NATURAL PARASITISM OF *SPODOPTERA FRUGIPERDA* AND *HELICOVERPA ZEA* (LEPIDOPTERA: NOCTUIDAE) EGGS IN CORN BY *TRICHOGRAMMA PRETIOSUM* (HYMENOPTERA: TRICHOGRAMMATIDAE) IN BRAZIL

L. A. N. DE SÁ[1] AND J. R. P. PARRA[2]
[1]National Research Center of Agriculture Protection
Brazilian Agricultural Research Corporation
C. Postal 69
13820-000 - Jaguariúna - SP, Brazil

Department of Entomology
Escola Superior de Agricultura "Luiz de Queiroz"
University of Sao Paulo
C. Postal 9
13418-900 - Piracicaba - SP, Brazil

The efficiency of field released *Trichogramma* spp. is dependent upon the population dynamics of the targeted host, the host plant phenology and the density of the host insect. Population dynamics of corn pests have been studied in the State of São Paulo (Carvalho 1970, Lara & Silveira Neto 1978), but almost all the data are related to light trap captures of adults (Deary et al. 1964, Everly & Barret Junior 1965, Silveira Neto et al. 1979) with only a few studies related to egg dynamics of corn pests. Latin American literature concerning *S. frugiperda* is reviewed by Andrews (1988). There are only a few records of natural parasitization of *S. frugiperda* eggs by *Trichogramma* species (Sá 1991), and these indicate that the levels achieved are low. Conversely, natural parasitization of *H. zea* by *Trichogramma* spp. has been reported to reach high levels by Vargas & Nishida (1982). Factors affecting the *Trichogramma* parasitism of *H. zea* were reviewed by Oatman (1966) in the USA.

This paper reports on the population dynamics of eggs of *S. frugiperda* and *H. zea*, and their parasitism by *T. pretiosum*. They are correlated with the phenology of the dent corn variety C555 to determine the best conditions for conducting field releases of the parasitoid.

The study was conducted in three field corn plots located in Santo Antônio de Posse, State of São Paulo planted in November 1989 and March and May 1990, respectively. Each plot was about 10,000 m^2. Sampling was done every third day, starting about 11 days after planting and concluding just before harvest. At each sampling date, groups of 10 plants adjacent to each other were randomly taken for analysis at each of 10 sites, also randomly chosen within each plot. The whole plant was surveyed for eggs of *S. frugiperda*, whereas only the tips of the silks were inspected for eggs of *H. zea*.

In the laboratory, *H. zea* and *S. frugiperda* eggs were counted and incubated in Petri dishes at 25±1°C. Because *S. frugiperda* egg masses contain more than one egg layer, the number of eggs in the upper layer was counted and this value was then multiplied by the number of layers; the exposed single egg layers were added according to the method proposed by Leuck & Perkins (1972) and Nalin (1991). The parasitoid was identified by Dr. R.A. Zucchi, Department of Entomology, Escola Superior de Agricultura "Luiz de Queiroz", University of Sao Paulo and the specimens were deposited at the Department of Entomology *Trichogramma* strain collection.

S. frugiperda egg masses were found in all experimental plots, starting approximately 11 days after germination, between December 1989 and mid July 1990 (Fig. 1-A). The peak egg populations occurred 12 to 71 days after germination (Fig. 1-A_2 and A_3). The

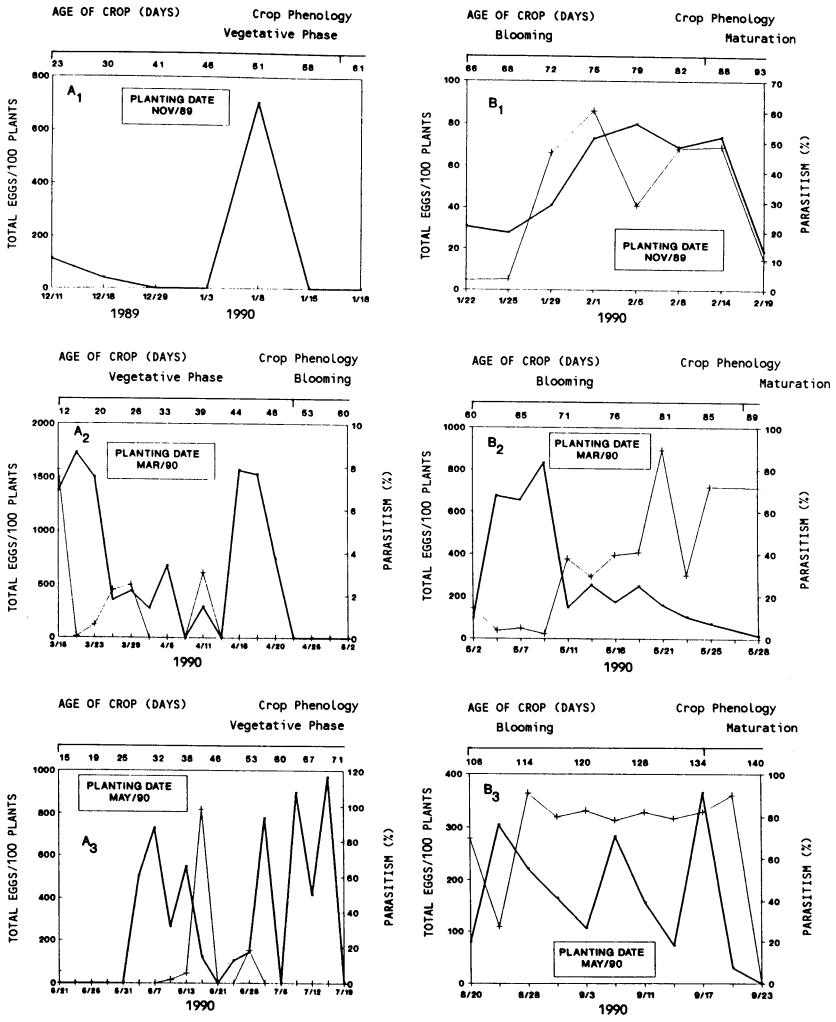

Fig. 1. Numbers of *Spodoptera frugiperda* eggs in (A_1, A_2 and A_3) and *Helicoverpa zea* eggs (B_1m B_2 and B_3) in the corn variety C555 and the percent parasitism by *Trichogramma pretiosum* in Santo Antônio de Posse - State of São Paulo, Brazil.

————total eggs, +-----+ parasitism (%)

highest egg population occurred when corn (variety C555) was planted in March 1990 (Fig. 1-A_2). The thermal temperature requirements suggested the possible occurrence of 2 generations during the crop season (Sá 1991).

Natural parasitism of *S. frugiperda* by *T. pretiosum* was observed only when corn was planted in March 1990 or later. The highest two levels occurred in March and June 1990. In the sample taken in June 1990, 98.3% of the 120 eggs collected were parasitized (Fig. 1-A_3). However, this should be considered as an exception, because those eggs

were laid in a single layer, whereas the normal oviposition of this pest is done in 2 or 3 overlapping layers. Parasitism was observed between 12 and 53 days after the crop was planted (Fig. 1-A). According to Andrews (1988), Loya (1978) attempted to control *S. frugiperda* with mass releases of an unspecified species of *Trichogramma* without success. Parasitism levels of 0.18% in fields where no releases were made increased to only 0.56% in treated fields. Another attempt to use mass releases of *Trichogramma* spp. in Tamaulipas resulted in less than 15% average parasitism (Peralta et al. 1981).

H. zea was also found in all experimental plots, when the first silks appeared [January and September 1990 (Fig. 1-B)]. The first eggs were found 66 days after the crop was planted (Fig. 1-B_1). As observed for *S. frugiperda*, the highest *H. zea* egg populations occurred when corn (variety C555) was planted in March and May 1990 (Fig. 1-A_2 and A_3). The thermal temperature requirements suggested the possible occurrence of 1 or 2 *H. zea* generations during the crop season (Sá 1991). These results are similar to those reported by Trujillo (1942).

Natural parasitism of *H. zea* eggs by *T. pretiosum* was relatively high, reaching 90.1% in August 1990 (Fig. 1-B_3). Frequently, more than 50% of the eggs were parasitized. However, most often the rates of parasitism peaked after the *H. zea* population had reached high levels and larval damage to silks had already occurred (Fig. 1-B).

The unsuitability of eggs of *S. frugiperda* as hosts for *T. pretiosum* has been previously reported in the literature (Sparks 1979, Pinto et al. 1986). Because the eggs are laid in overlapping layers and are covered with large amounts of scales, *Trichogramma* spp. are prevented from reaching many of the eggs in the mass. Noldus (1989) verified that eggs of *S. frugiperda* are rarely attacked by *T. pretiosum*, and that *T. pretiosum* does not respond to chemical compounds produced by *S. frugiperda*.

High levels of natural parasitism of eggs of *H. zea* by *T. pretiosum* have also been reported previously on different crops (King et al. 1986, Ridgway et al. 1988, King & Coleman 1989). Noldus (1989) reported that *T. pretiosum* respond positively to chemicals produced by *H. zea*, which is considered a preferred host for the parasitoid.

The results of this study indicate that *T. pretiosum* is not an effective parasitoid of *S. frugiperda*, and its practical use under field conditions for control of this species is not very promising. Conversely, it seems that timely periodical releases of *T. pretiosum* for the control of *H. zea* might result in effective control. Further studies should be conducted to compare the effectiveness of introduced and native biotypes and to determine details of the releasing process, i.e., the appropriate timing for releases and number of parasitoids to be released. The results suggest that the field releases of *Trichogramma* should be done when the first silks appear (Fig. 1-B).

Summary

Natural parasitization of *Spodoptera frugiperda* (J. E. Smith) and *Helicoverpa zea* (Boddie) eggs by *Trichgramma* spp. occurred in all corn test plots. The highest levels occurred when corn was planted in March. Parasitism of *S. frugiperda* by *Trichogramma pretiosum* Riley was usually less than 20%, while parasitism of eggs of *H. zea* commonly exceeded 50%. Parasitism of singly laid eggs of *H. zea* was higher than eggs of *S. frugiperda*, which are laid in overlapping layers and protected by scales.

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