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Studies on the Seasonal Incidance of Leaf Folder, *Cnaphalocrocis Medinalis* Guenee in Midland Sri and Normal Transplanted Rice Ecosystem

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ABSTRACT: *Field experiment was conducted at research farm of Indira Gandhi Krishi Vishwa Vidyalaya, Raipur during* kharif *season 2013-14 using midland SRI and midland normal transplanted rice ecosystem. The results of experiments revealed that the infestation of leaf folder (LF) started from 31 SMW and 32 SMW in month of July with 4.35 and 5.58 per cent leaf damage/hill, respectively in midland normal transplanted rice ecosystem (MNT) and midland SRI rice ecosystem (MSR). The maximum incidence of LF observed during 37 SMW and 38 SMW in month of September with 4.35 and 5.58 per cent leaf damage/hill, respectively in MNT and MSR. During season maximum incidence of LF recorded in MSR (1.75%) as compare to MNT (1.25%). The correlation studies revealed that minimum temperature (r = + 0.573*), (r = + 0.543*), average temperature (r = + 0.546*), (r = + 0.599*), showed significant positive correlation with per cent incidence of LF in MNT and MSR, respectively, while all another weather parameters showed non-significant positive and negative correlation with per cent incidence of LF in both rice ecosystem at 1 and 5 per cent level of significance.*

Key words: *leaf folder, rice ecosystem, system of rice intensification and weather parameters.*

INTRODUCTION

Rice, *Oryza sativa* Linnaeus is the most important staple food grain in the global food grain production. India has the largest acreage under rice, about 44.6 m ha of land with a production of about 90 MT [1]. Even though, there are many constraints in rice production, insects' pests remain a constant problem in all the rice growing regions. In Chhattisgarh there are 5 agro-ecosystems in which rice is cultivated with different practices. These ecosystems are: upland ecosystem, midland ecosystem, lowland ecosystem, submergence prone and irrigated ecosystem. Chhattisgarh is popularly recognized as rice bowl of the country as rice is the principal crop of this state and about 69.7 per cent of net sown area is covered under *kharif* rice and rice grown under transplanting, direct line seeding and system of rice intensification (SRI) which have some challenges like insect pest rice leaf folder, *Cnaphalocrocis medinalis* Guenee [2]. Paddy leaf folder, *Cnaphalocrocis medinalis* Guenee is one of the most important insect pests in Indian subcontinent. Leaf folder (LF) has assumed major pest status in some parts of India due to injudicious cultivation practices [3]. Second instar LF larvae glues the growing paddy leaves longitudinally for accommodation and feeds voraciously green foliage which results in papery dry leaves [4]. Feeding on paddy leaves often results in stunting, curling or yellowing of plant green foliage [5]. Severe infestations may annihilate the plant totally [6]. Losses that incurred to the growing paddy crop are insurmountable [7]. According to [8] reported that in favorable conditions LF affected the crop adversely resulting severe loss. System of Rice Intensification (SRI) is as a technique of agronomic manipulation [9]. Earlier reports indicated that rice plants grown under SRI method are less susceptible to insect pests and diseases due to their healthy growth. The incidence of pests in SRI crop appears to be influenced by the micro-environment created for plants. The physiological and morphological characteristics of rice plants raised under SRI management are significantly different in many respects from non-SRI rice plants [10]. Grain yield loss in rice due to insect pest in India has been estimated from 21 to 51 per cent varying from area to area as per variation in the agro climatic condition [11]. The aims of this study was to determine the seasonal incidence of leaf folder, *Cnaphalocrocis*

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medinalis Guenee and role and reliability of weather factors in midland SRI and normal transplanted rice ecosystem. It is hoped that the findings from the study can contribute to the more ecological precise ways in dealing with outbreaks and control of leaf folder of rice.

MATERIALS AND METHODS

The incidence of rice leaf folder, *Cnapholocris medinalis* Guenee was recorded through the damaged leaves and total number of leaves from 10 randomly selected hills at four spots (m^2) in both midland normal transplanted (MNT) and SRI rice ecosystem (MSR) modified according to [12-15]. Correlation analysis was carried out between field incidence of stem borer and weather parameters during *kharif* season 2013-14. Regression analysis was worked out as per method given by [16]. The percentage of leaf damage was calculated as follows:

$$\text{Per cent incidence} = \frac{\text{Number of damaged levels}}{\text{Total number of leaves}} \times 100$$

RESULT AND DISCUSSION

Seasonal incidence of rice leaf folder, *Cnapholocris medinalis* Guenee

The incidence of rice leaf folder, *Cnapholocris medinalis* Guenee (Table 1 fig 1) revealed that the per cent leaves damage/hill were appeared on 31 and 32 SMW of July with (1.98%), (0.63%) and the maximum per cent leaves damage/hill observed on 37 and 38 SMW of September with (4.37%), (5.58%) in MNT and MSR respectively. At this time maximum, minimum and average temperature (mean of both weeks) was 30.9^{0}C, 24.65^{0}C and 27.78^{0}C respectively which dominantly affect the pest incidence. The seasonal incidence of rice leaf folder, *Cnapholocris medinalis* Guenee revealed that the maximum per cent leaves damage/hill was recorded in MSR with 1.75 per cent as compare to MNT with 1.25 per cent. The present findings are in conformity with [17-25] reported that the higher leaf folder incidence under SRI system as compare to conventional method of rice cultivation. Similarly, [26] reported that the leaf folder reached at the peak during tillering and booting stage of crop. Leaf folder, *Cnaphalocrocis medinalis* reached at the peak during August- September which coincided with the vegetative stage of the plant [27].

Correlation co-efficient (r) and regression analysis

The correlation studies (Table 2 and fig 1) revealed that minimum temperature (r = + 0.573*), (r = + 0.543*), average temperature (r = + 0.546*), (r = + 0.599*), showed significant positive correlation with per cent incidence of LF in MNT and MSR, respectively. The maximum temperature (r = + 0.124), (r = + 0.319), morning relative humidity (RH-I) (r = + 0.194), (r = + 0.070), evening relative humidity (RH-II) (r = + 0.570),

Table 1
Mean per cent incidence of leaf folder, *Cnaphalocrocis medinalis* Guenee in SRI and transplanted rice ecosystem

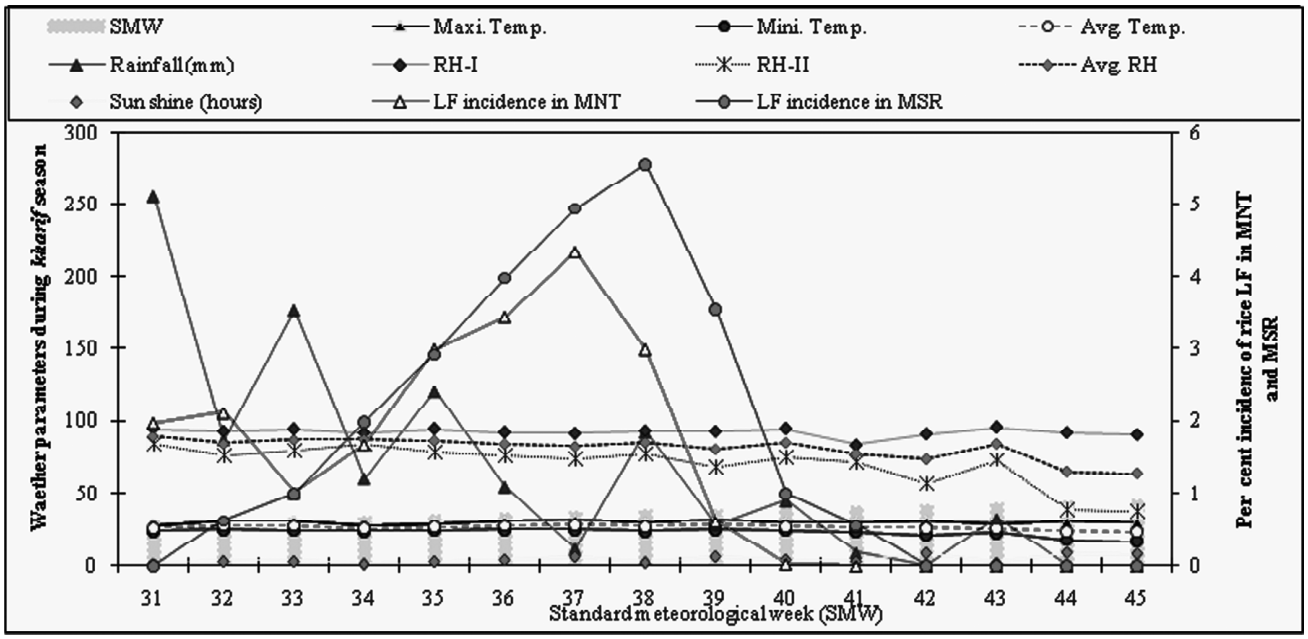
	% Incidence of LF in midland rice ecosystem		Temperature (^{0}C)				Relative humidity (%)			
SMW	Incidence of LF in in MNT	Incidence of LF in MSR	Maxi. Temp.	Mini. Temp.	Average Temp.	Rainfall (mm)	Morning	Evening	Average	Sun Shine (hours)
31	1.98	0.00	28.3	23.9	26.1	255.8	95.1	83.9	89.5	1.3
32	2.12	0.63	31.1	24.7	27.9	87.4	93.1	76	84.55	3.3
33	1.01	1.00	31.3	24.4	27.85	177	94.7	79.6	87.15	3.3
34	1.68	2.00	27.8	23.8	25.8	60.5	92	83.6	87.8	1.5
35	3.00	2.94	29.3	24.5	26.9	120.8	94.9	78.1	86.5	3.1
36	3.45	4.00	31.1	24.8	27.95	54.8	92.6	75.7	84.15	4.2
37	4.35	4.95	31.9	25.2	28.55	11.6	91.7	73.3	82.5	6.2
38	3.00	5.58	29.9	24.1	27	92.6	93.4	76.9	85.15	2.5
39	0.61	3.56	32	24.9	28.45	28.6	93	68	80.5	6.3
40	0.03	1.00	30.1	24.2	27.15	45.2	95	75.3	85.15	4.2
41	0.00	0.56	30.2	23.3	26.75	8.6	83.7	71.1	77.4	3.5
42	0.00	0.00	30.7	21.4	26.05	0	91.4	56.3	73.85	8.6
43	0.00	0.00	28.8	22.6	25.7	32.6	95.9	73.1	84.5	2.1
44	0.00	0.00	30.5	17.3	23.9	0	92.3	38.4	65.35	8.9
45	0.00	0.00	30	16.7	23.35	0	90.9	37.3	64.1	8.2
**SM	1.25	1.75								

*SMW = Standard meteorological week, **S.M. = Seasonal mean, MNT = midland normal transplanted rice ecosystem, MSR = midland system of rice intensification rice ecosystem

Table 2
Correlation co-efficient (r) and regression analysis between mean population of rice leaf folder and weather factors in SRI and transplanted rice ecosystem

Correlation with			*Correlation Coefficient r)*		*Coefficient of variation (%)*		*Regression equation value*	
Insect	*Weather parameter*		*MNT*	*MSR*	*MNT*	*MSR*	*MNT*	*MSR*
Per cen infestation leaf of folder	Temperature (^{0}C)	Maxi. Temp.	0.124	0.319	1.530	10.171	y = 0.102x + 30.05 R^2 = 0.015	y = 0.201x + 29.84 R^2 = 0.101
		Mini. Temp.	0.573*	0.543*	32.881	29.537	y = 1.012x + 21.62 R^2 = 0.328	y = 0.732x + 21.77 R^2 = 0.295
		Average Temp.	0.546*	0.599*	29.813	35.928	y = 0.557x + 25.83 R^2 = 0.298	y = 0.467x + 25.81 R^2 = 0.359
	Rainfall (mm)	0	.319	– 0.026	10.205	0.067	y = 15.60x + 42.95 R^2 = 0.102	y = – 0.962x + 66.71 R^2 = 0.001
	Relative humidity (%)	Morning	0.194	0.070	3.765	0.492	y = 0.376x + 92.11 R^2 = 0.037	y = 0.104x + 92.46 R^2 = 0.004
		Evening	0.510	0.368	26.023	13.516	y = 4.952x + 62.76 R^2 = 0.260	y = 2.726x + 65.00 R^2 = 0.135
		Average	0.512	0.356	26.170	12.651	y = 2.664x + 77.43 R^2 = 0.261	y = 1.415x + 78.73 R^2 = 0.126
	Sun shine (hours)		– 0.327	– 0.142	10.664	2.019	y = – 0.555x + 5.266 R^2 = 0.106	y = – 0.184x + 4.802 R^2 = 0.020

*Significant at 5 % level (2.145), **Significant at 1 % level (2.977), MNT = midland normal transplanted rice ecosystem, MSR = midland SRI (system of rice intensification) rice ecosystem.



MNT = midland normal transplanted rice ecosystem, MSR = midland SRI (system of rice intensification) rice ecosystem

Figure 1: Influence of weather parameters on the per cent incidence of leaf folder in SRI and transplanted rice ecosystem

(r = + 0.368) and average relative humidity (Avg. RH) (r = + 0.521), (r = + 0.356), showed non-significant positive correlation while sun shine hours (r = - 0.327), (r = – 0.142) showed non-significant negative correlation with per cent incidence of LF in MNT and MSR, respectively. Only rainfall showed non-significant positive correlation (r = + 0.319) in MNT and non-significant negative correlation (r = –0.026) in MSR with per cent incidence of LF at 1 and 5 per cent level of significance. The present findings are in conformity with [28] also reported that the abiotic factors viz., temperature, light, moisture etc. have a direct influence on insect distribution and development. Among these parameters, temperature plays an important role in determining the growth rate of insects as insects are poikilothermic animals whose metabolism, rate and magnitude of growth, development and overall behavioral activities respond significantly to temperature change. [29] reported that the global temperatures have risen by 0.85^{o}C since 1880, with the fastest increases since 1950. The IPCC has predicted that the surface temperatures will rise

by between 0.3°C and 4.8°C above pre-industrial levels by 2100, with most models predicting an increase of at least 1.5°C and little chance of a rise below 2°C temperature.

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