ENY-845

UF UNIVERSITY of FLORIDA
IFAS Extension

Thrips of Ornamentals in the Southeastern US[1]

Joe Funderburk, Stan Diffie, Jyotsna Sharma, Amanda Hodges, and Lance Osborne[2]

The current world checklist of Thysanoptera (Thrips) contains about 7400 species-group and 1200 genus-group names (Mound 2007). Common species associated with ornamental plants as their hosts are primarily in three of the nine Thysanoptera families. Most species of Phlaeothripidae feed on fungi and live on leaf litter or dead wood. A few species feed on higher plants, and some are pests of ornamentals. Most species of Aeolothripidae are predatory on mites and other small arthropods, and these sometimes inhabit ornamentals. The species that feed on higher plants are mostly in the family Thripidae, including most of the species that feed on ornamental plants.

Because of their small size, cryptic habits, and biological characteristics of rapid development, rapid mobility, high reproductive rate, and parthenogenesis (ability to reproduce without mating), some species of thrips are excellent invaders. Over 20 species are cosmopolitan. The most serious pest species of ornamental plants in the southern US are invasive. The chilli thrips, *Scirtothrips dorsalis,* is an invasive species recently established in the landscape (Silagyi and Dixon 2006; Ludwig et. al. 2007).

Biology

The life history of each thrips species includes the following stages: 1) egg, 2) two mobile, feeding larval instars, 3) two (or three) relatively inactive pupal (i.e. non-feeding) instars, and 4) adults (Figures 1 and 2). The eggs of species of Phlaeothripidae are laid directly on plants through a tube-like egg-laying structure, termed an ovipositor. Eggs of Aeolothripidae and Thripidae are laid directly into plant tissue with the use of a serrated ovipositor. Although some species-specific and temperature differences occur, most species complete their life cycles in 21 days in Florida.

The unusual reproduction strategies of thrips may increase their opportunities to successfully invade a new region. Most animals, including humans, have two chromosomes and are diploid. Some insects, including thrips species, are known to exhibit haplodiploid reproduction. In other words, one of the genders develops from unfertilized eggs, and the other gender is produced from sexual reproduction. Males of thrips typically develop from unfertilized eggs and have half the number of chromosomes (the haploid number) that is found in

1. This document is ENY-845 (IN754), one of a series of the Entomology & Nematology Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First published: December 2007. For more publications related to horticulture/agriculture, please visit the EDIS Website at **http://edis.ifas.ufl.edu/**.

2. Joe Funderburk, professor, Entomology and Nematology Department, North Florida REC, University of Florida, Quincy; Stan Diffie, staff scientist, Entomology Department, University of Georgia, Tifton; Jyotsna Sharma, assistant professor, Environmental Horticulture Department, REC, University of Florida, Quincy; Amanda Hodges, Southern Plant Diagnostic Network, assistant extension scientist, Entomology and Nematology Department, University of Florida, Gainesville and Lance Osborne, professor, Entomology and Nematology Department, Mid-Florida REC, University of Florida, Apopka.

Figure 1. Adult, larval, and pupal *Heliothrips haemorrhoidalis*.

Figure 2. Adult and pupal *Echinothrips americanus*.

females (the diploid number) (Crespi 1993). The males develop from unfertilized eggs, and the females from fertilized eggs. Some exceptions do occur, including the greenhouse thrips (*Heliothrips haemorrhoidalis*). Females of the greenhouse thrips are haploid and the males are diploid (Bernardo et al. 2005).

Small body size, temperature, and humidity often prevent long-distance flights due to risk of dehydration. Exceptions do occur, particularly for species of flower thrips. The length and number of flights differ by several factors including species, gender, weather conditions, and available food sources. Mass flights of western flower thrips, (*Frankliniella occidentalis*) are triggered in the spring when wild plant host flowers begin to die (Ramachandran et al. 2001). Western flower thrips are less active than other flower thrips, including the eastern flower thrips (*Frankliniella tritici*) and Florida flower thrips (*Frankliniella bispinosa*) when inhabitating a suitable host. Adult eastern flower thrips and Florida flower thrips rapidly recolonize a crop treated with insecticide. Other species of thrips, such as *Gynaikothrips* and *Heliothrips*, move primarily at specific times to form new colonies. Infested plant hosts and debris serve as reservoirs for thrips infecting new plants, and sanitation is an important tactic in managing thrips.

Thrips Feeding Behavior and Damage

Thrips use a punch and suck feeding technique that is unique among insects. They punch a hole in the plant surface (both epidermis and mesoderm cells can be affected) through which the stylet is inserted.

Thrips induce a range of damage symptoms in plant tissue by their feeding (Childers 1997). This damage results in deformed growth of the leaves (Figure 3) and, if severe, damage eventually results in defoliation. Some species of thrips such as the chilli thrips (*Scirtothrips dorsalis*) feed on new growth. The chilli thrips also will aggregate in flowers where feeding results in browning of petals and other tissues (Figure 3).

Figure 3. Damage to new growth and flowers of roses by chilli thrips, *Scirtothrips dorsalis.*

The western flower thrips, the orchid thrips (*Chaetanaphothrips orchidii*), the gladiolus thrips (*Thrips simplex*), the onion thrips (*Thrips tabaci*), the melon thrips (*Thrips palmi*), *Echinothrips americanus*, and the tobacco thrips (*Frankliniella fusca*) feed on the terminal growth of some ornamental plant species, but primarily these species aggregate in flowers where they feed and reproduce. The eastern flower thrips, the Florida flower thrips, the common blossom thrips (*Frankliniella schultzei*) and *Thrips hawaiiensis* primarily aggregate in flowers.

The Cuban laurel thrips (*Gynaikothrips ficorum*) and the weeping fig thrips (*G. uzeli*) form leaf roll galls on species of *Ficus* where the adults feed and lay eggs (Figure 4).

Figure 4. Leaf roll gall of weeping fig thrips, *Gynaikothrips uzeli.*

The redbanded thrips (*Selenothrips rubrocinctus*) and the greenhouse thrips form colonies on leaves and fruits. Feeding results in corky tissue and flecking (Figure 5).

Figure 5. Damage to leaves and fruit of avocado by greenhouse thrips, *Heliothrips haemorrhoidalis*.

Natural Enemies

Thrips natural enemies include predators, parasites, and pathogens. Minute pirate bugs such as the insidious flower bug (*Orius insidiosus*) are very effective predators of thrips in the flowers of many plant species (Funderburk et al. 2000). These predators occur naturally in the landscape throughout the southern US. Other important predators of thrips include lacewings, syrphid flies, mirid bugs, predatory thrips, and predatory mites (Sabelis and Van Rijn 1997). Numerous hymenopterous parasitoids and parasitic nematodes cause mortality to thrips in ornamentals (Loomans et al. 1997). There are also fungal pathogens of thrips (Butt and Brownbridge 1997). Many insecticides are detrimental to natural enemy populations. Management programs whenever possible need to employ conservation biological control. Conservation biological control focuses on choosing management programs that will result in less harmful impacts for pre-existing natural enemies. Minute pirate bugs are key natural enemies of thrips on numerous flowering plant species. Plants such as sunflowers are useful as banker plants to increase biological control using minute pirate bugs.

Sampling and Identification

Thrips can be collected from a plant, a growing terminal, a single flower, or leaf by beating the vegetation over a white plastic tray such as an artists palate. Thrips are stunned by the beating and they adhere momentarily to the tray. They can be counted or removed with a fine brush into collecting vials containing 70% alcohol (Figure 6). They also can be collected using a small aspirator equipped with fine thrips screen.

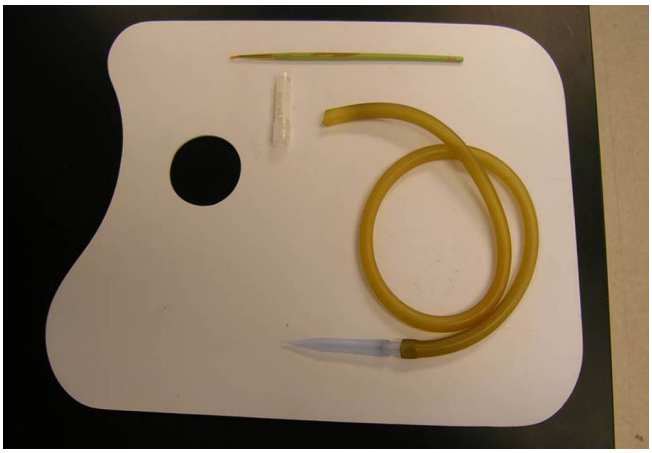

Figure 6. Artist's palate with fine brush, aspirator, and screw-cap vial.

Samples of flowers, leaves and other plant structures can be placed directly in jars of alcohol and the thrips extracted (Figure 7). The extraction can be done in the laboratory under a dissecting microscope. The sample also can be vigorously shaken to release the thrips into the alcohol medium.

Thrips are small but common pests can be easily identified with proper training and a microscope. Scouts are aided by knowledge of the species of

Figure 7. Placing flowers in vial containing 70% alcohol.

thrips for which a particular crop is host. If more than one thrips species occurs commonly on the crop in their geographic region, the species may be differentiated by color or some other easily-observable characteristics. A key is included of such characteristics to identify the pest and predatory thrips species commonly found on ornamentals.

For a description of the commonly occurring thrips species in Florida and the southern US, see Table 1.

Common Thrips Associated with Ornamentals in the Southeastern US

This is a simple guide useful in separating the common thrips species found on ornamentals in the greenhouse and landscape of the southern US. The characters used in the key can be seen by observing under a stereoscope with at least 50X magnification. Thrips can be prepared on slides or simply observed in 70% alcohol. This key can be used by practitioners with no previous experience. Users can fairly reliably identify an adult female collected from ornamentals by using the mentioned characters for family (and sometimes the subfamily), the genus, and finally the species as well as information about the plant species that are hosts and the damage to these hosts.

Thrips species from three families are represented in this key. These families are Phlaeothripidae, Aeolothripidae, and Thripidae.

FAMILY PHLAEOTHRIPIDAE

Most of the species in this family are fungus feeders. Only a few species are encountered on ornamentals. A few species are predatory and some species are pests. Thrips in the family Phlaeothripidae have a tube-like egg-laying structure at the end of the abdomen, and they have no veins or setae on the wings (Figure 8). The apex of the forewing is broadly rounded.

Cuban laurel thrips, *Gynaikothrips ficorum* & Weeping fig thrips, *G. uzeli*

Gynaikothrips ficorum, the Cuban laurel thrips, is widespread throughout the tropics and subtropics on its host-plant *Ficus microcarpa* and *Ficus retusa* on which it causes leaf-roll galls. Other species of *Ficus* are almost completely immune to its attack. The weeping fig *Ficus benjamina* supports the weeping fig thrips, *Gynaikothrips uzeli* (Figure 8).

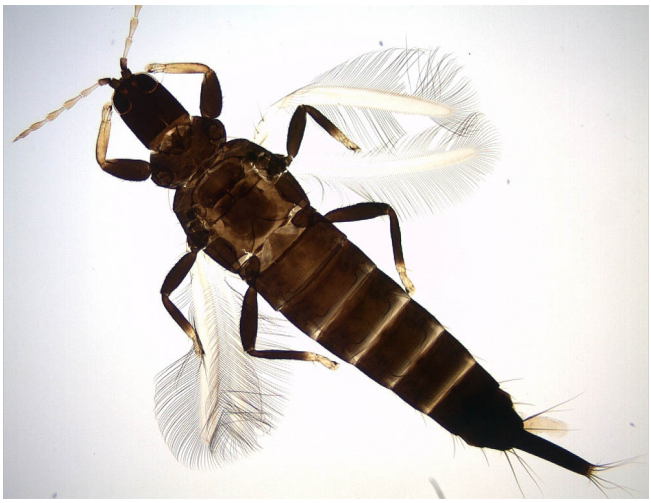

Figure 8. The weeping fig thrips, *Gynaikothrips uzeli* (family Phlaeothripidae).

FAMILY AEOLOTHRIPIDAE

Thrips in this family are obligate predators or facultative predators in flowers feeding on plant tissues as well small arthropods. Many species are ant mimics. Species in this family have an up-turned serrated egg-laying structure and they have veins in the forewings. The tip of the forewing is rounded.

Aeolothrips bicolor

Aeolothrips bicolor is a predator commonly found in flowers in the southern US (Figure 9). This ant-mimicking thrips is black with a white midsection. It feeds on spider mites.

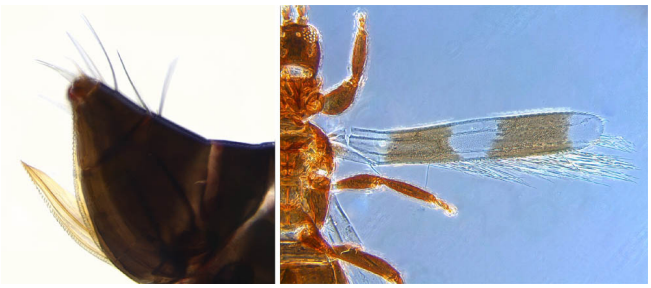

Figure 9. Up-turned, serrated egg-laying structure and wing of *Aeolothrips bicolor*.

FAMILY THRIPIDAE

Nearly all of the pest species of ornamentals occur in the family Thripidae. Thrips in the family Thripidae have a serrated egg-laying structure near the end of the abdomen and they have veins and setae on the wings (Figure 10).

Figure 10. Down-turned, serrated egg-laying structure of a thrips in the family Thripidae.

Subfamily Panchaetothripinae

The members of the subfamily Panchaetothripinae within the family Thripidae are all leaf-feeders. Some species are also damaging to fruits. Species of Panchaetothripinae are usually dark with strong polygonical reticulations (i.e., a lattice-like pattern) on the head, prothorax, and forelegs.

Greenhouse thrips, *Heliothrips haemorrhoidalis*

The greenhouse thrips, *Heliothrips haemorrhoidalis*, occurs in the field and greenhouse (Figure 11). Adults and larvae are slow moving and are found on mature leaves together with pupae. The larvae raise their abdomen over their head when disturbed and secrete a drop of dark liquid. The adults are dark brown with pale wings with short setae. The legs are yellow.

Figure 11. Head, prothorax, and front leg of *Heliothrips haemorrhoidalis*.

Red-banded thrips, *Selenothrips rubrocinctus*

The red-banded thrips, *Selenothrips rubrocinctus*, feeds on the leaves of a number of plant species (Figure 12). Damage is usually associated with older leaves on trees that for whatever reason are physiologically stressed. It is known as the red-banded thrips because of the color of the second-instar larvae. The head, throrax, and abdomen are dark blackish brown. The wings and most of the legs are brown. The setae on the wings are well developed.

Subfamily Thripinae

The members of the subfamily Thripinae within the family Thripidae have diverse habits living in the flowers, leaves, or fruits of plants. Most of the pest species of thrips are in this subfamily. Thrips in the

Figure 12. Head, prothorax, and front leg of *Selenothrips rubrocinctus.*

subfamily Thripinae usually have no sculpturing on the head and prothorax, never with reticulations on the front legs.

Echinothrips americanus

The thrips *Echinothrips americanus* is common on ornamental plants in the field and greenhouse throughout the southern US (Figure 13). It is distinguished by the presence of reticulations on the head and prothorax together with the absence of reticulations on the front legs. This species also has a red internal pigment.

Figure 13. Head, prothorax, and front leg of *Echinothrips americanus*.

Genus *Frankliniella*: There are many species of thrips in the genus *Frankliniella* in the southern US. Most species are flower inhabiting although sometimes they may inhabit leaves. Some species are very common on ornamental crops. The upper surface of the prothorax of the flower thrips in the genus *Frankliniella* has the unique feature of five pairs of large, elongate setae.

Western flower thrips, *Frankliniella occidentalis*

The five pair of elongate setae on the prothorax are very long with each about the same length in *Frankliniella occidentalis*, the western flower thrips, thereby separating it from other common species of *Frankliniella* usually found on ornamentals (Figure 14). This species is light yellow with a median dark stripe. It is common throughout the southern US.

Eastern flower thrips, *Frankliniella tritici*

Another light yellow species of flower thrips in this genus is common on ornamentals in the southern US, but not in central and southern Florida where it is very rarely found (Figure 14). The setae on the prothorax of the eastern flower thrips are not of equal length.

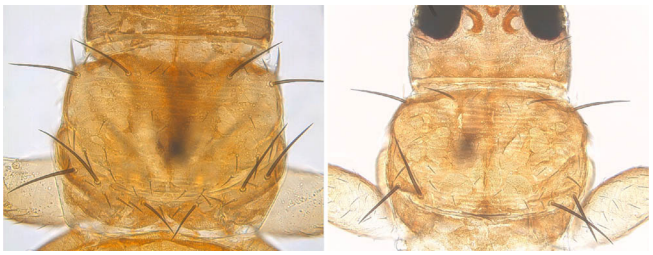

Figure 14. Prothorax of *Frankliniella occidentalis* (left) and *Frankliniella tritici* (right).

Florida flower thrips, *Frankliniella bispinosa*

The Florida flower thrips is very common in central and southern Florida (Figure 15). It is occasionally found in northern Florida, southern Alabama, and southern Georgia, while it is very rare in the rest of the southern US. The Florida flower thrips can be distinguished from the eastern flower thrips by its two very stout setae at the base of the third antennal segment.

Figure 15. Antennae of *Frankliniella bispinosa* (left) and *F. tritici* (right).

Tobacco thrips, *Frankliniella fusca* & common blossom thrips, *Frankliniella schultzei*

Other species of *Frankliniella* can be found on ornamental plants. The common blossom thrips, *Frankliniella schultzei*, and the tobacco thrips, *Frankliniella fusca*, are dark brown to black species (Figure 16). The common blossom thrips is usually encountered only in central and southern Florida. The inner setae of the elongate pair on the anterior of the prothorax of the tobacco thrips are much shorter than the outer setae, while it is only somewhat shorter than the outer setae in the common blossom thrips.

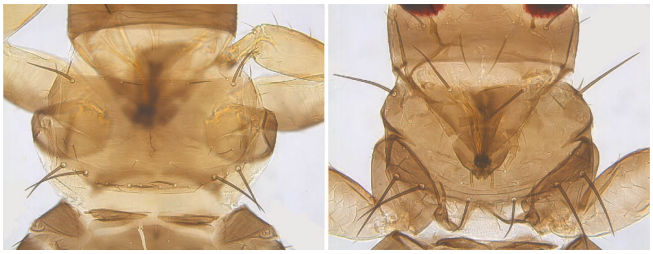

Figure 16. Prothorax of tobacco thrips, *Frankliniella fusca* (left) and common blossom thrips, *F. schultzei* (right).

Genus *Thrips*: There are many species of thrips in the genus *Thrips* in the southern US. Most species inhabit flowers and leaves. Some species are very common on ornamental crops in the field and greenhouse. The upper surface of the prothorax of the thrips in the genus *Thrips* has two pairs of large, elongate setae (Figure 17).

The onion thrips, *Thrips tabaci*, is not common in the southern US although it is occasionally encountered on ornamentals in the field and greenhouse (Figure 18). This species is brown to black, and it has a wide host range. The three simple eyes that are located between the much larger compound eyes are grey whereas in the other species these simple eyes are red colored. Another dark

Figure 17. Prothorax of the melon thrips, *Thrips palmi*.

species of thrips that is rather host specific to gladiolus is the gladiolus thrips, *Thrips simplex*. The melon thrips, *Thrips palmi*, is common on a wide range of ornamental plants (Figure 18). The species is pale yellow. The wings have some dark pigment, and when they are folded over the back, the species appears to have a dark longitudinal stripe. *Thrips hawaiiensis* breeds in the flowers of a wide range of ornamental species. The body color is dark brown although populations in northern Florida sometimes are bi-colored with the head and thorax paler than the abdomen.

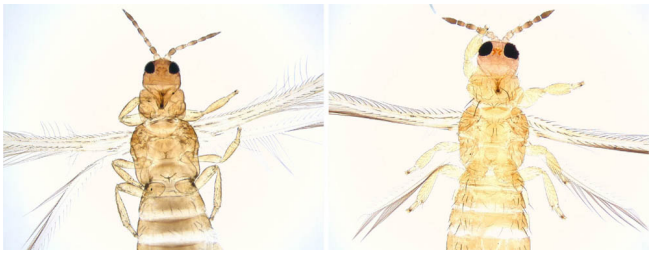

Figure 18. The onion thrips, *Thrips tabaci*, (left) and the melon thrips, *Thrips palmi* (right).

Orchid thrips, *Chaetanaphothrips orchidi*

The orchid thrips is common in the field and greenhouse. Hosts under field conditions include orchids and citrus (Figure 19). It is a common pest in greenhouses where it has a fairly wide host range. The species is pale yellow. Due to dark coloring on portions of the wings, the species appears to have a dark spot over the thorax and a dark stripe over the abdomen.

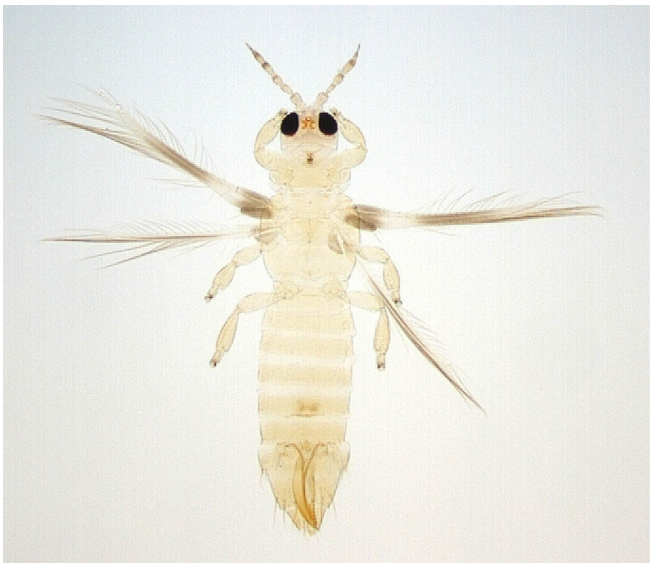

Figure 19. The orchid thrips, *Chaetanaphothrips orchidi*.

Chilli thrips, *Scirtothrips dorsalis*

The chilli thrips is established in central and southern Florida on a wide range of ornamental plant species in the field and greenhouse. This is a small thrips that has very pale yellow, almost white, body color (Figure 20). Most segments of the abdomen have a very dark ridge on the anterior. The prothorax has one pair of elongate setae on the posterior margin.

Figure 20. Prothorax and abdomen of the chilli thrips, *Scirtothrips dorsalis.*

Six-spotted thrips, *Scolothrips sexmaculatus*

The six-spotted thrips is light yellow with grey markings on the pronotum and top of the abdomen (Figure 21). Each forewing has two dark bands and the base of the wing is dark which gives the species its common name. The species is predatory on spider mites and it is commonly found on ornamental plants. This species is easily identified by the six pairs of extraordinarily long setae on the prothorax.

Figure 21. Head and prothorax of the six-spotted thrips, *Scolothrips sexmaculatus.*

Acknowledgements

We would like to thank Lyle Buss, University of Florida/IFAS Extension, Entomology & Nematology Department and one anonymous reviewer for editorial comments.

References Cited

Bernardo, U., G. Viggiani, and R. Sasso. 2005. Biological parameters of *Thripobius semiluteus* Boucek (Hym., Eulopidae), a larval endoparasitoid of *Heliothrips haemorrhoidalis* (Bouche) (Thysan., Thripidae. JEN 129(5) doi: 10.1111/j.1439-0418. 2005.00957.250-257

Butt, T. M., and M. Brownbridge. 1997. Fungal pathogens of thrips. *Thrips As Crop Pests* (ed. T. Lewis), pp. 505-538. CAB International, Wallingford, UK.

Childers, C. C. 1997. Feeding and oviposition injuries to plants. *Thrips As Crop Pests* (ed. T. Lewis), pp. 339-433. CAB International, Wallingford, UK.

Crespi, B. J. 1993. Sex ration selection in Thysanoptera. *Evolution and Diversity of Sex Ratio in Insects and Mites* (eds. D. L. Wrensch and M. Ebbert), pp. 214-234. Chapman and Hall.

Funderburk, J., J. Stavisky, and S. Olson. 2000. Predation of *Frankliniella occidentalis* (Thysanoptera: Thripidae) in field peppers by *Orius*

insidiosus (Hemiptera: Anthocoridae). Environmental Entomology 29: 376-382.

Loomans, A. J. M., T. Murai, and I. D. Greene. 1997. Interactions with Hymenopterous parasitoids and parasitic nematodes. *Thrips As Crop Pests* (ed. T. Lewis), pp. 355-397. CAB International, Wallingford, UK.

Ludwig, S, L. Osborne, M. Ciomperlik, and G. Hodges. 2007. Chilli thrips, *Scirtothrips dorsalis* Hood National Pest Alert http://www.ncipmc.org/alerts/chilithrips.cfm.

Mound, L. A. 2007. Thysanoptera (Thrips) of the World – a Checklist. Commonwealth Scientific and Industrial Research Organization, Entomology, Canberra, Australia. http://www.ento.csiro.au/thysanoptera/worldthrips.html.

Ramachandran, S., J. Funderburk, J. Stavisky, and S. Olson. 2001. Population abundance and movement of *Frankliniella* species and *Orius insidiosus* in field pepper. Agricultural and Forest Entomology 3: 129-137.

Sabelis, M. W., and P. C. J. Van Rijn. 1997. *Thrips As Crop Pests* (ed. T. Lewis), pp. 259-354. CAB International, Wallingford, UK.

Silagyi, A. J., and W. N. Dixon. 2006. Assessment of chilli thrips, *Scirtothrips dorsalis*, in Florida. Florida Cooperative Agricultural Pest Survey, Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville.

Table 1. Thrips pests associated with ornamentals in the southern US.

Common and Scientific Names	Crops and Damage	Other Information
Western flower thrips *Frankliniella occidentalis*	Wide range of damage to leaves, flowers, and fruits of field and greenhouse ornamentals. Damage includes tissue distortion, flecking on leaves, and browning of petals.	Worldwide secies originally from Southwest US. Visits flowers of many crop and wild plant species.
Florida flower thrips *Frankliniella bispinosa*	Common in the flowers of many field and greenhouse ornamentals. Damage results in browning of petals.	Common throughout Florida and ranging into Georgia and Alabama. Visits flowers of many crop and wild plant species.
Eastern flower thrips *Frankliniella tritici*	Common in the flowers of many field ornamentals. Sometimes results in browning of petals.	Common in the eastern US including northern Florida, but rarely found south of Ocala. Visits the flowers of many crop and wild plant species.
Tobacco thrips *Frankliniella fusca*	Sometimes encountered on ornamentals.	Common throughout Florida and the southern US.
Onion thrips *Thrips tabaci*	Rarely a pest on ornamentals.	Old World species now worldwide; common throughout Florida.
Melon or palm thrips *Thrips palmi*	Distorted, corky tissue on the leaves and flowers of many nursery plants such as orchids.	Originally from SE Asia but widespread in tropical regions including southern Florida.
Common blossom thrips *Frankliniella schultzei*	Sometimes common in the flowers of ornamentals.	Common in central and southern 'Florida and in northern Florida following warm winters. Visits the flowers of many crop and wild plant species.
Chili thrips *Scirtothrips dorsalis*	Distorted tissue on the growing terminals and flowers of numerous ornamental plants.	South Asia species established in the landscape of central and southern Florida.
Legume thrips *Megalurothrips mucunae*	Found in the flowers of crepe myrtle. Pest status uncertain.	Asian species established in the landscape of northern Florida.
Greenhouse thrips *Heliothrips haemorrhoidalis*	Forms colonies on leaves and fruits and damages a wide range of plants in the greenhouse and sometimes the field.	Brazilian species introduced into the US and other parts of the world.
Gladiolus thrips *Thrips simplex*	Breeds in the flowers and on the leaves of *Gladiolus* and related species of Iridaceae.	Sometimes encountereed in southern US.
Echinothrips americanus	A pest of several greenhouse plants and woody ornamentals. Flecking damage primarily on the undersides of leaves.	A field and greenhouse pest in southern US. Some preferred hosts include *Dieffenbachia, Philodendron, Ficus*, poinsettia, and Impatiens.
Orchid thrips *Chaetanaphothrips orchidii*	Distorted tissues on the flowers of orchids and other plants in the greenhouse.	Established in the landscape in Florida but mostly a greenhouse pest.
Cuban laurel thrips *Gynaikothrips ficorum*	Forms characteristic leaf rolls used as galls for adults and larvae.	Occurs in tropical and subtropical climates including central and southern Florida. *Ficus retusa* is preferred and Viburnum and citrus are hosts.