

GROWERTALKS

Pest Management

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Tackling Thrips in the Greenhouse

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Thrips, part of the Thysanoptera order, still remain one of the most challenging pests around the world and can feed on a large variety of commercial crops and ornamental plants at all altitudes and climates zones. Unfortunately, there's no one simple management solution, but some farms do noticeably better than others.

Pictured: An adult western flower thrips (Frankliniella occidentalis). Photo courtesy of Frank Peairs, Colorado State University, Bugwood.org.

The pest's highly polyphagous feeding behavior, high reproduction rate and ability to vector plant viruses such as tospovirus have made it a source of constant global monitoring. Importation hubs of fresh produce, in particular, remain vigilant for notifiable thrips species (such as the melon thrips, *Thrips palmi*), as direct feeding damage can make crops unmarketable. With around 6,000 known thrips species worldwide, greenhouse growers need to stay alert for any early signs of thrips development before an infestation becomes too costly.

Identify the threat—inside and out

“Resident thrips” and “immigrant thrips” can be found in greenhouse host crops, so understanding what's in the crop is a key component of effective pest management. Resident thrips are thrips that have multiplied in the crop. If you observe thrips larvae during direct crop scouting, this confirms the presence of the resident thrips.

The immigrant thrips, on the other hand, have come in from outside. These thrips derive from either “migratory thrips”—which migrate long distances, like passive floating aerial plankton at high altitude—or “local flyers,” which fly guided by visual cues. In greenhouse crops, growers are much more likely to find the local flyers that have come in through the doors, holes and cracks in plastic walls or when lifting wall curtains for the purpose of ventilation.

Limit the damage with effective pest management

When adult and nymph thrips feed, they pierce and suck cell contents from flowers and fruits, which leaves behind silvery or corky scars, and can cause leaf deformation or chlorosis. This level of cosmetic damage, especially of flower petals, can ruin a grower's chances of taking their ornamental crops to market, so it's important that a zero-

tolerance policy is adopted in the management of thrips.

Our experience at Scarab shows there are particular intervention actions that, when combined, can help growers effectively manage and control the destructive power of thrips:

Start clean and prioritize good greenhouse hygiene. The first stage in thrips management is prevention and initial efforts must start in the production area where cleanliness is a top priority. To successfully reduce the chances of bringing a new source of infestation into the greenhouse, it's crucial that any new crops being introduced must be clean and free of resident thrips. The use of clean growing media and thorough inspections of any planting material will also help growers significantly reduce the threat of thrips during the early stages of crop cycles.

Position sticky traps to target thrips activity. For convenience, growers tend to place sticky traps for monitoring thrips above the crop canopy where the tender plant tissue the pest feeds on is located, but with a slight adjustment, the number of captures could be higher. If growers bring the traps further down within the canopy and nearer to the ground level, they'll yield more reliable data for monitoring thrips and will enable mass capturing as thrips adults emerge from pupae in the soil or growing media (research shows that 70% of flying thrips adults are captured at a height lower than 3.2 ft. [1 meter] from the ground). Sticky traps with a formulation of male-aggregation pheromone incorporated into the glue layer of the trap also can keep the thrips population under control by almost doubling the number of captures.

Beware of the leeward side. Thrips fly upwind during periods of light wind and fall shy of taking off during windy weather, which more than doubles the risk of thrips entering greenhouses from the leeward side than from the windward side. Researchers verified this when they used traps mounted on wind vanes and found that 75% of the thrips were caught on the leeward side. To account for this, we recommend that growers define the prevailing wind direction on the farm's location so they can focus their efforts on stopping thrips from entering on the leeward side.

Reinforce greenhouse defenses to keep the thrips out for as long as possible. After identifying key thrips hotspots, you should reinforce your defenses to limit the pest's infiltration into the greenhouse. The installation of double doors to create a small airlocked room connected to the entrance of a greenhouse can limit the movement of thrips, but don't forget to close the first door before opening the next, unless you're letting in large machinery. Workers should also report, and immediately fix, any holes in the greenhouse plastic wall, especially near the ground level.

Grass close to the greenhouse should be frequently mowed and never allowed to flower, as thrips can easily move from there into the greenhouse. Growers tend to hang repellent substances, such as naphthalene balls, at head height on the outside of the greenhouse plastic wall, but we recommended placing them nearer to the ground to target emerging thrips. Scout all the outdoor plants on the farm for thrips, including bushes, trees and crops, and remove or replace the plants and even trees that are attractive to thrips—paying particular attention to the leeward side of the greenhouses and the farm.

Timely release of predatory mites. Once thrips are detected, predatory mites can be a crucial biological control to keep the thrips population low, but it's important to note that different mite species are only effective at certain stages in the thrips lifecycle. *Neoseiulus cucumeris*, *Amblyseius swirskii*, *Amblydromalus limonicus* and *Transeius montdorensis* only predate the larval stages, which means that they'll only feed on the "resident thrips" offspring and help keep the resident population low. However, soil-dwelling predatory mites *Stratiolaelaps scimitus* (formerly *Hypoaspis* mites) and *Macrocheles robustulus* feed on thrips pupae in the soil and the predatory bug *Orius laevigatus* feeds on both adults and larvae.

This is where thorough systematic in-crop scouting and data collection of both thrips adults and thrips larvae will refine your control efforts. A good scouting system can calculate the proportion between thrips adults and thrips larvae, and help growers decide when to release the most effective mite species to control the thrips population.

Combine insecticides with effective entomopathogens. Fungi-attacking insects (entomopathogens), such as *Verticillium lecanii*, are another biological control that can limit the spread of thrips in the greenhouse. The effectiveness of certain entomopathogens (*Paecilomyces* and *Beauveria bassiana*) can be further enhanced if you combine with a mixture of conventional insecticides, such as neem extract.

Or add liquid sugar additives. Longstanding research indicates that liquid sugar additives can enhance the efficacy of nerve-acting insecticides against thrips. While the mode of action is still not clear, a dosage between 0.125% to 0.25% is recommendable. Dissolved solid sugar doesn't have this effect.

Rotate MOA for each thrips generation. A chemical spray at least once a week can control the resident thrips, but it's important to change to a new chemical with a different mode of action (MOA) every two weeks. Thrips can build up resistance against your chemicals, so sticking to one mode of action that lasts as long as the 19-day thrips life cycle (at 68F/20C) will ensure continued effectiveness.

Spray at dawn to maximize contact. Chemical sprays rely on contact with thrips to be effective, so timing is everything. Diurnal flight activity patterns of the adult thrips peak between 8:00 a.m. to 10:00 a.m. and again between 2:00 p.m. to 4:00 p.m. in greenhouses, so avoid spraying during these periods when the thrips adults can easily fly away. Instead, concentrate your sprays before 8:00 a.m., and between 10:00 a.m. and 12:00 p.m. when thrips are active on the plant and can make contact with the chemical before it dries. However, be careful of spraying during strong midday sunlight, as this can increase the risk of scorching.

Thrips in unopened rose buds and the underside of developing leaves are far less exposed to insecticide treatment compared to flowers with disc florets, so a thorough spray coverage of all plant parts (flowers and leaves) is recommended. To reach the underside of leaves, flat fan nozzles with an inclined spray angle 30 degrees have the best penetration and deposition on the underside of the leaves.

Manipulate greenhouse lighting to limit movement. As thrips orientate themselves to the sunlight, filtering out some UV light will help control the pest's activity and movement between plants. Growers can cover the greenhouse in UV-absorbing plastics to discourage thrips from moving into the perceived dark spaces. Highly-reflective, metalized ground mulch can also be spread on the ground outside the greenhouse periphery or be hung up as a skirt around the greenhouse from 3.2 ft. (1 meter) down to disorientate the thrips and limit their invasion into the greenhouse. The mulch cover also kills off weeds, thus reducing the source of thrips in the nearby surroundings.

Intervene now and outsmart the elusive pest

Due to their small stature (1 to 1.5 mm), thrips can enter the greenhouse and quickly reproduce to dangerous population levels before they're discovered. At this point, you have limited opportunities to take back control and will most likely be left with greenhouse crops that are unmarketable. But a reliable scouting system and consistent intervention can help you turn the tables on thrips and safeguard your protected ornamental crops against the destructive pest throughout the entire crop cycle. **GT**

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