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ADVANCES IN THE CONTROL OF *THRIPS PALMI* (KARNY) (THYSANOPTERA : THRIPIDAE) IN PUERTO RICO

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ABSTRACT

The oriental *thrips* , *Thrips palmi*, was introduced into Puerto Rico in 1986-87, causing severe damage on solanaceous and cucurbitaceous crops. In 1988 and 1989, trials were established at the Juana Diaz Experiment Substation to evaluate the efficacy of low and high rates of methomyl (0.5 Kg & 1 Kg Al/ha), azinphosmethyl (281 & 560 g Al/ha), esfenvalerate (32 & 57 g Al/ha) and oxamyl (560 g & 1.1 Kg/ha) in reducing oriental *thrips* populations. Application intervals, i.e, once or twice/week, were also studied in a completely randomized block factorial design. Plots were sampled at weekly intervals. No differences in *thrips* population densities were detected between insecticides nor application rates from neither year. Similarly no differences were found between the effectiveness of high or low insecticide doses. Plant yield was greatly influenced by treatment, with esfenvalerate methomyl unsprayed control azinphosmethyl oxamyl. No correlations were found between yield and *thrips* population density. Mean *thrips* population was 0.1 individuals per leaf.

RESUME

DEVELOPPEMENTS DE LA LUTTE CONTRE *THRIPS PALMI* (*THYSANOPTERA THRIPIDAE*) A PORTO RICO

Le Thrips oriental, *Thrips palmi*, a été introduit à Porto Rico en 1986-87, causant des pertes sérieuses sur les cultures de Solanées et de Cucurbitacées. En 1988 et 1989, des études ont été entreprises à la station expérimentale de Juana Diaz pour évaluer l'efficacité de traitement à faibles et fortes doses de méthomyl (0,5 Kg et 1 Kg Al/ha), d'azinphosméthyl (281 et 560 g Al/ha), d'esfenvalerate (32 et 57 g Al/ha) et d'oxamyl (560 et 1,1 Kg/ha) pour le contrôle des populations de *thrips*. L'effet de l'intervalle entre plusieurs applications (une ou deux fois par semaine) a également été étudié en utilisant un dispositif en bloc et en randomisation totale. Des échantillonnages hebdomadaires ont été effectués pour cela. La densité de population des *thrips* n'a pas été influencée par l'insecticide utilisée, ni par les doses ni par les dates de traitement. Par contre, le rendement a beaucoup varié suivant l'insecticide. On peut donner le classement suivant par ordre décroissant d'efficacité : esfenvalérate, méthomyl, témoin, azinphosméthyl, oxamyl. Nous n'avons mis en évidence aucune corrélation entre le rendement et la densité de population de *thrips*. Les moyennes de population étaient de 0,1 individu par feuille.

INTRODUCTION

The oriental *thrips* (*Thrips palmi*) was discovered in Puerto Rico in 1986. First reports of this pest indicated severest damage on eggplants, sweet pepper, watermelon, cucumber and musk melon. A similar host range and injury has been reported in other parts of the world by Sakimura et al. (1986). The oriental *thrips* is currently distributed in most parts of the island were ist hosts are grown. However, severe infestations have only occured in the drier southern agricultural plains. Current estimates of economic loss due to this pest are not accurately known. Knowledgeable appraisers have estimated up to 90 % yield loss on sweet pepper, as damaged fruits are unsuitable for local or export markets. A dramatic example of the damage potential of this *thrips* is illustrated by a drop of one third of the total sweet pepper production from 1987 to 1988 (most of this reduction is presumably attributable to the introduction of *T. palmi*).

The oriental *thrips* is a polyphagous pest known to attack more than 50 plant species in 20 families (Wang & Chu 1986). *T. palmi* is widely distributed in the Orient, Pacific and more recently in the Caribbean Region (Hamasaki 1987). Typically, oriental *thrips* population exhibit explosive buildups which cause severe damage in very short periods of time. Both immature and adults feed gregariously on leaves, stems, flowers and fruits. Feeding activities often cause scarring, deformities, leaf bronzing and in severe cases death of plants (Sakimura et al. 1986).

The principal objective of our research was to evaluate the control efficacy of four registered insecticides, applied at high and low rates and at varying application time intervals on the population density of *Thrips palmi* . Additionally, efforts were directed to determine the relationship between yield and *thrips* population density.

MATERIALS AND METHODS

In 1988 and 1989, insecticide efficacy trials on sweet pepper were established at the Fortune Experiment Substation, Juana Diaz, Puerto Rico. This substation is located in the southern agricultural plains where most sweet pepper production of the island is located. Completely randomized factorial design was utilized to evaluate the efficacy of low and high rates of methomyl [Lannate L (0.5 kg & 1 kg Al/ha)], azinphosmetyl [Guthion 2L (281 & 560 g Al/ha], esfenvalerate [Asana 1.9 EC (32 & 57 g Al/ha)] and oxamyl [Vydate L (560 g & 1.1 kg/ha)] in reducing oriental *thrips* populations. Application intervals, (i.e., once for twice/week) were included in the factorial analysis in the preliminary screening of 1988. Number of applications per trial were 8 and 9 in 1988 and 1989, respectively.

Plots consisted of 60 sweet pepper plants (cvar. Emerald Giant) arranged in three double drip-irrigated rows at a planting density of 33 000 plants/ha. Plots were replicated four times and samples at weekly intervals from planting through two harvest passes. Samples consisted in collecting five flowers (1988) or five fully formed leaves from the top of the plants (1989) per plot. Flowers and leaves were deposited in vials containing 70 % ethanol and transferred to
our laboratory at Rio Piedras for examination. Samples were thoroughly washed with ethanol and filtered through a 200 mesh standard sieve (Hamasaki 1987). Extracted material was examined under stereomicroscope and the number of immature and adults in each sample recorded.

RESULTS AND DISCUSSION

No significant differences in *thrips* population density were detected between insecticides, application rates from trial of neither year (Fig. 1). In 1988 the most effective insecticide seemed to be oxamyl with a mean population density of 0.48 *thrips* /flower and the least effective was esfenvalerate with 0.54. In addition no differences were detected between the unsprayed control and insecticide treatments plots (Fig. 2). Similarly, no differences were found between the effectiveness of neither high of low insecticide doses nor application intervals in lowering *thrips* population densities. In the 1989 trial similar results were obtained with the oxamyl treated plots which exhibited the lowest *thrips* numbers at 0.35 indiv./leaf, and esfenvalerate, showing the highest at 0.52 indiv./leaf (Fig. 3). Azinfosmethyl and methomyl kept *thrips* population densities intermediate to those observed for oxamyl and esfenvalerate and at equal levels to those recorded in the unsprayed control plots.

Figure 1

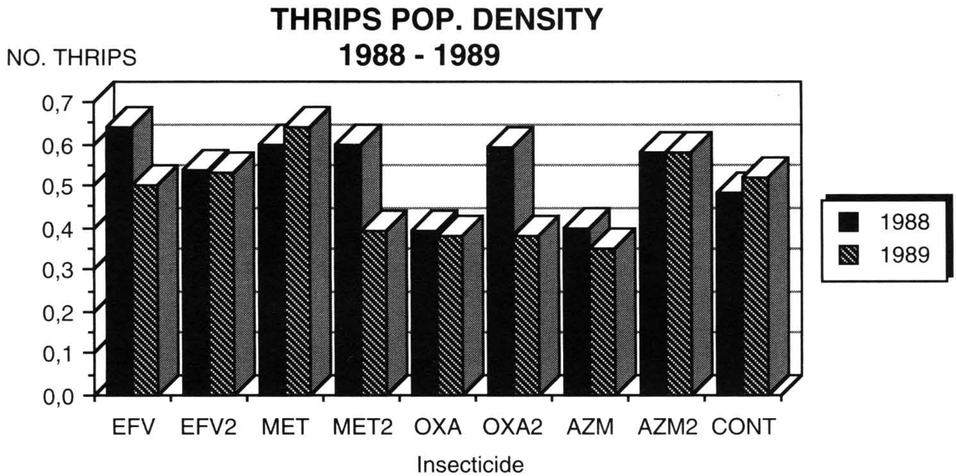


Figure 2Figure 1Figure 1

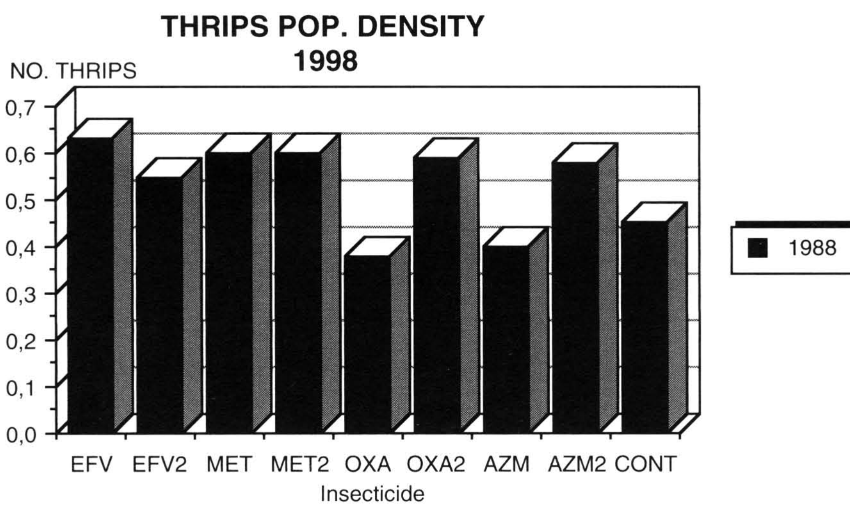


Figure 3

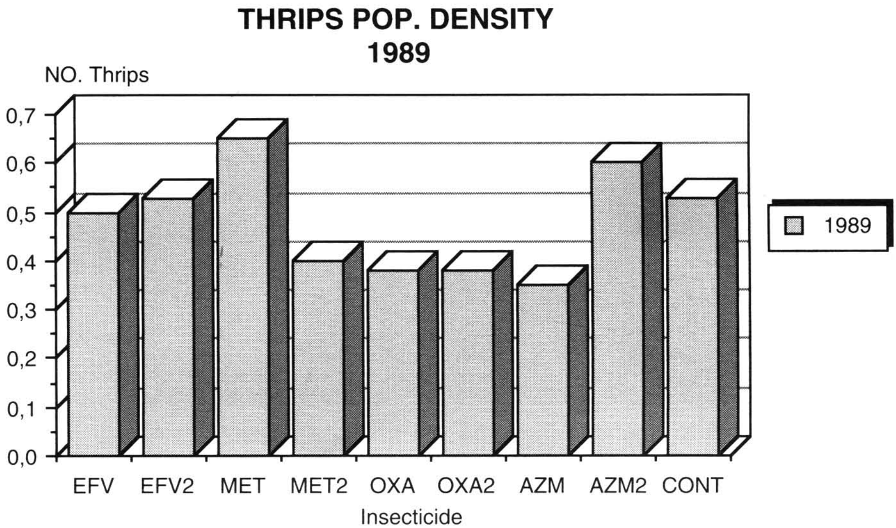


Figure 5

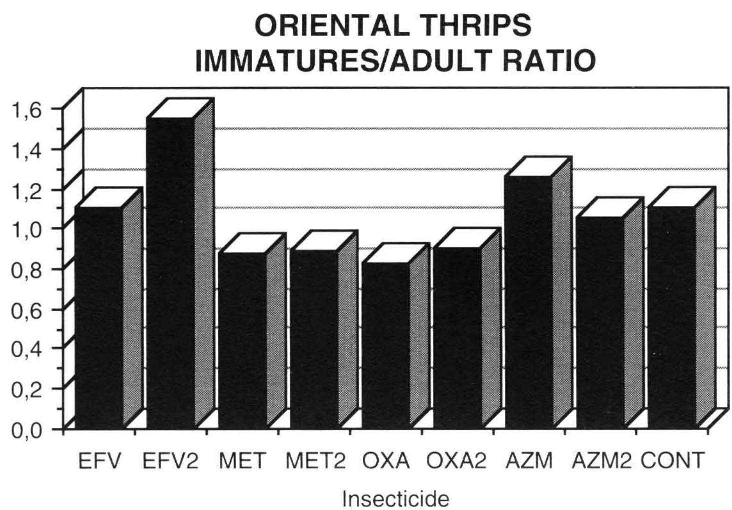
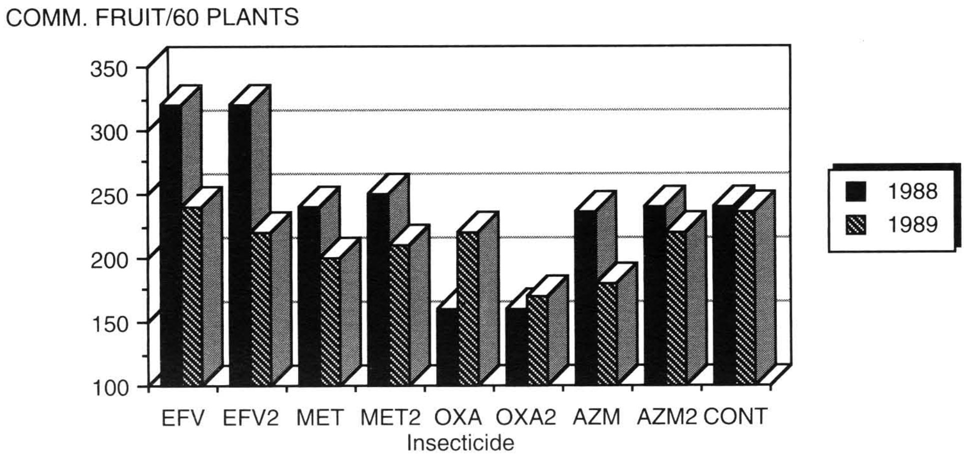


Figure 6


COMM. FRUIT/60 PLANTS
350
300
250
200
150
100
EFV
EFV2
MET
MET2
OXA
OXA2
AZM
AZM2
CONT
Insecticide
1988
1989

The number of immatures and the ratio between immature to adult *thrips* in 1989 are given in figures 4 and 5 respectively. In general terms most insecticides seemed to be equally effective against adults as to immature stages of the *thrips* (Fig. 4). No signigicant differences were detected between insecticide treatments and unsprayed control plots. Similarly the immature/adult ratio of treatments did not show significant differences. However ratios greater than one were observed in esfenvalerate, azinfosmethyl and the unsprayed control. It remains uncertain whether this ratio represents differential susceptibility of stages to different insecticides or the declining reproductive success of *thrips* populations within treated plots. Further experiments and toxicological laboratory screening are being planned to explain the mechanisms involved and their significance.

Sweet pepper yield was significantly influenced by treatment, with yield of plants treated with esfenvalerate > methomyl >= unsprayed control >= azinphosmethyl > oxamyl in 1988 (Fig. 6). In 1989 no significant differences were found between treatments, nevertheless trends similar to those of 1988 were observed. No correlations were found between yield and *thrips* population density either in 1988 or 1989. It is suggested that these results are inconclusive as observed *thrips* population densities appeared to be much below an economic injury level. Mean *thrips* population density was 0.5 individuals per leaf.

CONCLUSIONS

Complex interactions are apparently at play in determining *thrips* population density and sweet pepper yield in our trials. While *thrips* populations were apparently unaffected by our treatments as compared to control plots, other pests such as the green peach aphid (*Myzus persicae*), and the soybean looper (*Pseudoplusia includens*) did respond to treatments. For example, azinfosmethyl was consistently poor controlling aphids, while was oxamyl mostly ineffective against loopers. Even so, esfenvalerate treated plots consistently showed the highest insect population densities, yet in all cases sweet pepper yields from these plots were higher than those in plots treated with insecticides like oxamyl or methomyl which kept most other pests under control. While these interactions are yet to be identified, it appears evident that more research is needed to recognize the effect of insecticide treatment on parameters such as the population dynamics of natural enemies, differential parasitoid-host susceptibility, and fundamentally the relationship between pest density and yield loss in this multi-pest system.

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