

Studies on Incidence of Major Lepidopteran Pests in Rice and its Correlation with Weather Parameters

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ABSTRACT

A field experiment was carried out at Agricultural College Farm, Naira during *rabi*, 2020-21 to evaluate the incidence pattern of major lepidopteran pests with relevance to change in abiotic factors in rice crop. The incidence of yellow stem borer and leaf folder were initiated from 7th - 8th SMW and attained maximum during 12th and 13th SMW, respectively. The correlation of yellow stem borer for dead heart shows non-significant positive correlation with the maximum temperature and morning relative humidity whereas non-significant negative correlation was observed with minimum temperature, evening relative humidity and rainfall. The correlation of white ear heads shows significant positive correlation with minimum temperature and rainfall whereas non-significant positive correlation with maximum temperature and evening relative humidity. The correlation of leaf folder shows non-significant positive correlation with maximum temperature, minimum temperature and morning relative humidity whereas non-significant negative correlation was observed with evening relative humidity and rainfall.

Keywords: Correlation, Seasonal incidence, Yellow stem borer and Leaf folder.

Rice (*Oryza sativa* L.) is an important cereal crop in the world and is primary source of energy for millions of people. More than 90% of the world's rice is cultivated and consumed in Asia, which is home to 60% of the world's population. As a result, Asia is known as the "Rice Bowl" of the planet (Kakde and Patel, 2018). In 2018-19, rice is grown on 43.79 million hectares in India with a production of 116.42 million tonnes and a productivity of 2659 kg/ha (Anonymous, 2019). Rice crop is infested by more than 100 species of insects, but only 20 species are of economic importance (Kalode, 2005). Out of which, the lepidopteron pests are the main class of pests causing significant yield loss to rice crop.

The most common lepidopteran pests of rice are, the yellow stem borer (*Scirpophaga incertulas*)

(Walker) and the leaf folder (*Cnaphalocrocis medinalis*) (Guenee) invading the rice ecosystem at different stages of the crop. The yellow stem borer can cause dead hearts at tillering stage and white ears at reproductive stage (Karthikeyan and Purushothaman, 2000). Rice production losses due to yellow stem borer are expected to be approximately 20 and 70 per cent (Chelliah *et al.*, 1989). Only the rice leaf folder's larval stage is harmful and the results in folding of the leaves longitudinally by stitching the leaf margins and feed by scraping the green mesophyll tissue from within the folded leaves. The yield loss is from 30 to 80 per cent due to leaf folder epidemic situation (Nanda and Bisoi, 1990). Keeping in view, present study on incidence of major lepidopteran pests were estimated under the natural condition at

Table 1. Mean weather parameters and incidence of major lepidopteran pests of rice during *rabi* 2020-21.

S. No.	Standard week	Mean temperature (°C)		Mean relative humidity (%)		Rain fall (mm)	Stem Borer infestation (%)		Leaf folder infestation (%)
		Max.	Min.	Mor.	Eve.		DH	WEH	Leaf damage
1	6	31.30	16.60	76.80	42.20	0.00	0.00	0.00	0.00
2	7	33.10	18.70	88.20	46.60	0.00	0.00	0.00	0.00
3	7,8	31.30	20.00	81.00	57.40	0.00	3.24	0.00	2.89
4	8,9	36.00	18.20	81.60	46.40	0.00	7.28	0.00	4.55
5	9	36.40	22.00	84.00	48.00	0.00	9.52	0.00	7.88
6	9,10	36.40	22.10	83.40	38.60	0.00	13.26	0.00	9.96
7	10,11	34.10	22.10	83.60	57.80	0.00	15.60	0.00	15.54
8	11	38.30	22.60	83.20	48.60	0.00	18.20	0.00	16.32
9	12	38.30	24.00	78.80	48.20	0.00	23.50	0.00	19.86
10	12,13	38.00	23.00	75.40	43.40	0.00	17.55	0.00	22.28
11	13	37.80	24.80	84.60	54.60	0.00	14.28	0.00	24.56
12	14	36.10	24.60	83.00	54.00	0.70	8.26	0.00	17.55
13	14,15	35.80	24.50	75.00	54.80	0.60	5.62	0.00	13.30
14	15,16	35.50	24.30	74.00	51.40	0.00	3.65	6.65	11.20
15	16	36.70	25.50	76.00	54.20	0.00	0.00	8.43	8.44
16	17	38.30	26.60	76.00	51.20	0.00	0.00	11.38	5.32
17	17,18	36.40	26.20	80.20	54.20	0.68	0.00	14.85	2.88
18	18	36.50	26.00	73.80	57.80	0.00	0.00	18.90	2.00
19	19	37.40	26.20	74.20	47.00	3.24	0.00	21.57	0.65
20	19,20	36.70	26.20	76.60	51.20	0.60	0.00	19.20	0.00
21	20,21	37.60	27.30	90.00	64.80	4.40	0.00	14.22	0.00
22	21	36.80	25.80	77.20	58.60	0.00	0.00	12.20	0.00

Table 2. Simple correlation between major lepidopteran pests and abiotic factors during *rabi*, 2020-21.

Major lepidopteran pests		Temperature (°C)		Relative humidity (%)		Rainfall (mm)
		Max.	Min.	Mor.	Eve.	
Yellow stem borer	Dead hearts	0.315	-0.179	0.222	-0.307	-0.313
	White ears heads	0.315	0.693*	-0.384	0.359	0.515*
Leaf folder (% leaf damage)		0.372	0.042	0.059	-0.134	-0.324

* Significant at 5 % level

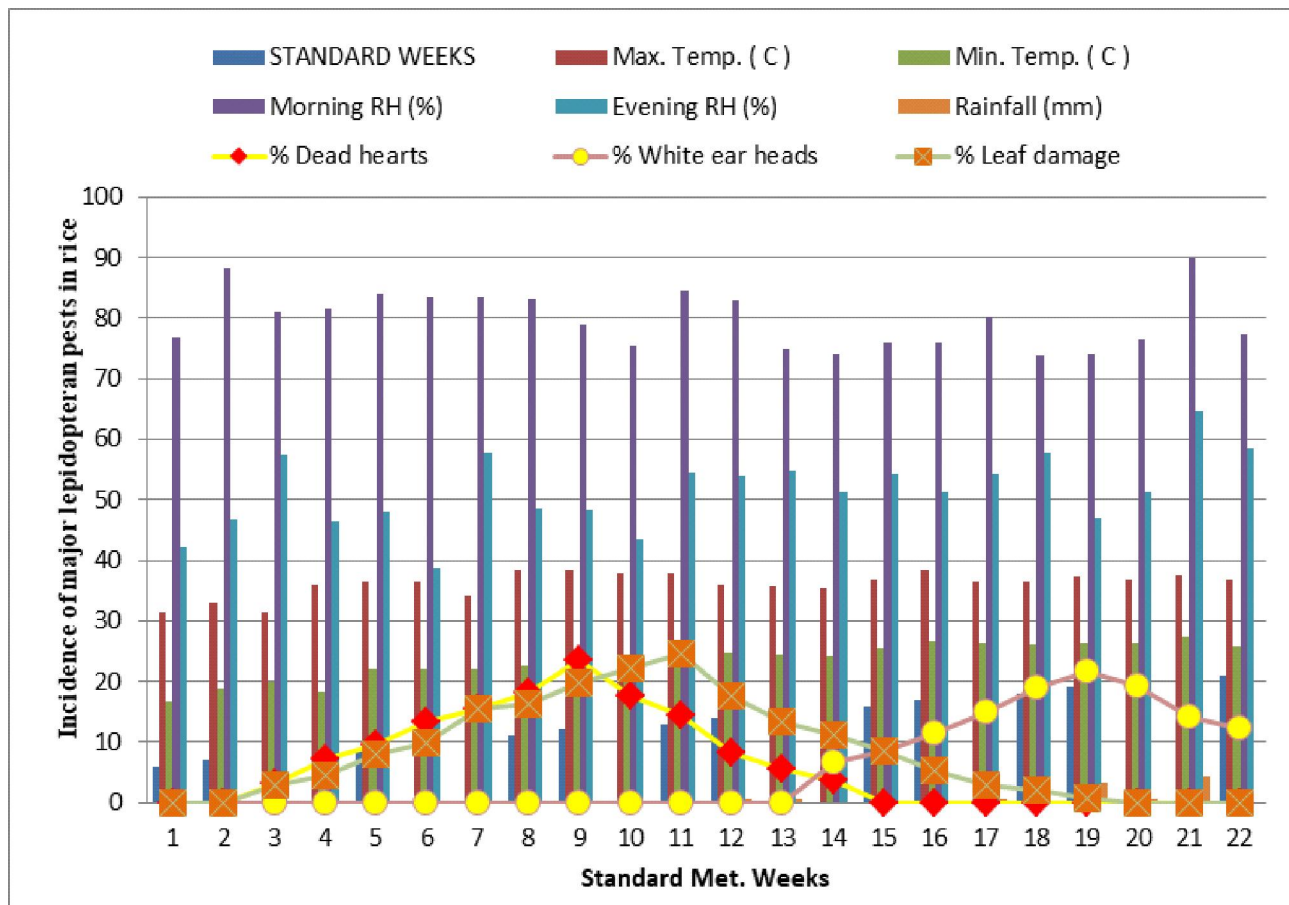


Figure 1. Influence of weather parameters on the incidence of major lepidopteran pests in rice in rice during *rabi*, 2020-21.

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MATERIALS AND METHODS

In order to evaluate the incidence of major lepidopteran pests in rice with relevance to change in abiotic factors, a field experiment was conducted at Agricultural College Farm, Naira during *rabi*, 2020-21. A bulk plot of 200 m² of rice variety MTU-7029 was raised and maintained without any insecticidal application to study the seasonal incidence of major lepidopteran pests in relation to abiotic factors *viz.*, maximum and minimum temperature, morning and evening relative humidities and rainfall. The incidence of yellow stem borer and leaf folder was recorded at 5 days interval from 15 days after transplanting in terms of number of dead hearts/total number of tillers

and number of damaged leaves/total number of tillers on 10 randomly selected hills. The abiotic factors were recorded from the meteorological observatory at Agricultural College Farm, Naira. A simple correlation was also worked out between the mean pest populations (% incidence) and weather parameters.

RESULTS AND DISCUSSION

The mean data of weather parameters and incidence of major lepidopteran pests were presented in the Table 1 and Figure 1, revealed that incidence of major lepidopteran pests *i.e.*, yellow stem borer and leaf folder started at 7th - 8th SMW (3.24% DH and 2.89% leaf damage, respectively). The peak incidence of yellow stem borer was observed during 12th and 19th SMW (23.5% DH and 21.57% WEH, respectively), whereas leaf folder incidence at 13th

SMW was 24.56% leaf damage. The correlation studies between yellow stem borer and weather parameters presented in the Table 2 revealed that maximum temperature ($r = 0.315$) showed non-significant positive correlation with per cent dead hearts and white ear heads. The present finding was in conformity with the findings of Kumar *et al.* (2018). The minimum temperature ($r = 0.693$) and rainfall ($r = 0.515$) showed significant positive correlation with per cent white ear heads caused by yellow stem borer.

The present results were conferred by Silpha *et al.* (2020), Nag *et al.* (2018) and Rana *et al.* (2017) who reported that maximum temperature was positively correlated with infestation of yellow stem borer. The correlation studies between leaf folder and abiotic factors presented in Table 2 revealed that there was non-significant positive correlation with maximum temperature ($r = 0.372$), minimum temperature ($r = 0.042$) and morning relative humidity ($r = 0.059$) whereas non-significant negative correlation showed by evening relative humidity ($r = -0.134$) and rainfall ($r = -0.324$). These findings affirmed by Patel *et al.* (2011) and Kharat (2006) who reported that maximum temperature, minimum temperature and relative humidity showed positive correlation with leaf folder incidence and also Kumar *et al.* (2017) who reported that morning relative humidity showed positive correlation with infestation of leaf folder.

CONCLUSION

The peak period of yellow stem borer was recorded at 12th SMW (23.5% DH) at vegetative stage and 19th SMW (21.57% WEH) at reproductive stage during *rabi*, 2020-21. The correlation analysis between incidence of yellow stem borer with environmental factors indicated that there was a positive correlation with maximum temperature and morning relative humidity and negative correlation was

showed minimum temperature, evening relative humidity and rainfall with the dead hearts caused by yellow stem borer. Minimum temperature and rainfall showed significant positive correlation with white ear heads caused by yellow stem borer. The correlation studies of leaf folder revealed that non-significant positive correlation was observed with maximum temperature, minimum temperature and morning relative humidity.

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