Journal of Crop and Weed 6(2)74-77: (2010)

Determination of ETL of yellow stem borer (*Scirpophaga incertulus*) by egg mass estimation in relation to seasonal variations

K. CHAKRABORTY AND J.GHOSH[1]

Department of Zoology, Alipurduar College, Alipurduar, Jalpaiguri.
[1]Department of Agricultural Entomology,
Uttar Banga Krishi Viswavidhyalaya, Pundabari, Cooch Behar.

Key words : Climatic variations, ETL, YSB eggs.

Initiation of infestation by YSB is manifested with the appearance of the first batch of YSB adult in early February when the paddy plant is at seedling stage .Overlapping multiple generations increase the magnitude of the damage more in the *kharif* season than in *boro* season. Absence of the region-specific pest monitoring strategy compels the farmers to rely upon the 'National protocol' which suggests the periodic paddy growth stage specific surveillance of the YSB egg masses to check the subsequent pest outbreak by the adoption of proper pest controlling strategy. A notified limit of 1 egg mass and 2 egg mass respectively at seedling and vegetative stages has been standardized as the ETL determination unit (Directorate of Rice Research, Rajendranagar, Hyderabad).Fields cross the limit Such ETL value disregards the season and types of cultivation, heterogeneity of the paddy variety cultivated. Such over reliance upon the quantitative value of the YSB egg masses alone often give erroneous result for the subsequent pest intensity which is more guided by the hatchability of the eggs rather than by the total quantity of the eggs. Present study contemplates the qualitative assessment on the seasonal viability of the eggs for the crop year 2006-2007 and accordingly the correlation was drawn between the climatic parameters and the viable egg masses in the field of Swarna mashuri (MTU 7029) at Raiganj, Uttar Dinajpur,West Bengal.

Field experiment was conducted on five different plots (200 m x 200m) in three seasons (*Aus, Aman* and *Boro*) at Raiganj, Uttar Dinajpur during 2006-07. The paddy (Variety-MTU 7029) was cultivated by standard cultivation technique having a fertilizer dose of 60:30:30 kg N:P:K/ha.

Study on YSB's egg mass

Fields were examined fortnightly interval from the early vegetative stage to the maturation stage of paddy variety Swarna mashuri (MTU 7029) .Twenty five hills were randomly inspected from each 200 m x 200 m crop areas for YSB egg masses. The plant parts bearing egg masses were cut off and the percentage of hatchability was calculated.

Study on YSB's parasitized eggs

Four freshly cut leaves bearing egg masses were collected at different growth stages from the paddy field at 15 days interval from vegetative to maturation phase and put inside a plastic vial which was plugged with wet tissue paper. The vials were kept with open end down in a jar/basin having 5 mm standing water for continuous wetting. A total of 64 leaves were collected from each of the three paddy fields (200x 200mt) and kept in 16 vials, each with 4 leaves, arranged in test tube racks , allowing necessary time for parasite emergence. The average percentage of parasitic emergence was put graphically after conducting the experiment in 5 replications.

Species composition

Seven parasites were recorded from both the infected eggs and larval stages of YSB. But their relative abundance and effectivity depended on the prevailing agro climatic situation and stages of the life cycle of the host occurring in the field. The species of the parasites recorded are given below:

Family	Species	Stage of life cycle attacked
Eulophidae	**Tetrastichus* sp.	Eggs
Braconidae	**Stenobracon* sp.	Eggs
	Apanteles sp.	Larva and pupa
	Chelonus sp.	Larva and pupa
Scelionidae	**Telenomus* sp.	Eggs
Ichneumonidae	**Temalucha* sp.	Larva and pupa
	Isotima sp.	Larva

* Most abundant and active parasite

Email:jaydebubkv@yahoo.com
Short communication

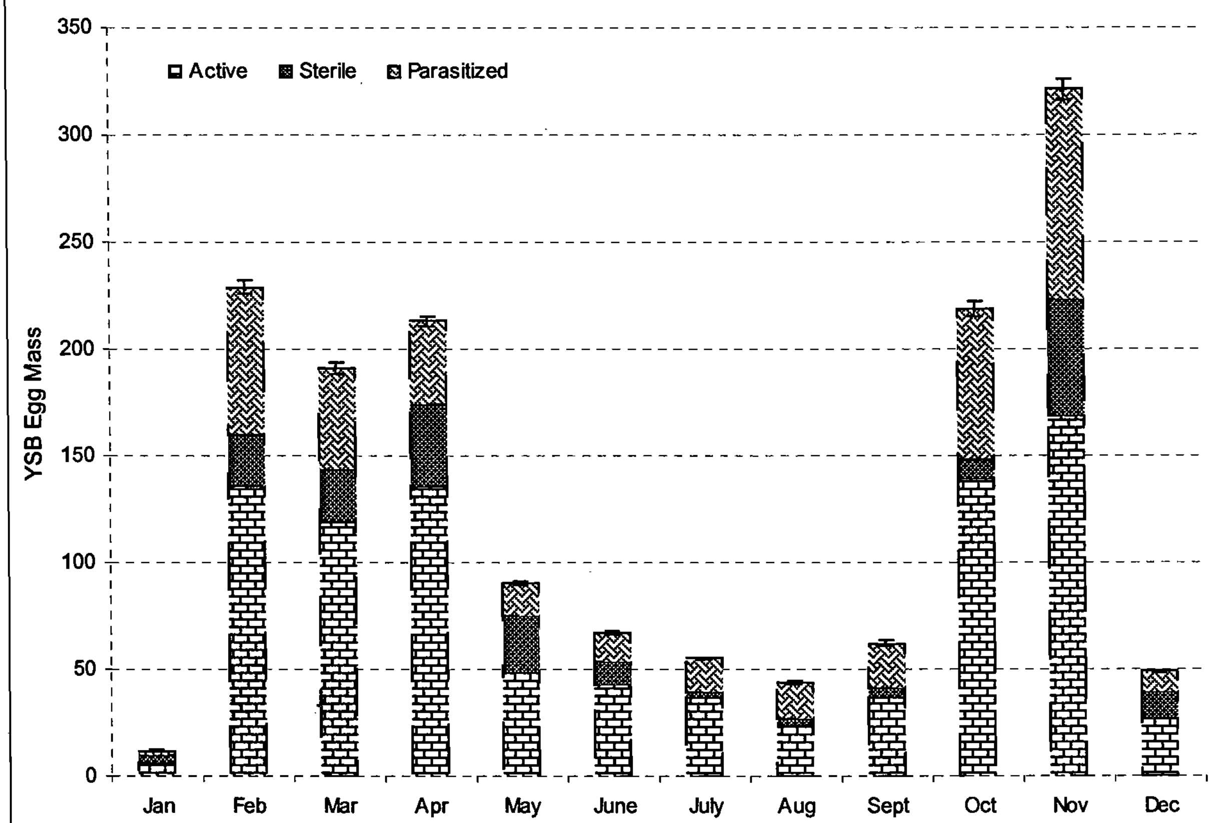

Fig.1 Nature of YSB eggs in different months

Seasonality of the egg laying by YSB

Available egg masses of YSB befitted the field adult incidence. The rate of parasitization and inactivation was found to be density dependent and accordingly varied in different seasons. Higher the availability of egg masses the greater was the rate of parasitization.

Collected egg masses broadly represent two categories, active and inactive(sterile + parasitized). Eggs were inactivated either by parasitization or by season induced sterilization. The active egg masses hence influence the subsequent pest intensity. Available egg masses and the quantum of their viability also differ in different seasons. The highest number of egg masses was obtained in the month of November followed in descending order by February, October, April and March. The number of egg masses was nearly the same in August and December. The frequency of inactive eggs was season specific. Maximum number (%) of inactive egg masses were found in the month of January (50.1%) followed in descending order by May (46.6%), August (45.45%), December (44.89%), September (40.32%) and July (32.70%) respectively. The percentage of sterile eggs was the highest in the month of January (33.3%) followed by May (30.1%), December (24.48%), April (17.8%), June (16.41%) and February (10.48%). Low temperature in the months of December and January promoted the sterility while high temperature in April and June reduced sterility. In general least number of active eggs was noted in January and the highest in November.

Correlation study between YSB egg masses and climatic parameters :

In relation to maximum temperature (Tmax)

Tmax was found to impart a significantly positive effect on the number of available eggs during the months from February to the first fortnight of May and again, during October and November (Table 1)

In relation to minimum temperature(Tmin)

Significantly positive relations between Tmin and the number of egg masses were restricted to the months of February, second fortnight of March ,April , May and July and the entire months of October and November.

In relation to maximum relative humidity (RHmax)

Egg masses showed positive and negative relation with the RHmax. Significant positive relation was restricted to the second fortnight of June, August and the entire months of October and November.

Second half of March only showed significant negative relation with the field egg mass status.

In relation to minimum relative humidity (RHmin)

Except a few weeks of insignificant negative relation, overall impact of RHmin was positive. Significant positive relation was noted only in November.

In relation to rainfall (Rainfall)

Throughout the year rainfall exerted negative effect on the available egg masses. Significant negative relation was noticed during second fortnight of April, entire June, July and August and first fortnight of September.

In relation to sunshine hour (Shr)

Sunshine hour exerted positive effect on the available field egg masses. Significant positive relation was observed during February, March, April, October and November and first fortnight of May, July and December and second fortnight of January.

Table 1. Correlation coefficient between meteorological parameters and active egg masses of YSB.

Months	Fortnight	Pattern of correlation between the egg mass and the climatic factors.					
		Temperature(°c)		Relative humidity(%)		Rainfall (mm)	Sunshine (hours/day)
		Max.	Min.	Max.	Min.		
Jan.	A	0.123	0.214	0.082	0.112	0.097	0.345
	B	0.233	0.277	0.034	-0.119	-0.112	0.511*
Feb.	A	0.512*	0.566*	0.312	0.453	-0.202	0.521*
	B	0.765*	0.634*	0.456	0.224	-0.131	0.611*
March	A	0.531*	0.411	0.342	0.113	-0.311	0.523*
	B	0.511*	0.602*	-0.514*	0.443	-0.456	0.567*
April	A	0.877*	0.497	0.451	0.236	-0.500*	0.778*
	B	0.671*	0.777*	0.322	-0.564	-0.234	0.678*
May	A	0.532*	0.426	0.411	-0.224	-0.455	0.511*
	B	0.456	0.567*	0.321	-0.445	-0.612*	0.345
June	A	0.453	0.134	-0.135	0.342	-0.512*	0.336
	B	0.467	0.345	0.541*	0.113	-0.649*	0.411
July	A	0.421	0.231	0.254	0.432	-0.911*	0.502*
	B	0.411	0.512*	0.356	0.312	-0.561*	0.311
Aug.	A	0.199	0.322	-0.112	0.442	-0.788*	0.344
	B	0.187	0.145	0.542*	-0.211	-0.677*	0.207
Sept.	A	0.265	0.321	0.421	-0.332	-0.532*	0.399
	B	0.455	0.411	0.345	0.321	-0.311	0.566*
Oct.	A	0.767*	0.621*	0.611*	0.453	-0.211	0.789*
	B	0.788*	0.881*	0.678*	0.343	-0.132	0.711*
Nov.	A	0.878*	0.722*	0.557*	0.546*	-0.098	0.854*
	B	0.911*	0.767*	0.532*	0.661*	0.012	0.876*
Dec.	A	0.254	0.231	0.321	0.034	0.059	0.536*
	B	0.121	0.110	0.032	0.336	0.067	0.112

*A-First fort night, **B**-Second fort night, * Significant at 5% level of significance*

No works were previously documented describing the relative viability of the YSB egg parasites in case of paddy. The YSB population may be assessed in two ways, prophylactic by ready assessment of the available field YSB egg masses from the very beginning of the seed bed to the end of the tillering stage or collective pool analysis by the installation of the light trap. Prasad *et al.* (2003) determined the ETL value for YSB disregarded the growth stages of paddy and found that for 5-10% dead hearts, 1 egg mass per mt^2or 1 adult moth per mt^2 was sufficient .The prevailing practice of estimation of the extent of damage by counting the number of dead heart and white head is not appropriate for adopting control measure as the damage has already been inflicted. So, in consideration of all the procedures described, the best result is served by the egg mass estimation. Matteson *et al.* (1994) trusted more on the visible symptoms of white head and dead heart rather than the availability of the egg masses. Dhaliwal *et al.* (1996) considered only fixed range of egg masses as the indicator for a particular growth stage of paddy. He did not pay attention to the seasonal quantitative variation of the egg mass. Obviously, in most of the cases such egg mass assessment proved erroneous and false for the subsequent outbreaks. Such single criterion based determination of ETL disregards the heterogeneity of the land condition, variety of the cultivar and the mode of cultivating practices. Ooi *et al.*(1994) pointed out the role of parasitization of YSB eggs, but very little inference was drawn regarding their relative importance on the field pest structure.

Generally the climatic parameters differed considerably from place to place. Further during such assessment more focus was given on the quantitative availability of the egg masses rather than their qualitative variations. But the following pest attacks can not be roughly foreseen of such ETL values. Viability of the egg masses are season specific. So it is not the total number of the eggs laid but actually the number of active eggs which govern the pest dynamics. The proportion of the active eggs relative to the laid numbers varied from season to season. In such condition we have studied the variability of the YSB eggs in relation to the seasonality of occurrence. The Fig.1 shows that the available egg masses were increased in the month November but actually half of the eggs were not viable. Although in the month of March the poor egg masses are available but greater portion of them are active. It is thus judicious to formulate a season and location specific ETL depending on the viability of the active eggs.

REFERENCE

Atwal A S. 1986. *Agricultural Pests of India and South East Asia*, 2nd Ed. Kalyani Publisher, New Delhi,.

Banerjee, S. N. and Pramanik, L. M. 1967. The lepidopterous stem borers of rice and their life cycle in the tropics. In *The Major Insect of Rice Plant.* John Hopkins Press, Baltimore. p 103-25.

Chelliah, S; Bentur, J. S. and Prakasa Rao, P. S. 1989. Approaches in rice pest management – achievements and opportunities. *Oryza,* **26**:12-26.

Das, N. M., Mammen, K. V. and Christudas, S. P. 1972. Occurrence of *Nilaparvata Iugens* (Stal.) (Delphacidae : Nomoptera) as a serious pest of paddy. *Kerala. Agri. Res. J. Kerala,* **10:** 191-92.

Dhaliwal, G. S. and Arora, R. 1996. An estimate of yield losses due to insect pests in Indian agriculture. *Indian. J. Ecol.*, **23**: 70-73.

Matteson, P. C. 2000. Insect pest management in Tropical Asian irrigated rice. *Ann. Rev. Ent.*, **45:** 549-74.

Ooi, P. A. C. and Shepard, B. M. 1994. Predators and parasitoids of rice insect pests. *In: Biology and Management of Rice Insects*. (Ed. E.A. Heinrichs,). Wiley, New Delhi, India, p. 585-12.

Pasalu, I. C., Katti, G, Dani, R. C, Bora., D. K., Sing, M. P., Satpathi, C. R., Reddy, P. S., Rao, G. G. S. N. and Venkateswartu. 2004. *Integrated pest management in rain-fed rice production systems.* Directorate of Rice Resarch, Rajendranagar, Hyderabad.

Prasad, A .S. R.,Krishnaiah, N. V, Pasalu, I. C, Lingaiah, T, Lakshminarayanamma, V. and Raju, G. 2003. Regression models for predicting the peak light trap catches of rice yellow stem borer, *Scirpophaga incertulas* (Walker) based on weather parameters. *Indian J. Pl Prot.*, **31**: 34-39.