FIELD EVALUATION ON DIFFERENT CONTROL METHODS AGAINST EGGPLANT SHOOT AND FRUIT BORER[1]

R.C. Bustamante*), P.B. Luzaran*), L.T. Gruber*), E. Villanueva**)

*) Philippine-German Biological Plant Protection Project, Bureau of Plant Industry, 692 San Andres St., Malate, Metro Manila, Philippines
**) Philippine National Agricultural School, Guyong, St. Maria, Bulacan, Philippines

ABSTRACT

An experiment to determine an effective control measure against eggplant shoot and fruit borer, *Leucinodes orbonalis* GUENÉE was conducted at the Philippine National Agricultural School in Guyong, Santa Maria, Bulacan from January to June 1990. It compared the effects of the egg parasitoid *Trichogramma chilonis* ISHII, the Green muscardine fungus (*Metarhizium anisopliae*), botanical extracts of neem (*Azadirachta indica*), Lemon grass (*Andropogon schoenanthus*) and Galangal (*Alpinia pyramidata*), a mechanical method (by cutting of infested parts) and farmers practice (use of commercial insecticides). Randomized complete block experimental design was used.

Results showed that yield was highest from the Trichogramma treated plot, followed by plots treated with Thiodan + Decis, botanicals and Metarhizium, respectively. The mechanical method gave the lowest yield of fruits. However, there were no statistical significant differences between treatments of the study in respect to yield, non-marketable fruits, entrance and exit holes and infested shoots. This may be attributed to an inadequate supply of water (drought) during the experiment which effected the different plots unequal.

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INTRODUCTION

The Eggplant fruit and shoot borer (*Leucinodes orbonalis* GUENEE) is one of the most destructive pests of eggplant (*Solanum melongena* L.) in India (GUPTA & KAWALSHARI 1981). Studies on the degree of damage found yield losses ranging from 51 to 73%. The pest attacks all development stages of the crop. At early vegetation stage, the larvae feed on the stem, shoots and leaves (MORENO 1986, MONREAL et al. 1982). The feeding activity within the shoots of plants interferes with the plant sap transmission mechanism and causes the typical withering of the shoots in early stage of the plant growth. (YOZDANI et al. 1981). Later, at fruit setting the larvae bore into the fruits rendering them unusable for marketing and storage.

In the Philippines its presence has been reported with outbreaks especially in Bulacan, Batangas, Cavite and Laguna. Since the early 70's large scale farmers in Tarlac, Pangasinan and Nueva Ecija as well as farmers from other parts of the Philippines have been experiencing great losses (NAVASSERO 1983).

At present, to protect their crops farmers depend solely on commercial insecticides which are applied 1-2 times a week. But it can be expected that the continuous use of chemicals will lead to development of insecticide resistance in the near future.

Present research work is dealing mostly with the efficacy of different insecticides which show to control this pest but with varying degree of success.

Another approach is the selection of resistant varieties of eggplant. GILL & CHADHA (1985) tested 22 varieties under field conditions in replicated trials from 1972 to 1975. According to their data some of the tested varieties showed to be fairly resistant with a minimum percentage of infested shoots and fruits and loss in yield.

To cope with the pest by means of biological agents or cultural management seems to be quite neglected hence this study was undertaken.

OBJECTIVES

1. To verify if the egg parasitoid *Trichogramma chilonis* ISHII can control *Leucinodes orbonalis* under field condition.
2. To test if botanical pesticides (Neem + Lemon grass + Galangal) can control *L. orbonalis*.
3. To determine the effectiveness of a mechanical method (removal of the infested parts) against *L. orbonalis*.
4. To see the effect of application of *Metarhizium anisopliae* on *L. orbonalis*.
5. To verify the presence of other natural enemies in eggplant fields (observed only in Trichogramma plot).

MATERIALS AND METHODS

The experiment was conducted at the Philippine National Agricultural School located at Guyong, Santa Maria, Bulacan from January to June 1990.

To avoid that *T. chilonis* interfere with the other treatments the test field was split into 2 blocks separated by a road and several rows of corn plants as barrier. Randomized complete block design with 4 replicates were formed. Plot size was 3 x 4 m with a spacing of 50 cm between plants and 100 cm betwee*p+3Xn rows. Each treatment plot contained 24 plants.

The seedlings were raised in plastic bags (6 x 10 cm) and transplanted after 5 weeks. Land preparation included hole digging (25 x 25 x 20 cm). Basal application of NPK fertilizer at the rate of 50-50-50 per hectare + mixed soil compost (garden soil, sawdust and horse manure) was done one day prior to transplanting. During the trial NPK fertilizer (25-25-25) was applied 4 times at monthly intervals.

The different treatments were:

(A) ***T. chilonis*** released weekly at 100 cards (200,000 parasitoids) per hectare for 4 consecutive weeks starting 1 week after planting.

(B) Weekly spraying of extracts of **Neem + Galangal + Lemon grass** for 4 consecutive weeks starting 1 week after planting. To get the formulation 200 g each of fresh Neem leaves, Lemon grass and Galangal tubers were crushed in a blender and mixed with 250 ml of tape water. In the field the solution was diluted in 8 liters of tape water for the treatment of 48 m^2 ($\approx$ 1700 l/ha)

(C) ***M. anisopliae*** applied twice throughout the season. First application took place in form of infested palay (rearing medium) with 5 grams rice kernels (3×10^8 conidia) per plant at the time of planting. The second application at the beginning of flowering 4 weeks later was sprayed directly onto the plants with 10 ml solution (5×10^7 conidia) per plant.

(D) **Farmer's practice** - weekly spraying of pesticides (Thiodan and Decis) at 1 liter per/ha.

(E) Weekly **removal of infested shoots** by hand.

(F) **Untreated control.**

Weekly monitoring started one week after planting and lasted up to harvest. Yield, percentage of marketable and damaged fruits were computed and analyzed statistically.

RESULTS AND DISCUSSION

In Table 1 the results of the different treatments in respect to yield and damage are listed.

In respect to damage (entrance/exit holes) the treatment with *T. chilonis* and the mechanical method showed to be the best protection whereas the plots with regular spraying of insecticides (farmers practice) and the application of botanicals experienced the highest degrees of damage.

T. chilonis showed also to be superior in respect of yield. The lowest yield was achieved by the mechanical method which can be attributed to the continuous removal of infested shoots. Due to the drought there were not enough new shoots formed to replace the removed ones. Also, the plants were mechanically injured.

Whether the high difference in yield in the Trichogramma treated plots can be contributed to *T. chilonis* alone can be questioned. The unexpected drought made it that topographical differences in the trial area could have an impact on the yield. To prevent that *T. chilonis* migrate to the other plots all 4 replicates were put together and kept separated from the rest of the trial area, surrounded by several row of corn plants as barrier. Since the selected area was on a lower elevation than the area of the other treatments the effect of the drought was less severe for the Trichogramma plot then for the other treatments. Also, the barrier of corn plants shielded the plot against wind thus prevented a high evaporation.

Additionally, natural occurring parasitoids and predators of *L. orbonalis* in the Trichogramma plot were monitored and listed in Table 2. The observed Trichogramma plot proved to be attractive to several parasitoids and predators. Besides the released *T. chilonis* 5 parasitoids and 1 predator could be found abundantly. The rows of corn plants served as food reservoir and created a favorable microclimate for these biological agents to thrive.

Table 1. Effect of different treatments on yield of eggplant

Treatment	Means of 4 replicates per treatment							
	Marketable fruits (kg)		Non-marketable fruits (kg)		% marketable fruits		No. of holes in fruit	
A. Trichogramma	1182.5	a	64.0	b	94.9		25.75	d
B. Botanicals	692.5	bc	69.0	b	90.9		71.0	b
C. Metarhizium	625.75	c	55.25	b	91.9		46.75	c
D. Farmers practice	855.5	b	98.0	a	89.7		91.25	a
E. Mechanical	441.5	d	24.0	c	94.8		25.0	d
F. Control	583.75	cd	71.0	b	89.2		75.5	b
CV =	16.39%		20.87%				11.93%	

Within a column, means, followed by a common letter are not significantly different at the 5% level

Table 2. Natural enemies of *L. orbonalis* GUENÉE found in Trichogramma plot

Scientific name	Family/order	Stage of the pest attacked
Parasitoids		
Trathala flavo-orbitalis CAMERON	Ichneumonidae/Hymenoptera	Late larva instar, pupa
Apanteles sp.	Braconidae/Hymenoptera	Larva
Xanthopimpla punctata FABRICIUS	Ichneumonidae/Hymenoptera	Late larva instar, pupa
Brachymeria excarinata GAHAN	Chalcidae/Hymenoptera	Pupa
Brachymeria lasus WALKER	Chalcidae/Hymenoptera	Pupa
Predator		
Euborellia annulata FABRICIUS	Carcinophoridae/Dermaptera	Larva, pupa

CONCLUSION

It is still too early to draw any conclusion since the effect of the different treatments to control the pest was not highly significant. However, it can be suggested that border rows with the use of biological agents may help in enhancing higher yield without much use of insecticides especially during the dry season. The experiment needs to be repeated during the rainy season to gather more information on the treatments.

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