), Entrust™ (spinosad) and Hymal™ (maldison), which was applied after the plants were cut back in March/April.

The aim was to reduce the pest population before releasing predators such as *Cucumeris* and *Orius*.

Cucurmeris mites (*Neoseiulus cucumeris*)

Cucumeris mites are less than 1mm in length and can be distinguished from most pest mites by their shape and mobility. *Cucumeris* is teardrop shaped and moves rapidly along the underside of leaves and in flowers. Development of the mite takes from 8-11 days (at 25-20°C). *Cucumeris* mites can live up to 32 days and females produce an average of 35 eggs in their lifetime.

Cucumeris prefer environments with greater than 65% relative humidity (RH), but eggs can survive as low as 40% RH. Microclimates within the greenhouse crop appear to be important for their survival. *Cucumeris* feed on small (1st and 2nd instar) thrips on foliage and flowers, and will not feed on large larvae or adult thrips. *Cucumeris* is a generalist predator and will also feed on other mites.

Cucumeris rate: 20 litres / hectare (strawberries) in two releases each of 10 litres. They can be supplied as loose material or sachets.

Orius bugs (*Orius tantillus*)

Orius go through 7 developmental stages in their life cycle which includes egg, five larval (nymphal) stages and adult. The female lays eggs into the plant tissue of the stem, fruit, petiole and major veins on the underside of leaves. The eggs are almost completely embedded within the plant tissue and only the cap-like upper part of the egg is visible. Monitoring of egg laying should be carried out with the use of a hand lens. The development time from egg to adult can vary from 16-18 days at 25°C, to 12 days at 30°C. Females lay at a relatively slow rate of around 2-3 eggs per day, but adults live for 3-4 weeks.

All life stages of *Orius* feed on live prey with adults being able to kill up to 20 thrips per day. When the pest population is high, *Orius* will kill more thrips than are required for their nutritional needs. *Orius* adults are competent fliers and can move through a crop quickly when searching for food. During the cooler darker periods of the day *Orius* will hide in flowers, leaf axils and on stems (Figure 8). They are more active in the middle of the day.

For strawberries 2-4 *Orius*/m² is used.

Figure 8. Orius feeding on Chilli thrip in a strawberry flower. Photo credit: Cezar Moraes, Biological Services

Blueberries and blackberries

Blueberries and blackberries had significant issues with Chilli thrips during the 2023 season. During summer and autumn frequent applications of chemicals were essential. The high pest pressure and low humidity meant biological controls were not effective.

Some spray applications incorporated two chemicals at the same time. During the peak times of February and March, two spray applications in the same week (Monday and Friday) were necessary.

Currently *Cucumeris* are applied at the end of autumn and during winter to keep Chilli thrip populations lower during the following spring season, but it appears they will be an issue even from May onwards, so the use of *Cucumeris* may become more important from May to November.

Chemical control

Management of Chilli thrips can be challenging. The insects can move to surrounding weed crops to take refuge and they lay eggs inside the leaf tissue where they are protected from pesticide sprays. Thrips hide in concealed places such as leaf curls or under fruit calyxes where they can avoid pesticide applications.

It is necessary to apply insecticides in rotation to prevent resistance development.

Trials by Biological Services in Western Australia used a range of pesticides including:

- Success Neo™ (*Spinetoram*)
- Vertimec™ (*Abamectin*)
- Py-bo™ (*Natural Pyrethrum*)
- Entrust™ (*Spinosad*)
- Benevia™ (*Cyantraniliprole*)
- Transform™ (*Sulfoxaflor*)
- Movento™ (*Spirotetramat*)
- Velifer™ (*Beauveria bassiana*)
- Adjuvants: Wetcit™/Molasses

Chemicals that offered temporary reductions in numbers were:

- Entrust™
- Hymal™ or Fyfanon™
- Benevia™

Control was improved when adjuvants were used.

Control Summary

- Maintain a weekly monitoring schedule from spring until autumn
- Use more selective chemicals to control Chilli thrips
- Ensure you follow the application instructions on the label or Minor Use Permit
- Avoid using the same chemical more than three times during the season

Challenges and future directions

- As in-field identification of Chilli thrips is difficult, better methods for accurate and rapid identification are required.
- Populations develop rapidly often overwhelming bio controls.
- We need better knowledge of overwintering hosts.
- Cryptic behaviour and a lifecycle in different parts of the environment/plant make control difficult. A better understanding of the thrips behaviour throughout its life cycle on different hosts is required. This may include varietal susceptibility and thrips behaviour in response to different substrates such as coir.
- Thrips are notorious for developing insecticide resistance so any control strategy must use a combination of methods including biological controls and chemicals. There are a number of additional biological controls that could be screened including other predatory mites and entomopathic fungi.
- Chemicals currently being used need to be monitored for resistance and also crop residues.
- In the longer term there may be a need for new pesticide chemistry which is compatible with biological control agents.
- Control strategies using predictive models may be developed as we gain more knowledge on the interaction of the Chilli thrips life cycle in conjunction with climatic variables and crop species.