Journal of Biological Control, 28(3): 144-146, 2014

Research Article

Parasitism efficiency of *Trichogramma pretiosum* on the eggs of brinjal shoot and fruit borer, *Leucinodes orbonalis* Guenee

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ABSTRACT: The parasitizing efficiency of the egg parasitoid, *Trichogramma pretiosum* on *Leucinodes orbonalis* was studied under laboratory conditions during two different seasons, *Kharif*, 2013 and *Rabi*, 2014. The results showed that parasitism and emergence rate of *T. pretiosum* was 91.9 and 87.5%, respectively, during *Kharif*, 2013 at 25°C compared to 41.5 and 35.6%, respectively, during *Rabi* season on one-day old eggs. It was noted that the parasitoid, *T. pretiosum* preferred one-day-old eggs of *L. orbonalis* for parasitism during both the season compared to 2- or 3-days old eggs. The results indicated usefulness of *T. pretiosum* in parasitizing eggs of *L. orbonalis*.

KEY WORDS: Emergence, *Leucinodes orbonalis*, Parasitism, Temperature, *Trichogramma pretiosum*

(Article chronicle: Received: 14-07-2014; Revised: 28-08-2014; Accepted: 03-09-2014;)

INTRODUCTION

Brinjal, *Solanum melongena* (L.) is one of the economically important agricultural crops grown throughout the India. According to the findings of Tewari (1986), more than 150 insect pests infest the brinjal crop, of which brinjal shoot and fruit borer, *Leucinodes orbonalis* is the most serious pest. Anoorag (2010) reported that *L. orbonalis* remains active throughout the year (2009) and Dhandapani *et al.* (2003) reported that it causes damage varying from 70 to 92% at various places.

As per the seriousness of this pest, the management of *L. orbonalis* is generally achieved by frequent use of insecticides Anoorag (2010). The overuse of insecticides trigger some negative effects Song (2009) and Swinton (2009) such as resistant development Diez-Rodriguez (2001) and Omoto (2001) and reduction of natural biological control agents, especially when non-selective insecticides are used Carmo *et al.* (2010); van Lenteren (2003) and Bueno (2003).

By considering these impact of insecticides on natural eco-system, it is preferred that to adopt some complementary tactics into the pest-control system as eco friendly (Regiane *et al.*, 2012). The bio-control agents naturally occurring in the environment can associate with the different life stages of brinjal shoot and fruit borer and have the capability to maintain the pest population under equilibrium condition Natarajan (2005) and Srinivasan (2008). At this juncture the parasitism ability of egg parasitoid, *Trichogramma pretiosum* on the eggs of *L. orbonalis* was investigated in order to recommend it as a suitable biocontrol agent for *L. orbonalis*.

MATERIALS AND METHODS

The laboratory experiment to find out the parasitism efficiency of *T. pretiosum* against *L. orbonalis* was carried-out in the Bio-control laboratory, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore, India during *Kharif*, 2013 and *Rabi*, 2014.

Parasitism efficiency of *Trichogramma pretiosum* on *Leucinodes orbonalis*

One-day, two-day and three-day old eggs of *L. orbonalis* were collected from the laboratory cultures of *L. orbonalis*. The number of eggs in each cotton cloth used for egg laying by *L. orbonalis* was counted and placed in a polyethylene cover. Based on the number of eggs of *L. orbonalis*, the adults of *T. pretiosum* were collected from the laboratory cultures at the rate of 6:1 by aspirator and

introduced into the cover containing eggs of *L. orbonalis*. Each treatment was replicated six times and arranged in Completely Randomized Design (CRD).

As the incubation period of eggs of *L. orbonalis* is 4 days, the daily observations were made up to 4 days to count the number of eggs hatched into neonates of *L. orbonalis*, parasitized by *T. pretiosum* and died by physiological disorders. At the same time when the color of eggs of *L. orbonalis* was changed into black, the cloth containing parasitized eggs of *L. orbonalis* was placed into a new polyethylene cover and carefully tied. The observations were continued until the emergence of parasitoids.

RESULTS AND DISCUSSION

The statistical analysis (two-way ANOVA with replications) showed that there is significant difference in the selection of eggs having different ages for parasitization by *T. pretiosum*. The parasitization rate was reduced with the senescence of eggs of *L. orbonalis*. The parasitoid prefers the one-day-old eggs of *L. orbonalis* for parasitization.

Table 1. Mean of parasitized eggs of *Leucinodes orbonalis* and the emergence rate of parasitoid, *Trichogramma pretiosum* during *Kharif*, 2013 and *Rabi*, 2014

Seasons	Treatments	Mean of Parasitized Eggs of *L. orbonalis* (in percentage)	Mean of Emergence Rate of *T. pretiosum* (in percentage)
Kharif, 2013 (25°C ± 2°C)	T_1 – 1 day old eggs	91.99 [a] (73.56)	87.52 [h] (69.31)
	T_2 – 2 days old eggs	75.15 [b] (60.10)	83.93 [hi] (66.37)
	T_3 – 3 days old eggs	33.45 [d] (35.34)	81.62 [i] (64.62)
	T_4 – Control (1-day old eggs)	0.00 [g] (2.03)	0.00 [l] (2.03)
Rabi, 2014 (32°C ± 2°C)	T_1 – 1 day old eggs	41.51 [c] (40.11)	35.57 [j] (36.61)
	T_2 – 2 days old eggs	24.32 [e] (29.55)	34.74 [jk] (36.11)
	T_3 – 3 days old eggs	13.56 [f] (21.61)	30.72 [k] (33.66)
	T_4 – Control (1-day old eggs)	0.00 [g] (2.03)	0.00 [l] (2.03)
CV%		8.24	9.01
C.D (0.05)			
Seasons		1.812	2.241
Treatments		2.562	3.169
Interaction		3.624	4.482

*Figures in parentheses are arcsine-transformed values.

In columns, means with similar alphabet do not vary significantly at P = 0.05 by LSD.

The mean value of parasitized eggs of *L. orbonalis* and the emergence rate of parasitoid, *T. pretiosum* in *Kharif*, 2013 (25°C ± 2°C) and *Rabi*, 2014 (32°C ± 2°C) are shown in the Table 1.

Parasitism efficiency

The statistical analysis clearly showed that the parasitization rate of *T. pretiosum* on one-day-old eggs of *L. orbonalis* was 91.99% during *Kharif*, 2013 (25°C ± 2°C) and 41.51% during *Rabi*, 2014 (32°C ± 2°C). When the two-days-old eggs were exposed to *T. pretiosum*, 75.15% and 24.32% of parasitization was observed in *Kharif* and *Rabi* respectively. The results show that parasitization rate of *T. pretiosum* was reduced with the age of eggs of *L. orbonalis* in both seasons.

The prevailing temperatures in the two seasons, *Kharif*, 2013 and *Rabi*, 2014 highly influenced the host selection ability of *T. pretiosum*. It was also observed that the mortality rate of the eggs of *L. orbonalis* were high during *Rabi*, 2014 especially at 32°C. Owing to physiological disorders found in the eggs of *L. orbonalis* at high temperature, the preference rate of *T. pretiosum* was low during *Rabi*, 2014. From these studies it can be concluded that the parasitism efficiency of *T. pretiosum* was high during *Kharif*, 2013 at 25°C than the *Rabi*, 2014.

In contrast the laboratory study conducted by Regiane et al. (2012) revealed that the egg parasitoid, *T. pretiosum* performed well in minimum (18°C) and maximum (32°C) temperatures that existed in Brazil and exhibited maximum parasitism efficiency against the eggs of lepidopteran pests, *Anticarsia gemmatalis* and *Pseudoplusia includens*. Thiago *et al.* (2012) too stated that the *T. pretiosum* actively searched the eggs of *Trichoplusia ni* in different temperatures (from 18 to 33°C) and therefore it can be used in bio-control programs where the extreme temperatures prevailed.

The studies on egg parasitoids of *L. orbonalis* revealed

that periodical release of *T. chilonis* effectively control the problem of *L. orbonalis* in brinjal cultivation with substantial increase of yield Satpathy *et al.*, (2005); Yadav (2005) and Sharma (2005). Sasikala *et al.* (1999) found that the egg parasitoid, *T. japonicum* had efficiency in controlling *L. orbonalis* and reduced the damaged fruits of brinjal.

Emergence rate of parasitoid, *Trichogramma pretiosium*

The Tables 1 shows that there are differences in emergence rate of *T. pretiosum* from the parasitized eggs of *L. orbonalis* in the both seasons, *Kharif*, 2013 and *Rabi*, 2014. The temperatures prevailed in these two seasons highly prejudiced the emergence rate of parasitoid.

However within the season there was no significant difference in the emergence rate of *T. pretiosum* when compared to those that emerged from one-day and two-days-old eggs of *L. orbonalis* and two-days and three-days-old eggs of *L. orbonalis*. Hence, comparatively the emergence rate *T. pretiosum* was more from the one-day-old eggs of *L. orbonalis* than the two-day and three-day old eggs.

CONCLUSIONS

The findings indicate that the parasitism efficiency of egg parasitoid, *T. pretiosum* against *L. orbonalis* was high during *Kharif*, 2013 at 25°C than the *Rabi*, 2014. However, it was noted that the egg parasitoid, *T. pretiosum* preferred one-day-old eggs of *L. orbonalis* for parasitism during both the seasons.

The study showed that the temperature that prevailed in *Kharif*, 2013 enhanced the emergence rate of *T. pretiosum* and on the other hand the temperature that existed in *Rabi*, 2014 suppressed the emergence rate of *T. pretiosum*.

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