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SEASONAL ABUNDANCE AND DISTRIBUTION OF *THRIPS PALMI* KARNY (THYSANOPTERA: THRIPIDAE) IN SOUTHERN FLORIDA

DAKSHINA R. SEAL
University of Florida, TREC
18905 S.W. 280th Street
Homestead, FL 33031

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Abstract. **Seasonal patterns of *Thrips palmi* Karny populations were observed on two major crops, potato, (*Solanum tuberosum* L.) and eggplant, (*Solanum melongena* L.), during the 1991-92 and 1992-93 vegetable growing seasons. In different plantings of potatoes, *T. palmi* population densities initially were low, but increased as the season progressed. The population density decreased as the plants senesced. *T. palmi* populations in 'Thai' eggplants were smaller in Jan. than in other months when additional vegetable crops were available as host plants. Population densities peaked in May and declined during the remainder of the growing season. In 'Dusky' eggplants, the *T. palmi* infestation began on the older, lower plant leaves but moved upward to the middle and top of the plant. Populations of this thrips were significantly more abundant on the abaxial surface of the leaves than on the adaxial surface, irrespective of location of a leaf on plants in the field; but the reverse was observed in the greenhouse. Thrips infestations were initiated at the edges of eggplant fields and moved progressively inwards with time. This information contributes to our understanding of when and where damaging populations may occur. Further, this information may enable growers to sample their crops for *T. palmi* infestations reliably. Additionally, if the onset of an economic infestation can be detected in a localized part of the field, then a site-specific management program can be implemented.**

The melon thrips, *Thrips palmi* Karny, has become one of the most serious pests of vegetables in southern Florida since its arrival in 1989. Serious yield losses of eggplants (*Solanum melongena* L.), pepper (*Capsicum annum* L.), potatoes (*Solanum tuberosum* L.), beans (*Phaseolus vulgaris* L.), cucumber (*Cucumis sativus* L.), and squash (*Cucurbita maxima* L.) have resulted in the Homestead, Florida area from leaf, flower, and fruit damage caused by larvae and adults of this pest (D. R. S., unpublished data). Also, this pest can cause severe damage to additional crops in the Solanaceae [tobacco (*Nicotiana tabacum* L.), ground cherry (*Physalis peruviana* L.)], Cucurbitaceae [muskmelon or cantaloupe (*Cucumis melo* L. Reticulata group), pumpkin (*Cucurbita pepo* L.), bitter melon (*Momordica charantia* L.), hairy gourd [*Benincasa hispida* (Thunb.) Cogn.], Leguminosae [kidney bean (*Phaseolus vulgaris* L.), broad bean (*Vicia faba* L.), cowpea [*Vigna unguiculata* (L.) Walp. ssp. *unguiculata*], soybean [*Glycine max* (L.) Merrill], white clover (*Trifolium repens* L.) families, as well as to other miscellaneous crops [chrysanthemum (*Chrysanthemum* × *morifolium* Ramat.), dahlia (*Dahlia* × *hortensis* Guillaum), sesame (*Sesamum indicum* L.), morning glory (*Ipomoea violacea* L.), sweetpotato [*Ipomoea batatas* (L.) Poir.], cotton (*Gossypium hirsutum* L.), cyclamen (*Cyclamen persicum* Mill.), and amaranth spinach (*Amaranthus tricolor* L.)] (D. R. S., unpublished data; Sakimura et al., 1986). Johnson (1986) reported that *T. palmi* is an economic pest in commercial watermelon (*Citrullus lanatus* Matsum. & Nakai) in Hawaii. Besides feeding damage, *T. palmi* transmits viruses, including the spotted wilt virus on watermelon in Japan (Honda et al., 1989; Kameya-Iwaki et al., 1988).

Thrips palmi originated in the Asian tropics and has been reported to occur in India, Bangladesh, Thailand, Malaya, Pakistan, Taiwan, the Philippines (Bhatti, 1980), and in Japan, where it is considered to be a significant pest of vegetable crops (Nakahara et al., 1984).

Thrips palmi has a high reproductive rate. This, and other aspects of its life cycle and habits, contributes to the substantial difficulty in managing this pest. Adult and larval stages occur mainly on leaf surfaces of most host plants, whereas eggs are laid within plant tissues and pupation takes place in the soil. The presence of pupae in the soil assures that the population density on infested crops will tend to remain high despite the use of foliar insecticides at weekly intervals (Seal and Baranowski, 1993). In addition, failure of insecticidal control may be caused by insufficient coverage of the target area (undersides of leaves, calices and other hidden areas), as well as by the use of intrinsically ineffective insecticides. Moreover, reinfestation by immigration of adults from adjoining fields is very common.

Full-season (Oct. to May) vegetable production followed by small plantings of summer vegetables ('Thai' eggplant [*Solanum undatum* Walsh] and okra [*Abelmoschus esculentus* (L.) Moench.]), and the presence of wild hosts exacerbate the thrips problem in southern Florida (D. R. S., unpublished data). After infesting winter vegetable crops, thrips move to summer vegetables and alternate hosts, where they maintain significant populations that subsequently reinfest winter vegetables and ornamentals.

Because the seasonal trends of *T. palmi* populations in southern Florida are not known, the major objective of this study was to determine seasonal abundance of *T. palmi* in potato and eggplant plantings. To understand population trends in summer, the abundance of thrips during other seasons was studied in sparsely distributed 'Thai' eggplant plantings. Also, the distribution of this thrips on individual eggplants as well as between them in the field was studied.

Materials and Methods

Seasonal patterns of *T. palmi* populations were studied on 'La Rouge' potatoes and on 'Dusky' eggplants from Oct. 1991 to May 1992, and again between Nov. 1992 and May 1993. Corresponding studies on 'Thai' eggplant were conducted from Nov. 1991 to July 1992, and again from Jan. to July 1993.

Seasonal abundance in potato. Density of *T. palmi* populations was studied in three plantings of 'La Rouge' potato planted on 20 Oct., 10 Nov. 1991 and 2 Jan. 1992, respectively.

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In each planting, seed pieces were inserted into raised beds of Perrine marl soil in two, 2-ha commercial fields located in Homestead, Fla. Standard cultural practices for the management of potatoes were used. Plants were irrigated weekly using overhead irrigation. Each field was divided into 20 sections (ca. 0.025 ha each) and was sampled 10 times at approximately weekly intervals beginning 3 to 4 weeks after planting. Thrips populations were estimated by collecting ten randomly selected middle trifoliates, one per plant, from the sampling location. Each sample was placed separately in a plastic cup (32 oz) with a closely- fitted lid, and transported to the laboratory. Thrips were separated from the leaves by washing with 70% ethyl alcohol. They were counted under a binocular microscope (18×) and were differentiated as adults and immatures.

Seasonal abundance in 'Dusky' eggplant. Seasonal abundance of *T. palmi* was studied in four plantings (ca. 1 ha each) of commercial eggplants located in Homestead, Fla. In the first planting (Field 1), 'Dusky' eggplants were planted into a raised beds of Krome gravely loam soil on 15 Oct. 1991. Standard cultural practices for growing crops were used. Plants were irrigated twice weekly with 3 cm of water using a sprinkler system. The field was divided into eight sections (ca. 0.05 ha each). Sampling was initiated when plants were 4 weeks old and continued twice monthly (eight sampling dates) until harvest. At each site, a sample consisted of 10 mature leaves selected randomly from the middle stratum of 10 plants (one leaf/plant). Methodology for processing samples was as discussed previously.

In the second planting (Field 2), 'Dusky' eggplant was planted on 2 Dec. 1991. Soil type and all other cultural practices were as in Field 1. Sampling was initiated 6 weeks after planting in Jan. 1992 and continued at monthly intervals until June 1992.

In the third (Field 3) and fourth (Field 4) plantings in the 1992-93 season, 'Dusky' eggplants were planted into a Krome gravely loam soil in two fields. Field 3 was planted on 10 Nov. 1992, and Field 4 was planted on 10 Dec. 1992. Plants in Field 3 were drip irrigated and Field 4 was overhead irrigated. Fertilization, weeding, sampling procedures, and other cultural methods were as recommended or discussed. Field 3 was sampled 10 times at intervals of 6 to 31 d from 69 to 194 d after planting. Field 4 was sampled 13 times at 5- to 35-d intervals from 56 to 194 d after planting.

Seasonal abundance in 'Thai' eggplant. The study was conducted in a 0.4-ha commercial field of Krome gravely loam soil. The field was planted 15 Oct. 1991 and managed using standard cultural practices. The field was divided into five sections, each 0.08 ha. Thrips were sampled twice-monthly beginning 4 weeks after planting by randomly collecting five leaves (one per plant) in each plot.

In another study in 1992, a commercial 'Thai' eggplant field (ca. 2 ha) was planted on 30 Sept. Soil type was Rockdale. Plant spacing and other management practices were as in 1991 field. The field was divided into 16 equal plots (ca. 0.13 ha each), and was sampled monthly from Jan. to July 1993 following methodology similar to the previous study.

Thrips feeding damage on all crops was visually identified by looking at the leaf color. The infested leaf turned bronze because of intensive feeding activity.

Within plant distribution. This study was conducted in the commercial 'Dusky' eggplant field used for the seasonal abundance study. Thrips were sampled for the determination of distribution by randomly selecting eight plants 4, 7, and 10 weeks after planting. One leaf was collected from the top, middle, and bottom strata of each plant. Numbers of adult males, females, and larvae on the adaxial and abaxial surfaces of each leaf were recorded by collecting them separately with an aspirator.

In another study, 'Dusky' eggplants were grown in a greenhouse and were infested with *T. palmi* adults when plants were 6 weeks old. Thrips were sampled on the adaxial and abaxial surfaces of each of three leaves per plant, one leaf from the top, middle, and bottom strata of each plant. Thus, five plants were randomly selected and sampled on three dates at 2-d intervals. Numbers of *T. palmi* adults and larvae per sample were recorded. A similar number of plants were taken out of the greenhouse and exposed for 4 d in full sunlight. Thrips were sampled in the similar way as in the greenhouse study.

Within field distribution. This study was conducted in a commercial 'Dusky' eggplant field of 5 ha planted on 3 Jan. 1995. The field was divided into three, 100-ft-wide sections (0-100, 101-200, 201-300 ft) between the edge and the center. The length of each section was 200 ft. Thrips were sampled 4 weeks after planting at a weekly interval for 3 weeks. Ten samples, each consisting of 10 leaves (one full grown leaf near the terminal region per plant) were randomly collected from each section on each sampling date. Numbers of *T. palmi* adults and larvae in each sample were recorded following previously described methodology.

Statistical analyses. All data were transformed by the square root of X + 0.5 transformation to normalize variance. Transformed data were analyzed with one-way analysis of variance (ANOVA; Steel and Torrie, 1980) to determine if there were any differences in the abundance of thrips population at different ages of plants on different sampling dates. When significant *F*-values were found in the ANOVA, means were separated using the Ryan-Einot-Gabriel-Welsch multiple-range F-test (PROC GLM, option REGWF; SAS Institute, 1985) at the P = 0.05 level of significance. When only two means were compared, the t statistic was applied (Steel and Torrie, 1980). The PROC REG option of PROC GLM (SAS Institute, 1985) was used to regress overall mean thrips over sampling dates (Julian dates).

Results and Discussion

Seasonal abundance in potato. In the first planting, the mean number of thrips per sample was very low on the first two sampling dates (F = 222.73; df = 9,470; P = 0.0001) (Fig. 1). However, numbers of larvae increased dramatically by the third sampling date. But, numbers of adults did not differ from those on the previous sampling date. Adult populations increased by the seventh sampling date. On the subsequent sampling dates, adult populations remained unchanged, except on the eighth sampling date. Increases in the total numbers of thrips were recorded with the progression of sampling dates. Numbers of thrips recorded decreased suddenly on the last sampling date. By this time, plants had turned bronze because of thrips feeding damage.

In the second planting, the thrips population was low on the first three sampling dates (F = 142.63; df = 9,470; P= 0.0001) (Fig. 2). An increase in the thrips population was observed on the fifth sampling date, which was caused by an increase in larvae. The density of the adult population on this date did not differ from that of previous sampling dates. An

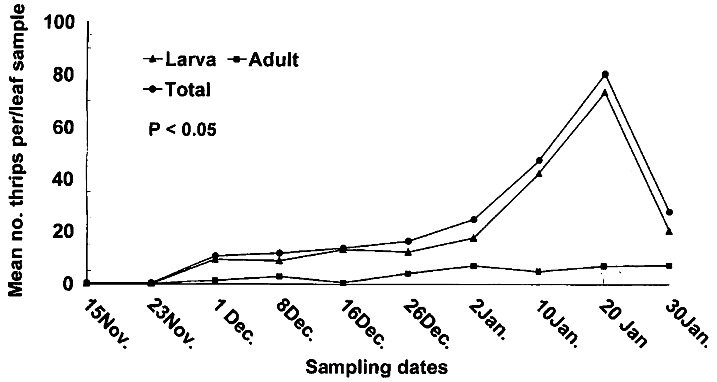

Figure 1. Mean number of *T. palmi* per leaf of potato on various sampling dates, planted in Oct. 1991.

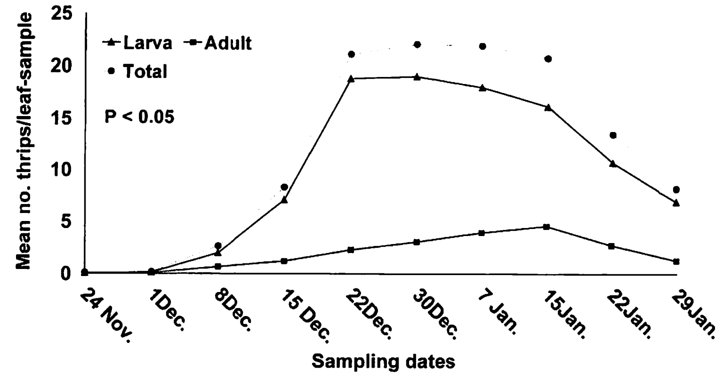

Figure 3. Mean number of *T. palmi* per leaf of potatoon various sampling dates, planted in Nov. 1991.

increase in adults was observed on the subsequent sampling dates followed by increase of larvae and of the total thrips population. The populations decreased after the ninth sampling date. A second order model ($r^2 = 0.60$, a = -19.21, b_1 = 1.23, b_2 = -0.01) fitted data of the second planting, indicating a curvilinear pattern of thrips distribution over time. Data for the third planting (Fig. 3) showed a pattern of thrips abundance similar to that found in the previous plantings. Adult populations did not differ among the sampling dates, although total populations were greater ($P < 0.05$) on the 5th to 8th sampling dates than on the other dates. Total populations decreased (F = 569.82; df = 9,470; P = 0.0001) on the last two sampling dates.

Seasonal abundance in eggplant. T. palmi populations were low to moderate (2-6 larvae/leaf) at the beginning of the sampling on 29 Oct. 1991 when plants were 5 weeks old (F = 21.74; df = 5,104; P = 0.0001) (Fig. 4). Significant increases in the numbers of all developmental stages of *T. palmi* were observed on the second and third sampling dates. Populations peaked in late Feb. on the fourth sampling when plants were 17 weeks old. At this time, bronzing had occurred on approximately 90% of the bottom leaves due to the feeding of *T. palmi.* By then, most thrips moved upward to the middle and top leaves. About 60% of the total thrips populations was observed on the middle leaf. On the following sampling dates, thrips populations declined due to the depletion of food sources as evidenced by the bronze color of the leaves. About 60% of middle leaves and 40% of top leaves were bronze in color because of the feeding damage of thrips. However, the thrips population was predominant (ca. 60%) on the top leaves. The overall population trend can be best expressed by the third order model, $Y = a + b_1X + b_2X_2 + b_3X_3$ ($r^2 = 0.41$, a = 104.96, $b_1 = -211.02 \pm 148.21$, $b_2 = 86.00 \pm 28.16$, $b_3 = -6.06 \pm 1.55$).

The trend with time of the total number of thrips in the second planting is described by a quadratic equation (r^2 = 0.78, a = 21.07, $b_1 = -22.98 \pm 11.83$, $b_2 = 6.09 \pm 0.96$; F = 192.42, $P < 0.01$) (Fig. 5). Thrips populations were low on the first sampling date and increased significantly on the subsequent sampling dates. Highest numbers of thrips were recorded on the sixth sampling date, and decreased sharply thereafter. On the last sampling date, 6 June 1993, numbers of thrips per sample were zero to one.

In 1992-93 seasons, population abundance of *T. palmi* in Field 3 was low (n = 100, mean = 0.05) at the beginning of the season. At the first sampling date, 26 d after planting, *T. palmi* was absent on eggplants (Fig. 6). Few adults (ca. 2/10-leaf sample) were observed on eggplant at 62 d after planting. The adult population increased ($P < 0.05$) on subsequent sampling dates with the increase in plant age. Thrips larvae were first recorded on the third sampling date when plants were 77 d old. Total number of thrips increased significantly ($P < 0.01$, $r^2 = 0.45$, a = -5.14, $b_1 = 0.28 \pm 0.04$, $b_2 = -0.001 \pm 0.0$) in the subsequent sampling dates with the peak on the 9th sampling date, when plants were 167 d old. About 9-26% of the total populations were adults, except on the second sampling date. Percentages of females were always greater than those of males during this study (unpublished data, D. R. S.).

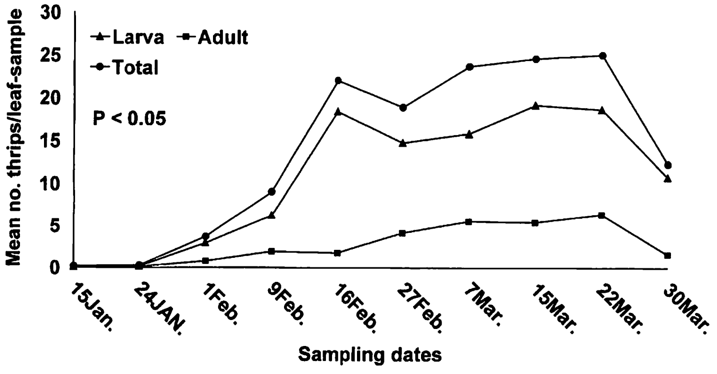

Figure 2. Mean number of *T. palmi* per leaf of potato on various sampling dates, planted in Dec. 1991.

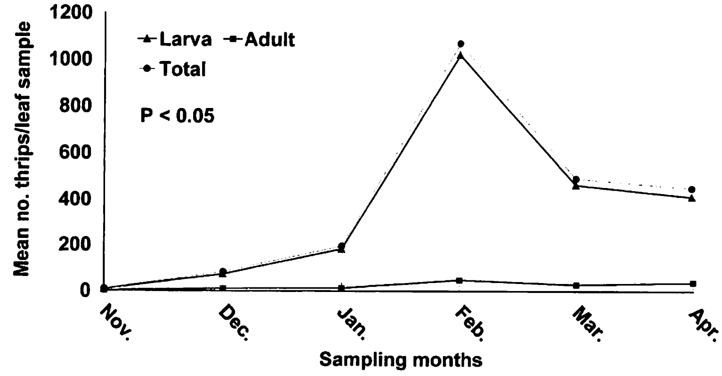

Figure 4. Mean numbers of *T. palmi* per leaf of 'Dusky' eggplant on various sampling dates, planted in Oct. 1991.

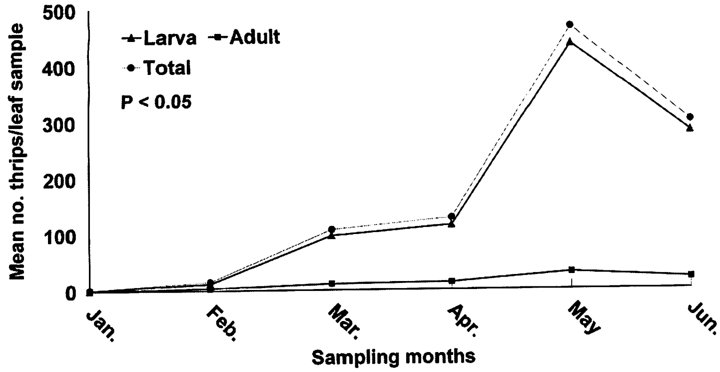

Figure 5. Mean numbers of *T. palmi* per leaf of 'Dusky' eggplant on various sampling dates, planted in Dec. 1991.

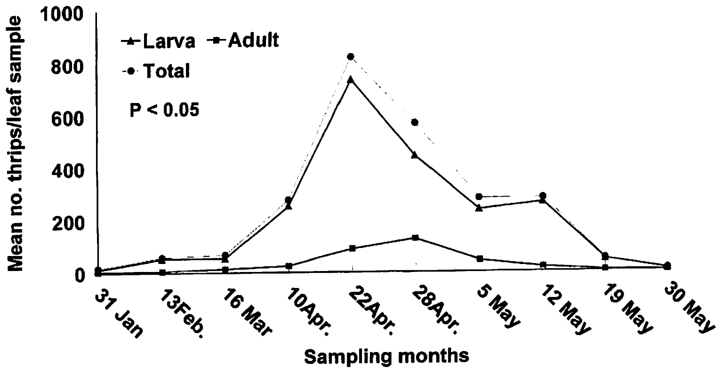

Figure 7. Mean numbers of *T. palmi* per leaf of 'Dusky' eggplant on various sampling dates, planted in Dec. 1993.

In Field 4, seasonal patterns of thrips distribution were similar to those in the third field. All stages of *T. palmi* were recorded on the first sampling date when plants were 82 d old (Fig. 7). Increases in the number of thrips of all life stages were observed in the subsequent sampling dates as plants grew older. The numbers of larvae and adults peaked on the fifth and sixth sampling dates, respectively, but decreased thereafter. The second order model best fits ($r^2 = 0.22$, a = -605.93, $b_1 = 17.62$, $b_2 = -0.1$) the data of distribution patterns of *T. palmi* in Field 2.

Seasonal abundance in 'Thai' eggplants. 'Thai' eggplants are perennials that serve as a host of *T. palmi* in the summer when field vegetable hosts are absent. The total number of *T. palmi* was the lowest in Nov., when the numbers of adults were significantly fewer than during other months (Fig. 8). Population abundance on 'Thai' eggplant was low to medium (0-5 per leaf) until Mar., when most host vegetable crops were in fields. Total numbers of adults and larvae increased dramatically in Apr., when commonly grown commercial vegetable crops were being harvested. Population abundance on 'Thai' eggplant was high until June, and decreased significantly in July. Populations increased (5-120/leaf) sporadically in Aug., Sept., and Oct.

In 1993, all stages of *T. palmi* were very low on 'Thai' eggplants in Jan. (Fig. 9). Numbers of thrips increased in the subsequent months. *T. palmi* larvae and adults peaked in May when 'Thai' egglants were 236 d old. This increase in the number of thrips population on this host during May could have been caused by the elimination of major vegetable crops. *Thrips palmi* males and females decreased significantly in June and July when decreases of larvae and of the total population occurred. Overall, thrips population showed a curvilinear ($r^2 = 0.31$, a = 19.50, $b_1 = -33.65$, $b_2 = 16.76$, $b_3 = -1.54$) pattern of seasonal distribution in 'Thai' eggplants.

Within plant distribution. Statistically significant interactions were observed between the location of the leaf × weeks after planting and location of the leaf × leaf surface data (Tables 1 and 2). Based on these interactions, locations of the sampled leaf were compared separately from the post planting time and leaf surface. Mean numbers of larvae and adult thrips were the highest on the abaxial surface of the bottom leaf on the first sampling date 4 weeks after planting (larva: F = 25.88; df = 2,12; P = 0.0001; total thrips: F = 33.38; df = 2,12; P = 0.0001). Thrips populations moved to the leaves of higher strata as the post plant time progressed. The most larvae and adults were on the abaxial surface of a leaf at the middle stratum of a plant 7 weeks after planting (larva: F = 36.11; df = 2,12; P = 0.0001; total thrips: F = 49.28; df = 2,12; P = 0.0001). Mean numbers of thrips were significantly greater on the abaxial surface of a leaf of the top stratum than on the same surface of a leaf at the bottom stratum of a plant 10 weeks after planting (larva: F = 13.24; df = 2,12; P = 0.0009; total thrips: F = 8.85; df = 2,12; P = 0.0004). Larvae and adults also were recorded on the adaxial surface of leaves at bottom, middle, and top strata, but these numbers were significantly smaller than the numbers on the abaxial surfaces of corresponding leaves on all sampling dates.

Although thrips populations were higher consistently on the abaxial surface of the leaves than on the adaxial surface of the leaves in the field studies, a different trend was observed

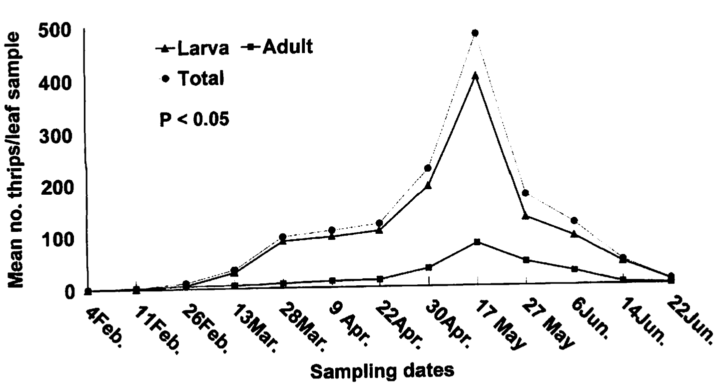

Figure 6. Mean numbers of *T. palmi* per leaf of 'Dusky' eggplant on various sampling dates, planted in Jan. 1993.

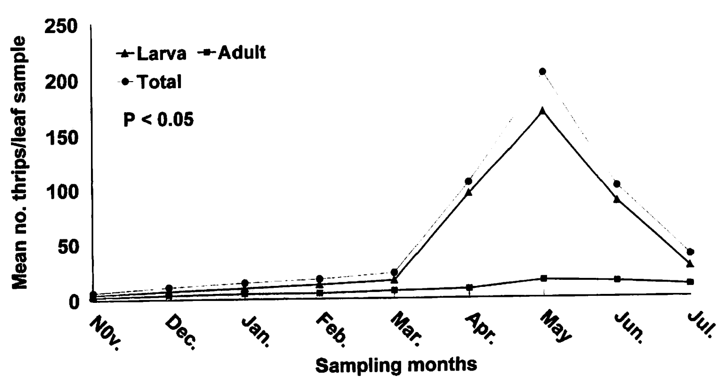

Figure 8. Mean numbers of *T. palmi* per leaf of 'Thai' eggplant on various sampling dates, planted in Dec. 1991.

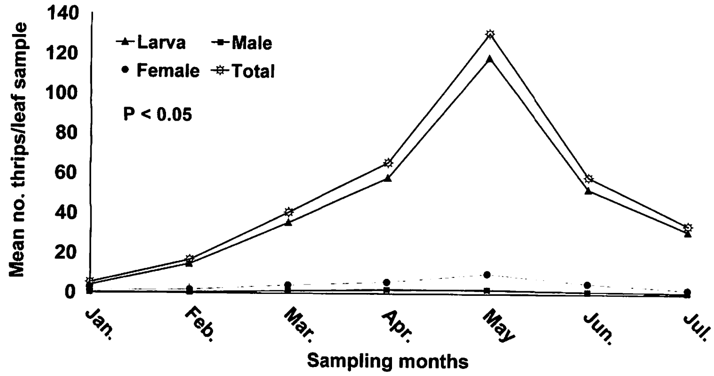

Figure 9. Mean numbers of *T. palmi* per leaf of 'Thai' eggplant on various sampling dates, planted in Dec. 1992.

Table 1. Mean numbers of larvae and adult *Thrips palmi* on abaxial and adaxial surfaces of 'Dusky' eggplant leaves located at top, middle, and bottom strata of a plant 4, 7, and 10 weeks after planting.

Location of leaf	Weeks after planting					
	4		7		10	
	Adaxial	Abaxial	Adaxial	Abaxial	Adaxial	Abaxial
			Larvae			
Bottom	17.00 a	143.60 a	9.60 a	39.60 a	5.00 b	24.00 c
Middle	12.40 ab	77.20 b	22.60 a	162.40 a	41.00 a	102.40 b
Top	3.60 b	29.40 c	16.80 a	77.40 b	45.80 b	226.60 a
			Total			
Bottom	31.00 a	193.80 a	15.20 b	63.00 c	7.40 b	35.80 c
Middle	20.80 ab	101.00 b	44.60 a	233.40 a	52.60 a	131.00 b
Top	7.00 b	9.80 c	23.80 b	110.80 b	65.80 a	298.60a

Means followed by same letter within a column are not statistically different by Duncan's multiple range test (P = 0.05).

in the greenhouse study. Both larvae and total numbers of thrips were significantly higher ($P < 0.05$) on the adaxial surface of leaves than on the abaxial surface sampled from bottom, middle, and top strata. However, when these same plants were exposed to open sunlight in the field for 96 h, most of the larvae and adult thrips moved to the abaxial surface of the

Table 2. Analysis of variance of factors affecting the numbers of larvae and adult *Thrips palmi* on abaxial and adaxial surfaces of 'Dusky' eggplant leaves located at top, middle, and bottom strata of a plant 4, 7, and 10 weeks after planting. Data from Table 1.

Sources of variation	Mean number of *T. palmi*			
	df	MS	*F* value	*P* value
Week after planting (Wk)	2	8157.63	12.31	0.0001
Location of leaf on plant (Loc)	2	13544.13	20.45	0.0001
Surface of leaf (Sur)	1	244922.50	369.77	0.0001
Wk × Loc	4	48884.76	73.80	0.0001
Wk × Sur	2	918.23	1.39	0.2566
Loc × Sur	2	3428.13	5.18	0.0079
Wk × Loc × Sur	4	24508.66	37.00	0.0001
Error	72	662.36		

leaves. The difference in the abundance of *T. palmi* populations between the two leaf surfaces in the greenhouse versus direct sun may be caused by the great difference in light intensity.

Within field distribution. T. palmi infestations began at the edges of the fields (Tables 4 and 5). The sampling time × distance from the margin interaction was significant (Table 5); mean numbers of thrips at various distances were compared for each sampling date. At 3 weeks after planting, significantly higher numbers of *T. palmi* were recorded within 0-100 ft from the edge of the field than within 101-200 ft and at 201-300 ft ($F = 3.36$; df = 2,27; $P = 0.0496$). With the passage of time after planting, the population densities of thrips distant from the field margin increased gradually but progressively. Thus the mean number of thrips at the edge (0-100 ft) of the field was significantly higher ($F = 20.93$; df = 2,27; $P = 0.001$) than in interior sections 4 weeks after planting; yet the numbers of thrips in the latter tended to increase more rapidly. The mean numbers of thrips increased significantly in all sections 5 weeks after planting when compared with the previous samples. Numbers of thrips in the first two sections (0-100 ft) differed significantly from the most interior section (201-300 ft) 5 weeks after planting ($F = 3.96$; df = 2,27; P 0.0318).

My studies showed that *T. palmi* populations became abundant in winter when substantial acreages of potato and eggplants are grown. In each planting of potato and eggplant, the population peaked when plants were full grown, and decreased at the end of the season when plants senesced.

Table 3. Mean numbers of larvae and adult *Thrips palmi* on adaxial and abaxial surfaces of 'Dusky' eggplant leaves located at top, middle, and bottom strata of a plant.

Location of leaf on plant	Leaf surface			
	Larva		Adult	
	Adaxial	Abaxial	Adaxial	Abaxial
		Greenhouse environment		
Bottom	34.60 ± 6.90 a	6.00 ± 4.00 b	46.40 ± 6.60 a	12.80 ± 9.30 b
Middle	100.60 ± 17.50 a	23.00 ± 3.30 b	131.00 ± 18.90 a	36.80 ± 3.90 b
Top	228.60 ± 30.00 a	35.40 ± 9.30 b	273.00 ± 31.60 a	50.60 ± 13.60 b
		Field environment		
Bottom	1.20 ± 0.97 b	36.40 ± 4.70 a	6.60 ± 2.98 b	49.20 ± 6.50 a
Middle	8.60 ± 2.98 b	119.00 ± 21.55 a	20.00 ± 5.30 b	143.20 ± 22.70 a
Top	81.60 ± 64.98 b	265.00 ± 32.23 a	96.40 ± 71.87 b	327.80 ± 42.72 a

Means within rows of each category followed by the same letter are not significantly different ($P > 0.05$ level; Proc T test [SAS Institute, 1985]).

Table 4. Within eggplant and field distribution of *Thrips palmi* (larvae and adults were recorded together).

Distance from the edge of the field (ft)	Weeks after planting		
	3	4	5
100	2.300 ± 0.73 a	27.60 ± 5.51 a	126.50 ± 18.84 a
200	0.830 ± 0.30 b	9.70 ± 2.21 b	122.10 ± 18.74 a
300	0.700 ± 0.39 b	2.50 ± 0.26 b	69.80 ± 11.96 b

Means followed by the same letter in the same column are not statistically different by Duncan's multiple range test (P = 0.05).

T. palmi population increased initially in 'Thai' eggplants when 'Dusky' eggplants and 'LaRouge' potatoes were harvested. However, after June or July, the population decreased and remained stable for the rest of the calendar year. Thus, 'Thai' eggplant is an important summer host that maintains a *T. palmi* population reservoir for subsequent reinfestation of traditional winter vegetable crops.

Use of biological controls, cultural methods, and biorational insecticides may be incorporated into a sound strategy to manage this pest in winter vegetables when its population is low at the early stage of plant growth. Additional investigations on population trends of *T. palmi* in other winter vegetables and summer hosts probably would be helpful in managing this devastating pest.

Table 5. Analysis of variance of factors affecting the within eggplant and field distribution of *Thrips palmi*. Data from Table 4.

Source of variation	Mean number of *T. palmi*			
	df	MS	F value	P value
Wk after planting	2	645.60	231.97	0.0001
Distance from edge (ft)	2	41.35	14.86	0.0001
Wk × distance	4	8.77	3.15	0.0018
Error	81	984.63		

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A PEER REVIEWED PAPER

EVALUATION OF *IN SITU* N MINERALIZATION OF COMPOSTED ORGANIC WASTES APPLIED TO SANDY SOIL

Monica Ozores-Hampton and Thomas A. Obreza
University of Florida, IFAS
Southwest Florida Research and Education Center
Immokalee, FL 33142-9515

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Abstract. **If all biodegradable waste materials in Florida were composted, about 12 million metric tons (Mt) of compost would be produced annually. If this compost were used as an agricultural soil amendment, knowledge of its N mineralization rate would be important in determining the application rate. The field N mineralization rate of four commercial Florida composts was measured. Compost sources and rates (dry weight basis) were Jacksonville yard trimmings (127 Mt ha^{-1}), Sumter**

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