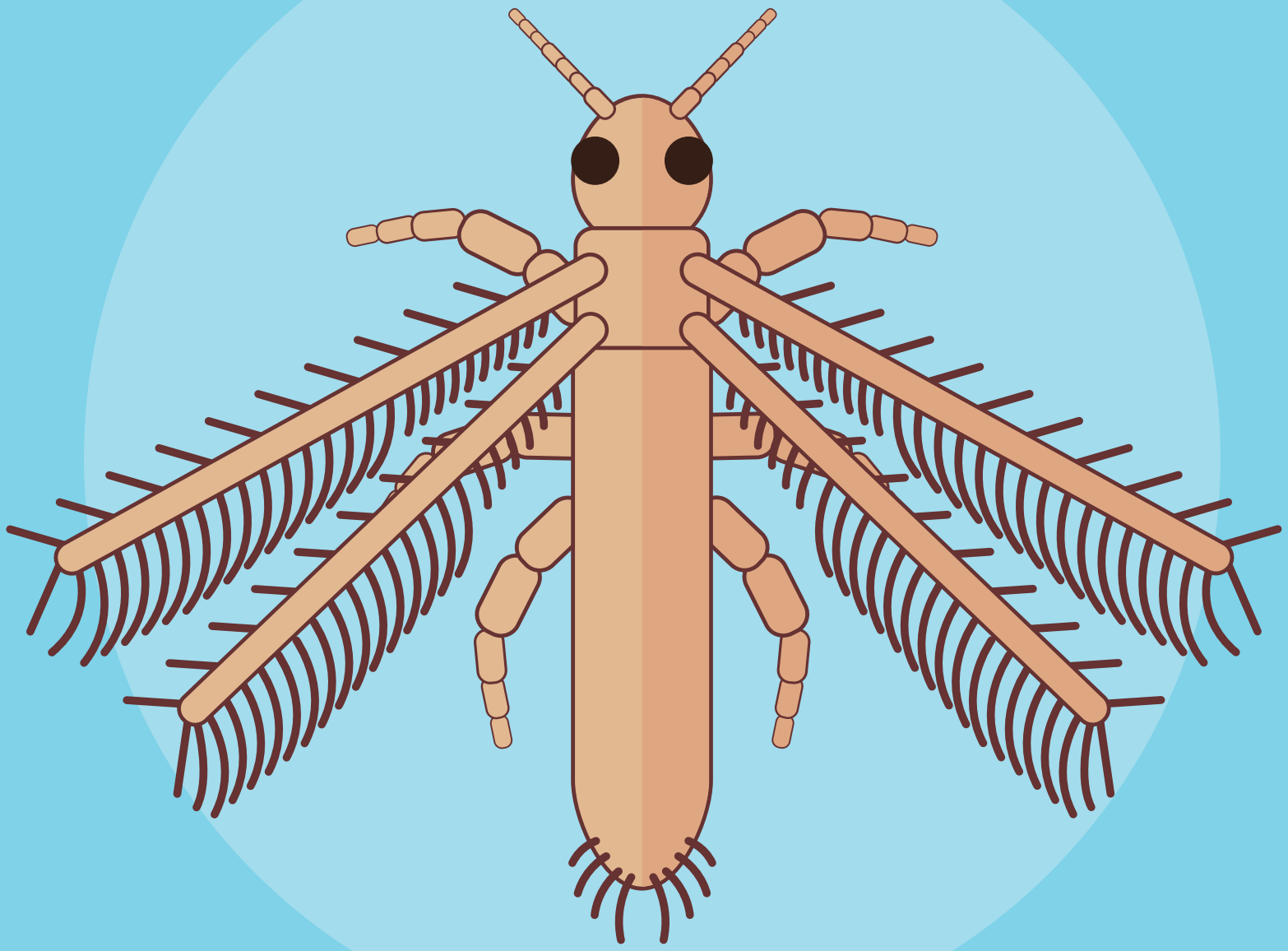
Biology and Management of Thrips
AFFECTING THE PRODUCTION NURSERY AND LANDSCAPE

Shimat V. Joseph, Kris Braman, Will Hudson, and Shakunthala Nair | *Department of Entomology*



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EXTENSION

Thrips are tiny, cigar-shaped insects belonging to the order Thysanoptera, whose name refers to the fringed wings of insects in this order. About 5000 species of thrips are known, and many cause damage to cultivated plants by feeding or vectoring plant diseases. Some thrips are predatory.

It is usually difficult to identify thrips species. Although they are winged, thrips are generally weak fliers, but they can be dispersed by wind and the transport of infested plant material. Many thrips are attracted to bright colors and may fly to human skin and clothing, where they may occasionally cause irritation by biting. Some of the common thrips affecting landscape and nursery plants are described below.

Identification and biology

Thrips are generally very small (up to 2 millimeters (mm), or 1/10 inches, in length) and their colors range from pale yellow to black. Some predaceous species are brightly colored. Correct identification to species level can be made only under magnification or with the help of an expert. The life cycle of thrips consists of the egg stage, followed by two larval stages, two pupal stages, and finally the adult stage (Figure 1). Males are generally smaller than the females. Thrips display parthenogenesis (reproducing without mating), and both mated and unmated females can lay eggs. The eggs of most plant-feeding thrips are inserted into plant tissue by the females. The larval stages actively feed on plant material.

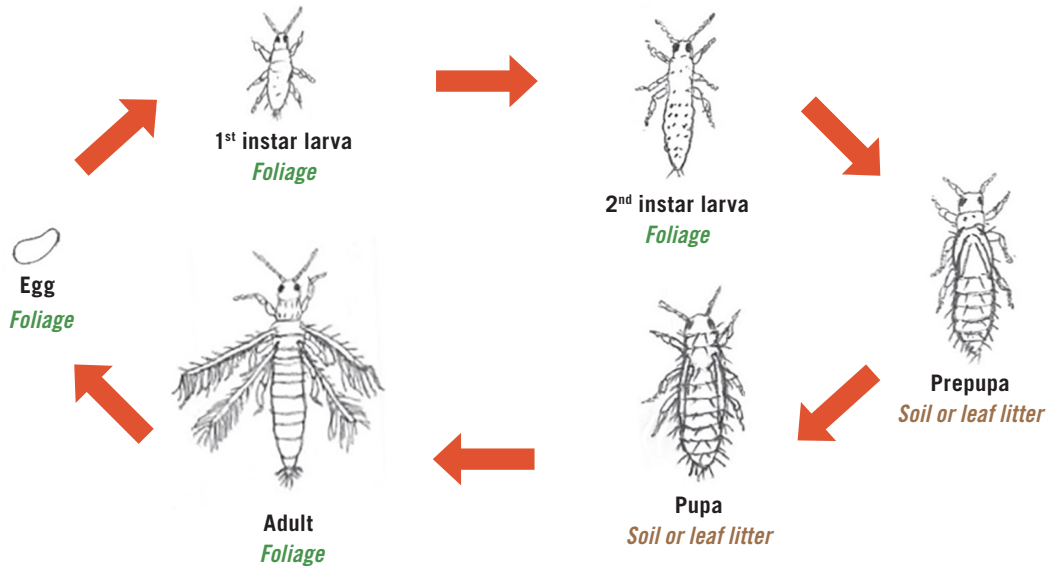

Figure 1. The life cycle of western flower thrips.
Illustration: Shimat Joseph, University of Georgia

Larvae generally resemble the adults but are wingless. The pupal stages (prepupa and pupa) are resting stages and do not feed. They can be identified by wing pads and antennae that are folded over their heads, and may be found on the plant, in the soil, and under leaf litter. Several generations may occur in a year, since the life cycle can be completed in about two weeks under favorable conditions. Thrips populations generally peak during spring and early summer.

Flower thrips:

Western flower thrips, *Frankliniella occidentalis* (Pergande)

shown in Figure 2, are some of the most serious pests of greenhouse plants as well as many other outdoor ornamental, vegetable, fruit, horticultural, and agronomic crops. In addition to causing feeding damage, they also transmit plant viruses such as tomato spotted wilt virus (TSWV) and impatiens necrotic spot virus (INSV), causing significant economic losses. More than 500 plant species, such as petunia, verbena, and impatiens, are affected by western flower thrips. Adult females are dark yellow to dark brown in color, and males are mostly light yellow. Eggs are translucent, white, and kidney-shaped. Larvae are pale yellow in color and both instars have red eyes. Pupal stages are also pale yellow in color and are found inside flowers or in soil.

Figure 2. Adult and larva western flower thrips.
Photo: Jack T. Reed, Mississippi State University, Bugwood.org

Florida flower thrips, *Frankliniella bispinosa* (Morgan), are another species becoming common in southern Georgia and Florida. Adult females are yellow in color with faint gray markings on each abdominal segment. Males are pale yellow or white. Flower thrips are attracted to white or yellow flowers with open corollas.

Greenhouse thrips, *Heliothrips haemorrhoidalis* (Bouche) shown in Figure 3, are widely distributed all over the world and particularly common in greenhouses. Adults have black bodies with light yellow wings, usually seen folded lengthwise over the middle line of the body. Eggs are white and banana-shaped. Larvae are pale yellow in color and measure about 1 mm in length at the end of the second (final) instar. Both pupal stages are also pale yellow in color.

Gladiolus thrips, *Thrips simplex* (Morison) shown in Figure 4, are an important pest of gladiolus flowers (Figure 3) and corms, but they attack other hosts as well. They are mostly spread by the transport of infested gladiolus corms. Adults are brown in color and can be identified by their antennae, which have a light brown segment, and their wings, which have a light colored transverse band near the base. Eggs are smooth, bean-shaped and white in color. Larvae are pale yellow and are usually found on the undersides of leaves and inside bracts. The two pupal stages are found on flowers or corms.

Melon thrips, *Thrips palmi* Karny, are a major pest of vegetables, but they sometimes attack other landscape and garden plants. Adults, larvae, and pupae are pale yellow or off white in color. Adults have dark setae on the body and pale wings, seen as a dark line when folded lengthwise over the body. Eggs are colorless or pale white and bean-shaped.

Red-banded thrips, *Selenothrips rubrocinctus* (Giard), are shown in Figure 5. As the name suggests, larvae and pupae of this tropical and subtropical species can be identified by the red bands on their abdomens. The adults are dark brown to black with pale gray wings. Larvae and pupae are yellow to orange in color and the first three and last abdominal segments of all of these stages show reddish pigmentation (Figure 4). The females insert the eggs into plant tissue and secrete a drop of fluid over them, which dries to form a protective cover.

Chilli thrips, *Scirtothrips dorsalis* Hood shown in Figure 6, are also referred to as strawberry thrips, castor thrips, yellow tea thrips, or Assam thrips. These are a relatively new invasive species introduced from South Asia. They are extremely small and difficult to identify with the naked eye. Adults are pale yellow with light brown wings. Larvae are also pale yellow in color, but they are wingless.

Cuban laurel thrips, *Gynaikothrips ficorum* (Marchal) are shown in Figure 7. Adults are dark brown to black in color with red eyes. Eggs are white and cylindrical with rounded ends. Larvae are a translucent, pale yellow-white and also have red eyes. The abdominal segments in adults and larvae taper to a point and are held pointing upwards.

Figure 3. Adult and larva greenhouse thrips.
Photo: David Cappaert, Michigan State University, Bugwood.org

Figure 4. Gladiolus flowers damaged by *Thrips simplex*.
Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Figure 5. Adult and larva red-banded thrips.
Photo: Lyle Buss, University of Florida, Bugwood.org

Figure 6. Adult chilli thrips.
Photo: Andrew Derksen, FDACS/DPI, Bugwood.org

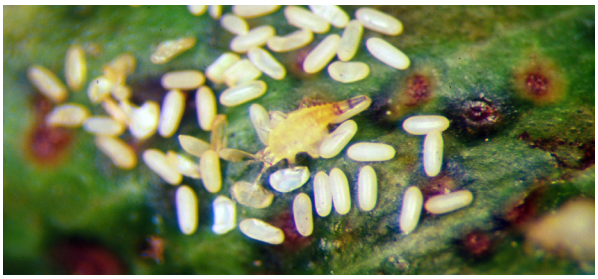

Figure 7. Egg and larva Cuban laurel thrips.
Photo: Whitney Cranshaw, Colorado State University, Bugwood.org

Host plants

Many of the species described above are polyphagous, feeding on a variety of unrelated plants. Flower thrips, chilli thrips, and red-banded thrips are reported from hundreds of plants including trees, ornamentals and vegetable crops, field crops, and weeds. Greenhouse thrips are widespread on most greenhouse-grown crops but are also seen attacking outdoor plants in warm weather. Gladiolus thrips are mainly seen on gladiolus flowers and corms. However, they have been recorded (but not successfully reared) on other plants such as *Philodendron* spp., *Clitoria* spp., and *Rhododendron* spp. Melon thrips are polyphagous but are primarily known as pests of cucurbits and solanaceous plants. They also attack other vegetables such as beans, peas, cabbage, and lettuce; ornamentals such as carnation, chrysanthemum, hibiscus; and trees such as avocado, peach, and plum. Cuban laurel thrips are mainly found on ficus, *Ficus retusa* L. being their preferred host. They are reported to feed occasionally on eucalyptus and orchids.

Damage symptoms

The mouthparts of thrips are unique to their family and asymmetrical, unlike those of most insects. The left mandible forms a narrow stylet that draws out plant sap, and the right mandible is reduced or absent. The feeding mechanism may be described as "punching and sucking," through which the plant surface is rubbed to break the surface and the exuding sap is sucked up. Some species inject digestive enzymes into the wound, and this causes silver or bronze colored speckles on the surface of the plant parts (Figure 8). Small black specks of excrement may also be seen on the affected parts. Some thrips also excrete honey dew, which favors the growth of black sooty mold.

◀ Figure 8a. Leaf distortion caused by western flower thrips.
Photo: Carroll E. Younce, USDA ARS, Bugwood.org

▶ Figure 8b. Leaf silvering caused by western flower thrips.
Photo: Shimat Joseph, University of Georgia

Thrips may feed on leaves, flower buds, flowers, or fruit, depending on the species. Thrips damage causes discoloration, distortion, premature drying, and shedding of leaves, flowers, and buds (Figures 4, 8, 9). Feeding can also impact a plant's ability to grow, causing stunting or dwarfing. Infested fruits are discolored, deformed, and scabby (Figure 10). Corms and bulbs turn soft and susceptible to decay.

Figure 9. Leaf discoloration (white speckles) caused by red-banded thrips.
Photo: Scot Nelson, University of Hawaii at Manoa, Bugwood.org

Figure 10. Thrips damage to fruits.
Photo: David Riley, University of Georgia, Bugwood.org

Monitoring

Thrips are attracted to the colors yellow and blue, so yellow and blue sticky cards are an effective way to monitor populations (Figure 11). The cards should be placed among plants just above the canopy level so that the insects are caught during flight. Blue or white water pan traps can also be used for monitoring. Regular inspecting plants for damage symptoms, like silvery or bronze discoloration, and the distortion of leaves and flowers will also help to identify damage from thrips.

Gently tapping affected plant parts onto a white sheet of paper dislodges the thrips. Samples of affected plant parts should be collected and placed in sealable plastic bags and sent for correct identification. Using indicator plants that are more attractive and susceptible to thrips than the primary crop may provide an early indication of thrips infestation. For example, petunias are useful indicators of western flower thrips infestation.

Figure 11. Yellow sticky cards in a commercial greenhouse.
Photo: Rachel McCarthy, Cornell University - NEPDN, Bugwood.org

Management strategies

Several species of thrips attack landscape, nursery, and greenhouse plants. The correct identification of the species may become necessary to properly manage the pest. Sometimes, thrips species occur on different host plants but may not cause significant damage and treatment may not be necessary. An integrated approach is always best to manage thrips, and the sanitation of the field area or greenhouses is integral to thrips management. Weeds may serve as alternate hosts for thrips as well as reservoirs for viruses. Fallen leaf litter or debris should be removed to reduce pupation rates and disrupt population buildup.

Physical exclusion can help prevent infestation. Placing fine mesh screens over fans and other vents restricts the entry of thrips. Mesh screens can also be used to restrict small areas of nurseries to prevent thrips from attacking new plants or to examine and quarantine plant material brought from outside. Greenhouse workers should avoid wearing bright colored clothes, especially when moving between greenhouses, so that thrips are not attracted and transported.

Most thrips are attacked by one or more natural enemies and chemical control may not be required in certain situations, especially in the landscape. For example, red-banded thrips and melon thrips are preyed upon by lacewings, spiders, predatory thrips, mites, and predatory bugs like minute pirate bugs. Some natural enemies are specific, like the larval endoparasitic wasp *Thripobius semiluteus* Boucek (Eulophidae), which specifically attacks greenhouse thrips. Biological control of thrips in greenhouses and high-value landscapes and nurseries can be successful only if it is part of integrated management program.

Chemical control often becomes necessary in severe infestations, but it is important to understand that thrips are difficult to control due to several reasons. Owing to their tiny size, they can hide in places that cannot be reached by pesticides. Systemic insecticides also have limitations, because they may not reach growing points of plants like tender leaves and buds where the thrips feed. The continuous exposure to insecticides leads to the development of resistance in thrips. Therefore, the choice of insecticides and their application methods should be made after considering these points. Insecticides should be used sparingly if the damage is tolerable and natural enemy populations are high. Using the Georgia Pest Management Handbook, choose insecticides labeled for use against thrips and for application on the host plant. Contact your local University of Georgia Cooperative Extension office for specific recommendations. Follow all directions, particularly safety precautions on insecticide labels.

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