INFORMATION ON THE CURRENT STATUS OF *THRIPS PARVISPINUS* (KARNY), A NEW INVASIVE PEST OF VEGETABLE CROPS IN SOUTH FLORIDA

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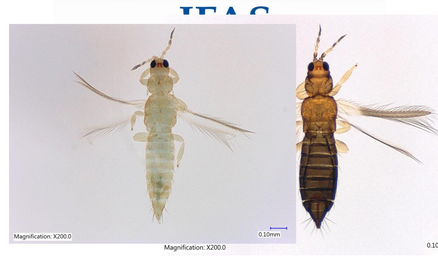


Abstract. *Thrips Parvispinus* (Karny) is an economic pest of various pepper cultivars. Plants become seriously affected due to the feeding of *T. parvispinus*. Pepper flowers are more attractive than the leaves and fruits. Population abundance is always higher on the newly emerged young leaves before appearance of flowers. In the pepper fields, *T. parvispinus* distribution is clumped. In all infested pepper fields, *T. parvispinus* aggressively surpasses the abundance of *T. palmi*. Radiant®, Torac®, Exirel and Agrimek provided suppression of *T. parvispinus* when applied weekly for 4 to 6 weeks using label rates of these products.

Introduction. *Thrips parvispinus* (Karny) (Thysanoptera: Thripidae) is a recently recorded invasive species in Florida. It was reported in 2020 for the first time in the United States in Orange County, Florida (Sotto-Adames 2020). Since its arrival, it has spread rapidly and established in Martin, Miami-Dade, Palm Beach and St. Lucie. It has been intercepted in at least 22 Counties in Florida (research surveys and Department of Plant Inspection). *T. parvispinus* is an economic pest of various nursery plants. It is a serious pest of peppers grown in fields and greenhouses. Besides, this thrips has been recorded on squash, bean, cucumber, and eggplants in Miami-Dade County with a very low abundance. In the present project, we conducted preliminary studies to understand its vegetable hosts, abundance on each host, within-plant and within-field distribution. We also conducted two field studies to evaluate efficacy of various insecticides for suppressing *T. parvispinus*.

Objectives

-Determine status of *T. parvispinus* in various vegetable crops

-Determine within-plant distribution

-Determine within-field distribution

-Evaluate efficacy of chemical insecticides

Materials and Methods. The study was conducted in growers' fields in Homestead, Florida. To determine the current status of *T. parvispinus*, we visited various crop fields weekly for four weeks and collected leaf and flower samples from each field. Each time we collected 10 samples of leaves and flowers. Each sample consisted of 10 leaves/flowers, one leaf or flower/plant from randomly selected ten plants. Each sample was placed into a pint plastic cup with 20 ml. ethyl alcohol (70%) and covered with an air-tight lid. The samples were then transported to the Vegetable IPM laboratory, TREC, UF-IFAS, Homestead, Florida and processed for separating thrips larvae and adults. Thrips were then separated into species based on specific characters following the keys of Mound (2004) and Nakahara (1997).

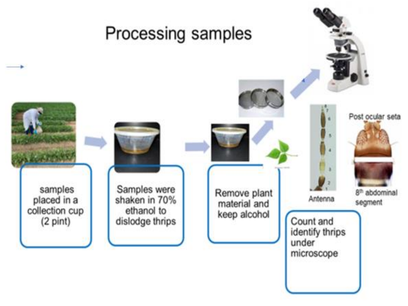
Within plant distribution. From each field, four 6-meter long and the 0.92-meter-wide plots were randomly selected to sample for within-plant thrips distribution. From each plot, 10 leaves, 10 flowers, and 10 bean pods were collected from 10 randomly selected plants. Samples were then processed as discussed above.

Within field distribution. This study was conducted in a two-acre Jalapeno pepper field. The field was divided into 40 equal plots each 20 feet long and 12 feet wide. Five flowers, one/plant, were collected from randomly selected five plants and processed for thrips adults and larvae following methods as discussed above. We used Taylor's Power Law and Iwao's Patchiness for assessing distribution pattern of thrips in the field.

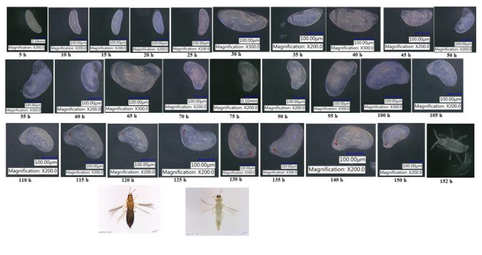
Insecticides efficacy trial. We evaluated six insecticides including Lannate®, Sivanto®, Torac®, Radiant®, Minecto Pro, Novaluron® and an untreated control. AI, Rate/ acre and IRAC group of each insecticide is shown below.

Trade name	Chemical name	Rate [oz]/acre	IRAC Group
Lannate	Methomyl	36.0	1A
Sivanto	Flupyradifurone	21.0	4D
Torac	Tolfenpyrad	21.0	21A
Radiant	Spinetoram	8.0	5
Minecto Pro	Cyantraniliprole	10.0	28
Agri-Mek	Abamectin		6
Novaluron	Novaluron	12.0	15
Control			

Sample collection



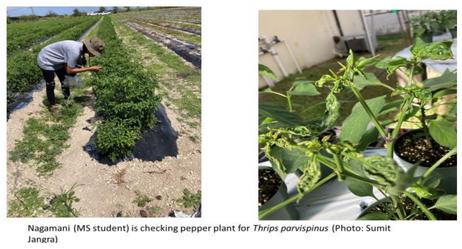
Future study: Thrips parvispinus ebyonic development



Conclusions

- At vegetative stage of plants, the top growing point with young leaves provide better information about the thrips than other parts of the plant.
- At flowering stage, flowers provide better information about the presence of this thrips.
- Distribution of this thrips is aggregated.
- Initiation of infestation starts at the edge of a field. Thus, effective biological and chemical control approach can be used in the limited area at a low cost and minimum labor to avoid crop loss.
- In the present study, Torac, Novaluron, Agrimek+Torac, Actara-Vydate rotation and Plinazolin provided significant reduction on trips population.

Pepper field



Nagamani (MS student) is checking pepper plant for *Thrips parvispinus* (Photo: Sumit Jangra)

Results

Host status. Reported vegetable hosts of *T. parvispinus* are shown in Table 1. Most of those crops belong to the families Fabaceae, Solanaceae, Moringaceae and Cucurbitaceae. Different vegetable hosts recorded in Miami-Dade County include various cultivars of pepper, snapbean, eggplant, squash, and cucumber (Table 2). During the present study, we recorded very few adults. In most instances we did not observe any larvae. Population abundance was consistent in peppers.

Within plant distribution. We conducted this study in a Jalapeno pepper field. The field was heavily infested with *T. parvispinus*. We checked different plant parts including bottom leaf, middle leaf, top young leaf, flowers, and fruits. During the vegetative stage, we recorded the highest number of adults and larvae on the top young leaves followed by middle and bottom mature leaves (Table 3). However, during reproductive phase, the highest number of *T. parvispinus* was recorded from the flowers followed by top young leaves.

Within field distribution. We recorded aggregated distribution of *T. parvispinus* in the Jalapeno pepper fields in small (540 sq ft) and large plots (1180 sq f t) (Table 4). Taylor's Power Law and Iwao's Patchiness regression model provided consistent information about the field distribution pattern of *T. Parvispinus*. In the same field, the distribution pattern of *Thrips palmi* was regular or random (Table 5).

Evaluation of chemical insecticides. We conducted two field studies to evaluate various insecticides. In the first study, Torac and Novaluron provided significant reduction of T. parvispinus populations when compared with the untreated control (Table 6). In the second study we used two insecticide treatments including Plinazolin and Actara-Vydate rotation. Plinazolin significantly reduced thrips numbers as compared to the untreated control (Table 7).

Vegetable hosts of *Thrips parvispinus* (Reported)

- Most of the spread of *Thrips parvispinus* occurred through trades of ornamental and vegetable live materials shipped from Indonesia, Thailand, Cambodia, and Vietnam.

*	**Green bean**	*Phaseolus vulgaris* L.	Fabaceae
	Vigna	*Vigna* sp. Savi	Fabaceae
*	**Eggplant**	*Solanum melongena* L.	Solanaceae
**	**Chilli pepper**	*Capsicum frutescens* L.	Solanaceae
	Paprika	*Capsicum annuum* L.	Solanaceae
	Bitter tomato	*Solanum aethiopicum* L.	Solanaceae
	Drumstick	*Moringa oleifera* Lam.	Moringaceae
*	**Bottle gourd**	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae
*	**Bitter gourd**	*Momordica charantia* L.	Cucurbitaceae
	Cucumber	*Cucumis sattvus* L.	Cucurbitaceae
	Coriander	*Coriandrum sattvum* L.	Apiaceae
	Brocoli	*Brassica oleracea* L.	Brassicaceae

Different vegetable crops found positive for *Thrips parvispinus* in Miami-Dade County (Hosts?)

Crop		Fields checked	No. Positive	Abundance
Pepper	Jalapeno	4	2	0-5/sample
	Indian long hot	3	1	0-1/sample
	Chilli	3	0	0
	Ghost	1	1	0-1/sample
	Scorpion	1	0	0
Bean	Snap bean	5	1	0-1/sample
	Pole bean	2	1	0-1/sample
Eggplant	Unknown	3	1	0-1/sample
Cucurbit	Yellow squash	3	1	0-1/sample
	Zhuccini	1	0	0
	Gourd	1	1	0-1/sampl1

Within pepper field distribution of *Thrips parvispinus* adults (based on one sample)

4	2	12
1	9	1
0	4	15
5	7	5
3	1	3
3	3	1
2	1	1

- Each plot= 6 beds x 30 feet
- 10 flowers were randomly collected from each plot
- Thrips were separated using the above method

	Taylor's Power Law			Iwao's Patchiness regression			
Area	a	*b*	r^2	a	β	r^2
540 sq ft	-0.51	**2.18***	0.61	-1.00	**1.68***	0.77
1180 sq ft	-0.68	**2.64***	0.84	-0.51	**1.50***	0.80

b value >1.00 indicates aggregated or clumped distribution of *Thrips parvispinus* in pepper field.

Within pepper field distribution of *Thrips palmi* adults (based on one sample)

7	2	4
8	7	6
8	5	9
1	11	8
9	6	4
6	5	5
5	4	5

- Each plot= 6 beds x 30 feet
- 10 flowers were randomly collected from each plot
- Thrips were separated using the above method

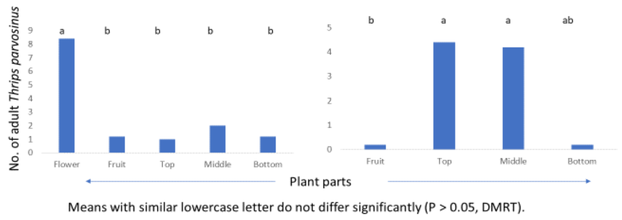
	Taylor's Power Law			Iwao's Patchiness regression			
Area	a	*b*	r^2	a	β	r^2
540 sq ft	0.67	-.129	0.0015	1.94	0.70	0.24
1180 sq ft	-4.68	6.68*	0.47	-4.08	1.67*	0.81

b value >1.00 indicates aggregated or clumped distribution of *Thrips parvispinus* in pepper field.

Within-Jalapeno pepper plant distribution of *Thrips parvispinus*

Photo: Sumit Jangra and Nagamani

Table 3. Abundance of *Thrips parvispinus* adults on different parts of a pepper plant



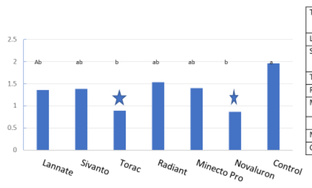
Means with similar lowercase letter do not differ significantly (P > 0.05, DMRT).

Samples were collected during the flowering and fruiting of pepper plants

Samples were collected when flowering period is over

- Effectiveness of different insecticides

Effectiveness of insecticides in controlling *Thrips parvispinus* in field pepper

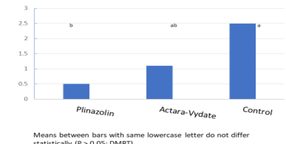


Means between bars with same lowercase letter do not differ statistically (P > 0.05; DMRT)

Trade name	Chemical name	Ra36te [oz]/acre	IRAC Group
Lannate	Chloropyrifos	36.0	1A
Sivanto	Flupyradifurone	12.0	4D
Torac	Tolfenpyrad	21.0	21A
Radiant	Spinetoram	8.0	5
Minecto Pro	Cyantraniliprole	10.0	28
	Abamectin		6
Novaluron	Novaluron	12.0	15
Control			

This is not a recommendation. Insecticides must be used according to the label.

Effectiveness of insecticides in controlling *Thrips parvispinus* in field pepper



Means between bars with same lowercase letter do not differ statistically (P > 0.05; DMRT)

Trade name	Chemical name	Ra36te [oz]/acre	IRAC Group
Plinazolin	Isocycloserum	5.2	30
Actara + Vydate	Thiamethoxam + Oxamil	5.5 + 24 oz	4A + 1A
Control			

This is not a recommendation. Insecticides must be used according to the label.

Thank You!