

## 'New' thrips problems in protected ornamentals and herbs

Jude Bennison and Elysia Bartel, ADAS Horticulture

### Background

#### *Thrips setosus*

A 'new' thrips species has been causing problems on some UK protected ornamental and herb crops including *Cyclamen*, New Guinea *Impatiens*, primrose, basil and rosemary. The thrips has been confirmed as Japanese flower thrips, *Thrips setosus*, which is alien to the UK but is not currently classed as a notifiable quarantine species. Where *T. setosus* has been confirmed, the growers have been routinely using the predatory mite *Neoseiulus cucumeris* for biological control of thrips within integrated pest management (IPM programmes). This usually gives good control of western flower thrips (WFT) but *T. setosus* does not seem to have been controlled. A range of plant protection products have been used on the infested ornamental crops to control *T. setosus* with variable success and this has sometimes disrupted IPM.

#### *Dichromothrips corbetti*

One or two growers have also experienced problems with control of 'Vanda thrips' (*Dichromothrips corbetti*) on *Phalaenopsis*. This thrips species is also alien to the UK but is not currently a notifiable quarantine species.

### Worldwide distribution and host plants

#### *Thrips setosus*

*Thrips setosus* is native to South East Asia and is widespread in Japan, and has also been confirmed in, Korea, Indonesia and more recently in some Northern European countries including Belgium, Croatia, France, Germany and the Netherlands. *Thrips setosus* was first found in the Netherlands in 2014, on both protected and outdoor *Hydrangea* and was first detected in the UK in 2016 on poinsettia. The pest will feed on many different plant species – recorded ornamental host plants include: *Abelia*, *Aster*, *Begonia*, *Chrysanthemum*, *Cyclamen*, *Dahlia*, *Gerbera*, *Hippeastrum*, *Hosta*, *Hydrangea*, lily, poinsettia, primrose, rose, *Saintpaulia*, *Sparmannia*, *Streptocarpus*, and *Tagetes*. Recorded edible host plants include: aubergine, bean, chilli, cucumber, grapevine, lettuce, pea, pepper, potato, pumpkin, strawberry, tomato and various herbs. Weed hosts include hogweed, knotweed, nettle, red deadnettle and sowthistle. In the UK, particular problems have occurred on *Cyclamen*, New Guinea *Impatiens*, basil and rosemary. Other protected herb crops that have been infested in the UK include marjoram, mint, parsley, sage, tarragon and thyme. In the Netherlands, on some crops like poinsettia and *Saintpaulia*, *T. setosus* adults have been found but no larvae, indicating that they do not lay eggs and breed on these plants.

#### *Dichromothrips corbetti*

*Dichromothrips corbetti* is also native to South East Asia and has been recorded in Fiji, Florida, French Polynesia, Hawaii, India, Indonesia, Kuala Lumpur, Malaysia, Northern Australia, the Philippines, Puerto Rico, Samoa, Singapore, Taiwan and Thailand. The pest has spread to Europe via plant trade and has been recorded in the UK, Belgium, Germany, the Netherlands, Hungary and Slovakia. *Dichromothrips corbetti* feeds and breeds on various orchids including *Arundina*, *Cattleya*, *Dendrobium*, *Phalaenopsis* and *Vanda* species.

## Recognition

### *Thrips setosus*

The adult females are approximately 1.3mm long, dark brown with pale patches at the base of the wings (Fig. 1). They have seven antennal segments (only visible with a microscope). The females are easily distinguished from those of WFT which are paler and about 1.2mm long (Fig. 2). *Thrips setosus* males, like those of WFT, are yellow but the paler patches at the base of the wings are still visible (Fig. 3). *Thrips setosus*, like other thrips species have two wingless larval stages. The first stage larvae are white and smaller than the second stage larvae which are usually white (Fig. 4) but sometimes yellowish, depending on what they have fed on. With WFT, the first stage larvae are white and the larger, second stage larvae are always yellow.



Fig. 1 (top left) *Thrips setosus* adult female ©Dr Manfred Ulitzka; Fig. 2 (top right) WFT adult female, ©Nigel Cattlin/FLPA; Fig. 3 (bottom left) *Thrips setosus* adult male ©Dr Manfred Ulitzka; Fig. 4 (bottom right) *Thrips setosus* second stage larva ©Dr Manfred Ulitzka

### *Dichromothrips corbetti*

The adult females are 1-1.2mm long, dark brown or black with white patches at the base of the wings (Fig. 5). They have eight antennal segments (only visible with a microscope). The second stage larvae are yellow.

For further information on the identification of thrips see [Thrips identification poster | AHDB](#).



Fig. 5 *Dichromothrips corbetti* adult female ©Dr Manfred Ulitzka

## Damage symptoms

### *Thrips setosus*

Due to their dark brown bodies, the adult females are easily visible on petals and leaves (Figs 6 and 7).



Fig. 6 (left) *Thrips setosus* adult females on cyclamen flower, grower source; Fig. 7 (right) *Thrips setosus* adult females on underside of cyclamen leaf, grower source

Like other thrips species, *Thrips setosus* feed by piercing plant cells and sucking out their contents, leaving bleached or silvery flecks or patches on leaves and petals which can then become brown and necrotic. *Thrips setosus* leaf damage tends to be more severe than that of WFT, leading to severe browning and scarring on the underside of the leaves (Fig. 8) and on flower petals (Fig. 9). *Thrips setosus* is reported to be primarily a leaf-feeding thrips which does not feed on pollen. However, an experiment in the Netherlands showed that *T. setosus* larvae survived on *Typha* (cattail) pollen for three days. In addition, as *T. setosus* have occurred on the flowers of some plants such as *Cyclamen* and *Saintpaulia*, it is possible that they feed on the pollen of some plant species but not others. On *Saintpaulia*, damage has been restricted to the flowers, whereas on New Guinea *Impatiens* damage seems to be restricted to the leaves. On both New Guinea *Impatiens* and *Cyclamen*, severe leaf damage has also led to increased susceptibility to infection with *Botrytis*.

In addition to causing direct damage, like WFT, *T. setosus* can transmit Tomato spotted wilt virus (TSWV), but unlike WFT, it is not a vector of Impatiens necrotic spot virus (INSV). As with WFT, TSWV is transmitted by *T. setosus* adults after the virus is acquired by larvae feeding on infected plants. Adult *T. setosus* can also acquire TSWV but cannot transmit it unless it is acquired at the larval stage. This is

important to consider for control of TSWV, i.e. good control of larvae plays an important part in preventing or reducing virus spread.



Fig. 8 (left) *Thrips setosus* damage to cyclamen leaf underside, grower source; Fig. 9 (right) *Thrips setosus* damage to cyclamen petals, grower source

On protected herbs, *T. setosus* causes typical pale flecks or patches similar to those caused by WFT and as on other host plants, the small black faecal specks are often visible on the feeding patches (Fig. 10). However, basil seems to be particularly susceptible to damage by *T. setosus* where in addition to the flecking and bleaching, leaf distortion and discolouration often occurs and the leaves can appear shiny and wet (Fig. 11).



Fig. 10 (left) WFT damage to basil showing bleached patches with small faecal specks © ADAS; Fig. 11 (right) *Thrips setosus* leaf damage to basil showing distortion and shiny wet appearance, grower source

### *Dichromothrips corbetti*

This species can cause feeding damage and distortion to young foliar growing points and to flowers and buds of susceptible orchid species (Fig. 12). Flower damage symptoms include chlorosis and deformation and excessive feeding can cause the flowers to dry up. *Dichromothrips corbetti* has not been recorded as a virus vector.



Figure 12. *Dichromothrips corbetti* damage to *Phalaenopsis* flower, grower source

### Sources of infestation

The original source of infestation with both *Thrips setosus* and *Dichromothrips corbetti* is likely to be imported plant material. In addition to plant material being infested with adults, eggs and larvae, pupal stages might be brought onto the nursery in the growing media of host plants, as *T. setosus* larvae are reported to drop to the ground to pupate. However, once these thrips species have occurred on a nursery, it is also possible that they spread and carry over from previously infested crops on site.

### Biology and life cycle

#### *Thrips setosus*

##### *Adults*

On French bean, adult *T. setosus* females live for around 31 days at 20°C and each female lays around five eggs per day. Adult females are reported to go into reproductive diapause (they stop laying eggs) at daylengths of less than 12 hours at 20°C and at daylengths of less than 10 hours at 18°C. This means that although *T. setosus* females have been seen on UK crops of ornamentals and herbs all year round, at daylengths shorter than 12 hours and at lower temperatures they may not lay eggs.

##### *Eggs*

As with other thrips species, *T. setosus* eggs are laid into plant tissue and therefore are not visible. The eggs hatch faster at warmer temperatures – for example, at 20°C, eggs hatch after around eight days and at 25°C, eggs hatch after four to five days, the exact time varies depending upon host plant.

##### *Larvae*

As with other thrips species, *T. setosus* eggs hatch into first stage larvae which feed for a few days then develop into larger second stage larvae. As with the eggs, development of larvae is faster at warmer temperatures. At 20°C, the first larval stage lasts for three to four days and at 25°C, the second larval stage lasts for three days.

##### *Pupae*

Like other thrips species, *T. setosus* has two pupal stages, the prepupa and the pupa, neither of which feed. At 20°C, the combined pupal stages last for six to seven days and at 25°C they last for four to five

days. *Thrips setosus* second stage larvae are reported to drop from host plants to pupate in the ground. This indicates that in addition to using biological control agents against adults and larvae, ground-based biological control agents could also have potential for contributing to control of *T. setosus*, as used in IPM programmes for control of WFT.

#### *Time from egg to adult*

At 25°C, *Thrips setosus* completes its life cycle from egg to adult in 13-15 days, depending on host plant, while at 20°C it completes its life cycle in 20-22 days. At lower temperatures (15°C) the life cycle can take up to 36 days. Thus, like WFT, *T. setosus* has the potential to complete several generations on a crop, depending on temperature, host crop and production cycle.

#### *Dichromothrips corbettii*

The life cycle of *D. corbettii* has been studied on *Vanda* orchid flowers used for mass rearing of the thrips in the laboratory, the temperature was not specified. Adult females laid eggs in the flower tissue and these hatched into first stage larvae after three to four days. The first and second stage larvae fed for around three days and the mature second stage larvae then left the flowers to pupate. As with *T. setosus* and WFT, this indicates that *D. corbettii* larvae drop to the ground to pupate. All the next generation adults had emerged from pupae after a further seven days. The total time from egg to adult was 9-13 days. On a UK nursery, *D. corbettii* has been found on young plants where it has survived in foliar growing points, indicating that it does not need flowers or pollen for survival.

### **Management strategies for *Thrips setosus* and *Dichromothrips corbettii***

#### *Cultural control and monitoring*

- Careful and prompt disposal of any badly infested plants will reduce the risk of thrips migrating onto other crops on site.
- Good nursery hygiene and weed control will reduce potential sources of thrips. Known weed hosts for *T. setosus* include hogweed, knotweed, nettle, red deadnettle and sowthistle, but as this species has a wide host range, other weeds might also be potential hosts. So far only orchid species have been recorded as hosts for *D. corbettii*.
- Bought-in plant material should be monitored for thrips and damage symptoms on arrival, checking both upper and lower leaf surfaces and the flowers and buds. If no thrips are visible, eggs may be present in plant tissue and pupae may be present in growing media, so regular monitoring should be maintained during production.
- Thrips species should be identified by an entomologist.
- *Thrips setosus* adults have been caught on both yellow and blue sticky traps on UK nurseries and *D. corbettii* has been caught on yellow traps (blue have not been tried to date). It is not yet known which colour trap is most effective for monitoring either species. In the Netherlands, sticky traps are not used for monitoring *T. setosus* in *Hydrangea* as more are found on the plants than on the traps.

#### *Biological control*

##### *Predatory mites*

- The predatory mite, *Neoseiulus cucumeris* is commonly used in many UK protected crops including ornamentals and herbs, for control of WFT. This predator feeds only on first stage larvae, it does not feed on the larger second stage larvae or adults. However, where *T. setosus*

has been confirmed on UK protected ornamentals and herbs, although *N. cucumeris* has given good control of WFT, *T. setosus* has not been controlled.

- In the Netherlands, laboratory tests confirmed that three other species of predatory mite will feed on both first and second stage *T. setosus* larvae. The three species tested were *Transeius montdorensis*, *Amblydromalus (Typhlodromalus) limonicus* and *Amblyseius swirskii*, all of which can be released to permanently protected (glasshouse) crops in the UK. On *Hydrangea* in the Netherlands, Koppert are advising growers to use *Transeius montdorensis* for control of *T. setosus* and this predator is giving promising results. Koppert are also advising the use of 'Nutari' (*Carpoglyphus lactis* mites) as 'feeder mites' to maintain high numbers of *T. montdorensis* for control of this pest. Some UK growers of both protected ornamentals and herbs where *T. setosus* has been confirmed have now switched to using *T. montdorensis* instead of *N. cucumeris* and have reported successful results to date. So far 'feeder mites' have not been tried on UK crops. It is possible that *T. setosus* first stage larvae are larger than those of WFT, which could explain why *N. cucumeris* might not feed on them. The three other species of predatory mite that have been shown to feed on both first and second stage *T. setosus* larvae are also known to feed on both first and second stage WFT larvae, whereas *N. cucumeris* only feeds on the first stage WFT larvae.
- On a UK nursery where *D. corbeti* has been confirmed on *Phalaenopsis*, use of predatory mites is avoided as previous experience of releasing *A. swirskii* to a flowering crop led to flower drop, possibly a result of flower pollination. Research in the Philippines has shown that the predatory mite *Proctolaelaps yinchuanensis* will predate *D. corbeti* adults and larvae, but this predator is not available in the UK.
- Releases of green lacewing larvae, *Chrysoperla carnea*, with or without the predatory thrips, *Franklinothrips vespiformis*, both at a rate of 20 per m<sup>2</sup> reduced numbers of *T. setosus* on *Hydrangea* in the Netherlands. The lacewings were released every two weeks from mid-March when thrips numbers were low. Although neither predator established in the crop, the repeated releases kept thrips numbers low and leaf and flower damage was negligible. *Franklinothrips vespiformis* is not native or commercially available in the UK. Optimum and cost-effective release rates for *C. carnea* on *Hydrangea* and other crops would need to be tested. *Chrysoperla carnea* are available in the UK as eggs or larvae and will feed on a range of prey including thrips, aphids, moth eggs, mealybugs and spider mites.
- Research in the Netherlands is currently being undertaken on the potential of *Orius* species (predatory bugs) against *T. setosus*. Laboratory tests have indicated that both *Orius laevigatus* and *Orius majusculus* had more predatory encounters with both *T. setosus* and *Echinothrips americanus* than with WFT. It is possible that WFT is a more difficult prey to catch as it is more agile than the other two thrips species. *Orius laevigatus* is commonly used on some UK crops including strawberry and sweet pepper for WFT control to supplement predatory mites. The predator feeds on both WFT adults and larvae needs warm temperatures and plenty of prey or pollen to establish.

### Plant protection products

- *Thrips setosus* is reported to be susceptible to many insecticides. However, UK growers of both protected ornamentals and herbs have reported poor control with most plant protection products. For contact-acting products, this could be due to them not reaching all the target thrips on leaf undersides, buds and growing points.
- UK growers have experimented with using tank mixes of products with different modes of action and also with adding adjuvants such as Adpro Attrack (formerly known as Attracker)

(fructose, glucose, saccharose). Adpro Attrack claims to lure thrips out of sheltered plant parts and increase their exposure to plant protection products. Another product based on sugars and plant extracts, Combi-protec claims to increase efficacy of ingested insecticides against some pests, although this has not yet been tested for thrips control. Biosweet is another sugars product that claims to attract thrips out of flowers onto leaves where they may be easier targets for both predators and plant protection products. No research has been done on comparative efficacy of plant protection products against *T. setosus* or on whether adjuvants or tank mixes improve control of this species.

- Frequency of application will also affect product efficacy. Research in the Netherlands on the development rate of *T. setosus* on *Hydrangea* indicated that if an effective plant protection product kills all adults and larvae, sprays should be applied every 14-days at 15°C, every seven to eight days at 20°C and every five to six days at 25°C in order to kill the next generation of larvae hatching from any eggs. However, applications will need to be planned according to product label recommendations, permitted frequency and number of applications, and resistance management guidelines. In addition, the development rate of *T. setosus* varies with host plant and with fluctuating glasshouse temperatures so the data on *Hydrangea* at constant temperatures will not apply to all crops.
- If using biological control agents in an integrated pest management (IPM) programme, any plant protection products should be selected and timed carefully, using the least harmful and least persistent products when possible.
- Table 1 lists plant protection products currently approved on protected ornamentals and herbs that may give some control of *T. setosus* and *D. corbettii*.

**For further detailed information see the full review '*New*' thrips problems in protected ornamentals and herbs prepared by Jude Bennison and Elysia Bartel, ADAS Horticulture.**



**Table 1. Currently approved plant protection products that may give some control of *Thrips setosus* on protected ornamentals and herbs and of *Dichromothrips corbetti* on protected orchids (April 2021)**

| Active ingredient                     | Example product names                  | Insecticide group/ bioprotectant type             | Approval status for protected ornamentals   | Approval status for protected herbs   | Compatibility with biological controls*       | Comments  |
|---------------------------------------|--|---|---|---|---|---|
| <b>Bioprotectants</b>                 |  |   |   |   |   |   |
| Azadirachtin                          | Azatin                                 | Azadirachtin (botanical bioprotectant)            | Approval (permanent protection). Label recommendation for thrips control  | -   | Safe/slightly harmful                         | Partially systemic on some host plants  |
| <i>Beauveria bassiana</i>             | Botanigard WP                          | Entomopathogenic fungus (microbial bioprotectant) | Approval (permanent protection). Label recommendation for whitefly control  | EAMU 1792/2018 for control of thrips and other pests  | Safe to most biocontrols                      | Contact action. Needs 20-30°C and over 70% relative humidity for optimum control                  |
| <i>Beauveria bassiana</i>             | Naturalis-L                            | Entomopathogenic fungus (microbial bioprotectant) | Approval (permanent protection). Label recommendation for whitefly and reduction of thrips  | Label approval on any edible crop   | Safe to most biocontrols                      | Contact action. Needs 20-30°C and over 60% relative humidity for optimum control                  |
| <u><i>Lecanicillium muscarium</i></u> | Mycotal                                | Entomopathogenic fungus (microbial bioprotectant) | Approval (permanent protection). Label recommendation for whitefly control  | EAMU 2679/2014 (permanent protection)   | Safe to most biocontrols                      | Contact action. Use with Addit. Needs at least 18°C and 70% relative humidity for optimum control |
| Maltodextrin                          | Eradicoat<br>Eradicoat Max<br>Majestik | Botanical bioprotectant                           | Approval for all non-edible crops (permanent protection for Eradicoat Max). Label recommendation for spider mite and whitefly control | Approval for all edible crops (permanent protection for Eradicoat Max). Label recommendation for spider mite and whitefly control | Safe to biocontrols once spray deposit is dry | Contact action  |

| Active ingredient  | Example product names     | Insecticide group/ bioprotectant type | Approval status for protected ornamentals                             | Approval status for protected herbs                           | Compatibility with biological controls*   | Comments   |
|--|---------------------------|---------------------------------------|---|---|---|--|
| Fatty acids  | Flipper                   | Botanical bioprotectant               | EAMU 1415/2020 for control of aphids, spider mites and whitefly       | EAMU 3416/2019 for control of thrips, aphids and spider mites | Safe – moderately harmful to biocontrols depending on species. Safe once spray deposits are dry   | Contact action. Use soft or rain water or add X-Fusion conditioner   |
| <b>Physically acting products (exempt from plant protection product regulations)</b> |                           |                                       |   |   |   |  |
| Silicone polymers, siloxanes and organic antioxidants                                | ProTAC SF                 | Physically acting                     | Exempt  | Exempt  | Likely to be harmful to biocontrols hit by the spray but safe once spray residues are dry   | Contact action. Spray during day in low humidities to avoid plant scorch. Do not spray to flowering crops due to high risk of damage |
| <b>Chemical plant protection products</b>  |                           |                                       |   |   |   |  |
| Abamectin  | Clayton Abba, Dynamec     | Avermectin                            | Approval (permanent protection). Label recommendation for WFT control | Dynamec has EAMU 2832/2017 for use on certain herbs           | Harmful to nematodes for up to seven days and to most other biocontrols for one to three weeks depending on species (6 weeks for <i>Orius</i> ) | Contact and translaminar action  |
| Acetamiprid  | Clayton Vault, Gazelle SG | Neonicotinoid                         | Approval. Label recommendation for aphid and whitefly control         | Gazelle SG has EAMU 2251/2019 for aphid control               | Harmful to most biocontrols for one to three weeks depending on species (six weeks for <i>Orius</i> )   | Systemic action  |
| Deltamethrin   | Decis Forte               | Pyrethroid                            | Approval. Label recommendation for control of various pests           | -   | Safe to nematodes. Harmful to most other biocontrols for up to 12 weeks   | Contact action. WFT and onion thrips likely to be resistant  |

| Active ingredient  | Example product names         | Insecticide group/ bioprotectant type | Approval status for protected ornamentals  | Approval status for protected herbs   | Compatibility with biological controls*  | Comments   |
|--------------------|-------------------------------|---------------------------------------|--|---|--|--|
| Esfenvalerate      | Clayton Cajole Sumi-Alpha     | Pyrethroid                            | Approval. Label recommendation for control of thrips and other pests on flowers            | -   | Safe to nematodes. Harmful to most other biocontrols for up to 12 weeks  | Contact action. WFT and onion thrips likely to be resistant  |
| Lambda-cyhalothrin | Hallmark with Zeon Technology | Pyrethroid                            | EAMU 2944/2008   | -   | Safe to nematodes. Harmful to most other biocontrols for up to 12 weeks  | Contact action. WFT and onion thrips likely to be resistant  |
| Pyrethrins         | Spruzit                       | Pyrethrins                            | Approval (permanent protection). Label recommendation for thrips (not WFT) and other pests | Approval (permanent protection). Label recommendation for thrips (not WFT) and other pests on certain herbs | Harmful to some biocontrols for up to one week   | Contact action. WFT and onion thrips likely to be resistant  |
| Spinosad           | Conserve                      | Spinosyn                              | Approval. Label recommendation for WFT control   | -   | Harmful to some biocontrols for up to two weeks  | Contact and ingestion action. WFT and onion thrips likely to be resistant  |
| Spinosad           | Tracer                        | Spinosyn                              | -  | EAMU 1205/2018 for control of thrips and caterpillars   | As for Conserve  | As for Conserve  |
| Spirotetramat      | Batavia                       | Ketoenol                              | EAMU 2597/2019 (permanent protection) for control of WFT, aphids and whitefly              | -   | Moderately harmful to <i>T. montdorensis</i> . Harmful to <i>Phytoseiulus</i> for three to four weeks. Safe/slightly harmful to most other biocontrols | Two-way systemic action. Do not spray specified ornamentals including <i>Begonia</i> , <i>Cyclamen</i> and <i>Hydrangea</i> due to high risk of damage |
| Spirotetramat      | Movento                       | Ketoenol                              | -  | EAMU 0918/2018 for control of aphids and whitefly   | As for Batavia   | Two-way systemic action  |

- The information in this table has been collated using information from the Health and Safety Executive (HSE) website ([www.pesticides.gov.uk](http://www.pesticides.gov.uk)) and from suppliers' labels and product technical information. Important - regular changes occur in the approval status of plant protection products, arising from changes in the legislation or for other reasons. For the most up-to-date information, please check the HSE website or with a professional supplier or BASIS-qualified consultant, as information could have changed since this table was created.
- EAMU - Extension of Authorisation for minor use.
- Growers must hold a paper or electronic copy of an EAMU before using any product under the EAMU arrangements. Any use of a plant protection product with an EAMU is at grower's own risk.
- Always follow approved label or EAMU recommendations, including rate of use, maximum number of applications per crop or year and where crop safety information is not available, test the product on a small number of plants to determine crop safety prior to widespread commercial use.

\* Further details of compatibility of plant protection products with biological control agents are available from suppliers of biological control agents or plant protection products or consultants. See the following websites: <https://www.biobestgroup.com/en/side-effect-manual> and <https://sideeffects.koppert.com/side-effects/>. 'Safe': kills <25% of the biological control agents; 'slightly harmful': kills 25-50%; 'moderately harmful': kills 50-75%; 'harmful': kills >75%.