DIFFERENCES IN HOST FINDING EFFICIENCY OF TRICHOGRAMMA SPP (*HYMENOPTERA: TRICHOGRAMMATIDAE*) IN FOUR AGROECOSYSTEMS IN THE MESILLA VALLEY

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ABSTRACT. In this study the objective was to determine differences in parasitism of natural occurring *Trichogramma spp* populations in corn, cotton, alfalfa and pecan. For this purpose 900 sentinel egg traps were placed for 24 hours in the four crops during 9 dates through the season in 2000 year. After that, the traps were carried to the lab and were put under suitable conditions of temperature and relative humidity. Four days after, the traps were checked under the stereo microscope to determine they contained parasitized eggs. The number of traps with parasitized eggs was registered for each crop and for each date. A statistical analysis of means comparison (Tukey a= .05) for dates and crops was performed using SAS V8 software. Results showed that there was not significant difference among dates, but there was among crops. Parasitism was higher in corn than in the rest of the crops. There was no difference between alfalfa, cotton and pecan.
Key words: Host finding efficiency, host plant, sentinel egg trap

INTRODUCTION

Host finding efficiency measures the capability of parasitoids to locate host plant (habitat) and hosts (Bin and Vinson 1991). This phenomenon implies a complex of factors such as parasitoid behavior, host plant or crop (habitat), and chemical substances that regulate inter-specific relationships that determine the success of a parasitoid in locating hosts (Nordlund 1994). *Trichogramma spp* are the most studied parasitoids around the world (Smith 1996). *Trichogramma* are parasitoids that show more preference for environments than for hosts (Flanders 1937; Smith 1996). However, *Trichogramma spp* behavior is also influenced by host plant characteristics, plant growth stages change through the season generating different microclimatic conditions in the crops (Nordlund 1994; Flanders 1937). For example, plant morphological characteristics such as canopy shape affect the temperature, relative humidity and photoperiod in the crops. Leaf texture of corn directly affects parasitism and *Trichogramma spp* prefer arboreal, field or ornamental crops (Powers and McSorley, 2000; Nordlund, 1994; Flanders, 1937; Almeida, de Sobrinho, Araujo, de Souza, and Dias, 1998). After the effects of morphological features the volatile chemicals have a strong effect on host finding efficiency. Synomones and kairomones are the principal chemicals that regulate or influence the host finding behavior of *Trichogramma spp*. *Amaranthus spp* and corn extracts influence positively the parasitization rate in corn, tomato, cotton and other crops. However, some cotton chemicals repulse *Trichogramma spp*. When plants are under herbivorous attack, some of them produce synomones that attract Trichogramma increasing searching on those plants. Finally, adult moths produce kairomones that can be perceived by *Trichogramma spp* in such away that adult wasps intensify their searching behavior in sites where these chemicals are detected (Nordlund 1994; Smith 1996).

Bin and Vinson (1994) proposed a method to evaluate host-finding efficiency for *Trichogramma spp*. They stated that an egg mass that present a parasitized egg can be taken as "discovered and exploited", and then

the host finding efficiency can be expressed as the percentage of egg masses discovered divided by the total number of egg masses used for this purpose. To carry out this procedure many tools have been used to assess host finding efficiency and parasitism by *Trichogramma spp*. According to Smith (1996) the use of sentinel egg traps (or trap-cards) that consist of host eggs glued to cards and exposed in the field for a time period is one of the most extensively used. Natural host eggs or factitious host eggs such as *Sitotroga cerealella* can be used on the trap-cards. Even though they have been useful, there is always a difference in relation with natural hosts that are present in the field.

Although many studies have been carried out on *Trichogramma spp*, this is the first attempt to determine differences in host finding efficiency of this parasitoid in alfalfa , pecan (perennial crops), cotton and corn (annuals crops). Consequently, the objective of this study was to detect differences in host finding efficiency of Trichogramma genus between these four crops.

MATERIALS AND METHODS

During year 2000, 900 sentinels eggs traps were placed in four crops (pecan, alfalfa, cotton and corn), for 24 hours during 9 sampling dates in 5 locations in the Mesilla Valley. A sentinel egg trap or trap card is a 2 sq. inches card on which host eggs are glued. Twenty-five sentinel egg traps (*Sitotroga cerealella* eggs), were exposed at random on each crop on each date. Each trap was considered to be a sample and once collected they were taken to the laboratory and kept at 27° C and 70 % relative humidity. After 4 days the traps were checked under a stereo microscope for parasitized eggs, and then reared to determine the presence of *Trichogramma spp*. To determine host finding efficiency the trap-cards that possessed parasitized eggs or that were "discovered" were noted for each date and for each crop and their percentages calculated " (Bin and Vinson 1994). The number of eggs parasitized per trap-card varied from 0 to 108. Data was analyzed statistically by using SAS V8. An analysis of variance was performed to determine differences between dates and crops. After that, a Tukey's means comparison test (a= .05) was performed to determine where the differences lay.

RESULTS AND DISCUSSION

Even though the main objective was to determine differences between crops, the differences between sampling dates were also analyzed. Results of the analysis of variance showed that there were no significant differences between sampling dates, but there was a significant difference between crops. The host finding efficiency was similar during the entire season. Trichogramma did not search more in the four crops in relation to global environment conditions of the Valley. The highest host finding efficiency values were found on August 8, and on July 18.

The host finding efficiency was different in at least one crop. The host finding efficiency in corn was significantly higher than in other crops (Table 1). There were not differences between alfalfa, pecan and cotton. Morphological characteristics and chemical volatiles from corn may increase the host finding efficiency of *Trichogramma spp* in corn (Figure 1).

Table1. Host finding efficiency differences of Trichogramma spp in cotton, pecan, corn and alfalfa. Las Cruces, N.M. 2000

Crop	Mean (%) of Host finding efficiency	
Corn	32.000	A
Alfalfa	12.889	B
Cotton	12.889	B
Pecan	0.000	B

*Tukey (a=.05) *Means with the same letter are not significantly different (a= .05)

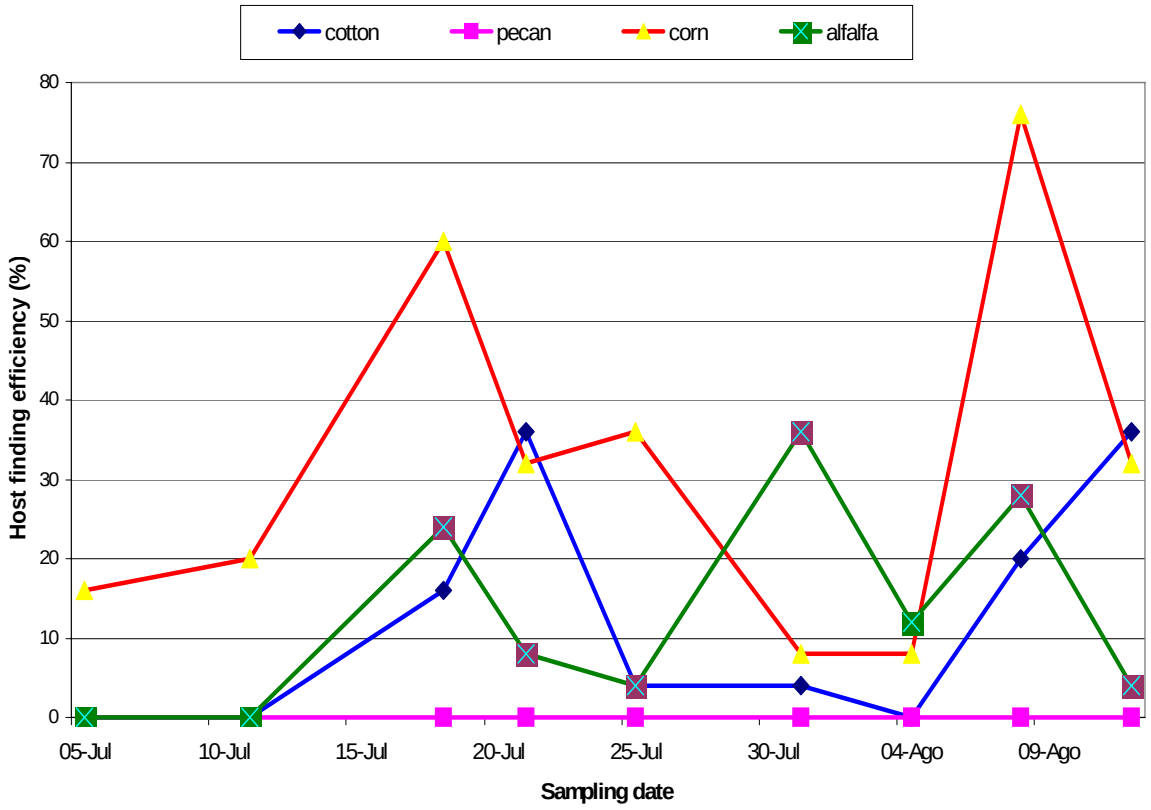

Figure 1. Host finding efficiency of Trichogramma in cotton, pecan, corn, and alfalfa. Las Cruces, N.M. 2000

REFERENCES

Almeida, R.P., R.B. de Sobrinho, L.H. Araujo,J.Eg> de Souza, and J.M. Dias. 1998. Parasitism by native Trichogramma on *Alabama arguillacea* in areas of arboreal cotton. Comunicado Tecnico- Embrapa Algodao. No. 98, 6p.

Bin, F. and S.B. Vinson. 1990. Efficacy assessment in egg parasitoids (Hymenoptera): proposal for a unified terminology. Trichogramma and other egg parasitoids. San Antonio TX, USA. September 23-27, 1990. Ed INRA, Paris 1991 (Les Colloques). 56:175-179.

Nordlund, D.A. 1994. Habitat location by Trichoghramma. Biological Control with Egg Parasitoids. CAB International. Wallingford: Oxon, UK 286p.

Flanders, S.E. 1937. Habitat selection by Trichogramma. Annals of the Entomologic Society of America. 30:208-210.

Powers, L.E. and McSorley, R..2000. Phenology and plant growth stages. Ecological Principles of Agriculture.1st Ed. Thompson Learning. Albany, NY. 433p.

Smith, S.M. 1996. Biological control with trichogramma: Advances, success, and potential of their use. Annual Reviews Entomologicals. 41:375-406.