Journal of Agrometeorology 20 (3) : 256-258 (September 2018)

Short Communication

Influence of different abiotic factors on the incidence of major insect pests of rice (*Oryza sativa* L.)

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Rice (*Oryza sativa* L.*)* is one of the world's most important cereal crops providing a staple food for nearly half of the global population (FAO, 2004).Introduction and wide adoption of high yielding varieties has led to severe incidence of different insect pests. Nearly 300 species of insect pests attack the rice crop at different stages and only 23 species cause notable damage (Pasalu and Katti, 2006).Among them, yellow stem borer (YSB), *Scirpophaga incertulas* (Walk.), plant hoppers [both brown plant hopper; *Nilaparvata lugens* (Stål) and white-backed plant hopper; *Sogatella furcifera* (Horvath)], Asian rice gall midge (GM), *Orseolia oryzae* (Wood-Mason) and leaf folder; *Cnaphalocrocis medinalis* Guenee are very important and responsible for huge economic crop losses (Seni and Naik, 2017).

Weather plays an important role for determining the geographical distribution and periodic abundance of major insect pests in rice (Singh *et al*., 2012). Among the weather factors; temperature, rainfall, relative humidity plays the crucial role in insect life. For this, it is necessary to acquire a thorough knowledge on relation of weather parameters to insect pests which will be very helpful to formalize a suitable management practices in the areas where major insect pests are appearing year after year and causing serious damage to rice crops. Hence, considering the importance of insect-pests of rice an attempt has been made to study the influence of different abiotic factors on the incidence of major insect pests of rice.

The experiment was conducted at the experimental farm of Regional Research and Technology Transfer Station (OUAT), Chiplima, (Lat. 20°21'N, Long. 80°55'E, altitude 178.8 m above) Sambalpur, Odisha, during *kharif* 2015 and 2016 in randomized block design (RBD) with rice variety Jaya. The climate of the area is warm and sub humid. All the agronomic practices were followed except plant protection measures during crop growth period. Observations on the incidence of YSB producing dead heart/white ear head (DH/WEH),GM producing silver shoot (SS), leaf folder damage leaves, plant hoppers number per hill were taken on 10 randomly selected hills per plot from each replication and were recorded at weekly interval, 10 days after transplanting to harvesting stage. Then percentage of dead hearts/ white ears/ silver shoot/ leaf folder damage leaves were worked out. The data on weather parameters during the crop growing periods were taken from the meteorological observatory located in the RRTTS, Chiplima.The influence of abiotic factors on the incidence of major insect pests of rice was analyzed by correlation analysis using SPSS 16 statistical software.

The data on influence of major abiotic factors on the incidence of YSB producing dead heart or white ear-head (DH/WEH), gall midge producing silver shoot (SS), leaf

Table 1: Correlation between insect pests incidence of rice and different abiotic factors

Weather Parameters	Correlation coefficient (r)			
	DH/WEH	SS	LFDL	Plant hoppers (BPH+WBPH)/hill
Max. temp.	0.072	0.743**	0.749**	-0.619**
Min. temp.	-0.209	0.624**	0.654**	-0.755**
Rainfall	-0.488*	0.168	0.216	-0.583*
Morning relative humidity	-0.506*	-0.384	-0.365	-0.015
Evening relative humidity	-0.680**	0.130	0.150	-0.788**

*-Significant ($p<0.05$), **-Significant ($p< 0.01$)

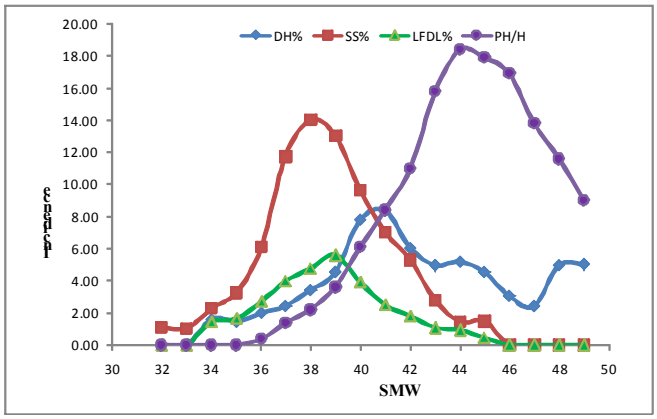

Fig 1: Weekly incidence of major insect pests of rice (Pooled of *Kharif,* 2015 and 2016)

folder damage leaves (LFDL) and plant hopper numbers per hill (PH/H) were pooled for the *kharif* 2015 and 2016 and are presented in Fig. 1.

Fig.1 shows that the infestation of yellow stem borer (*S. incertulas*) was initiated from the 3rd week of August (34 SMW), which gradually increased during successive standard weeks and reached at the maximum level (8.38 per cent DH) during 2nd week of October (41 SMW). The maximum (5.02 per cent) white earheads was observed during 49 std. week. The correlation analysis revealed that the incidence of yellow stem borer was non-significantly correlated with maximum temperature (r= 0.072) and minimum temperature (r= -0.209) and significant negative correlation with morning relative humidity (r= -0.506), evening relative humidity (r= -0.680) and rainfall (r= -0.488) (Table 1).Similar type of seasonal incidence of yellow stem borer was reported by Singh *et al* (2018).

The gall midge (*O. oryzae)* producing silver shoot incidence was observed from 32 to 45th std. week and found maximum (14.04% SS) in 3rd week of September (38th SMW) (Fig. 1). Shrivastava *et al* (2008) studied the seasonal incidence of the gall midge at Zonal Agricultural Research Station, Raipur and found that the major active period of the gall midge was 36th to 43rd standard week. The correlation analysis revealed the positive significant correlation with maximum temperature (r=0.743) and minimum temperature (r= 0.624) only. The other correlations with rainfall (r= 0.168) and evening relative humidity (r= 0.130) and morning relative humidity (r= -0.384) were non-significant. The correlation of incidence of silver shoot with maximum temperature and minimum temperature was found positively significant (Table 1). So, maximum temperature, minimum temperature, evening relative humidity and rainfall had a positive impact on the incidence of gall midge.

The incidence of leaf folder (*C. medinalis)* was started from 3rd week of August (34 SMW) and peak infestation (5.59 per cent damaged leaves) was observed at 4th week of September (39 SMW) (Fig. 1). Kakde and Patel (2015) also observed that leaf folder, *C. medinalis* was first appeared on 3rd week of August (34 SMW) in Bardoli, Gujarat and the peak activity of the pest was found in 4th week of September (39 SMW).The correlations of weather components and leaf folder damage leaves are shown in Table 1. The results showed that the percentage of damaged leaves in the field had significant positive correlation with maximum temperature (r = 0.749) and minimum temperature (r= 0.654). The correlations with rainfall (r=0.216) and evening relative humidity (r= 0.150) and morning relative humidity (r= -0.365) were non-significant.The result supported the findings of Singh *et al.* (2018) who observed that there were no negative correlations with leaf folder population and temperature (both maximum and minimum) and rainfall.

The number of plant hoppers (both *N. lugens* and *S. furcifera*) per hill was found initially low (0.4/hill) during 2nd week of September (36 SMW), which gradually increased during successive standard weeks and reached at the maximum level (18.40/hill) during 1st week of November (44 SMW) and thereafter hopper population declined to 9.0/hill during 49 std. week (Fig. 1). The population of plant hoppers on rice crop was significantly negatively correlated with maximum temperature (r= -0.619), minimum temperature (r= -0.755), evening relative humidity (r= -0.788) and rainfall (r= -0.583). Whereas, negatively non-significantly correlated with morning relative humidity (r= 0.015).Chaudhary *et al.* (2014) also found that the population of BPH was negatively correlated with rainfall. This correlation study revealed that the population build-up of different insect pests in rice was influenced by the different abiotic factors in nature and this information can be utilized in formulating site specific suitable management practices for the major insect-pests of rice.

ACKNOWLEDGEMENT

The authors are highly thankful to ICAR-Indian Institute of Rice Research, Rajendranagar, Hyderabad and Orissa University of Agriculture and Technology, Bhubaneswar for financial assistance.

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Received : May 2018; Accepted: June 2018