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Natural Enemies of Rice Yellow Stemborer, *Scirpophaga incertulas* (W.) and its Relationship with Weather Elements

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ABSTRACT

Egg parasitoids were more predominant than those attacking other developmental stages of yellow stemborer *Scirpophaga incertulas* (W). Activity of *Tetrastichus schoenobii* was negatively influenced by maximum temperature and wind velocity. Weather elements had little influence on the activity of *Telenomus*.

Key Words : Yellow stemborer, *Tetrastichus, Telenomus*

Among the different insects associated with rice, the yellow stemborer, *Scirpophaga incertulas* (Walker) is one of the most destructive and widely distributed from tropics to temperate regions (Torii,1967). Many workers reported the population regulation of yellow stemborer at high density level by the action of egg parasitoids rather than weather factors (Pathak,1968; Nishida and Wongsiri,1974; Subba Rao *et al.,* 1983). The natural enemies of yellow stemborer and the influence of weather factors and host density on the abundance of egg parasitoids are discussed in this paper.

MATERIALS AND METHODS

The parasitoid complex of yellow stemborer occurring in Paddy Breeding Station, Tamil Nadu G.D.Naidu Agricultural University was studied from 1988-89. For recording the percentage of egg parasitism and the type of parasitoids, twenty unhatched egg masses were collected every week from unprotected fields and confined individually in a 7.5x2.4cm glass tube capped with cotton plug. The egg parasitism was calculated based on the emergence of larvae or adult parasitoids.

For recording the larval and pupal parasitoids, fifty plants with dead heart/white earhead symptoms were uprooted every week from the unprotected fields. Twenty larvae and pupae collected from the damaged stems were reared individually in stem cuttings kept in a 15x2.4cm glass tube filled with a thin film of water at the bottom. The per cent parasitism was worked out based on the emergence of adult parasitoids.

Multiple regression analysis was made to understand the influence of seven weather elements on the parasitic activity of *Tetrastichus schoenobii* (F.) and *Telenomus rowani* (G). As the mean immature life stages of the egg parasitoids was seven days, weather elements of the previous week were compared with egg parasitism of the prevailing week. The density of the egg mass was assessed in three one square metre area at fortnightly interval. Weekly parasitism for the corresponding period was determined as detailed elsewhere.

RESULTS AND DISCUSSION

A total of eight different species were observed, four affecting the egg stage and the rest on the larval stage (Table 1). Among the natural enemy complex, egg parasitoids were the most predominant. Earlier investigations have also shown that parasitism in stemborer was higher in the eggs than in other development stages (Rao, 1972; Yunus and Rothschild, 1967; Israel and Padmanabhan, 1978). Among the egg parasitoids, *T.schoenobii* was the predominant one and parasitism by this was as high as 46.63 per cent in February (Figure 1) and parasitism did not occur in the months of August and September. Parasitism by *T.*

Table 1. Egg and larval parasitoids of *S. incertulas* recorded at the Paddy Breeding Station, Tamil Nadu G.D.Naidu Agricultural University, Coimbatore.

Parasitoid	Family	Host stage	Mean % parasitism	Period of activity
Tetrastichus schoenobii Ferriere	Eulophidae	Egg	46.63	September - March
Telenomus rowani Gahan	Scelionidae	Egg	19.32	October
Telenomus sp.	Scelionidae	Egg	1.00	January - February
Scelio sp.	Scelionidae	Egg	1.00	January - February
Apanteles schoenobii Wilkenson	Braconidae	Larva	10.26	January - February
Rhaconotus sp.	Braconidae	Larva	1.72	January - February
Topobracon schoenobii Viereck	Braconidae	Larva	2.86	January - February
Amauromorpha accepta metathoracica Ash	Ichneumonidae	Larva	1.00	September

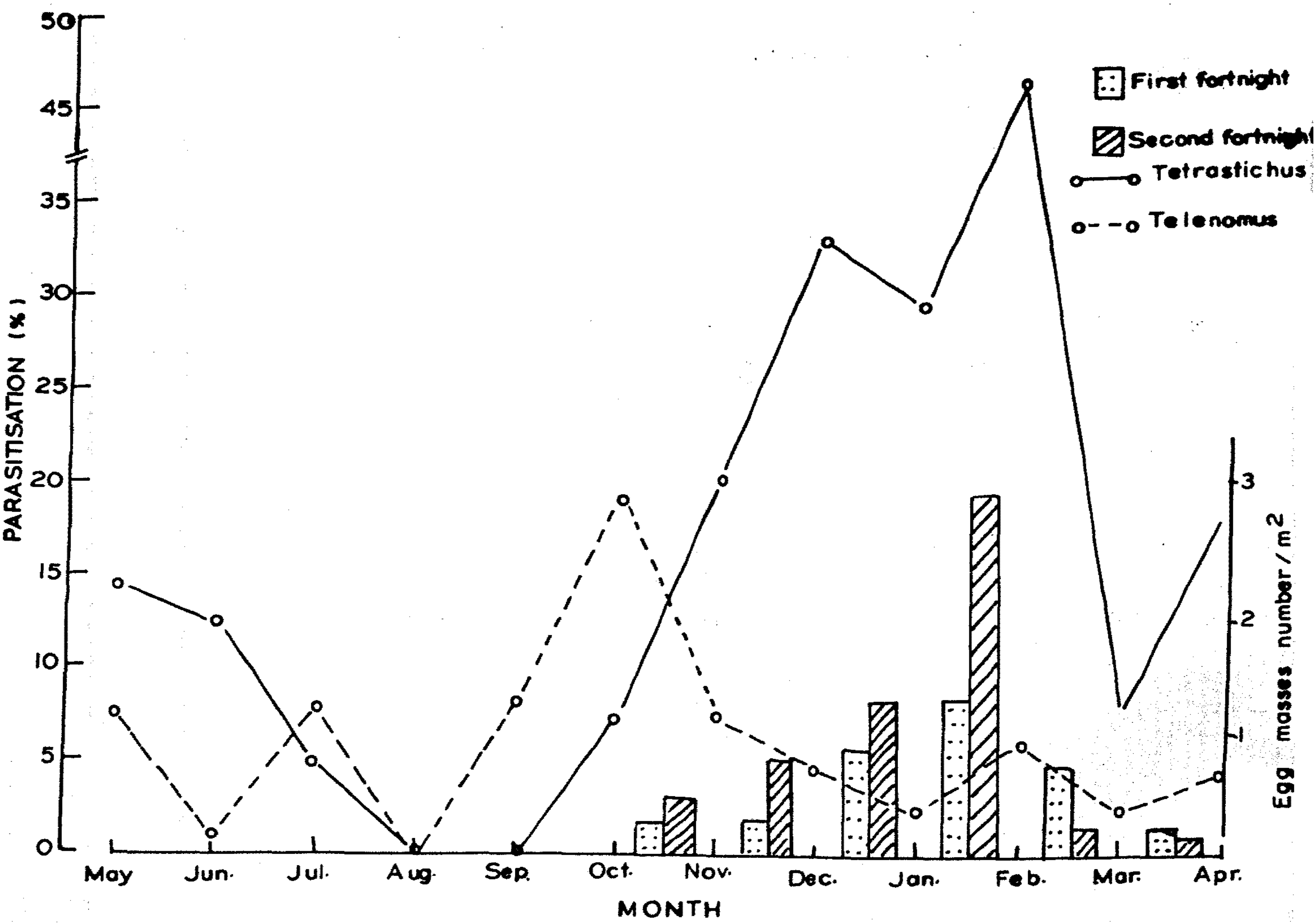

Fig. 1. Parasitisation by *Tetrastichus schoenobii* and *Telenomus rowani* on eggs of *S. incertulas*

Table 2. Multiple regression analysis of egg parasitism by *Tetrastichus* and *Telenomus* with weather elements (n=70)

Variables	*Tetrastichus*			*Telenomus*		
	Partial regression coefficient (b)	Standard error (SE_b)	t	Partial regression coefficient (b)	Standard error (SE_b)	t
X_1(Rainfall - mm)	-0.1405	0.1232	-1.1313	0.0107	0.0461	0.0366
X_2(Maximum temperature °C	-8.7089	2.1621	-4.0287**	0.0004	0.8023	-0.0001
X_3(Minimum temperature °C	2.0632	1.9932	1.0350	-0.2501	0.7396	-0.0831
X_4(% Relative morning Humidity °C	-0.1974	0.7056	-0.2798	-0.1747	0.2618	-0.1450
X_5(% Relative evening Humidity °C	-0.4424	0.4851	-0.9118	-0.0598	0.1800	-0.1312
X_6(Sunshine hours)	4.8974	2.5384	1.9293	1.2874	0.9419	-0.4570
X_7(Wind velocity Km/hr)	-1.8107	0.8936	-2.0262*	-0.4883	0.3316	-0.2951

Constant term R^2 = 0.5865 A = 268.9435 (*Tetrastichus*); Constant term R^2 = 0.0999 A = 41.8402 (*Telenomus*)

* Significant (P=0.05) **Significant (P=0.01)

rowani, on stemborer egg was seen in all the months. The level of parasitism by *Telenomus* was higher in the month of october with 19.32 per cent parasitism.

In the present investigation, peak activity of *Tetrastichus* was seen between October to January months. The egg mass density in the above periods ranged from 0.5 to 3 per square meter with a slow increase in egg mass number from October to January months followed by decline in subsequent periods (Figure 1). In other periods, the egg mas was less than 0.01/square meter. The higher egg parasitism of 46.63 per cent was recorded following the higher egg population in the second fortnight of January. Increased level of *Tetrastichus* parasitism with corresponding increase in host density was earlier reported by many workers (Rao,1929; Nickel,1964; Catling *et al.*, 1983). Among the larval parasitoids, *Apanteles schoenobii* (W) registered 10.26 per cent parasitism during January-February months. The larval parasitism by other species was of low order and it ranged from 1 to 2.86 per cent only.

Studies on the relationship between the activity of *Tetrastichus* and weather elements revealed a significant negative association with maximum temperature and wind velocity (Table 2). For every percentage increase in maximum temperature and wind velocity, there was a decrease of 8.71 and 1.81 percentage of parasitism respectively. The most favourable temperature for the development of *Tetrasichus* was observed to be between 20- 30°C (Chao *et al.*, 1979). In the present place of investigation, a temperature of 20-30°C used to prevail during December-January months with increase in temperature in succeding months. Increase in temperature during summer months might have impaired the parasitic activity resulting in negative association with maximum temperature. High wind interupts the flight activity of stemborer and egg parasitoid (Banerjee and Pramanik,1967). The negative association of *Tetrastichus* parasitism with wind velocity was attributed to interuption of dispersal of pest and parasitoid.

Unlike *Tetrastichus*, none of the weather elements influenced the activity of *Telenomus*. Parasitic activity was also seen round the year. *Telenomus* has better searching ability (Catling *et al.*, 1983) and phoretic behaviour (Fernando, 1967) and can tolerate extremes of temperature with extended activity even at low host density

(Rao,1929). These three factors aided *Telenomus* to perpetuate at all periods and therefore weather elements exerted little role on the activity of *Telenomus.*

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