

Relative Composition of Egg Parasitoids of Rice Yellow Stem Borer, *Scirpophaga incertulas* (Walker)

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Abstract

Studies on the extent of parasitization of yellow stem borer (YSB), *Scirpophaga incertulas* (Wlk.) egg masses for four consecutive years (2009-2012) was assessed in insecticide free paddy field at Rajendranagar, Hyderabad, Andhra Pradesh. The hymenopteran parasitoids, *Telenomus dignus* (Gahan), (Scelionidae), *Tetrastichus schoenobii* Ferriere (Eulophidae) and *Trichogramma japonicum* Ashmead (Trichogrammatidae) were the three important YSB egg parasitoids recorded from this area which played a pivotal role in population regulation of YSB. The peak parasitization ranging from 75.29 to 97.56% was observed during *kharif*, particularly in October. The parasitization during *rabi* varied from 42.60% to 69.79%. In *kharif*, parasitization by *Trichogramma* was more prevalent during September, while that of *Telenomus* and *Tetrastichus* was more during October.

Keywords: *Scirpophaga incertulas*, egg parasitoids, egg parasitization, *Trichogramma*, *Telenomus*, *Tetrastichus*

Rice is one of the most important food crops, with its production crossing 100 million tonnes in 2011-12, accounting for 22.81 per cent of global production. In Andhra Pradesh, rice is cultivated in about 38 lakh hectares with a production of 72.12 lakh metric tonnes and productivity of 2900 kg/ha. Among the various insect pests of rice inflicting yield loss, yellow stem borer, *Scirpophaga incertulas* (Walker) is considered one of the major insect pest of rice, having a potential to cause yield losses ranging from 3%-95% in India (Ghose *et al.*, 1960) while Prasad *et al.* (2007) reported yield losses ranging from 38%-50%. In terms of grain production loss over ecosystems, 1% dead heart, or white ear head, or both phases of stem borer damage would be 108 kg/ha, 174 kg/ha and 278 kg/ha, respectively (Muralidharan and Pasalu, 2006).

Host plant resistance to yellow stem borer is ambiguous. The most

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commonly used method of control is insecticides, but less effective due to the concealed habit of the larvae. Biological control offers an eco-friendly option for management of this pest. Several workers have reported on egg parasitisation of YSB from different parts of the country. Chandramohan and Chellaiah (1984) identified several parasites of *S. incertulas* from Coimbatore. Hikim (1988) reported that parasitoid activity showed periodical fluctuation coinciding with emergence of YSB moths. Chakraborty (2012) recorded egg parasitoids of YSB from West Bengal. The present study was contemplated to document the extent of parasitism by egg parasitoids against rice yellow stem borer at Rajendranagar, Hyderabad.

Materials and Methods

Field study was conducted at the Rice Section of Agricultural Research Institute, Rajendranagar, Hyderabad, during four consecutive crop years (2009-2012) with variety Sumati during *kharif* and var. Tellahamsa during *rabi*. The observation plot (1000 m²) was kept pesticide free and the planting time was adjusted to facilitate incidence of rice yellow stem borer and its natural enemies. The entire plot was divided into 4 blocks of equal size, demarcated with bunds and channels. The stem borer egg masses were collected from

these unsprayed blocks twice or thrice in a crop season depending upon the availability of egg masses. A minimum of 8-10 egg masses were collected from each block accounting for 30-40 egg masses per observation date.

The collected egg masses were placed individually in separate plastic vials (15 cm long and 2.5 cm wide) and observed periodically for emergence of adult parasitoids. After the emergence, the adult parasitoids were observed under a stereo-zoom microscope (Magnus MSZ with a zoom ratio of 1:7), to identify the respective species and number.

The per cent egg parasitism was computed based on number of live larvae and parasitoid emergence. The species identification of egg parasitoids was done at Directorate of Rice Research, Rajendranagar, Hyderabad.

Results and Discussion

The egg parasitoids of the yellow stem borer, *S. incertulas* prevalent in Rajendranagar were identified as the hymenopterans *Trichogramma japonicum* (Ashm.) (Trichogrammatidae), *Telenomus dignus* (Gahan) (Scelionidae) and *Tetrastichus schoenobii* (Ferr.) (Eulophidae). Perusal of *kharif* 2009 data (Table 1) revealed that 24 per cent of the eggs were parasitized during 2nd week of

October, while maximum parasitization was observed during October 1st (75.29) and 3rd weeks (82.23%). Lakshmi *et al.* (2010) reported 95 per cent egg mass parasitization. The composition of *Tetrastichus*, *Telenomus* and *Trichogramma* was 43.13 per cent, 25.90 per cent and 6.26 per cent, respectively during 1st week of October, 6.74, 6.99 and 10.30 per cent during October 2nd week and 35.88, 39.77 and 6.38%, during October 3rd week. Chakraborty (2012) reported parasitization by *Trichogramma sp.*, *Telenomus spp.*, and *Tetrastichus spp.* to be 6.12 per cent, 9.53 per cent and 48.44 per cent, respectively.

During *kharif* 2010, total parasitization increased gradually from September 1st week to October 4th week ranging from 39.34% to 97.56%, except during fourth week of September where in only 33.33% eggs were parasitized (Table 1). *Trichogramma* was the predominant egg parasitoid during September, while it was overtaken by *Tetrastichus schoenobii* and *Telenomus dignus* during October 4th week.

Lakshmi *et al.* (2010) reported that *T. schoenobii* was prevalent from September to November and *Trichogramma* and *Telenomus* from September to October, but the activity of egg parasitoids decreased during November. Similar

observations were made in the present study. During *kharif* 2011, the egg mass parasitization of *Tetrastichus*, *Telenomus* and *Trichogramma* was 20.8 per cent, 28.0 per cent and 13.2 per cent during October 1st week and 42.5, 6.2 and 22.0 during 2nd week, respectively. The parasitization was relatively low during *kharif* 2012 with 37.96 per cent, 68.97 per cent and 29.45 per cent parasitization, respectively during 3rd week of September, 3rd week of October and 1st week of November. Similarly during *kharif* 2012 *Trichogramma* was the predominant egg parasitoid during September, while *Telenomus* and *Tetrastichus* have become dominant during October.

The total parasitization during *rabi* 2009-10 varied from 51.78% during 4th week of March to 42.60% in 3rd week of April (Table 2). During *rabi* 2009-10 *Telenomus* was the predominant egg parasitoid followed by *Trichogramma* and meager incidence of *Tetrastichus* was noticed.

During *rabi* 2010-11 maximum parasitization (69.79%) was recorded during April 3rd week with *Trichogramma* being the predominant egg parasitoid. Contrastingly, *Tetrastichus* parasitization was more during April 3rd and 4th weeks, while *Telenomus* parasitization was negligible during *rabi* 2010-11. Gupta *et*

al. (1985) reported egg parasitization of 30.6% and 23.7% respectively during *kharif* and *rabi* by *T. schoenobii* while in the present study the parasitization by *T. schoenobii* ranged from 2.19% to 48.61% during *kharif* and 4.35% to 19.14% during *rabi*.

Even though all the three egg parasitoids were observed, *Trichogramma* was more predominant during September, while the other two egg parasitoids viz., *Telenomus* and *Tetrastichus* dominated during October. At Navsari, Gujarat, *T. dignus* and *T. schoenobii* were most abundant parasitoids of YSB eggs (Pandya *et al.*, 1995) and *T. schoenobii* was reported to be second important parasitoid during winter (Hikim, 1988). Senapati *et al.* (1999) reported that the extent of parasitism in different parts of India ranges from 4.0% to 97.2%.

Further, it was observed that there was larval survival in egg masses parasitized by *Trichogramma* but very rarely live larvae were recorded from egg masses parasitized by *Telenomus* and *Tetrastichus*. The extent of parasitization was more during *kharif* than during *rabi*. It was observed that mostly the egg masses were parasitized either by single or two parasitoid species. Occasionally all the three parasitoid species were observed in a

single egg mass. Chakraborty (2012) also reported parasitization of YSB egg mass by more than one species viz., *Trichogramma spp* + *Telenomus spp* (3.46%), *Telenomus* + *Tetrastichus* (21.06%) and *Trichogramma* + *Tetrastichus* (2.35%).

The study on composition of egg parasitoids of rice yellow stem borer, *S. incertulas* revealed that *Trichogramma japonicum*, *Telenomus dignus* and *Tetrastichus schoenobii* are predominant egg parasitoids of this region. Considerable variations in egg parasitoid composition were observed across the seasons and in different months within the season. Looking at the predominance of egg parasitoids in *kharif* than in *rabi* there is a greater scope of conserving these parasitoids and augmenting with *Trichogramma* releases, particularly during September and October months, so that the surviving larval population after natural parasitization can be taken care of at the egg stage, through inundation, whereby pesticide usage can be minimized. During *rabi* natural parasitization is relatively low necessitating more inundative releases for effective management of yellow stem borer.

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Table 1: Relative composition of egg parasitoids of rice yellow stem borer in *kharif* season at Rajendranagar

Year	<i>Trichogramma japonicum</i>	<i>Telenomus dignus</i>	<i>Tetrastichus schoenobii</i>	Total **
2009	% Egg Parasitization*			
October (1 st week)	6.26	25.90	43.13	75.29
October (2 nd week)	10.30	6.99	6.74	24.00
October (3 rd week)	6.38	39.97	35.88	82.23
2010				
September (1 st week)	39.34	0.00	0.00	39.34
September (2 nd week)	28.70	14.29	0.00	42.99
September (3 rd week)	39.40	10.34	6.90	56.64
September (4 th week)	16.68	14.46	2.19	33.33
October (4 th week)	7.54	41.41	48.61	97.56
2011				
October (1 st week)	13.20	28.00	20.8	54.00
October (2 nd week)	22.00	6.20	42.5	70.70
2012				
September (3 rd week)	24.52	13.44	0.00	37.96
October (3 rd week)	11.86	35.91	21.20	68.97
November (1 st week)	15.34	11.17	2.94	29.45

* Each value is a mean of 30 to 40 egg masses

** The total indicates the extent of parasitization observed in the specified week

Table 2: Relative composition of egg parasitoids of rice yellow stem borer in *rabi* season at Rajendranagar

Year	<i>Trichogramma japonicum</i>	<i>Telenomus dignus</i>	<i>Tetrastichus schoenobii</i>	Total**
2009-10	% Egg Parasitization*			
March (4 th week)	19.74	26.33	5.71	51.78
April (3 rd week)	8.57	34.03	0.00	42.60
2010-11				
April (1 st week)	34.10	8.70	4.35	47.15
April (2 nd week)	52.40	0.31	17.38	69.79
April (4 th week)	32.20	0.57	19.14	51.96

* Each value is a mean of 30 to 40 egg masses

** The total indicates the extent of parasitization observed in the specified week