

**Seasonal Abundance of Thrips (Thysanoptera: Thripidae) and Their Predators in Peppers and Ground
Cover Plantings in South Florida**

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Abstract

The seasonal abundance of flower thrips, *Frankliniella* spp, melon thrips (MT), *Thrips palmi* Karny, and composite thrips (CT), *Microcephalothrips abdominalis* Crawford, was determined by collecting infested blooms from bell peppers, crimson clover (CCL), and creeping oxeye (COE) *Wedelia trilobata* (L.). Predatory mites (Acari: Phytoseiidae) and minute pirate bugs (MPB), *Orius insidiosus* (Say) (Hemiptera: Anthocoridae) were collected from all host plants. The abundance of thrips and predatory species was affected by the season, with moderate numbers in the Fall declining through the winter months and rebounding in the Spring. Events such as the destruction of the Fall pepper crop, the onset of blooming in an adjacent citrus grove influenced insect numbers. The potential utility of cover crops as refuges for beneficial arthropods is discussed.

Introduction

Thrips have damaged Florida vegetable crops for many years. The native Florida flower thrips (FFT), *Frankliniella bispinosa* (Morgan) is the most common thrips species encountered in the southern part of the state, inflicting economic levels of damage in several crops, including citrus, strawberries and tomatoes (Childers and Achor, 1991). Thrips management has become more complicated with the recent introductions of the western flower thrips, *F. occidentalis* (Pergande), in the late 1980's (Frantz and Mellinger 1990) and MT, in 1990. Both pests can transmit virus diseases and cause novel types of damage to Florida vegetables, notably tomatoes and peppers (Salguero, et al., 1991). Conventional chemical control of these species is fairly ineffective. The purpose of this study was to determine whether biological control agents were present in sufficient numbers to reduce thrips numbers, and whether they could be found in planted cover crops or in naturally occurring weeds.

Materials & Methods

Host plants

Pepper fields were located at Green Cay Farms (GCF), Boynton Beach, FL, and at Shiloh Farms (SHF), Jupiter, FL. The west part of GCF was planted in August and September 1995 (Fall crop). The east part was planted in October and November (Winter crop). A 3 acre woody ornamental nursery and a series of buildings separated the Fall and Winter pepper crops. Spring peppers were planted at SHF in December and January, and harvested until May 10, 1996.

Greenhouse-grown transplants were set into plastic-mulched beds fumigated with methyl bromide/chloropicrin. Irrigation was supplied by drip irrigation tubes placed under the plastic mulch. Fertilization and other grower practices were standard for this area.

Insecticides were applied on an as needed basis, based on scouting reports, and were chosen for the preservation of beneficial insects. The insecticides were azadirachtin, *Bacillus thuringiensis* (B.t.), imidacloprid and methomyl. Azadirachtin was used during high armyworm incidence in August-October, and was discontinued after their incidence decreased. B.t. was used as needed throughout the season. The Spring crop received imidacloprid during a thrips peak in mid-March, and methomyl was applied later when the population rebounded.

Cover crops evaluated included CCL, arrowleaf clover, ladino clover and a naturally occurring patch of COE. Seeds for the clover plantings were obtained from a commercial source, and were mixed with Japanese millet before planting. Clovers were planted in the driveway middles running through the pepper blocks in the Winter crop. Drive middles in four adjacent blocks were planted, 2500 feet long by 4 feet wide with each variety. COE occurred in an extensive area on a ditch bank on the east end of the Winter crop.

Thrips and predator evaluation

Insects were collected by picking flowers directly into plastic bags containing 70% isopropyl alcohol. Samples were sifted through a coarse strainer then through a 120 mesh strainer. The thrips and other small insects collected on the fine strainer were transferred to Syracuse dishes, and identified under 40X magnification. Thrips identifications were double checked by examining occasional specimens with a compound microscope. Larval thrips were not identified to species. Predatory mites and other predators were submitted to the Division of Plant Industry, Florida Department of Agriculture and Consumer Services, for identification.

Samples consisted of 25 blooms of each of the host plants. Collections were made approximately every 14 days during the bloom period for each host, except Fall peppers, where sampling was delayed until scouting reports indicated thrips presence. One sample of 25 blooms was taken from CCL and COE on each sample date. The number of samples from peppers ranged from 1-5 for each date, depending on the availability of blooms.

Results & Discussion

Cover crops

The clovers seeded in drive middles emerged by mid November. Only CCL grew well enough to compete with the normal weedy growth in this environment. The weed competition included grasses, nutsedge, and white sweet clover. CCL formed a dense growth and became an effective weed barrier through early April. Blooming was from February to early April. With the cessation of blooming, CCL declined quickly. By late May, grasses and nutsedge dominated the seeded area.

COE grew luxuriantly on a ditch bank and blooms were present when insect sampling began in early November. Blooming continued through mid-January. The plants remained green through the remainder of the winter and a re-bloom bloom sample was collected in late May.

White dutch clover had seeded in parts of SHF several years earlier. During the cropping cycle at that location, white dutch clover was observed to grow vigorously in many of the drive middles. This variety began blooming in mid-winter, and continued through the end of May, when the driveways were mowed. An exploratory insect sample, contained numerous thrips and parasitic wasps indicated that this variety may warrant comparison with CCL in the future.

Thrips and predator evaluation

The primary species of thrips collected were FFT, CT, and MT,. FFT occurred on all hosts surveyed. MT was only collected from peppers. Except for a few pepper blooms, CT was only found in COE. Predatory mites in the genera *Neoseiulus* and *Protopsoseiulus* were collected from one or more hosts. MPB were also collected from all hosts. The seasonal abundance of the insects collected is presented in Table 1.

The seasonal cycle of thrips collected from peppers follows that observed in a previous survey on the west coast of Florida (Frantz et al., 1993). Following a low peak in November, FFT declined through the winter months. Their numbers rose again in March. This pattern was observed in the Fall and Winter peppers at GCF.

At SHF, FFT increased sharply with the onset of the citrus bloom in February, and remained at high levels (10-17/bloom) until reduced by insecticide treatments.

In the cover crops, thrips abundance was related to the availability of blooms, and to the abundance of thrips in the pepper crop. Thus, thrips numbers increased in CCL blooms proportionately with the increase in the Winter pepper blooms. In COE, thrips were most common from November to December. Blooming in COE stopped in January, but CT reinfested the new bloom in large numbers when blooming resumed in May.

MPB were common in the Fall crop, where they were detected in the first collections of 11/06/95. Thrips and MPB remained at stable, low levels through December and January. The short daylength and lower than normal temperatures were probably the cause of these low population numbers. Both thrips and predator numbers increased when a portion of the Fall crop was destroyed. The predators were able to keep thrips numbers from increasing out of control after being forced to leave destroyed blocks.

The sampling periods in the Fall and Winter crops overlapped, and similar trends in thrips numbers were seen in both crops. MPB were not as numerous at the outset in the Winter crop, but rebounded with the thrips increase in March, and probably had a role in reducing peak numbers of thrips in April. Predatory mites were collected at very low levels in both the Fall and Winter crops.

The situation in the Spring pepper crop at SHF was notable, in that the farm is bordered on the north by a large citrus grove. The citrus grove began blooming in February, which coincided with an explosive increase in FFT, that reached peak numbers over 10/bloom in March. Despite the abundant prey, MPB were not present in sufficient numbers to lower the thrips population. This resulted in the grower applying imidacloprid and methomyl to lower the population below the damage threshold. Withholding insecticide applications from fields with FFT infestations at or below the damage threshold may be a valuable way to allow populations of MPB to become established. Having a well-established population of thrips, which cause little or no damage can also deter the establishment of the more damaging MT.

The low number of beneficial insects in the Spring crop is most likely due to no opportunity for MPB to become established early in the season, as they did at GCF. Thrips immigrated from the neighboring citrus, without a simultaneous immigration of beneficials. Thus thrips numbers increased unchecked until insecticides were applied and these insecticides further suppressed the predator population.

The ability to use cover crops such as CCL and COE as breeding grounds for beneficial insects would be a significant help in avoiding the situation that occurred at SHF. The key would be to have suitable hosts for both thrips and their predators in bloom throughout the year. The overlap in bloom periods for these two hosts suggests strong possibilities for further development along these lines. This is made more attractive by the fact that COE is infested primarily by a species of thrips that rarely infests pepper. Further exploration of dutch white clover as such a nursery crop is also warranted, as its blooming period lasts longer than that of CCL. It also has a track record of being well adapted to the field environment in south Florida, while the adaptability of CCL needs further observation. An important step in this process will be to investigate the possibility that manipulating these hosts through mowing may serve to force whatever beneficial insects that are on them to move to the pepper crop.

Literature Cited

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Table 1. Insects collected from peppers, crimson clover and creeping oxeye, in Boynton Beach and Jupiter, FL. 1995-96. The frequency with which each insect was collected is shown as the number of detections over the total number of samples. Figures in parentheses indicate the range in numbers of each insect per bloom.

Species	Hosts				
	Fall peppers	Winter peppers	Spring peppers	Crimson clover	Creeping oxeye
Thysanoptera: Thripidae					
<i>Frankliniella bispinosa</i> (Morgan)	5/8 (0-1.28)	8/11 (0-5.08)	6/6 (0.08-10.02)	5/5 (0.04-1.85)	4/6 (0-1.30)
<i>Frankliniella insularis</i> Franklin		1/11 (0-0.02)			
<i>Frankliniella kelliae</i> Sakimura	3/8 (0-0.13)	2/11 (0-0.02)	2/6 (0-0.02)		
<i>Frankliniella occidentalis</i> (Pergande)	2/8 (0-0.02)	3/11 (0-0.04)	1/6 (0-0.12)	3/5 (0-0.07)	
<i>Frankliniella schultzei</i> Trybom		1/11 (0-0.01)			
<i>Microcephalothrips abdominalis</i> Crawford	1/8 (0-0.02)	1/11 (0-0.04)			5/6 (0-5.00)
<i>Thrips palmi</i> Karny	5/8 (0-0.07)	7/11 (0-0.12)	5/6 (0-1.32)		
Hemiptera: Anthocoridae					
<i>Orius insidiosus</i> Say	8/8 (0.10-0.74)	5/11 (0-0.30)	3/6 (0-0.10)	3/5 (0-0.24)	1/6 (0-0.12)
Acarina: Phytoseiidae	4/8 (0-0.02)	3/11 (0-0.04)	1/6 (0-0.04)	3/5 (0-0.07)	5/6 (0-0.68)