

***Parachrysocharis javensis* Girault (Hymenoptera:Eulopidae) -
An effective egg parasitoid of sugarcane planthopper *Pyrilla
perpusilla* in the wet zone of Sri Lanka.**

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Abstract

Parachrysocharis javensis is an effective egg parasitoid of *Pyrilla perpusilla* in the west zone of Sri Lanka. This study was conducted through out a period of two years to determine the percentage parasitism of this parasitoid and factors affecting it. The percentage egg cluster parasitism was positively correlated with the number of egg clusters present in the field. It was also confirmed that percentage parasitism was negatively correlated with rainfall and humidity and positively correlated with daily minimum and maximum temperature.

Key Words : Parasitoid, Sugar cane planthopper

1. Introduction

Parachrysocharis javensis Girault previously known as *Tetrastichus pyrillae* Crawford has been recorded from India, Pakistan, Bangladesh and Sri Lanka. It is considered to be an important biological control agent of sugarcane planthopper *Pyrilla perpusilla* Walker (Mani, 1939; Mohyuddin *et.al.*, 1982; Rajendra, 1979 and Miah *et.al.*, 1986).

Gupta *et.al.*, (1971) pointed out that *Parachrysocharis javensis* is an effective parasitoid of *Pyrilla* spp. It is specific to the genus *Pyrilla* and its own population declines when the host population dwindles and increases with the increasing population of the host. The parasitoid is more susceptible to unfavorable weather conditions than *Pyrilla*. Furthermore, population density of this parasitoid in heavily infested field was higher than in fields with a low level of infestation.

In the present study an attempt was made to evaluate the impact of *P. javensis* on *P. perpusilla* populations.

2. Materials and Methods

This study was carried out in a 25x35m sugarcane plot located within the premises of the University of Kelaniya, Sri Lanka. This experimental plot was divided into four sub plots. Cuttings of variety Co 775 obtained from the Sugarcane Research Institute (SRI) in Sri Lanka, were planted 20 cm apart with 1m between rows. After sprouting the total number of plants in the plot was about 1100. Initially fertilizers were applied according to SRI recommendations but no insecticides, herbicides or fungicides were applied during the study period (July 1993-May 1995). The plants were watered daily during the dry period. All plants were systematically numbered.

Field counts of egg clusters were made at weekly intervals and each time the number of parasitized and unparasitized eggs in each cluster was recorded for about a quarter of the clusters (the eggs were counted using a hand lens after removing the wax with a fine camel hairbrush). Parasitized eggs were identified by their blackish colour as opposed to the white colour of the others. On each sampling day two randomly selected parasitized egg clusters were collected by clipping the leaves and the number of parasitized and unparasitized eggs in each cluster were recorded. Each cluster was then placed in a test tube plugged with cotton wool. The eggs were allowed to incubate at room temperature and number of parasites emerging from each cluster was recorded. The number of parasitized eggs from which parasites failed to emerge was also recorded.

Daily records were kept of maximum and minimum temperature, relative humidity and rainfall. The hypotheses that the abundance of the *P.javensis* is influenced by climate were tested using Pearson product moment correlation analysis.

3 Results and Discussion

Parachrysocharis javensis is a small brown coloured wasp approximately 1 mm in length. Many workers in India have recorded the abundance of this parasitoid and the degree of parasitism in the field. According to Appanna *et al.* (1954), the extent of parasitism ranges from 14.2% to 100%. Cheema (1942) has observed that *P.javensis* tends to live longer when they feed on honey-dew secreted by *P.perpusilla*.

The overall mean percentage of egg cluster parasitism by *P.javensis* in the present study was found to be $57.4\pm 6\%$ and the overall mean percentage parasitism of individual eggs was $46.91\pm 5.2\%$. Both the egg cluster parasitism and percentage parasitism of individual eggs were higher than their overall average values in the months of July, August, and

September 1993, March, April, September and December 1994 and February, March April 1995 (Fig. 1)

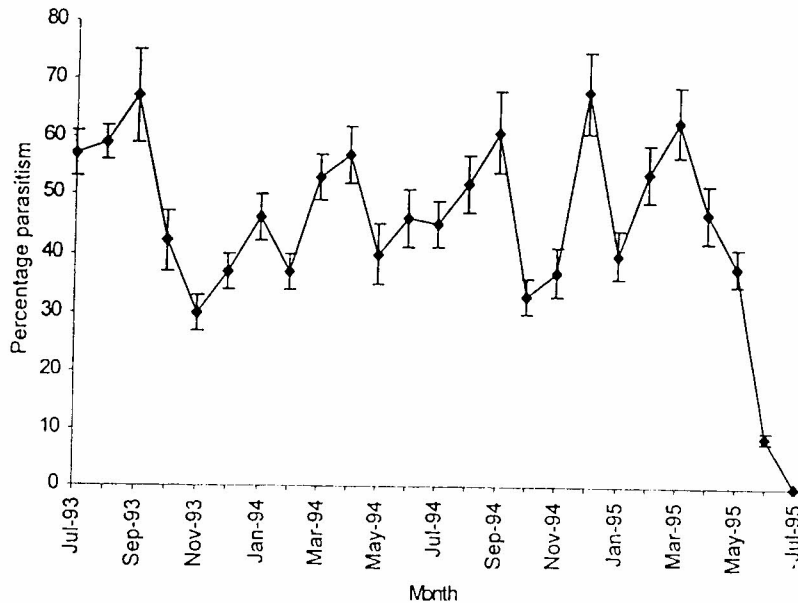


Figure 1. Monthly variation of percentage parasitism of eggs

Kumarasinghe and Ranasinghe (1988) have stated that *P. javensis* parasitism always stayed below 20% in the sugarcane growing areas of Sevanagala. This is probably due to the practice of burning the trash after harvesting which probably destroys part of the parasitoid population.

The percentage egg cluster parasitism was positively correlated with the number of egg clusters present in the field ($r=0.965$; $p<0.001$) (Fig. 2). This indicates that increase in the number of egg clusters increased the chances of the parasitoids finding eggs, which eventually resulted in an increase in their population.

Furthermore it was also observed during the present study that frequently all the eggs in an egg cluster were parasitized when number of eggs in a cluster was low. The mean number of eggs in a cluster and the mean number of parasitized eggs in a cluster are presented in figures 3. When egg clusters are scarce and the gravid parasitoids are unable to locate egg clusters of the host they probably resorb their own eggs as happens with many parasitic species.

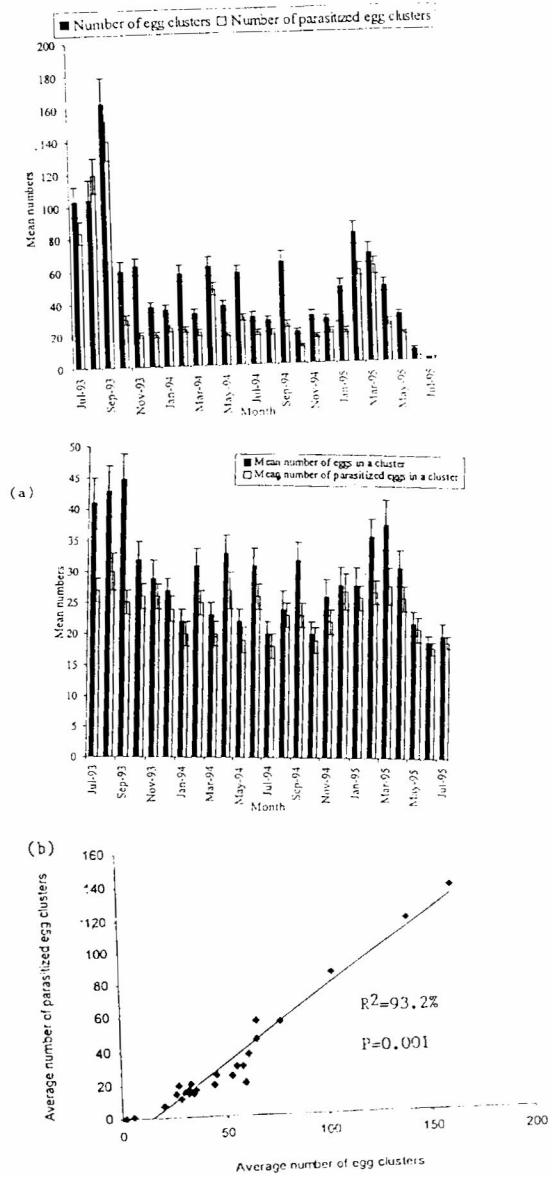


Fig.2 (a) Relationship between the mean number of egg clusters/sampling occasion/month and the mean percentage parasitized egg cluster/sampling occasion per month
 (b) Correlation between mean number of egg clusters/sampling occasion/month and mean percentage parasitism/sampling occasion/month

Fig 3 Relationship between the mean number of eggs in a cluster/sampling occasion/month and mean number of parasitized eggs/sampling occasion/month

The maximum number of parasitized eggs in a cluster was 52 out of a total of 52 eggs in a cluster and the minimum number was 03 out of a total of 17. However, it is uncertain if all the 52 host eggs were parasitised by the same parasitoid. The minimum number of parasitized eggs recorded during the entire study period was 3 out of total of 17 in cluster. Although the minimum number of parasitized eggs in a cluster was 3, it is unlikely that this figure represents the minimum fecundity of parasitoid female. It is more probable that a female having discharged the bulk of its eggs in another cluster laid the remaining eggs of the full complement in a second cluster and hence the low figures.

Percentage emergence of parasitoids from parasitized eggs varied from 60% to 100% with an average of $85.33 \pm 14.64\%$. This is comparable to the figures given by Chaudhary and Sharma (1983) (viz. 77% to 96%) from his studies on percentage emergence of *P.javensis* from eggs of *P.perpusilla*.

Narayan and Kundanlal (1953) had observed that emergence of adult parasitoids did not occur when the ambient temperature and RH were 10° C and 80% respectively. However, at 25° C and at the same RH minimum and maximum percentage emergence of *P.javensis* were 98% and 100% respectively with a mean of 99.60%. However, since an ambient temperature as low as 10°C does not occur at Kelaniya, the low temperature factor was not relevant to parasite emergence in the present study.

The percentage parasitism by *P. javensis* showed a negative correlation with the extent of rainfall and percentage relative humidity (Table 1). High rainfall had a detrimental effect on *P. perpusilla* populations. However, the negative correlation with humidity may be coincidental, since high rainfall was always accompanied by high humidity.

Table 1. The percentage parasitism with/respect to weather conditions

Parameter	% Parasitism
Rainfall	-0.49 (p<0.01)
Humidity	-0.62 (p<0.05)
Minimum temperature	0.42 (p<0.01)
Maximum temperature	0.42 (p<0.01)

Heavy rainfall during the months of Oct.-1993-Feb. 1994, May 1994, Aug 1994, Oct. 1994-Nov. and Jan. 1995 accounts for the decline in the population of *P. perpusilla* during these months. The decline in *P. perpusilla* population during those months is reflected in lowered oviposition which in turn affects the parasitoid populations.

The temperature fluctuations at Kelaniya during the entire period of study remained within 20°C to 32°C. It was observed that percentage peak percentage parasitism occurred in months where the mean minimum temperature was higher than 25°C; percentage parasitism was positively correlated with the daily minimum and maximum temperatures. It may be assumed that when the temperature increases the metabolic rate of *P. javensis* also increases resulting in a corresponding increase in its rate of oviposition. This means that during a given time span the number of eggs laid increased with increasing minimum and maximum temperatures within the range of 20°C and 32°C.

4. Acknowledgement

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