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## Effect of abiotic factors on incidence of leaf folder, *Cnaphalocrocis medinalis* guenee in rice ecosystem of Konkan region

**NS Dalvi, VS Desai, AL Narangalkar, SA Chavan, SK Mehendale and JS Dhekale**

### Abstract

The present experiment was conducted during *Kharif* season 2018-19 and 2019-2020 at Agronomy farm, Department of Agronomy, College of Agriculture, Dapoli to study the correlation between leaf folder incidence and weather parameters. Results revealed that morning relative humidity in  $S_1V_2$  ( $r=0.576$ ),  $S_1V_4$  ( $r=0.625$ ),  $S_1V_5$  ( $r=0.617$ ),  $S_1V_7$  ( $r=0.618$ ),  $S_1V_9$  ( $r=0.617$ ),  $S_2V_1$  ( $r=0.583$ ),  $S_2V_3$  ( $r=0.672$ ),  $S_2V_5$  ( $r=0.583$ ),  $S_2V_9$  ( $r=0.630$ ),  $S_3V_2$  ( $r=0.630$ ),  $S_3V_5$  ( $r=0.578$ ),  $S_3V_9$  ( $r=0.622$ ), evening relative humidity in  $S_2V_1$  ( $r=0.611$ ) and rainfall in  $S_2V_1$  ( $r=0.642$ ) was found to be positively significant. While, maximum temperature in  $S_1V_5$  ( $r=-0.599$ ),  $S_2V_1$  ( $r=-0.697$ ),  $S_2V_5$  ( $r=-0.634$ ),  $S_2V_9$  ( $r=-0.614$ ),  $S_3V_1$  ( $r=-0.614$ ),  $S_3V_2$  ( $r=-0.629$ ),  $S_3V_5$  ( $r=-0.599$ ),  $S_3V_8$  ( $r=-0.622$ ),  $S_3V_9$  ( $r=-0.647$ ) and bright sunshine hours  $S_2V_1$  ( $r=-0.714$ ),  $S_3V_8$  ( $r=-0.604$ ) was found to be negatively significant. Remaining all of the weather parameters were found to be non-significant.

**Keywords:** Leaf folder, weather parameters, Dapoli

### Introduction

Rice is one of the important cereal crops of the world and forms the staple food for more than 65 per cent of the world population and known as king of cereals, nearly 90 per cent of the area, production and consumption of rice are confined to South East Asian countries [8]. Rice has shaped the culture, diets and economics of millions of people. For more than half of the humanity "rice is life". Considering its importance, the United Nation designated year 2004 as the "International Year of Rice" [1]. It is a staple food for more than two billion people. Insect pests constitute the major yield limiting biotic stresses throughout the rice growing countries. About 300 species of insects have been reported to attack rice crop in India, out of which 20 have been found to be the major pests [2].

Rice leaf folder, *Cnaphalocrocis medinalis* Guenee is considered as the major pest of rice. The larvae fold the leaves with the help of silk strands where the larval and pupal stage survive. The silk contracts upon drying roll the entire leaf blade into tube [11]. Larva feeds voraciously on green foliage which results in papery dry leaves [4]. The larva scrap the chlorophyll content of leaves resulting in the reduction of photosynthesis and thus result in the reduction of yield. The yield loss caused by leaf folder reported from 5 to 25 per cent [7]. The yield loss varies from 30 to 80 per cent due to leaf folder in epidemic situation [9].

Climate change affects insect physiology, behaviour, and development as well as species distribution and abundance, evidenced by changes in the number of generations a year, increasing survival rates in winter, and the earlier appearance of some insects. Information about seasonal abundance and population build up trend is essential to ensure timely preparedness to tackle impending pest problems and prevent crop losses. In this regard, the present investigation was carried out with the following objectives of effect of weather parameters on leaf folder, *Cnaphalocrocis medinalis* incidence on rice

### Materials and Methods

The experiment was conducted to know correlation between leaf folder incidence and weather parameters. Data on weather parameters like, maximum temperature, minimum temperature, morning relative humidity, evening relative humidity, rainfall and sunshine hours for the years 2018-2019 and 2019-2020 were collected from meteorological laboratory, Department of

Agronomy, Dr. B. S. Konkan Krishi Vidyapeeth, Dapoli.

### Experiment Layout

The experiment was conducted during *Kharif* season 2018-2019 and 2019-2020 was laid out in split plot design with three replications. The main plot treatments were three sowing windows, viz., S<sub>1</sub>-23<sup>rd</sup> Met. Week, S<sub>2</sub>- 24<sup>th</sup> Met. Week and S<sub>3</sub>-25<sup>th</sup> Met. Week. The sub plot treatments comprised nine varieties.

Details of Experiments

Location	: Agronomy farm, Dr. B.S.K.K.V., Dapoli.
Season	: <i>Kharif</i> 2018-2019 and 2019-2020
Crop	: Rice
Treatment details	: <p><b>A] Main plot (Sowing time)</b>          S<sub>1</sub> - 23<sup>rd</sup> Meteorological week (4<sup>th</sup> to 10<sup>th</sup> June).          S<sub>2</sub> - 24<sup>th</sup> Meteorological week (11<sup>th</sup> to 17<sup>th</sup> June)          S<sub>3</sub> - 25<sup>th</sup> Meteorological week (18<sup>th</sup> to 24<sup>th</sup> June)</p> <p><b>B] Sub plot (Varieties)</b>          V<sub>1</sub> - Karjat-5          V<sub>2</sub> - Karjat-7          V<sub>3</sub> - Ratnagiri-24          V<sub>4</sub> - Karjat-2          V<sub>5</sub> - Palghar-1          V<sub>6</sub> - Karjat-3          V<sub>7</sub> - Swarna          V<sub>8</sub> - Sahyadri-4          V<sub>9</sub> - Jaya</p>
Plot Size (Gross Plot)	: Gross: 7.2 x 2.1 m Net plot: 6.8 x 1.8 m
Design	: Split plot design
Number of replications	: Three
Spacing	: 20 cm x 15 cm

### Method of recording observations

For leaf folder, total number of leaves per hill and infested leaves per hill were recorded from five randomly selected five hills. The per cent infestation of leaf folder was calculated by using formula given below.

$$\text{Per cent infestation of leaf folder} = \frac{\text{Total no. of infested leaves}}{\text{Total no. of leaves per hill}} \times 100$$

### Results and Discussions

#### *Kharif* 2018-2019

The data on correlation between leaf folder infesting rice at different sowing time and different meteorological parameters during 2018-2019 are presented in Table 1 revealed that, maximum temperature ( $r = -0.652$ ) was found to be negatively significant with leaf folder infestation in S<sub>3</sub> (25<sup>th</sup> SMW, 18<sup>th</sup> to 24<sup>th</sup> June). Remaining all of the weather parameters were found to be non-significant.

During 2018-2019 the data on correlation between leaf folder infesting rice at different varieties and different meteorological parameters presented in Table 1 revealed that, minimum temperature in V<sub>7</sub> ( $r=0.636$ ) and evening relative humidity ( $r=0.615$ ) were found positively significant. While, maximum temperature and bright sunshine hours had found to be negatively significant in V<sub>7</sub> ( $r=-0.591$ ) and V<sub>7</sub> ( $r=-0.613$ ). Remaining all of the weather parameters were found to be non-significant.

The data on correlation between leaf folder infesting rice at combine effect of different sowing time and varieties with different meteorological parameters during 2018-2019

presented in Table 1 revealed that minimum temperature in S<sub>2</sub>V<sub>7</sub> ( $r=0.577$ ) was found to be positively significant. While, maximum temperature in S<sub>3</sub>V<sub>1</sub> ( $r=-0.590$ ), S<sub>3</sub>V<sub>5</sub> ( $r=-0.622$ ), S<sub>3</sub>V<sub>7</sub> ( $r=-0.662$ ) and bright sunshine hours in S<sub>2</sub>V<sub>3</sub> ( $r=-0.580$ ), S<sub>3</sub>V<sub>5</sub> ( $r = -0.577$ ) was found to be negatively significant. Remaining all of the weather parameters were found to be non-significant.

#### *Kharif* 2019-2020

The data on correlation between leaf folder infesting rice at different sowing time, varieties and combine effect of different sowing time and varieties and different meteorological parameters during 2019-2020 are presented in Table 2 revealed that, all the weather parameters were found to be non-significant.

#### Pooled Data

The data on correlation between leaf folder infesting rice at different sowing time and different meteorological parameters during 2018-2019 and 2019-2020 are presented in Table 3 revealed that, morning relative humidity in S<sub>2</sub> ( $r=0.614$ ) was found to be positively significant. While, maximum temperature in S<sub>2</sub> ( $r=-0.719$ ), S<sub>2</sub> ( $r=-0.691$ ) and bright sunshine hours S<sub>2</sub> ( $r=-0.656$ ) was found to be negatively significant. Remaining all of the weather parameters were found to be non-significant.

During 2018-2019 and 2019-2020 the data on correlation between leaf folder infesting rice at different varieties and different meteorological parameters revealed that, weather parameters like morning relative humidity was found to be positively significant in V<sub>2</sub> ( $r=0.607$ ), V<sub>4</sub> ( $r=0.635$ ), V<sub>5</sub> ( $r=0.606$ ), V<sub>7</sub> ( $r=0.613$ ) and V<sub>9</sub> ( $r=0.665$ ). While, maximum temperature in V<sub>1</sub> ( $r=-0.610$ ), V<sub>2</sub> ( $r=-0.599$ ), V<sub>4</sub> ( $r=-0.632$ ), V<sub>5</sub> ( $r=-0.622$ ), V<sub>6</sub> ( $r=-0.583$ ), V<sub>7</sub> ( $r=-0.633$ ), V<sub>8</sub> ( $r=-0.638$ ) and V<sub>9</sub> ( $r=-0.624$ ) and bright sunshine hours V<sub>4</sub> ( $r=-0.578$ ) was found to be negatively significant. Remaining all of the weather parameters were found to be non-significant.

The results of data during 2018-2019 and 2019-2020 on correlation between leaf folder infesting rice at combine effect of different sowing time and varieties with different meteorological parameters revealed that morning relative humidity in S<sub>1</sub>V<sub>2</sub> ( $r=0.576$ ), S<sub>1</sub>V<sub>4</sub> ( $r=0.625$ ), S<sub>1</sub>V<sub>5</sub> ( $r=0.617$ ), S<sub>1</sub>V<sub>7</sub> ( $r=0.618$ ), S<sub>1</sub>V<sub>9</sub> ( $r=0.617$ ), S<sub>2</sub>V<sub>1</sub> ( $r=0.583$ ), S<sub>2</sub>V<sub>3</sub> ( $r=0.672$ ), S<sub>2</sub>V<sub>5</sub> ( $r=0.583$ ), S<sub>2</sub>V<sub>9</sub> ( $r=0.630$ ), S<sub>3</sub>V<sub>2</sub> ( $r=0.630$ ), S<sub>3</sub>V<sub>5</sub> ( $r=0.578$ ), S<sub>3</sub>V<sub>9</sub> ( $r=0.622$ ), evening relative humidity in S<sub>2</sub>V<sub>1</sub> ( $r=0.611$ ) and rainfall in S<sub>2</sub>V<sub>1</sub> ( $r=0.642$ ) was found to be positively significant. While, maximum temperature in S<sub>1</sub>V<sub>5</sub> ( $r=-0.599$ ), S<sub>2</sub>V<sub>1</sub> ( $r=-0.697$ ), S<sub>2</sub>V<sub>5</sub> ( $r=-0.634$ ), S<sub>2</sub>V<sub>9</sub> ( $r=-0.614$ ), S<sub>3</sub>V<sub>1</sub> ( $r=-0.614$ ), S<sub>3</sub>V<sub>2</sub> ( $r=-0.629$ ), S<sub>3</sub>V<sub>5</sub> ( $r=-0.599$ ), S<sub>3</sub>V<sub>8</sub> ( $r=-0.622$ ), S<sub>3</sub>V<sub>9</sub> ( $r=-0.647$ ) and bright sunshine hours S<sub>2</sub>V<sub>1</sub> ( $r=-0.714$ ), S<sub>3</sub>V<sub>8</sub> ( $r=-0.604$ ) was found to be negatively significant. Remaining all of the weather parameters were found to be non-significant.

The present findings are in close conformity with the results of Khan and Ramamurthy<sup>[5]</sup>. They stated that maximum and minimum temperature had negative impact on population built up of leaf folder. However, the relative humidity in the morning had a positive impact on population build up. Khan *et al.*<sup>[6]</sup> revealed that sunshine hours were highly significant and positively correlated with maximum temperature, rainfall and relative humidity in the evening had negative impact; and relative humidity in the morning did not have any influence. Sabir *et al.*<sup>[10]</sup> reported a negative but non-significant relation in case of minimum and maximum temperature and rainfall

but correlation with relative humidity was highly significant and positive. Chakraborty and Chandra Deb <sup>[3]</sup> reported that abiotic conditions such as maximum relative humidity and average relative humidity had significant positive influence on *C. medinalis* population. In case sunshine hours a negative influence was observed. In addition, other factors such as

maximum temperature, average relative humidity and rainfall imparted insignificant positive effect on population development. Zainab *et al.* <sup>[12]</sup> reported that per cent incidence of rice leaf folder was significantly and negatively correlated with mean temperature and positively correlated with mean relative humidity and total rainfall.

**Table 1:** Correlation between sowing time, varieties and interaction (sowing time and varieties) and weather parameters on per cent leaf folder infestation *Kharif* during 2018-2019

Treatments	Weather Parameter					
	TMax	TMin	RH-I	RH-II	Rain	BSS
<b>Main Plot: Sowing Time</b>						
S <sub>1</sub>	-0.439	0.100	0.274	0.310	0.234	-0.263
S <sub>2</sub>	-0.534	0.336	0.199	0.455	0.119	-0.397
S <sub>3</sub>	-0.652*	0.288	0.196	0.556	0.225	-0.424
<b>Sub Plot:- Varieties</b>						
V <sub>1</sub>	-0.536	-0.001	0.091	0.405	0.268	-0.289
V <sub>2</sub>	-0.446	-0.044	0.132	0.281	0.152	-0.117
V <sub>3</sub>	-0.561	0.176	0.363	0.499	0.453	-0.442
V <sub>4</sub>	-0.446	0.333	0.268	0.375	0.236	-0.463
V <sub>5</sub>	-0.516	0.248	0.246	0.393	0.210	-0.357
V <sub>6</sub>	-0.338	0.017	-0.003	0.219	-0.038	-0.014
V <sub>7</sub>	-0.591*	0.636*	0.323	0.615*	0.113	-0.613*
V <sub>8</sub>	-0.483	0.223	0.105	0.354	0.114	-0.341
V <sub>9</sub>	-0.495	0.304	0.259	0.431	0.118	-0.333
<b>Interaction- Main plot x Sub plot</b>						
S <sub>1</sub> V <sub>1</sub>	-0.440	-0.125	0.116	0.377	0.480	-0.247
S <sub>1</sub> V <sub>2</sub>	-0.389	0.188	0.394	0.289	0.283	-0.316
S <sub>1</sub> V <sub>3</sub>	-0.403	0.000	0.283	0.292	0.383	-0.268
S <sub>1</sub> V <sub>4</sub>	-0.459	0.187	0.298	0.379	0.303	-0.364
S <sub>1</sub> V <sub>5</sub>	-0.301	0.053	0.082	0.169	0.023	-0.115
S <sub>1</sub> V <sub>6</sub>	-0.241	-0.241	-0.218	0.205	0.059	0.058
S <sub>1</sub> V <sub>7</sub>	-0.228	0.348	0.183	0.208	-0.080	-0.238
S <sub>1</sub> V <sub>8</sub>	-0.437	0.078	0.344	0.301	0.305	-0.238
S <sub>1</sub> V <sub>9</sub>	-0.412	0.305	0.352	0.334	0.161	-0.328
S <sub>2</sub> V <sub>1</sub>	-0.282	0.035	-0.033	0.190	0.035	-0.199
S <sub>2</sub> V <sub>2</sub>	-0.265	-0.374	-0.339	0.085	-0.169	0.329
S <sub>2</sub> V <sub>3</sub>	-0.435	0.547	0.480	0.498	0.293	-0.580*
S <sub>2</sub> V <sub>4</sub>	-0.043	0.078	-0.139	-0.033	-0.183	-0.110
S <sub>2</sub> V <sub>5</sub>	-0.471	0.137	0.171	0.346	0.187	-0.288
S <sub>2</sub> V <sub>6</sub>	-0.374	-0.054	-0.005	0.188	0.033	-0.016
S <sub>2</sub> V <sub>7</sub>	-0.284	0.577*	0.241	0.386	-0.039	-0.453
S <sub>2</sub> V <sub>8</sub>	-0.321	0.132	-0.009	0.201	-0.037	-0.189
S <sub>2</sub> V <sub>9</sub>	-0.460	0.362	0.226	0.429	0.031	-0.323
S <sub>3</sub> V <sub>1</sub>	-0.590*	0.161	0.164	0.458	0.191	-0.345
S <sub>3</sub> V <sub>2</sub>	-0.505	0.071	0.165	0.357	0.111	-0.186
S <sub>3</sub> V <sub>3</sub>	-0.553	-0.079	0.055	0.444	0.360	-0.223
S <sub>3</sub> V <sub>4</sub>	-0.378	0.311	0.283	0.333	0.265	-0.396
S <sub>3</sub> V <sub>5</sub>	-0.622*	0.508	0.372	0.565	0.291	-0.577*
S <sub>3</sub> V <sub>6</sub>	-0.252	0.201	0.100	0.206	-0.100	-0.080
S <sub>3</sub> V <sub>7</sub>	-0.662*	0.158	0.178	0.569	0.299	-0.352
S <sub>3</sub> V <sub>8</sub>	-0.324	0.393	-0.137	0.341	0.011	-0.424
S <sub>3</sub> V <sub>9</sub>	-0.529	0.184	0.129	0.456	0.114	-0.275

Table 'r' value = 0.708 at 1% level of significance and

Table 'r' value = 0.576 at 5% level of significance (N = 12 i.e. N-2 d.f.)

\* Significant at 5% level of significance

\*\*Significant at 1% level of significance

**Table 2:** Correlation between sowing time, varieties and interaction (sowing time and varieties) and weather parameters on per cent leaf folder infestation during *Kharif* 2019-2020

Treatments	Weather Parameter					
	TMax	TMin	RH-I	RH-II	Rain	BSS
<b>Main Plot: Sowing Time</b>						
S <sub>1</sub>	-0.018	-0.371	0.022	-0.111	-0.131	0.095
S <sub>2</sub>	-0.306	-0.217	0.238	0.104	0.047	-0.181
S <sub>3</sub>	-0.247	-0.236	0.203	0.081	-0.041	-0.140
<b>Sub Plot:- Varieties</b>						
V <sub>1</sub>	0.053	-0.025	-0.068	-0.131	-0.293	0.118
V <sub>2</sub>	0.073	-0.003	-0.153	-0.090	-0.293	0.077
V <sub>3</sub>	0.121	-0.358	-0.056	-0.231	-0.251	0.236
V <sub>4</sub>	-0.139	-0.281	0.170	0.037	-0.006	-0.031
V <sub>5</sub>	0.044	-0.194	-0.093	-0.144	-0.291	0.099
V <sub>6</sub>	0.241	-0.153	-0.166	-0.265	-0.377	0.289
V <sub>7</sub>	-0.042	-0.185	-0.016	-0.145	-0.238	0.051
V <sub>8</sub>	0.036	-0.162	-0.050	-0.138	-0.284	0.088
V <sub>9</sub>	0.158	-0.193	-0.142	-0.220	-0.329	0.198
<b>Interaction- Main plot x Sub plot</b>						
S <sub>1</sub> V <sub>1</sub>	0.013	-0.096	-0.037	-0.135	-0.202	0.128
S <sub>1</sub> V <sub>2</sub>	-0.096	-0.050	-0.054	-0.002	-0.129	-0.078
S <sub>1</sub> V <sub>3</sub>	0.122	-0.485	-0.020	-0.221	-0.188	0.256
S <sub>1</sub> V <sub>4</sub>	-0.025	-0.336	0.055	-0.018	-0.020	0.057
S <sub>1</sub> V <sub>5</sub>	0.178	-0.117	-0.177	-0.228	-0.353	0.214
S <sub>1</sub> V <sub>6</sub>	0.169	-0.433	-0.041	-0.282	-0.263	0.303
S <sub>1</sub> V <sub>7</sub>	0.051	-0.088	-0.142	-0.138	-0.278	0.080
S <sub>1</sub> V <sub>8</sub>	0.222	-0.392	-0.158	-0.287	-0.355	0.289
S <sub>1</sub> V <sub>9</sub>	0.172	-0.243	-0.196	-0.232	-0.349	0.208
S <sub>2</sub> V <sub>1</sub>	-0.239	0.203	0.254	0.187	0.087	-0.194
S <sub>2</sub> V <sub>2</sub>	0.139	0.206	-0.160	-0.095	-0.342	0.095
S <sub>2</sub> V <sub>3</sub>	0.008	-0.277	0.002	-0.132	-0.166	0.107
S <sub>2</sub> V <sub>4</sub>	-0.232	-0.045	0.197	0.118	0.031	-0.157
S <sub>2</sub> V <sub>5</sub>	-0.165	-0.145	0.021	0.040	-0.128	-0.119
S <sub>2</sub> V <sub>6</sub>	0.337	0.137	-0.336	-0.226	-0.357	0.264
S <sub>2</sub> V <sub>7</sub>	-0.118	-0.262	0.091	-0.106	-0.141	0.006
S <sub>2</sub> V <sub>8</sub>	0.059	0.005	-0.060	-0.112	-0.276	0.075
S <sub>2</sub> V <sub>9</sub>	0.138	-0.190	-0.076	-0.245	-0.280	0.209
S <sub>3</sub> V <sub>1</sub>	0.235	-0.100	-0.238	-0.230	-0.493	0.237
S <sub>3</sub> V <sub>2</sub>	0.230	-0.066	-0.212	-0.176	-0.367	0.211
S <sub>3</sub> V <sub>3</sub>	0.326	-0.025	-0.370	-0.358	-0.513	0.324
S <sub>3</sub> V <sub>4</sub>	-0.083	-0.290	0.176	-0.005	-0.115	0.019
S <sub>3</sub> V <sub>5</sub>	0.087	-0.259	-0.101	-0.184	-0.318	0.154
S <sub>3</sub> V <sub>6</sub>	-0.306	0.060	0.309	0.246	0.047	-0.243
S <sub>3</sub> V <sub>7</sub>	0.128	-0.177	-0.126	-0.331	-0.413	0.221
S <sub>3</sub> V <sub>8</sub>	-0.146	0.070	0.042	0.027	-0.145	-0.123
S <sub>3</sub> V <sub>9</sub>	0.186	-0.111	-0.159	-0.200	-0.352	0.197

Table 'r' value = 0.708 at 1% level of significance and

Table 'r' value = 0.576 at 5% level of significance (N = 12 i.e. N-2 d.f.)

\* Significant at 5% level of significance

\*\*Significant at 1% level of significance

**Table 3:** Pooled correlation between sowing time, varieties and interaction (sowing time and varieties) and weather parameters on per cent leaf folder infestation during *Kharif* 2018-2019 and 2019-2020

Treatments	Weather Parameter					
	T Max	T Min	RH-I	RH-II	Rain	BSS
<b>Main Plot: Sowing Time</b>						
S <sub>1</sub>	-0.540	0.051	0.572	0.375	0.213	-0.409
S <sub>2</sub>	-0.719**	0.225	0.614*	0.567	0.528	-0.656*
S <sub>3</sub>	-0.691*	0.162	0.497	0.520	0.336	-0.543
<b>Sub Plot:- Varieties</b>						
V <sub>1</sub>	-0.610*	0.146	0.571	0.483	0.186	-0.416
V <sub>2</sub>	-0.599*	0.188	0.607*	0.480	0.201	-0.433
V <sub>3</sub>	-0.448	0.013	0.502	0.333	0.102	-0.266
V <sub>4</sub>	-0.632*	0.232	0.635*	0.510	0.396	-0.578*
V <sub>5</sub>	-0.622*	0.156	0.606*	0.453	0.271	-0.503
V <sub>6</sub>	-0.583*	0.195	0.503	0.448	0.050	-0.374
V <sub>7</sub>	-0.633*	0.244	0.613*	0.498	0.284	-0.550

V <sub>8</sub>	-0.638*	0.128	0.546	0.457	0.310	-0.503
V <sub>9</sub>	-0.624*	0.229	0.665*	0.503	0.242	-0.493
<b>Interaction- Main plot x Sub plot</b>						
S <sub>1</sub> V <sub>1</sub>	-0.368	0.040	0.433	0.294	0.006	-0.184
S <sub>1</sub> V <sub>2</sub>	-0.457	0.351	0.576*	0.351	0.113	-0.478
S <sub>1</sub> V <sub>3</sub>	-0.365	-0.036	0.415	0.239	0.068	-0.214
S <sub>1</sub> V <sub>4</sub>	-0.527	0.164	0.625*	0.455	0.373	-0.459
S <sub>1</sub> V <sub>5</sub>	-0.599*	0.153	0.617*	0.438	0.310	-0.487
S <sub>1</sub> V <sub>6</sub>	-0.316	-0.290	0.304	0.177	-0.044	-0.022
S <sub>1</sub> V <sub>7</sub>	-0.534	0.359	0.618*	0.428	0.213	-0.537
S <sub>1</sub> V <sub>8</sub>	-0.380	-0.025	0.412	0.229	-0.037	-0.206
S <sub>1</sub> V <sub>9</sub>	-0.517	0.216	0.617*	0.386	0.115	-0.436
S <sub>2</sub> V <sub>1</sub>	-0.697*	0.366	0.583*	0.611*	0.642*	-0.714*
S <sub>2</sub> V <sub>2</sub>	-0.277	-0.244	-0.044	0.206	0.014	0.086
S <sub>2</sub> V <sub>3</sub>	-0.525	0.333	0.672*	0.455	0.198	-0.494
S <sub>2</sub> V <sub>4</sub>	-0.454	0.140	0.338	0.323	0.494	-0.496
S <sub>2</sub> V <sub>5</sub>	-0.634*	0.143	0.583*	0.469	0.412	-0.545
S <sub>2</sub> V <sub>6</sub>	-0.367	0.389	0.490	0.358	-0.050	-0.295
S <sub>2</sub> V <sub>7</sub>	-0.504	0.175	0.518	0.440	0.326	-0.465
S <sub>2</sub> V <sub>8</sub>	-0.555	0.118	0.416	0.417	0.487	-0.483
S <sub>2</sub> V <sub>9</sub>	-0.614*	0.200	0.630*	0.498	0.308	-0.488
S <sub>3</sub> V <sub>1</sub>	-0.614*	0.149	0.507	0.469	0.079	-0.393
S <sub>3</sub> V <sub>2</sub>	-0.629*	0.155	0.630*	0.524	0.225	-0.422
S <sub>3</sub> V <sub>3</sub>	-0.228	-0.372	0.128	0.112	-0.093	0.117
S <sub>3</sub> V <sub>4</sub>	-0.528	0.231	0.424	0.391	0.047	-0.417
S <sub>3</sub> V <sub>5</sub>	-0.599*	0.181	0.578*	0.452	0.147	-0.464
S <sub>3</sub> V <sub>6</sub>	-0.548	0.435	0.389	0.467	0.201	-0.523
S <sub>3</sub> V <sub>7</sub>	-0.472	-0.045	0.276	0.313	0.106	-0.234
S <sub>3</sub> V <sub>8</sub>	-0.622*	0.329	0.431	0.491	0.366	-0.604*
S <sub>3</sub> V <sub>9</sub>	-0.647*	0.228	0.622*	0.541	0.237	-0.461

Table 'r' value = 0.708 at 1% level of significance and

Table 'r' value = 0.576 at 5% level of significance (N = 12 i.e. N-2 d.f.)

\* Significant at 5% level of significance

\*\*Significant at 1% level of significance

## Conclusion

The effect of climatic factors especially rainfall plays very important role in fluctuations in the pest population. The early sowing escapes the pest build up that can emerge as one of the eco-friendly management tactic of pest management in rice. The peak period of the major rice pests will give idea to the farmers for better and effective management of the pests.

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