

Population Dynamics of Rice Stem Borer (*Scirpophaga incertulas*, Walker) in Agro Ecosystem of Rewa District

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ABSTRACT

Field experiment were carried out during Kharif 2014 indicated the beginning of rice stem borer infestation was recorded in the 2nd week of August and the maximum number of larvae or pupae per dead heart/white ear head was recorded to the extent 2.8 in the 1st week of October when the temperature ranged between 32.6-18.7^oC & RH 99-74%. Correlation coefficient values for rice stem borer incidence and weather parameters showed that minimum relative humidity had positive influence on rice stem borer population.

Key words: Rice, Stem borer, Population dynamics, Weather parameters.

INTRODUCTION

Rice is a monocotyledonous crop, belongs to the Family Poaceae and genus *Oryza* with two cultivated & 22 wild species. *Oryza sativa* and *Oryza glaberrima* are the main cultivated species. *Oryza sativa* is a globally cultivated species while *Oryza glaberrima* is mainly cultivated in West Africa. Rice is one of the most important crops in the world, providing food for nearly half of the global population. It is also a key source of employment and income for rural people, who live in developing countries. It is grown under different agro climate and production systems. But, transplanting in puddled condition is the most common practice. China, India and Indonesia are major rice producing countries

in the world. It is cultivated in about 161.5 million ha area in the world with a production of about 678.9 million tones and the productivity of 4.2 q/ha. The area and productivity of rice in India, Madhya Pradesh and Rewa is nearly 44.10, 1.76 and 0.236 million ha and 29.80, 18.07 and 9.96 q/ha, respectively.

MATERIAL AND METHODS

A field experiment was carried out at Entomology Instructional Farm, JNKVV, College of Agriculture Rewa (M.P.), during Kharif 2014. Popular variety PS-3 was sown in 600 sq. meter area following the standard package and practices of the crop.

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This study was carried out from June to November and observation was recorded from this specified cropped area which was left unsprayed with any pesticides from beginning to harvesting of the crop. The observation on number of dead heart or white ear head were focused at weekly interval until harvesting of the crop. The dead heart or white ear heads were counted in one square meter cropped area. Such observation taken from five location of the experimental field. The numbers of larvae/pupae in each dead heart / white ear head were also counted. The present of dead heart and white ear heads were also calculated. The correlation between number of dead heart/white ear heads with the temperature, humidity and rainfall, correlation of insects population with weather parameters were worked out to find out if any relationship exist between them.

RESULTS AND DISCUSSION

Population dynamics of rice stem borer

Stem borer of rice is an important pest of the crop. Generally the pest appear on the crop during the month of July and peak of its infestation coincided with the panicle initiation stage of the crop⁷. But in the present investigation appearance of the pest in Rewa district was noticed in (Table-1, Fig 1) 2nd week of Aug. 2014 (i.e. 33rd SW). The different infestation level was found in the different weeks which crossed the ETL (5.0%) in the 37th (Sep 10-16) standard week.

So for, the larval number in the dead heart or white ear head is concerned; it was found on an average 1.2 larvae/dead heart. However, the number of larvae per dead heart varied from 1.2 to 2.8. Highest number of larvae or pupae/dead heart or white ear-head was recorded to the extent of 2.8 in the 40th standard week (Oct 1-7). The infestation of stem borer in the crop was found to continue up to the maturity the crop. However, the peak infestation of the insect was recorded in the 40th standard week (Oct 1-7), i.e. 96 days after transplanting. Alam, 1983 also reported peak infestation of the pest after 80 days of transplanting. The present finding also

indicated the same pattern of infestation in the Rewa district to some extent. Dogra and Choudhary³ also reported highest peak in the month of October-November, which further strengthen the present findings. Joshi *et al.*⁵, reported maximum population of borer in late season of the crop.

1.1 Correlation of per cent of infestation with metrological parameter

Correlation of per cent infestation with maximum & minimum temperature, maximum & minimum RH and rainfall has been worked out which (Table-2, Fig 2) indicated the following relation between them. Parwaze *et al.*⁹, studied the population dynamics of yellow stem borer and reported that its infestation level mostly dependent on the weather parameter.

(i) Maximum Temperature:

The association between per cent dead heart and maximum temperature showed a negative correlation ($r = -0.44$). Maximum increase number of dead heart (2.4) was observed while exiting the maximum temperature was 32.6°C.

(ii) Minimum Temperature:

Minimum temperature indicated a strong negative correlation, ($r = -0.90$) with in the present finding the per cent damage. The highest increase in infestation (9.2%) level was indicated at a minimum temp of 18.7 °C. While in contrast to present findings; Mukherjee *et al.*⁸, found in his study a highly significant positive correlation with minimum air temperature.

(iii) Relative Humidity (Maximum):

Maximum relative humidity (R.H) had shown a negatively correlation ($r = -0.39$) with per cent infestation. Maximum percent of dead heart was observed at a higher relative humidity (i.e. 99%). Hugar *et al.*⁴, reported a negative correlation with morning R.H with in conformity with present finding

(iv) Relative Humidity (Minimum):

The correlation with minimum relative humidity had indicated a week positive correlation ($r = 0.22$). An increased percent dead heart was recorded at minimum relative humidity of 74%. The present finding get support from the study of Hugar *et al.*⁴, who

also reported weak positive correlation with minimum R.H.

(v) Rainfall:

A weak negative correlation ($r = -0.16$) between percent dead heart and total rainfall was found in the present study. However, Justin and Preetha⁶ who studied the seasonal incidence of Rice stem borer observed a significant, negative correlation with rainfall and support to present finding to some extent as being negatively correlated.

1.2 Correlation of number of larvae or pupae with metrological parameters

The finding on this aspect is being discussed under the following sub headings.

(i) Maximum Temperature:

The association between number of larvae and pupae per dead heart and maximum temperature, found to be positive correlated ($r = 0.18$) but non-significantly. The highest number (2.8) of stem borer immature stages per dead heart was observed at a maximum temperature of 32.6°C but the correlation was poor.

(ii) Minimum Temperature:

Correlation with minimum temperature was found to be weakly negative correlated ($r = -0.15$). The maximum number of larvae and

pupae (2.8) per dead heart was recorded at an average minimum temperature of 18.7°C. Similar result was found by Justin and Preetha⁶.

(iii) Maximum Relative Humidity:

The number of larvae or pupae per dead heart/white ear-head with maximum relative humidity showed a positive correlation. The highest number of larvae and pupae per dead heart (2.8 L&P) were observed at 99% mean relative humidity in the present study.

(iv) Minimum Relative Humidity:

The correlation with minimum relative humidity was also found positive ($r = 0.25$). At 74% minimum R.H. maximum number of larvae and pupae (2.8) per dead heart were recorded.

(v) Rainfall:

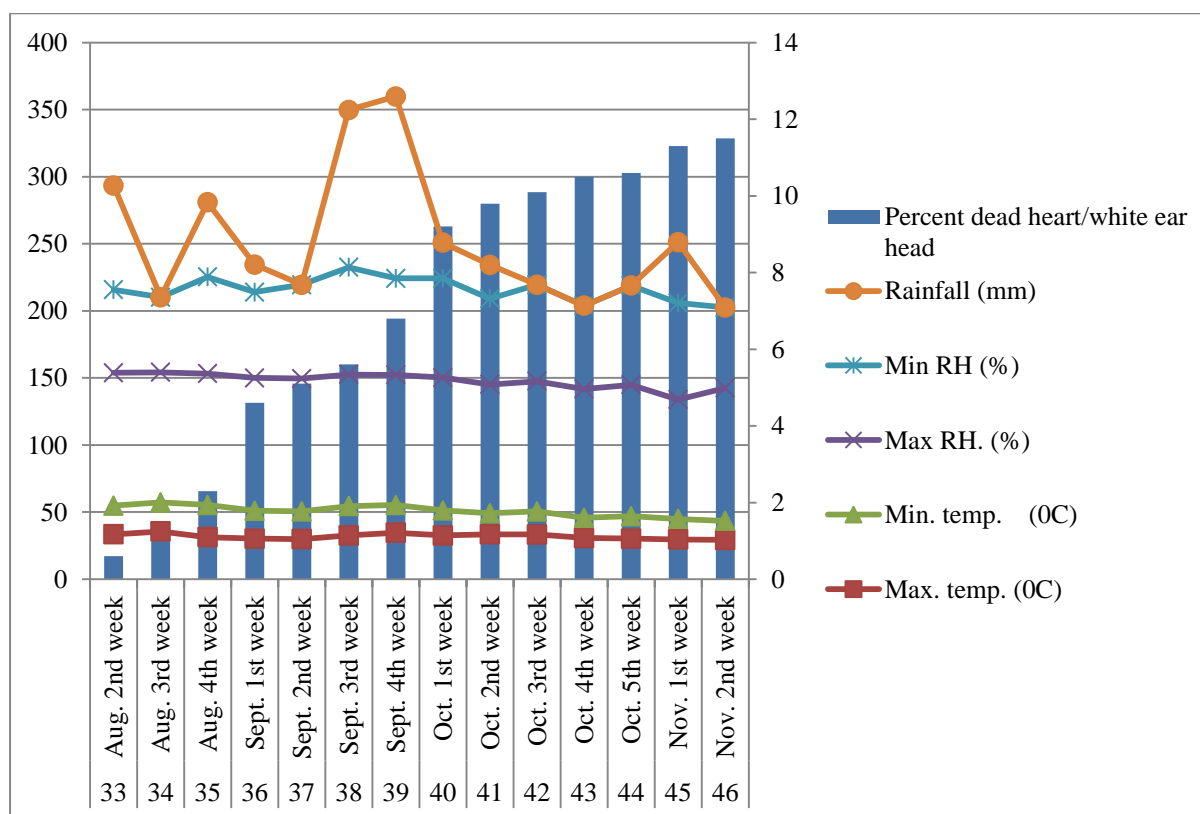
A non significant negative correlation ($r = -0.03$) was found with total rain fall. The findings of Hugar *et al.*⁴, are in support of the present study who reported a non-significant correlation with R.H. However, Justin and Preetha⁶, found a significant correlation with the rainfall. This indicate that rainfall have a variable effect on the infestation level of paddy stem borer.

Table 1. Population dynamics of rice stem borer in rice crop during Kharif 2014

S. No	Standard week (SW)	Duration month wise	Percent dead heart/white ear head	Average number of larvae or pupae/ dead heart
1	33	Aug 13-19	0.6	1.2
2	34	20-26	1.1	1.3
3	35	27-2 Sep	2.3	1.2
4	36	Sep 3-9	4.6	2.2
5	37	Sep 10-16	5.1	1.9
6	38	Sep 17-23	5.6	1.3
7	39	Sep 24-30	6.8	2.4
8	40	Oct 1-7	9.2	2.8
9	41	Oct 8-14	9.8	2.1
10	42	Oct 15-21	10.1	2.3
11	43	Oct 22-28	10.5	1.8
12	44	29-4 Nov	10.6	1.6
13	45	Nov 5-11	11.3	1.5
14	46	Nov 12-18	11.5	1.2

Table- 2: Correlation of percent dead heart or white ear head with temperature, relative humidity and rainfall during Kharif 2014

Standard weeks	name week of month	Percent dead heart/white ear head	Max. temp. (°C)	Min. temp. (°C)	Max RH. (%)	Min RH (%)	Rainfall (mm)
33	Aug. 2 nd week	0.6	33.5	21.3	99	62	77.5
34	Aug. 3 rd week	1.1	35.6	21.6	97	56	0.00
35	Aug. 4 th week	2.3	31.3	24	98	72	55.6
36	Sept. 1 st week	4.6	30.3	20.7	99	64	20.5
37	Sept. 2 nd week	5.1	29.9	20.6	99	70	0.00
38	Sept. 3 rd week	5.6	32.6	21.9	98	80	117.2
39	Sept. 4 th week	6.8	34.7	20.6	97	72	135.5
40	Oct. 1 st week	9.2	32.6	18.7	99	74	26.5
41	Oct. 2 nd week	9.8	33.5	15.6	96	64	25.2
42	Oct. 3 rd week	10.1	33.3	17.2	97	72	0.00
43	Oct. 4 th week	10.5	30.7	15.1	96	62	0.00
44	Oct. 5 th week	10.6	30.2	16.7	98	74	0.00
45	Nov. 1 st week	11.3	29.6	15.3	89	72	45.3
46	Nov. 2 nd week	11.5	29.3	14.2	99	60	0.00
Total		99.10	447.10	263.50	1361.00	954.00	503.30
Average		7.08	31.94	18.82	97.21	68.14	50.33
Correlation coefficient (r value)			-0.44	-0.90	-0.39	0.22	-0.16

**Fig. 1: Population dynamics of rice stem borer in rice crop during Kharif 2014**

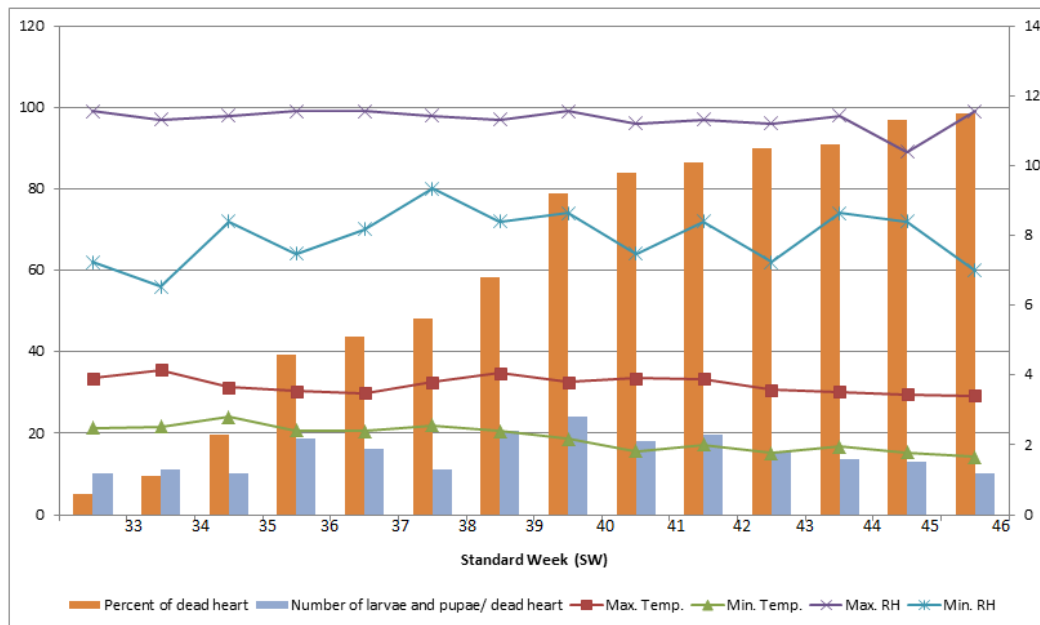


Fig. 2: Correlation of percent dead heart or white ear head with temperature, relative humidity and rainfall during Kharif 2014

REFERENCES

1. Alam, M.S., Seasonal Abundance of Rice Stem Borer Species in Upland and Irrigated Rice in Nigeria. *International Journal of Tropical Insect Science* **9(2)**: 191-195 (1988).
2. Dogra, I. and Choudhary, A., Some insect pests of rice, *Oryza sativa* Linn. in Kangra Valley of Himachal Pradesh. *Insect Environment* **11(1)**: 21-22 (2005).
3. Dogra, I. and Choudhary, A., Some insect pests of rice, *Oryza sativa* Linn. in Kangra Valley of Himachal Pradesh. *Insect Environment* **11(1)**: 21-22 (2005).
4. Hugar, S.V., Hosamani, V., Hanumanthaswamy, B.C. and Singh, P., Influence of weather factors on the infestation of yellow stem borer, *Scirpophaga incertulas* Walker in aerobic rice. *Asian Journal of Environmental Science*. **4(2)**: 151-154 (2010).
5. Joshi, G., Lakhi Ram, and Singh, R., Population dynamics of paddy stem borers in relation to biotic and abiotic factors. *Annals of Biology*. **25(1)**: 47-51 (2009).
6. Justin, C.G.L. and Preetha, G., Seasonal incidence of Rice yellow stem borer, *Scirpophaga incertulas* (walker) in Tamil nadu. *Indian Journal of Entomology*. **75(2)**: 109-112 (2013).
7. Kumar, P., Singh, R. and Pandey, S.K., Population dynamics of rice leaf folder, *Cnaphalocrocis medinalis* Guen., in relation to stage of the crop, weather factors and predatory spiders. *Journal of Entomological Research*. **20(3)**: 205-210 (1996).
8. Mukherjee, A., Bhowmik, P. and Chakraborty, G., Impact of different meteorological parameters on the population dynamics of rice stem borer (*Scirpophaga incertulus* (Walker)). *Environment and Ecology*. **23(4)**: 774-775 (2005).
9. Parwez, A., Mandal, S.K., Sattar, A. and Mishra, A.K., population dynamics of stem borer, *Scirpophaga incertulas* Walker and spider in bororice: A biometeorological interaction study. *Environment and Ecology*. **24(1)**: 152-154 (2006).