Thrips

Thrips are important pests of greenhouse crops. Western flower thrips (*Frankliniella occidentalis*) (WFT) is found in both vegetable and ornamental crops; onion thrips (*Thrips tabaci*) is usually a problem only in vegetable crops.

Damage
Thrips damage plants by feeding on leaf and flower tissue, leaving a silvery appearance. They also lay eggs in leaves and flower tissue and in young developing fruit (such as cucumbers). This damages leaves and flower petals and causes distortions in fruit and in the growing points. On tomatoes, thrips feeding causes “ghost rings” on the fruit. WFT can also transmit Tomato Spotted Wilt Virus, which is lethal to tomatoes and some ornamentals.

Description
- Both adult thrips and nymphs are minute, straw-coloured, elongated insects, less than 1 mm (1/25 inch) long.
- Adults have narrow, fringed wings; nymphs are wingless.
- Thrips can move rapidly and prefer to shelter in crevices and folds in foliage and flowers.

Life Cycle
Both species of thrips have similar life cycles. The overall life cycle of WFT takes 21 days at 22^{o}C (72^{o}F).
- Females lay eggs in leaf tissue. Each female lays 6-10 eggs per day over her life span of 4-5 weeks. The eggs hatch in five days at 22^{o}C (72^{o}F).
- The nymphs feed on plant tissue for 8-10 days, then drop to the ground to complete development in protected sites on the floor.
- Thrips have an immobile stage, similar to a pupal stage (called a pseudo-pupa), which takes 7-10 days.
- When adults emerge they fly to upper parts of plants and begin laying eggs after a day or two.

Monitoring Tips
- Use yellow or blue sticky cards at a rate of 1 trap/50-100 m^2 (500-1000 ft^2). Place traps at the top of the plant canopy.
- Count the number of thrips on traps weekly; replace traps every 3-4 weeks as the glue dries out.
- Use a 10-15 X lens to examine leaves for presence of thrips or signs of feeding damage.

Controls
As with any pest, a combination of biological and cultural controls, compatible chemicals and preventative measures gives the best results. The three biological controls described below are compatible and can be used together.

Biological Controls

'Hypoaspis': This soil-dwelling predatory mite feeds on the immature stages of thrips in the soil or growing media. For more information, see Sheet 230.
Hypoaspis alone cannot control thrips infestations, but it contributes to the effectiveness of biological control when used with other predators. Hypoaspis can be applied to seedlings before thrips populations become established. It can also be applied to soil under benches in greenhouses.

'Cucumeris': This predatory mite feeds on immature stages of thrips. For more information, see Sheet 220. Release rates for cucumbers and peppers are well established, however, for ornamentals, release rates are still experimental. Crops that produce pollen (e.g., sweet peppers) favour Cucumeris use, because the pollen is a supplemental food for the predator.

'Orius': The tiny pirate bug (*Orius* spp.) feeds on pollen and all mobile stages of thrips. For more information, see Sheet 222.

- Orius are only effective from March to September because they diapause and do not reproduce if daylength is less than 16 hours.
- Orius should be released once thrips are present in the greenhouse, in areas where thrips numbers are the highest in the greenhouse.
- When Orius is combined with Cucumeris, the thrips predatory mite, relatively low release rates have given excellent control; for example, 1 pirate bug per 1-2 cucumber plants can control an established thrips population in 5 weeks.

Chemical Controls

There are no pesticides for thrips control that integrate well with biological control agents.

- Endosulfan (Thiodan®) has been used at half-rate to knock back a high WFT infestation. It will allow some survival of Cucumeris and Hypoaspis, but will kill all Orius.
- Diatomaceous earth or silica aerogel applied to the floor under the plants will kill thrips as they drop to the ground to "pupate".
- Insecticidal soap or horticultural oil can be used to reduce thrips numbers before biological control agents are applied as they act on contact and do not leave toxic residues.
- Naled (Dibrom®) is effective, but kills all biological control agents and has a residual period of 14 days. It causes damage to flowers and is best used as a clean-up at the end of the crop.

Other Measures

- Avoid thrips infestations by thoroughly cleaning up the crop at the end of the season. Treat the greenhouse with naled (Dibrom®) after the last pick, before removing crop plants, and again after the greenhouse is empty. When removing plants, do not leave them within or near the greenhouse as surviving thrips will re-enter the
- greenhouse. Wash the greenhouse structure with strong detergent and hot water.

- To starve thrips between crops, maintain a heated greenhouse, empty of plants for 3-5 days, which forces adult thrips to emerge from the soil-borne stages.
- If thrips populations were high in the preceding crop, it may be advisable to apply lime to the ground before covering the greenhouse floor with plastic. Care should be taken to overlap and tape, or glue, the floor covering together.
- Keep ornamental plants out of vegetable greenhouses, and maintain a weed-free border 3 m (10 ft) wide around the outside perimeter of the greenhouse.
- Screen greenhouse vents with thrips-proof screening. This reduces air flow by a factor of 4-5 X, therefore surface area of vents must be increased accordingly.
- Inspect plants brought into the greenhouse for thrips and treat before a biocontrol program is started if many thrips are present.

Summary of IPM for Thrips

- Remove weeds in and around the greenhouse.
- Screen vents with thrips proof screening if thrips are likely to enter greenhouses from outside.
- Use yellow or blue sticky traps to monitor for thrips.
- From December-February:
    - Apply Hypoaspis and Cucumeris (in bran) to seedlings in propagation house, or upon planting out;
    - Apply Cucumeris to plants again once they are set out in the greenhouse.
    - Continue to release Cucumeris as required according to trap counts.
    - Release Orius in March or when thrips populations are established.
- For crops set out in summer for fall harvest, introduce all three predators as soon as plants are transplanted.
- At the end of the crop, do a thorough clean-up with naled (Dibrom®) and remove all plant debris. Wash greenhouse structure.