# DISTRIBUTION OF PARASITISM BY *TRICHOGRAMMA PRETIOSUM* ON THE COTTON LEAFWORM

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## Summary

The cotton leafworm *Alabama argillacea* causes serious damage in perennial cotton. The use of insecticide is the most expensive component of cost of the cotton production. Therefore, the profit is diluted specially due to the low level of production of this type of cotton. On the other hand, the negative effect of insecticides has led to a strong reduction on the natural enemies population. The use of biological control with *Trichogramma* has proven to be an efficient technique and is the best strategy for control. This study aimed to determine the distribution of parasitism by *T. pretiosum* on the cotton leafworm. The influence of the different parts of cotton plant on the parasitism is studied.

## INTRODUCTION

*Trichogramma* is one of the most important natural enemies for biological control of insect pest. According to Hassan (1996) around 18 different species of *Trichogramma* are being mass reared to control insect pest on 18 millions of hectares in 16 countries. Zucchi & Monteiro (1996) stated that 24 *Trichogramma* species were reported for the South America and approximately half of these species are present in Brazil, with *Trichogramma pretiosum* as the species with the widest distribution and the largest number of hosts.

In South America the first studies on mass rearing started in Peru in 1926, although it is only from 1933 that the large scale rearing of native *Trichogramma* from the field began (Herrera, 1959). In Brazil, the use of *Trichogramma* started for the control of *Neoleucinodes elegantis* and *Diatraea saccharalis* (Gomes, 1949). In cotton the most important lepidopteran pest that are targeted for control by *Trichogramma* are *Alabama argillacea* and *Heliothis virescens* (Almeida *et al.*, 1995).

*A. argillacea* is one of the insect pest in perennial cotton that causes serious damage from the seedling stage to the beginning of the harvest. The destruction of the leaves is responsible for yield losses and most of the times the farmers use chemicals to preclude economic losses. However, indirect and direct effects of the pesticides on the environment have been observed and the natural enemies have been frequently affected due to the incorrect use of pesticides.

Each crop requires specific management strategies. These strategies should not conflict with the application of *Trichogramma* (Almeida & Silva, 1998). Also the use of inundative release in biological control of insect pest requires extensive studies on the biological and ecological aspects (Tironi, 1992). Several authors show the importance of the intrinsic aspect of the crops such as architecture and height of plants, spacing of planting, variety, morphological changes etc influencing directly the parasitism by *Trichogramma* (Ables *et al.*, 1980, Burbutis & Koepke, 1981, Kekker *et al.*, 1985, Lopes, 1988, Botelho *et al.*, 1995).

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Parasitism by *Trichogramma* has been extensively studied on many species (Bjorksten & Hoffmann, 1988, Romeis *et al.*, 1998, Jong *et al.*, 1990, Pak *et al.*, 1991, Andow & Prokrym, 1990, Shu & Jones, 1988, Morrison, G. & Lewis, 1981, Burbutis *et al.*, 1977). However, fews studies has been published on *A. argillacea* eggs in perennial cotton. This study aims to evaluate the parasitism capacity by *T. pretiosum* on the cotton leafworm in the different parts of plant.

## MATERIAL AND METHODS

A field experiment was carried out in Paraíba State, Brazil, during the 1997 harvest, aiming to determine the distribution of parasitism by *Trichogramma pretiosum* on *A. argillacea*. The cotton CNPA 5M cultivar was used in this study. This study was done in an experimental plot of 0.36 ha (40x90m) containing 3600 plants. No chemicals were used for control.

Upon detection of the first cotton leafworm 100.000 parasitoids per hectare were released following Almeida & Silva (1996). Eight release points were used. The distance between each release point was of 20m in the cotton plants row and of 15m between rows.

The *A. argillacea* eggs distribution and the parasitism by *T. pretiosum* on the different parts of the cotton plant were evaluated. Weekly twenty plants were collected and taken to the laboratory. To analyse the searching behaviour of the wasps the following parameters were considered: 1-Leaf side (Upper side and lower side of leaf), 2-Plant portion (Upper part, middle part and lower part of plant) and 3- Leaf size (to determine the leaf size the leaves were measured on the main vein). Fifteen measurements were made during the cotton season.

Student's T-test (P=0.05) was used to determine the preference of *A. argillacea* for ovipositing eggs on the different parts of the cotton plants. The distribution of the parasitism by wasps was evaluated using the $X^2$ test of a 2 x 2 Contingency Table ($X^2_{0.05}$).

## RESULTS AND DISCUSSION

The preference of *A. argillacea* for ovipositing eggs with respect to the cotton leaf side is shown in the figure 1. Twenty three per cent of the cotton leafworm eggs were oviposited on the upper leaf side against 77% on the lower side leaf. Despite of this smaller preference for the lower side to *A. argillacea,* the parasitism by *T. pretiosum* reached 67% (Figure 2). The parasitism on the lower side leaf was significantly higher than the upper side. Almeida *et al.* (1984) found a highly significant positive correlation between the total eggs on the cotton and the percentage of parasitised eggs. According to Morrison *et al.*(1980) the probability of a *Heliothis zea* egg to be parasitised by *Trichogramma* depends on the probability of leaf discovery by the parasitoid and on the conditional probability of parasitism which increases with the eggs density per leaves. This fact was also observed by Gross *et al.*(1984).

The number of *A. argillacea* eggs on the upper part of the cotton plants was higher than the other parts of the plant, although no significant differences were found. The percentage of laid eggs decreased from the upper to the lower part of the plant (Figure 3). The parasitim percentage on these parts of the plant was significantly higher in the middle and lower part (85%) than in the upper part (70.85) of the plant (Figure 4).

The results of the distribution of cotton leafworm eggs with respect to the size of the leaves showed clearly that the smaller leaves are the most preferred ones with 38% of eggs oviposited, although no difference was found in leaves of 7.6 to 10.5cm of size. Leaves with 4.6 to 7.5 and 10.6 to 13.5cm were the least preferred by *A. argillacea*

(Figure 5). On the other hand, the smaller leaves had the lowest parasitism (67%) and were significantly differed from the other leaf sizes that ranged from 82 to 89% (Figure 6). These results agree with Almeida *et al.* (1997) who found that *T. pretiosum* parasitises the *A. argillacea* eggs wherever they are localised in the cotton plant. Saavedra *et al.* (1997) verified a higher percentage of *T. pretiosum* parasitism on *Heliothis virescens* in the older leaves.

The parasitism of *A. argillacea* during period of the study considering all parts of the plant was of 78%. Almeida *et al.*(1985) comparing two releasing techniques (Adults vs pupae) found that the maximum parasitism of *Trichogramma pretiosum* on *A. argillacea* in perennial cotton was of 71%.

*T. pretiosum* has a strong capacity of parasitising eggs of the cotton leafworm independent of its localisation on the plant. However, the lower side of leaves (7.6 to 10.5cm) in the middle part of the perennial cotton plant is the best place to take samples to evaluate the wasp parasitism.

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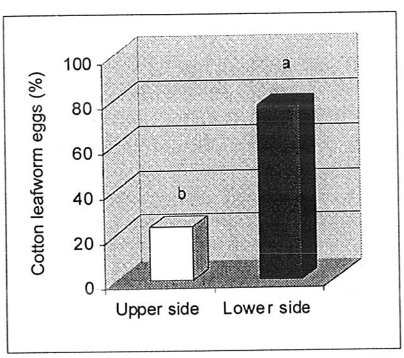


Figure 1. Percentage of *A. argillacea* eggs on the different leaf sides.

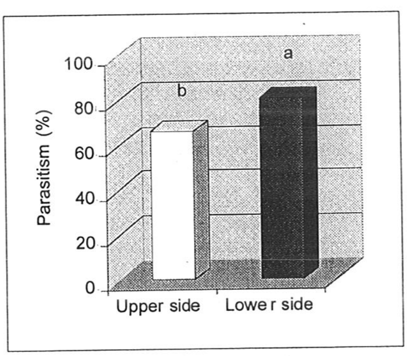


Figure 2. *T. pretiosum* parasitism on *A.* eggs on the different leaf sides.

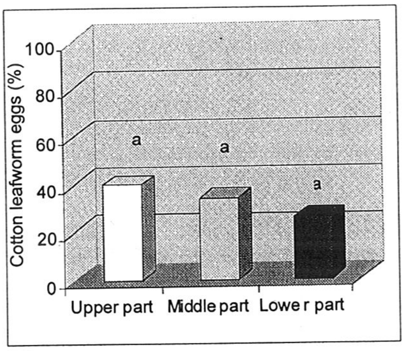


Figure 3. Percentage of *A. argillacea* eggs on the different parts of the plant.

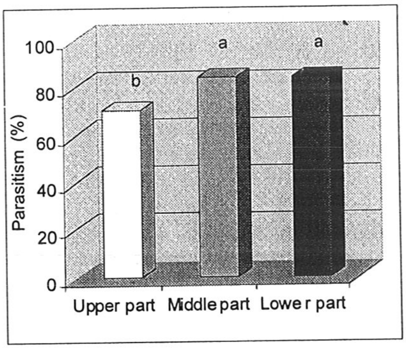


Figure 4. *T. pretiosum* parasitism on *A. argillacea* eggs on the different parts of the plant.

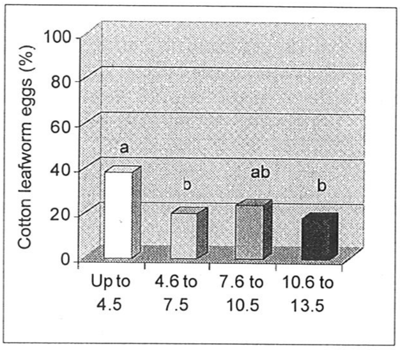


Figure 5. Percentage of *A. argillacea* eggs on the different leaf sizes.

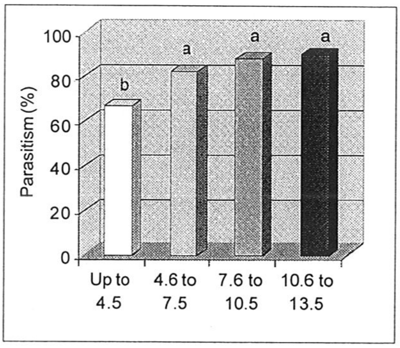


Figure 6. *T. pretiosum* parasitism on *A. argillacea* eggs on the different leaf sizes.

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