ESTABLISHMENT OF TRICHOGRAMMA EVANESCENS IN PREVIOUSLY RELEASED AND UNRELEASED CORNFIELDS TO CONTROL THE ASIAN CORN BORER IN REGION XI

by
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ABSTRACT

A study was conducted at Malagos, Baguio District, Davao City during the February to July 1989 cropping and in April to June cropping of 1990. The objectives are: to determine if *Trichogramma evanescens* can be established and multiplied in sites where inoculative releases were attempted; trace if parasitoid follow their host to neighboring corn field planted in staggered manner and determine the rate of parasitism.

The earliest planted corn field with an area of one hectare was released with 50 tricho cards at a distance of 14m x 14m square and monitored for corn borer eggmasses, parasitized, unparasitized (fresh) and hatched. A weekly monitoring was undertaken up to silking stage of corn growth. Other corn fields planted later and in staggered manner were used as recovery fields for trichogramma presence based on parasitized corn borer (CB) eggmasses and not released with the parasitoid.

In South Cotabato the presence of parasitized CB eggmasses in non-released areas were monitored once as comparison if similar observation occurred.

Results indicated that in Malagos, Davao City the parasitoid follow its host in the neighboring corn fields one hundred meters away from the previously released field by the presence of parasitized corn borer eggmasses. Similar results were obtained in South Cotabato even if the non-released area is about one kilometer away from the released area.

The most interesting and convincing results have shown that the parasitoid become established in sites where inoculative release has been done when after a long dry spell of five months, the new planting of corn showed CB eggmasses that were highly parasitized by *Trichogramma evanescens.*

INTRODUCTION

Corn is one of the most important food crops grown in Region XI and the most highly valued of all cereal grains for its multifarious uses. It serves as the major source of food for livestock and

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poultry, raw materials for flour industry and a good substitute for rice in the human diet.

In spite of the favorable climate and available production technology, corn production is not adequate to meet the need for food, seed and industry. The average production from the 3.3 million hectares planted in the country was 0.95 tons/ha. (PCARRD, 1981). This seemingly low yield could be attributed to many field problems, one of which is the Asian corn borer, *Ostrinia furnacalis* Guenee. This insect pest has a long history of infestation in Mindanao and was reported to reduce corn yield from 20 to 80 percent (Sanchez, 1971).

Corn borer, a destructive insect pest of corn in Mindanao, limits the successful production and therefore should be reduced to economic threshold level.

While many attempts have been done to control this pest, not one seem to have emerged economically satisfactory at farmer's fields. This could be one of the reasons why farmers still ask for effective control measures.

In 1982, *Trichogramma evanescens,* a known egg parasitoid of the European corn borer *Ostrinia nubilalis,* was introduced in the Philippines thru the Philippine-German Plant Protection Program as an alternate control against the Asian Corn Borer *Ostrinia furnacalis.* Early investigations about its efficiency indicated promising results with a recorded parasitism of 78.5% (Rodriguez, et.al. 1983) and again in 1984 in Region XI with 76.92% (Reloba et. al. 1984).

These earlier reports however do not preclude that we have to stop further investigation but verify further to make sure that it is really an efficient parasitoid under tropical conditions, the fact that this agent is an introduced parasitoid from temperate country.

At present little is known whether the parasitoid become established in corn fields where inoculative releases have been attempted. To the following objectives: to determine if *T. evanescens* become established and multiplied in sites where inoculative release was attempted; to trace the direction of dispersal from original released site if the parasitoid follow their host to the neighboring corn fields planted in staggered manner; and determine the rate of parasitism.

MATERIALS AND METHODS

Trichogramma Released Field

Field Establishment

This study was established at Malagos, Baguio District, Davao City in February to July, 1989 cropping and in April to June cropping of 1990. The farmers in the area follow a staggered cropping system. The farmer with at least one (1) hectare and who planted first was selected as a cooperator. Trichogramma cards were released (inoculative) in the field at the rate of 50 cards per hectare thirty (30) days after planting. The distance between cards is 14m x 14m square. These were hung on the third strongest leaf of a healthy plant. The rows with Trichogramma releases were marked with a yellow plastic string at the field border for easy identification during monitorings.

Monitoring and Data Collection

At the time of Trichogramma release, corn borer eggmasses were first counted from 100 plants in five sites at 20 plants per site randomly selected in the field. This is to check if there are already residual population of the bioagent. A week after release, the field was again monitored for eggs parasitized, unparasitized (fresh) and hatched eggs. There were five monitorings undertaken at different stages of corn growth (mid whorl, late whorl, tasseling, silking and milking stage).

Recovery Fields (non-released fields)

Field Establishment

Four (4) neighboring fields designated as recovery field numbers 1, 2, 3, and 4 planted later in staggered manner were monitored to check if the bioagent is dispersed to these neighboring fields.

Similar to the released field, corn borer (CB) eggmasses were monitored from 100 plants in five sites at 20 plants per site/field randomly selected in the field.

In other areas of South Cotabato especially in the different municipalities with inoculative releases as well as no release were also monitored to determine if the parasitoid is being dispersed to far distances from 0.5 km. or more. The same procedures were followed as in the experimental area. One monitoring was undertaken but at different stages of corn development. This is to compare if similar observations occur. The period covered from January to December croppings of 1989.

RESULTS AND DISCUSSION

Trichogramma Released Field

Data showed that inoculative release of Trichogramma at the rate of 50 cards per hectare could effect parasitization from 15% to 63.3% with a mean eggmass per 100 plant of 17.12. At early stage of corn plant development however, parasitization rates observed was low (Table 1). The rate of parasitism increased as the plant matured. High parasitization rates occurred during late whorl to silking stage. It is established that corn borer oviposition peaks during these stages.

Table 1. Rate of Trichogramma parasitism with inoculative release against the asian corn borer (CB) in field planted February 1989.

Treatment	GSP	Type of Eggmass		Total	% Parasitism
		Unparasitized	Parasitized		
Previously Released Field	MWH	17	3	20	15.00
	LWH	43.5	25.5	69	37.00
	T	5.5	9.5	15	63.3
	S	2.5	2.5	5	50.00
Mean		17.12	10.12	27.25	41.32

Non-Released Corn Fields

In contrast to released field, corn field without releases showed significant occurrence of parasitism on CB eggmasses signifying that *T. evanescens* is dispersed to these areas and followed their host to neighboring fields although planted later (Table 2). In recovery field Number 2 (Table 2a) which was 100 meters away from the recovery field number 1, significantly high parasitization was noted at 42% to 50% at late whorl and tasseling with a total eggmass of 7 and 4, respectively. Similar observation is noted in recovery field #3 (Table 2b) where 100% was parasitized at silking stage. This showed that the parasitoid is dispersed 100 meters away from released site.

A more convincing result was noted when after a long dry spell (5 months) occurred in the area. Residual population of the parasitoid was noted and parasitized 75.75% of the eggmasses at silking stage although there was no releases employed. The number of eggmasses was recorded at 33 per 100 plants, (Table 2c).

Table 2. Rate of Trichogramma parasitism in the 1st recovery plot adjacent to the released field and planted in May, 1989.

Treatment	GSP	Type of Eggmass		Total	% Parasitism
		Unparasitized	Parasitized		
Recovery Field No. 1	LWH	9.0	3.0	12.0	25.0
	T	3.5	2.5	6	41.9
	S	7.0	3.0	10	30.0
Mean		6.5	2.8	9.3	32.3

Table 2a. Rate of parasitism in the second recovery field planted in June, 1989 and 100 meters from released field.

Treatment	GSP	Type of Eggmass		Total	% Parasitism
		Unparasitized	Parasitized		

Recovery Field No. 2	LWH	4.0	3.0	7	42.9
	T	2.0	2.0	4	50.0
Mean		3.0	2.5	5.5	46.45

Table 2b. Rate of parasitism in the third recovery field planted in July, 1989 near recovery field no. 2.

Treatment	GSP	Type of Eggmass		Total	% Parasitism
		Unparasitized	Parasitized		
Recovery Field No. 3	Tasseling	3	0	3	0
	Silking	0	3	3	100
	Milking	0	0	0	0
Mean		1	1	2	33.33

Table 2c. Rate of parasitism in the fourth recovery field planted June, 1990 after a long dry spell of 5 months but was previously released with Trichogramma in February 1989.

Treatment	GSP	Type of Eggmass		Total	% Parasitism
		Unparasitized	Parasitized		
Recovery Field No. 4	MWH	1	0	0	0
	T	65	14	82	17.07
	S	8	25	33	75.75
Mean		22	13	38.33	30.94

Establishment and parasitism at South Cotabato corn fields

Data also show (Table 3) that the parasitoid were dispersed to corn fields previously released with *T. evanescens* and parasitization rate occurred significantly high ranging from 36.65 to 82.46% while in released fields ranged from 42.85 to 78.62% in the different municipalities covered during the January to December cropping. This rate of parasitism occurred when the number of eggmasses per 100 plants ranged from 2 to 11 regardless whether these are released or not released with the parasitoid.

As mentioned by Mr. Bigler (short time visiting scientist (1989 per. com) *T. evanescens* can be dispersed by wind more than 10 kilometers downwind. This observation therefore confirms the result of this study where the presence of the parasitoid in unreleased sites could be the result of wind as dispersal agent.

On the other hand according to Hassan (1987) as cited by Felkl (1990) there has been no CB eggmasses that were observed parasitized in 1984 in Mindanao when he conducted a survey but later when the parasitoid was introduced and inoculative releases were done in 1987 frequent reports of high parasitization have been submitted. In subsequent studies by Trans et.al. (1986) and Felkl (1989), *T. evanescens* were recovered in considerable numbers.

Table 3. Rate of Trichogramma parasitism in released and non-released corn fields in Region XI from January to December, 1989 croppings.

Province/Municipality	Total fields monitored	Distance from released field (km)	Mean Eggmass Per Field	EGGMASS Parasitized (P)	EGGMASS Unparasitized (UP)	Mean% Parasitism
A. Released Field						
Davao City	4	_	19.25	10.00	9.25	50.00
South Cotabato						
Koronadal	5	_	40.44	36.00	4.44	78.62
Gen. Santos City	6	_	24.08	14.75	9.33	62.64
Tampakan	2	_	7.00	3.00	4.00	42.85
Malapatan	6	_	17.00	12.50	4.50	73.52
B. Non-Released Field						
Davao City	3	2	37.66	14.66	23.06	38.92
South Cotabato						
Koronadal	14	.01-1	20.50	15.00	5.50	73.07
Polomolok	7	.01	18.99	15.66	3.33	82.46
Gen. Santos City	10	.01-1	24.97	18.33	6.40	73.40
Tampakan	2	.01-1	0	0	0	0
Banga	11	.05-1.5	2.72	1	1.72	36.76
Surallah	2	.05-1.5	4.50	3.50	1.00	77.77

CONCLUSION

The results of this study therefore suggest that *T. evanescens* has established itself in the corn growing areas in Mindanao and were dispersed to other corn growing areas. It was also found that the parasitoid can survive even after a long dry spell of five (5) months in Davao City suggesting that the parasitoid could probably survive on other alternate hosts present in the locality. The observed high parasitization by *T. evanescens* in other released and non-released corn fields may be safely attributed to the fact that the bioagent are multiplying and has adopted itself to the environmental conditions in Mindanao. No other trichogramma species has ever been reported to parasitize CB eggmasses other than those released initiated by the Philippine German Plant Protection Program in 1982. This was confirmed by Alba (1986) and Baltazar as reported by Felkl (1990).

RECOMMENDATIONS

In areas where inoculative releases of *T. evanescens* has been done, monitoring of the rate of parasitism should be undertaken. This is to determine if the parasitoid population is enough or not to parasitize whatever increase in CB eggmasses due to high oviposition rate in the succeeding stage of growth.

If rate of parasitism is below 50% at mid whorl stage the population of the parasitoid should be augmented by releasing tricho-cards.

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