MANAGEMENT OF THRIPS IN GREENHOUSE CROPS

G. Murphy, G. Ferguson and L. Shipp
(Replaces OMAF Factsheet Pest Management of Thrips in Greenhouse Vegetables, Order No. 94-023)

INTRODUCTION
Thrips are a major pest of greenhouse crops in Ontario. A number of thrips species are commonly found including western flower thrips (*Frankliniella occidentalis*), eastern flower thrips (*Frankliniella tritici*), onion thrips (*Thrips tabaci*), and Echinothrips. However, the western flower thrips is the predominant species and the most difficult to control. See OMAF Factsheet Order No. 03-077, Biology of Thrips in Greenhouse Crops for a detailed description of the pest.

MANAGEMENT STRATEGIES
Monitoring
Monitoring the population levels of western flower thrips is critical for successful pest management. In vegetable crops, begin monitoring during propagation and continue after transplanting. In floriculture crops, thrips can be present at damaging levels year-round, although populations are usually reduced during winter. Use commercially available blue or yellow sticky traps to monitor the population densities of adult thrips (*Figure 1*). Blue traps are more attractive to western flower thrips, although yellow traps are more attractive to other pests such as whiteflies and aphids. The choice depends on how many pests need to be monitored, the susceptibility of the crop to thrips and/or tospoviruses, and the need to detect thrips populations at low levels.

When setting up a monitoring program use 1 trap per 100–200 m². The exact number will depend on the layout of the greenhouse. A large open range will require a lower total density of cards than a greenhouse made up of a number of smaller areas. Place the sticky cards in a grid pattern throughout the greenhouse. Check the traps
weekly to record the average number of thrips per trap per week. Be aware that this is not an absolute measure of the population — it measures population trends, the increases and decreases in thrips numbers throughout the year. As you become more aware of how the numbers on sticky cards relate to the population in the crop, you can use the monitoring data to assist in making pest management decisions. There are precision-level sampling programs for monitoring adult western flower thrips on sweet pepper and cucumber. These sampling programs vary the number of samples taken according to the population level of the pest, and accurately predict the pest density to set precision levels. Contact an OMAF Greenhouse Pest Management Specialist or your IPM consultant for more detailed information before implementing your monitoring program.

Cultural Control
Sanitation is the first and most important step in implementing an effective pest management program. Effective sanitation reduces or even eliminates thrips as a pest problem. For example, in cut roses, removing all flower buds (including non-marketable flowers) can significantly reduce thrips populations in that crop. For more detailed information on implementing an effective sanitation program in greenhouse vegetables, see OMAF Factsheet, Order No. 94-029, Sanitation Recommendations For Management of Insect & Mite Pests of Greenhouse Vegetables. Cultural control measures also include maintaining a healthy crop and an optimal greenhouse environment (such as 80% RH) that would provide less favourable conditions for a rapid increase in population densities of thrips.

Physical Control
Insect exclusion screening restricts the movement into the greenhouse of many common greenhouse crop pests including thrips, removing an important variable from a grower’s pest management program. The influx of pests from outside can overwhelm an IPM program, making it difficult for a grower to plan ahead. For more information on screening, see the OMAF Factsheet Order No. 00-021, Screening of Greenhouses for Insect Exclusion.

Biological Control
Biological control of thrips is used more frequently and more successfully in greenhouse vegetables than in floriculture production. However, an increasing number of flower growers are also using this strategy with success. Predatory mites (Neoseiulus (=Amblyseius) cucumeris, Iphiseius (=Amblyseius) degenerans and Hypoaspis spp.) and minute pirate bugs (Orius insidiosus) provide effective biological control of thrips. \( N. cucumeris \) is the most extensively used of the predatory mites (Figure 2). \( N. cucumeris \) controls western flower thrips by feeding only on the first instar larvae. As such, it takes a number of weeks for the impact of this predator to be seen in the greenhouse, and it is unlikely that it will completely eliminate thrips populations. The life cycle for \( N. cucumeris \) is completed in approximately 10 days at 20°C and 6 days at 25°C.

Introduce predatory mites at the beginning of the crop or as soon as thrips are detected. Sanitation at the end and beginning of a cropping season is extremely important and will delay any thrips infestation until the biological control agents can be effective. Regular introductions of \( N. cucumeris \) are necessary, either by dispersing bran on plants or growing medium, or by hanging a bran bag rearing system on plants (Figure 3). The bag system provides a continuous release of mites to the plant and should be replaced monthly. The number of introductions of \( N. cucumeris \) depends on the crop and level of thrips infestation (contact an OMAF Greenhouse Pest Management Specialist or your IPM consultant). Control of the thrips should be achieved in 5–9 weeks. When using \( N. cucumeris \), it is important to maintain at least 70% RH in the greenhouse and not to have used any persistent pesticides such as carbamates or synthetic pyrethroids for several months.

\( O. insidiosus \) is effective in controlling thrips (Figure 4). Unlike \( N. cucumeris \), \( O. insidiosus \) feeds on all stages and is often found in the flowers where it feeds on pollen as an alternative food source. \( O. insidiosus \) does not seem to be as effective in flower crops as it is in vegetables. Development time from egg to adult is 31 days at 20°C and 19 days at 25°C. \( O. insidiosus \) enters reproductive diapause when daylength is less than 12 hours per day. Thus, \( O. insidiosus \) is only effective as a biological control agent from March to September.
The introduction rate for cucumber and sweet pepper is 0.5–1 *Orius* per plant when the pest level is low. One or two releases are usually sufficient to provide thrips control in approximately 3–5 weeks. *Orius* are introduced as adults in several locations and allowed to naturally disperse by flying throughout the greenhouse. Flower sampling is the best method to monitor the presence of *Orius*. *Orius* at 2.5 per cucumber plant also provides effective control in 3–6 weeks when the population levels of thrips are high (5–9 per flower).

*Iphesius degenerans* (Figure 5) differs from *N. cucumeris* in appearance and in being able to tolerate less humid conditions. It is dark, very agile and reproduces very well on pollen. Therefore it performs best in crops with a pollen source, e.g. greenhouse peppers, and is unlikely to be the best option for floricultural crops. It can be reared in the greenhouse on castor bean plants (which produce large amounts of pollen) that may be used as release points for the predator within the greenhouse.
Hypoaspis is a soil-dwelling predatory mite that feeds on a variety of soil organisms, including thrips pupae (Figure 6). Apply as a once-only application to the growing medium (e.g., rockwool, peat mixes) at the beginning of the crop. It is difficult to determine the exact impact of Hypoaspis on a thrips population, but it is better used in combination with other predators and is unlikely to provide sufficient control on its own.

**FIGURE 6.** The predatory mite, Hypoaspis.

**Chemical Control**

Chemical control of western flower thrips can be difficult. They are resistant to most pesticides and feed deep within the flower head or on developing leaves. This makes them a difficult target for insecticides, so thorough coverage is essential. General recommendations regarding pesticide use for thrips control are as follows:

- At the action threshold (when thrips population levels dictate spraying to prevent economically damaging numbers from appearing), spray 4–5 days apart for 3 consecutive applications.

- Rotate chemical classes and use a single chemical class only for the duration of the thrips’ life cycle. This generally means using a different class every 2–3 weeks depending on time of year. Generation times are longer at cooler temperatures.

- Apply pesticides in early morning or late afternoon, when flight activity of thrips is at a peak. This increases exposure of the thrips to the pesticides.

For more information refer to OMAF Publication 370, *Production Recommendations for Greenhouse Floriculture* or OMAF Publication 371, *Growing Greenhouse Vegetables*.

This Factsheet was written by Graeme Murphy, Greenhouse Floriculture IPM Specialist, OMAF, Vineland, Gillian Ferguson, Greenhouse Vegetable IPM Specialist, OMAF, Harrow, and Les Shipp, Greenhouse Entomologist, Agriculture and Agri-Food Canada, Harrow.