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Effect of abiotic factors on occurrence of yellow stem borer, *Scirpophaga incertulas* Walker in basmati rice in western plain zone of Uttar Pradesh

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Abstract

The present investigation was conducted to study the effect of abiotic factors on occurrence of yellow stem borer, *Scirpophaga incertulas* Walker in basmati rice in western plain zone of Uttar Pradesh during *Kharif* 2017 and 2018. Observations of *S. incertulas* infestation were recorded at weekly interval, 15 days after transplanting till harvesting. The peak period of pooled maximum dead hearts (12.60%) of both cropping seasons was recorded in 36th standard week. Thereafter, infestation declined gradually, but again increased at reproductive stage of crop and the pooled maximum white ears (11.95%) infestation was recorded during both the seasons at 41th standard week. The correlation matrix between infestation of yellow stem borer with weather parameters indicated that there was a positive correlation with maximum temperature ($r=0.15$), minimum temperature ($r=0.07$), evening relative humidity ($r=0.15$) and rainfall ($r=0.17$) and negative correlation with morning relative humidity, with the dead hearts and white ear heads caused by yellow stem borer.

Keywords: Basmati rice, *Scirpophaga incertulas*, dead hearts, white ears, correlation

1. Introduction

Rice an important staple food crop of India support more than two-third of its population [8]. In the World, rice is grown about in 167.24 million ha with an annual production of 769.65 million tonnes and 46.02 q/ha of productivity. In India, rice crop occupies an area of about 43.78 million ha with a total production of 168.50 million tones and the productivity of 38.50 q/ha [1]. Insect pests are responsible for considerable yield reduction of various crops in tropical Asian countries [10]. About 128 species of insects have been reported to ravage the rice field. Out of this only 15 to 20 insects are regarded as economically obnoxious species [4]. Stem borers are an important group of insect pests of rice. Among the borers, yellow stem borer, *Scirpophaga incertulas* Walker (Lepidoptera: Pyralidae), distributed all over India, is considered as the most destructive species. The symptoms of damage are seen in both vegetative stage (dead heart) and reproductive stage (white ear head). The larva after hatching enters into the stem and starts to feed on the growing shoot as a result of which the central shoot dries and results in the form of dead heart, the characteristic symptom of stem borer. The tillers are the affected part of the crop. When the infestation occurs during heading stage the grains become chaffy and are called as white ear heads [9]. Each insect pest require certain set of weather conditions for their survival and multiplication.

Therefore, it is necessary to gain a thorough knowledge on relation of weather parameters to insects (Entomo-climatology) which will be very useful to farmers in all areas where major insect pests are appearing year after year and causing serious damage to crops

Keeping in view, the severity of damage by yellow stem borer in rice growing area of western Uttar Pradesh and the influence of weather factors on their growth, multiplication and distribution. For developing any pest management programme, specific agro-ecosystem information on abundance and distribution of pest in relation to weather parameters is a basic requirement.

2. Materials and Methods

The field experiments were carried out during June to October 2017 and 2018 at Crop Research Centre, Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut

Uttar Pradesh. The experiment was conducted in Randomized Block Design (RBD) with rice cv. Pusa basmati 1. The spacing adopted was 20 × 20 cm and all the cultural operations except plant protection were followed as per the recommendations. The observations of *S. incertulas* infestation were recorded at weekly interval, 15 days after transplanting till harvesting. The borer infestation was assessed by counting number of dead hearts (DH) in the initial stage of damage and number of white ear heads (WEH) at later stage from five randomly selected spots consisting of 5 hills each. Both the dead hearts and white ear heads were removed from the infested tillers so that only fresh infestation of the pest can be realized every time. To the study instantaneous effect of major abiotic factors viz., maximum temperature, minimum temperature, average temperature, morning relative humidity, evening relative humidity, average relative humidity, rainfall on the population of *S. incertulas*, correlation coefficient was worked out. Finally data so obtained were worked out and converted into percentage of dead heart [Per cent dead hearts = Total number of dead hearts / Total number of tillers X 100] and percentage white ear [Per cent white ears = Total number of white ears / Total number of tillers X 100]. The weekly meteorological data recorded at ICAR-Indian Institute of Farming System Research, Modipuram (Meerut) during the *kharif* 2017 and 2018 from July to October period were utilized for this purpose.

2.1 Statistical analysis

The influence of weather parameters on damage done by *S. incertulas* (Dead Hearts and White Ears) was analyzed by correlation analysis for a period of two years. The data was analyzed by using statistical software SPSS 16.0.

3. Results and Discussion

The impact of major abiotic factors on the incidence of per cent dead hearts (DH) at vegetative stage and per cent white ear heads (WE) at reproductive stage at weekly interval during *Kharif* 2017 and 2018 according to standard weeks.

3.1 During *Kharif* season 2017

The data are depicted in Fig 1 revealed that the infestation of *S. incertulas* appeared first on 32th standard week and continued till the 44th standard week. The infestation of stem borer recorded as dead hearts/white ear heads ranged from 3.75 to 13.10 percent during *Kharif*, 2017. The infestation of stem borer increased from third week of August and reached its peak (13.10%) during 41st standard week (Second week of October). During this period the weather parameters like temperature, relative humidity and rainfall ranged from 18.20 to 32.5 °C, 48.70 to 97.40 percent and 0.00 mm, respectively. The stem borer infestation suddenly decreased after middle of October i.e. 42th and 43rd standard week and this might be due to the no emergence of new leaves. The infestation was high in the absence of rains.

The correlation between infestation of yellow stem borer with weather parameters are given in Table 1. The correlation matrix indicates that there was a positive correlation with maximum temperature ($r=0.35$), minimum temperature ($r=0.17$) and rainfall ($r=0.11$) and negative correlation with morning relative humidity, evening relative humidity, with the dead hearts and white ear heads caused by yellow stem borer.

3.2 During *Kharif* season 2018

The data depicted in Fig. 2 revealed that the infestation of yellow stem borer appeared first on 32th standard week and continued till the 44th standard week. The infestation of stem borer recorded as dead hearts/white ear heads ranged from 3.10 to 12.30 percent during *Kharif*, 2018. The infestation of stem borer increased from second week of August and reached its peak (12.30%) during 36th standard week (First week of September). During this period the weather parameters like temperature, relative humidity and rainfall ranged from 21.70 to 37.60 °C, 51.60 to 91.40 percent and 82.80 mm, respectively. The stem borer infestation suddenly decreased after middle of October i.e. 42th and 43rd standard week and this might be due to the no emergence of new leaves.

The correlation matrix between infestation of yellow stem borer with weather parameters indicated that there was a positive correlation with maximum temperature ($r=0.17$), evening relative humidity ($r=0.12$) and negative correlation with minimum temperature, morning relative humidity and rainfall, with the dead hearts and white ear heads caused by yellow stem borer (Table 1).

3.3 Pooled data during *Kharif* season 2017 and 2018

Perusal of pooled data of both the year (*Kharif*, 2017 and 2018) showed that the infestation of yellow stem borer appeared first on 32th standard week and continued till the 44th standard week (Figure 3). The infestation of stem borer recorded as dead hearts/white ear heads ranged from 3.42 to 12.60 percent during *Kharif*, 2017 and 2018. The infestation of stem borer increased from second week of August and reached its peak (12.60%) during 36th standard week (First week of September). During this period the weather parameters like temperature, relative humidity and rainfall ranged from 21.80 to 34.90 °C, 61.80 to 93.60 percent and 50.90 mm, respectively. The stem borer infestation suddenly decreased after middle of October i.e. 42th and 43rd standard week and this might be due to the no emergence of new leaves.

The correlation matrix between infestation of yellow stem borer with weather parameters indicated that there was a positive correlation with maximum temperature ($r=0.15$), minimum temperature ($r=0.07$), evening relative humidity ($r=0.15$) and rainfall ($r=0.17$) and negative correlation with morning relative humidity, with the dead hearts and white ear heads caused by yellow stem borer (Table 1).

The present findings uphold the views of [6] who reported that yellow stem borer found peak (8.48% W.E.) during 1st week of October (40th SW). Further this infestation turn down and observed with minimum infestation of 3.85% W.E. at 42nd S.W. Similar pattern of seasonal incidence was reported by [5, 2] who corroborates the present findings, that *S. incertulas* population had positive correlation with temperature, rain fall and relative humidity [3] also reported that the yellow stem borer showed positive correlation with maximum temperature ($r=0.74$) and ($r=0.66$), minimum temperature ($r=0.04$) and ($r=0.01$), morning relative humidity ($r=0.01$) and ($r=0.01$), evening relative humidity ($r=0.02$) and ($r=0.007$), rainfall ($r=0.13$) and ($r=0.29$), respectively [7] observed correlation between yellow stem borer and weather parameters and found that adult population of YSB showed positive correlation with maximum temperature ($r=0.07$), minimum temperature ($r=0.83$), morning relative humidity ($r=0.80$), evening relative humidity ($r=0.82$), rainfall ($r=0.64$).

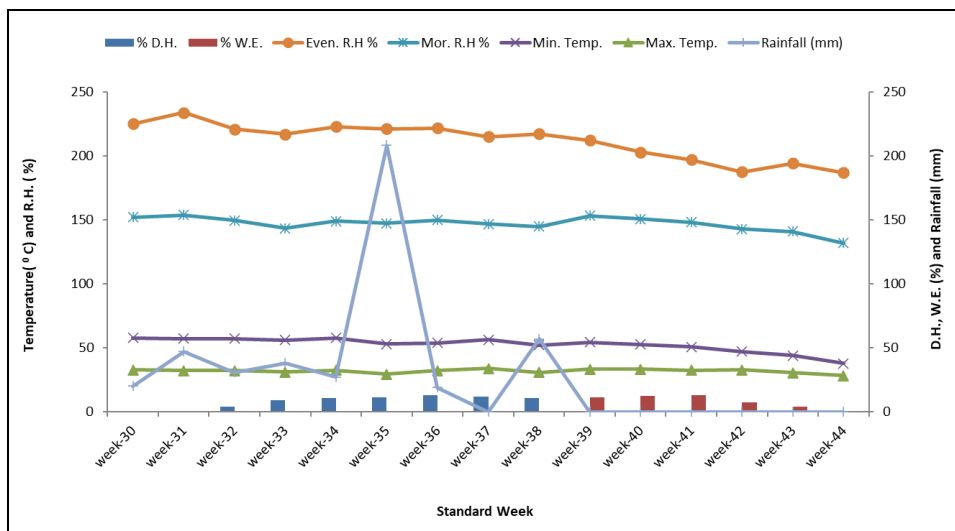


Fig 1: Seasonal incidence of rice stem borer, *S. incertulas* in relation to abiotic factors during *Kharif*, 2017

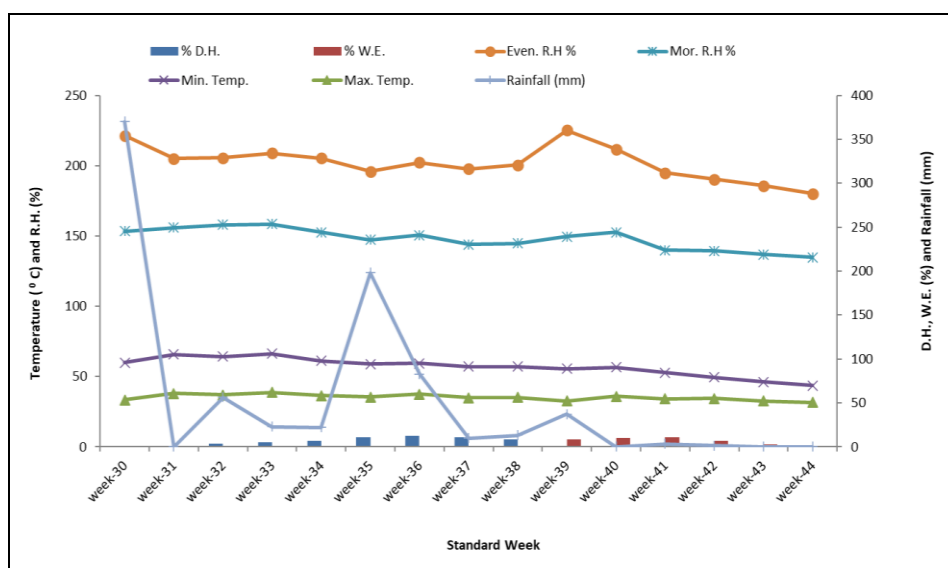


Fig 2: Seasonal incidence of rice stem borer, *S. incertulas* in relation to abiotic factors during *Kharif*, 2018

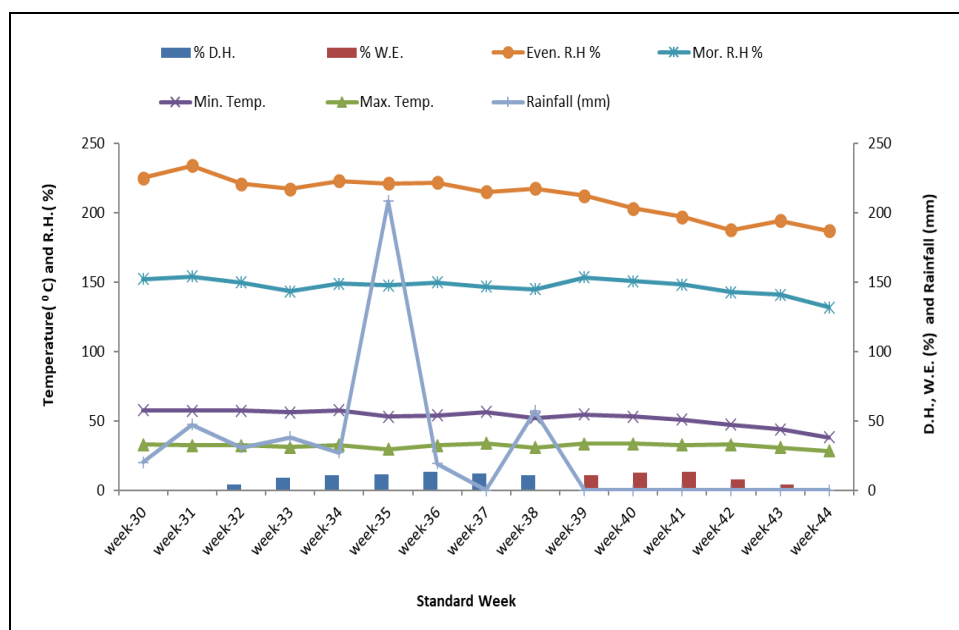


Fig 3: Pooled data for incidence of rice stem borer, *S. incertulas* in relation to abiotic factors (*Kharif*, 2017 and 2018)

Table 1: Correlation between seasonal incidence of *Scirpophaga incertulas* in relation to abiotic factors

Weather Parameters	Correlation coefficient (r)		
	Percent dead heart / White ear head		
	2017	2018	Pooled
Maximum Temp. (°C)	0.351	0.177	0.155
Minimum Temp. (°C)	0.176	-0.026	0.075
Average	0.246	0.034	0.097
Morning RH (%)	-0.001	-0.272	-0.168
Evening RH (%)	-0.125	0.129	0.156
Average	-0.14	0.032	0.087
Rainfall (mm)	0.11	-0.181	0.175

4. Conclusion

The peak period of *S. incertulas* was recorded in last week of August to first week of September (36th standard week) at vegetative stage and at reproductive stage the *S. incertulas* arrived at peak in 2nd week of October (41th standard week) during *Kharif*, 2017 and 2018. The seasonal incidence of *S. incertulas* delineated the YSB population build up and interaction with weather parameters, which can be utilized for decision making. The correlation analysis between infestation of yellow stem borer with environmental factors indicated that there was a positive correlation with maximum temperature, minimum temperature, evening relative humidity and rainfall. These negative correlation with morning relative humidity, with the dead hearts and white ear heads caused by yellow stem borer.

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6. Reference

1. Food and agriculture organization. <http://faostat.fao.org>, 2017.
2. Justin CGL, Preetha G. Seasonal incidence of rice yellow stem borer, *Scirpophaga incertulas* (Walker) in Tamil Nadu. *Indian Journal of Entomon.* 2013; 75(2):109-112.
3. Kalita H, Avasthe RK, Ramesh K. Effect of weather parameters on population buildup of different insect pests of rice and their natural enemies. *Indian Journal of Hill Farming.* 2015; 28(1):69-72.
4. Kalode MB. Insect pest of rice and their management in Indian Perspectiveeds. S.D. Sharma and B.C. Nayak. Today and tomorrow printers and publishers (India). 2005, 819-854.
5. Kakde AM, Patel KG. Succession of rice pest complex and natural enemies in conventional and sri methods of planting. *International Journal of Current Microbiology and Applied Science.* 2018; 6:2181-2188.
6. Mishra MK, Singh RB, Dwivedi JL, Ali S. Efficacy of insecticides against *Scirpophaga incertulas* (Walker) on basmati rice. *Annals of Plant Protection Sciences.* 2012; 20 (2):310-313.
7. Nag S, Chaudhary JL, Shori SR, Netam J, Sinha HK. Influence of weather parameters on population dynamics of yellow stem borer (YSB) in rice crop at Raipur. *Journal of Pharmacognosy and Phytochemistry.* 2018;

7(4):37-44.

8. Prakash A, Rao J, Singh ON, Tyagi JP, Singh S, Rath PC. Rice the queen of central, AZARA Publication CRRI. 2007, 1-40.
9. Renuka VVL, Sasmal A. Evaluation of efficacy and economics of certain bio-intensive and chemo-intensive management modules against stem borer of rice. *Journal of Entomology and Zoology Studies.* 2018; 6(5):714-719.
10. Savary S, Willocquet L, Elazegui FA, Castilla NP, Teng PS. Rice pest constraints in tropical Asia: quantification of yield losses due to rice pests in a range of production situations. *Plant Disease.* 2000; 84(3):357-369.