

Original Research Article

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Egg Parasitization of Yellow Stem Borer and Leaf Folder of Rice under Prevailing Weather Parameters

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ABSTRACT

Keywords

Stem borer, Leaf folder, Parasitization.

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This survey was conducted in rice field during *kharif* season of year 2017 at Pusa farm of Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar. The important egg parasitoids of major insect pest of rice were observed for stem borer egg mass and leaf folder egg mass. The dominant egg parasitoid actively present throughout the *kharif* season on stem borer eggs was *Trichogramma japonicum*, it was found most active during the 33rd standard week of August 51.42% and least active in the 30th standard week of July 3.03%. The dominant egg parasitoid observed for leaf folder was *Trichogramma chilonis* which was found also most active during the 33rd standard week of August 42.40% and least active in the 31st standard week of August 4.72%.

Introduction

Rice is the staple food of more than 60 per cent world population and most of the people of South East Asia. About 90 per cent of rice grown in the world is produced and consumed in Asian region. The production and productivity of rice in Bihar is less than other states of the country due to diverse ecological and climatological condition apart from poor socio-economic condition of the farmers along with the poor management of the crop. In Bihar only 33 per cent of total rice land has got irrigation facilities and rest is totally depending upon rain. With the introduction of changes in types of varieties being cultivated,

practicing of different cultivation systems and alterations in rice based cropping systems, certain pests earlier regarded as minor pests have now assumed significance as pests of regional significance. Weather factors are the main regulating causes for the insect pests populations under field conditions.

Investigation has revealed that rice ecosystem is very rich in natural enemies which are very useful in reducing the yield loss (Singh, 1990). Following inundative release of *Trichogramma japonicum* into a plot of rice in Assam, damage by stem borer moth was reduced by 54.9 per cent after 50 days (Borah, 1994). Study on biocontrol of yellow stem borer using *Trichogramma* revealed that

reduction in yield average 1.64 per cent in treated plot as compared to with 10.3 per cent in untreated plot (Mohanraj *et al.*, 1995). A study in Maharashtra on rice variety, Ambemohor revealed that the parasitoid *Trichogramma japonicum* released @ 50,000 adults/ha was more effective in controlling *Scirpophaga incertulas* than endosulfan. Significant role played by parasitoid in suppression of stem borer can be shown by the study of Punjab, where it was observed that the mean percentage of egg parasitization by *Telenomus dignus* ranged from 35.28 to 43.21, 3.66 to 12.06 and 17.82 to 30.22 during September, 1992 and August and September, 1993 respectively. While in case of *Trichogramma japonicum* it ranged from 1.55 to 6.23 during September, 1993 (Dulcha *et al.*, 1994).

Materials and Methods

Per cent parasitization of yellow stem borer egg

To know the extent of egg parasitization of yellow stem borer, *Scirpophaga incertulas* egg masses were collected at weekly intervals from 5 randomly selected egg mass in the experimental plot from 2nd week of August to October during *kharif* 2017. For the estimation of parasitism of yellow stem borer, 5 egg masses were randomly collected from the unsprayed field at the weekly interval and brought to the laboratory to estimate the emergence of larvae and parasitoids. The egg masses were kept separately in glass vials which were provided with sufficient moisture to prevent desiccation of larvae and leaf pieces. The vials were covered with cotton and numbered with date. Egg masses were observed every day and were recorded on number of larvae hatched. Based on the number of emerged larvae and parasitoids the percent egg parasitisms were calculated.

Per cent parasitization =

$$\frac{\text{Total number of parasitoids emerged} \times 100}{\text{Total number of eggs mass}}$$

The mean per cent parasitization of 5 randomly selected egg masses of yellow stem borer in rice cv. Rajendra Bhagwati during *kharif* 2017 were calculated.

Per cent parasitization of leaf folder egg

The egg parasitism by *Trichogramma chilonis* was estimated through sampling of leaf folder eggs. The parasitization was calculated from randomly selected eggs within 5 folded leaves. The collected eggs were brought to laboratory, healthy and parasitized eggs were kept under observation and the per cent of parasitization was worked out. The degree of parasitization on the different host eggs depends on the morphological characteristics of the egg and location on the leaf where egg masses were deposited. Eggs are laid singly in the leaf midrib within the folded leaf. Per cent damage by leaf folder at 45 DAT and 60 DAT were calculated then mean percent damage by leaf folder of 45 DAT and 60 DAT were worked out and data so obtained were subjected to analysis.

Results and Discussion

Stem borer egg mass parasitization

A regular survey of egg parasitization of yellow stem borer carried out from last week of July to fourth week of October during *kharif* 2017 in rice field of RPCAU, Pusa farm and data so obtained are presented in Table 1. Freshly laid five egg mass of stem borer were collected from the infested field at weekly interval. This egg mass were brought in the laboratory and kept in glass vials separately along with leaf pieces and vials were covered with cotton and observed every day for the

emergence of larvae and parasites. Based on the number of emerged larvae and parasitoids percent egg mass parasitization was calculated.

Data revealed that maximum percent of egg parasitization by *Trichogramma japonicum* was observed in the 33rd standard week of August (51.42%). The meteorological parameters viz. maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall during maximum parasitization were 31^oC, 25.3^oC, 94%, 79% and 214.4 mm respectively. The 36th standard week of September showed (43.20%) second position in percent egg parasitization.

Minimum percent of egg parasitization by *Trichogramma japonicum* was observed in the 30th standard week of July (3.03%). The meteorological parameters viz. maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall during minimum parasitization were 32.1^oC, 26.2^oC, 86%, 75% and 31.4 mm respectively. The seasonal average of percent egg parasitization was ranged from 3.03% to 51.42% (Table 1). The yellow stem borer egg parasitization declined from last week of September.

In order to find out the relationship between egg parasitism of yellow stem borer and weather parameters, correlation coefficient were worked out and presented in Table 2. It is revealed that all the weather parameters showed positive correlation with maximum temperature, morning relative humidity and rainfall ($r = 0.0363, 0.4941$ and 0.5658) and showed negative correlation with minimum temperature, evening relative humidity and wind velocity ($r = -0.3377, -0.2546$ and -0.2979) on egg parasitization of yellow stem borer during *kharif*2017. The multiple regression equation (Table 2) analysis

revealed that the total variation in the egg parasitization of yellow stem borer were 70.3% contributed by aforesaid weather factors. From the correlation studies, it was obvious that all the aforesaid weather parameters had a definite role in the egg parasitization of yellow stem borer in rice field. Of these abiotic factors maximum temperature, morning relative humidity and rainfall are found to be congenial for egg parasitization of yellow stem borer. But lower egg parasitization of yellow stem borer may be due to temperature fluctuation and also due to less number of bio agent present in the field. The rainfall seems to have positive effect on egg parasitization of yellow stem borer. The findings are partly supported by Pandey *et al.*, (2001) and Kumar *et al.*, (2008). Pandey reported that yellow stem borer showed significant negative correlation with relative humidity. Kumar (2001) reported that the pest incidence was negatively correlated with morning and afternoon relative humidity. Baghel (2011) who recorded *Telenomus sp.* as active egg parasite of rice stem borer, which was found most active during the fourth week of October and capable in parasitizing 0-71.02% eggs at Raipur.

It may be stated that the *Trichogramma japonicum* is the most important egg parasitoid of rice stem borer egg at Pusa which was found most active during first week of August to last week of September.

Leaf folder egg parasitization

A regular survey of egg parasitization of egg parasitization of leaf folder carried out from last week of July to fourth week of October during *kharif* 2017 in rice field of RPCAU, Pusa farm and data so obtained are presented in Table 3. Data revealed that maximum egg parasitization of leaf folder was done by *Trichogramma chilonis* in the rice field during *kharif* 2017.

Table.1 Influence of weather parameters on yellow stem borer egg parasitization during kharif 2017

Month	Std. week	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Wind speed (Km/hr)	Mean egg parasitization*
		Max.	Min.	Morning	Evening			
Jul.	30	32.1	26.2	86	75	31.4	8.7	03.03
Aug.	31	33.0	26.3	90	77	12.4	3.6	27.30
Aug.	32	32.8	26.5	93	79	116.3	5.2	43.18
Aug.	33	31.0	25.3	94	79	214.4	4.1	51.42
Aug.	34	33.2	26.8	87	71	41.8	4.7	42.40
Sept.	35	32.8	26.5	88	76	02.6	5.5	36.15
Sept.	36	33.9	26.3	88	65	11.2	3.3	43.20
Sept.	37	34.0	27.0	91	71	02.6	3.4	28.79
Sept.	38	33.5	26.1	88	70	30.0	6.0	37.40
Sept.	39	34.3	25.8	88	62	00.0	3.1	26.92
Oct.	40	33.2	25.0	87	70	00.0	3.6	29.78
Oct.	41	33.1	25.0	89	69	03.5	4.2	28.09
Oct.	42	33.4	22.8	88	63	00.0	3.5	24.81
Oct.	43	31.5	20.8	90	66	00.0	2.8	18.72

*Mean parasitization of five egg masses

Table.2 Correlation between per cent parasitization of yellow stem borer egg masses and prevailing weather parameters

Meteorological parameter	Correlation (r)
Temperature Maximum (X ₁)	0.0363
Temperature Minimum (X ₂)	-0.3377
Morning relative humidity (X ₃)	0.4941
Evening relative humidity (X ₄)	-0.2546
Rainfall (X ₅)	0.5658
Wind velocity (X ₆)	-0.2979

Multiple regression equation: $Y = -37.857 + 6.585 (X_1) + 0.316 (X_2) - 2.214 (X_3) + 0.806 (X_4) + 0.207 (X_5) - 5.172 (X_6)$
 Coefficient of determination (R²): 0.703

Table.3 Influence of weather parameters on leaf folder egg parasitization during kharif 2017

Month	Std. week	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Wind speed (Km/hr)	Mean egg parasitization*
		Max.	Min.	Morning	Evening			
Jul.	30	32.1	26.2	86	75	31.4	8.7	00.00
Aug.	31	33.0	26.3	90	77	12.4	3.6	04.72
Aug.	32	32.8	26.5	93	79	116.3	5.2	29.19
Aug.	33	31.0	25.3	94	79	214.4	4.1	42.40
Aug.	34	33.2	26.8	87	71	41.8	4.7	36.42
Sept.	35	32.8	26.5	88	76	02.6	5.5	30.26
Sept.	36	33.9	26.3	88	65	11.2	3.3	33.60
Sept.	37	34.0	27.0	91	71	02.6	3.4	31.15
Sept.	38	33.5	26.1	88	70	30.0	6.0	34.16
Sept.	39	34.3	25.8	88	62	00.0	3.1	19.80
Oct.	40	33.2	25.0	87	70	00.0	3.6	15.18
Oct.	41	33.1	25.0	89	69	03.5	4.2	18.36
Oct.	42	33.4	22.8	88	63	00.0	3.5	21.20
Oct.	43	31.5	20.8	90	66	00.0	2.8	12.25

*Mean parasitization of five eggs

Table.4 Correlation between per cent parasitization of leaf folder egg masses and prevailing weather parameters

Meteorological parameter	Correlation (r)
Temperature Maximum (X ₁)	0.0964
Temperature Minimum (X ₂)	0.3050
Morning relative humidity (X ₃)	0.3812
Evening relative humidity (X ₄)	-0.0861
Rainfall (X ₅)	0.4821
Wind velocity (X ₆)	-0.1776

The percent parasitization by *Trichogramma chilonis* showed no definite trend and varied between 4.72 to 42.40 per cent with maximum parasitization in the 33rd standard week of August. The egg parasitization was first noticed in the 31st standard week of August and nil during 30th standard week of July. The egg parasitization was not significant but maximum parasitization 42.40 per cent was recorded in the 33rd standard week of August. The meteorological parameters viz. maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall during maximum egg parasitization were 31^oC, 25.3^oC, 94%, 79% and 214.4 mm respectively. The minimum egg parasitization was 4.72 per cent in the 31st standard week of August. The meteorological parameters viz. maximum temperature, minimum temperature, morning relative humidity, evening relative humidity and rainfall during maximum egg parasitization were 33^oC, 26.3^oC, 90%, 77% and 12.4 mm respectively. The egg parasitization maintained no definite trend throughout the crop season during *kharif* 2017.

In order to find out the relationship between egg parasitism of leaf folder and weather parameters, correlation coefficient were worked out and presented in Table 4. It is revealed that all the weather parameters showed positive correlation with maximum temperature, minimum temperature, morning relative humidity and rainfall ($r = 0.0964, 0.3050, 0.3812$ and 0.4821) whereas, showed negative correlation with evening relative humidity and wind velocity ($r = -0.0861, -0.1776$) on egg parasitization of yellow stem borer during *kharif* 2017. The multiple regression equation (Table 4) analysis revealed that the total variation in the egg parasitization of leaf folder were 52.5% contributed by aforesaid weather factors. From the correlation studies, it was obvious

that all the aforesaid weather parameters had a definite role in the egg parasitization of leaf folder in rice field. Of these abiotic factors maximum temperature, minimum temperature, morning relative humidity and rainfall are found to be congenial for egg parasitization of leaf folder. But lower egg parasitization of yellow stem borer may be due to temperature fluctuation and also due to less number of bio agents present in the field. The evening relative humidity seems to have suppressive effect on egg parasitization of leaf folder. The findings are supported by Prabal Saikia and S. Parameswaram (2002) who reported that eggs parasitization of leaf folder eggs by *T. chilonis* revealed highest egg parasitization due to release of *T. chilonis* @ 1 lakh parasitoids/ha for six times.

It may be stated that the *Trichogramma chilonis* is the most important egg parasitoid of rice leaf folder egg at Pusa which was found most active during second week of August to fourth week of September.

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