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PB Suryavanshi
Assistant Professor
Department of Agrometeorology
DP COA, Dahegaon,
Maharashtra, India

NV Kashid
Officer in-charge, Agricultural Research Station farm, Vadgaon Maval, Tal- Maval, Dist- Pune, Maharashtra, India

SS Misal
Research Associate,
CASST-CSAWM, MPKV,
Rahuri, Maharashtra, India

KA Rewale
Assistant Professor, Department of Plant Pathology DP COA, Dahegaon, Maharashtra, India

Corresponding Author:
PB Suryavanshi
Assistant Professor
Department of Agrometeorology
DP COA, Dahegaon,
Maharashtra, India

Effect of weather parameters on pest incidence of summer paddy varieties: Bhogawati and Phule Radha

PB Suryavanshi, NV Kashid, SS Misal and KA Rewale

Abstract
The present investigation entitled "Effect of weather parameters on Pest incidence of summer paddy varieties" was carried out during summer, 2014 at Agricultural Research Station farm, VadgaonMaval, Tal- Maval, Dist- Pune. The field experiment was laid out in a split plot design with three replications. There were sixteen treatment combinations comprising of four varieties IET-13549 (Bhogawati) and RDN-99-1 (PhuleRadha) as main plot treatments and four fertilizer levels (F1-75% RDF through straight fertilizers, F2-100% RDF through straight fertilizers, F3-125% RDF through straight fertilizers and F4-RDF through Urea DAP form(57:29:00)+50 KgK2O)as sub plot treatments. The gross and net plot size were 2.95 m x 2.95 m and 2.55 m x 2.55 m, respectively. A spacing of 15-25 cm x 15-25 cm was adopted. Disease incidence and per cent disease intensity was lower with more with IET-13549 (Bhogawati) and RDN-99-1 (PhuleRadha).).Pest Incidence and pest intensity (%) was more with fertilizer levels of 75% RDF through straight fertilizers and lower with fertilizer through Urea DAP briquette form (57:29:00)+50KgK2O.There was positive correlation between maximum temperature, morning relative humidity, BSS and canopy temperature and incidence of leaf folder, stem borer and brown plant hopper but negative correlation with minimum temperature,, evening relative humidity, growing degree day.

Keywords: Summer, fertilizer, weather, pest

Introduction
Rice belongs to the genus *Oryza* and family *Poaceae*. It has two cultivated and 22 wild species. The cultivated species are *Oryza sativa* and *Oryza glaberrima*. *Oryza sativa* is grown all over the world while *Oryza glaberrima* has been cultivated in West Africa for the last 3500 years. From an early history in the Asian areas rice has spread and is now grown on all continents except Antarctica. Being able to grow in this wide spectrum of climates is the reason that why rice is one of the most widely eaten foods of the world. About 85% of the rice produced in the world is used for direct human consumption. Rice can also been found in cereals, snack foods, brewed beverages, flour, oil, syrup and religious ceremonies. Global demand for food is rising because of population growth, increasing affluence and changing dietary habits. The UN/FAO forecasts that global food production will need to increase by over 40% by 2030 and 70% by 2050. Yet globally, water is anticipated to become scare and there is increasing competition for land, putting added pressure on agricultural production. In addition, climate change will reduce the reliability of food supply through altered weather patterns and increased pressure from pests and diseases. Rice along with wheat from the bedrock of Indian food security and to meet the country's stated goal of ensuring food for all, farmer will have to produce more rice from lesser land, using less water, energy and other inputs and keeping in harmony with the fragile environment. For obtaining the higher summer paddy production study of crop in relation to weather condition and pest and diseases infestation is very necessary. As 2 ^{0}C increase in air temperature could decreased rice yield by about 0.75 tons ha^{-1} in high yielding area. There is 5% decrease in rice yield for every 1 ^{0}C rise in temperature above 32 ^{0}C. Attack of pest and disease is totally depends on weather condition and host abundance (Khan and Ram Murthy, 2004) have reported that, minimum temperature and rainfall had significant effect on leaf folder population structure in paddy.

Material and Methods
Details of the experimental material
Experimental site
The field experiment was conducted during *summer*, 2014 at Agricultural Research Station Farm, Vadgaon Maval, Tal. Maval, Dist. Pune.

Soil
The topography of the experimental field was uniform and leveled. The soil was clay loam in texture with a depth upto 60 cm. In order to know the physical and chemical properties of the experimental soil, representative composite samples from 0 to 30 cm depth were taken from randomly selected spots in zig-zag fashion before transplanting with the help of screw auger. These samples were mixed together and air-dried under shade. A representative soil sample was prepared for determining physical and chemical properties of the experimental soil.

Climatic conditions
General
Agroclimatically, Vadagaon Maval comes under the sub montane zone. Geographically, Vadagaon Maval is situated on elevation of 670 m above mean sea level on 18.74^0 North latitude and 73.64^0 East longitudes. The average annual rainfall of Vadagaon Maval is 1260 mm, out of the total annual precipitation, 75 per cent is received during the period from June to September from South-West monsoon, while the remaining quantity is received mostly in the month of October and November from North-East monsoon. The annual average maximum and minimum temperature ranged between 24 ^{0}C to 36 ^{0}C and 9 ^{0}C to 22 ^{0}C, respectively. The relative humidity during morning and evening ranged between 83 and 91 per cent, respectively

Meteorological observations
Growing Degree Day requirement
The GDD was computed by summing the daily mean temperature recorded during growing period by following formula

GDD = (Tmax+ Tmin) /2 –Base Temperature

Base temperature for paddy = 10 ^{0}C

Maximum temperature (^{0}C)
The maximum temperature was recorded with the help of maximum thermometer kept in Single Stevenson's screen from observatory.

Minimum temperature (^{0}C): The minimum temperature was recorded with the help minimum thermometer kept in Single Stevenson's screen from observatory.

Humidity (%): The humidity was recorded with the help of dry bulb and wet bulb thermometer kept i Single Stevenson's screen from observatory.

Bright sunshine (hrs.): Bright sunshine hours were recorded with the help of bright campbell stokes sunshine recorder from observatory.

Canopy temperature (^{0}C): The infrared thermometer was used to measure the canopy temperature remotely.

Theory of operation: It detects minute difference between crop canopy and surrounding air temperature. Telatemp (model AG-42) was used for measurement of canopy temperature and canopy-air temperature differential in this experiment.

Working principle: The energy flux emitted by an object is a function of its absolute temperature. The infrared thermometer senses long wave radiation emitted by the object and converts this value to a temperature scale according to Stefan's Law:

$E = \varepsilon\sigma T^4$

Where,

E = Energy flux, Wm^{-2}

ε = Emmissitivity of the body

σ = Stefan Boltzman constant = (5.67× 10^8 Wm^{-2} K^{-4}),

T= Absolute Temperature of the body, ^{0}K

Measuring temperature: To take temperature measurement, the instrument is held by grip, which promptly "come to life' as evidenced by the digital display.

Rainfall (mm): Rainfall was recorded with the help of automatic type of rain gauge from observatory.

Table 1: Details of treatment with their symbol

Sr. No.	Treatment Details	Symbol used
A.	**Main Plot treatments :Varieties(V)**	
3	IET-13549 (Bhogawati)	V_3
4	RDN-99-1 (PhuleRadha)	V_4
B.	**Sub Plot treatments:fertilizer levels (F)**	
1	75% RDF through straight fertilizer	F_1
2	100%RDF (100:50:50) through straight fertilizer	F_2
3	125%RDF through straight fertilizer	F_3
4	Fertilizer through Urea DAP briquette form (59:29:00)+50Kg K_2O ha^{-1}	F_4

Table 2: Treatment combinations (16)

1	V_3F_1	5	V_4F_1
2	V_3F_2	6	V_4F_2
3	V_3F_3	7	V_4F_3
4	V_3F_4	8	V_4F_4

Table 3: Preparation of field layout

The other details of layout are given below:			
1.	Name of crop	:	Paddy
2.	Varieties	:	As per treatments
3.	Season	:	*Summer*, 2014
4.	Design	:	Split plot
5.	No. of Replications	:	Three

6.	Treatments	:	Eight
7.	Spacing	:	15-25 cm x 15-25 cm
8.	Plot size	:	Gross: 2.95 m x 2.95 m Net: 2.55 m x 2.55 m
9.	Place of research work	:	A.R.S.farm, VadgaonMaval, Tal.Maval, Dist.Pune.
10.	Commencement of research work	:	Summer, 2014
11. 12.	Transplanting date Fertilizer	: :	2/1/2014 100:50:50 NPK kg ha^{-1}

Pest Observation

Leaf folder (*Cnaphalocrocis medinalis*)

Larvae consume the leaf tissue except the epidermis, causing typical white streaks. They create a leaf tube during later stages of feeding.

Used the following scale on the basis of the percentage of damaged leaves on a 0-9 scale.

Scale for leaf folder:	
0	No damage
1	1-10%
3	11-20%
5	21-35%
7	36-50%
9	51-100%

The observations were recorded a tillering, stem elongation, booting, heading, milk stage and dough stages.

Stem Borers (*Scirpophaga incertulas*)

Scale for stem borer (Dead hearts):	
0	No damage
1	1-10%
3	11-20%
5	21-30%
7	31-60%
9	61% and above
Scale for stem borer (White heads):	
0	No damage
1	1-5%
3	6-10%
5	11-15%
7	16-25%
9	26% and above

The observations for stem borer were recorded at tillering, stem elongation and booting (Dead hearts), and dough stage and grain mature stages (Whiteheads).

Brown plant hopper (*Nilaparvata lugens*)

Partial to pronounced yellowing of plant with increased severity of stunting. Extreme signs are wilting to death of plants. Infested areas in the field may be patchy.

The observations were recorded at tillering, stem elongation, booting, heading, milk stage, dough stage and mature grain stages.

Scale for brown plant hopper

0	No damage
1	Very slight damage
3	First and 2nd leaves of most plants partially yellowing
5	Pronounced yellowing and stunting or about 10 to 25% of the plants wilting or dead and remaining plants severely stunted or dying
7	More than half of the plants
9	All plants dead

Result and Discussion

The present investigation entitled "Performance of summer paddy varieties under fertilizer levels in relation to weather parameters" was carried out during *summer*, 2014 at Agricultural Research Station farm, Vadgaon Maval, Tal-Maval, Dist- Pune.

On variety Bhogawati

a) Incidence of leaf folder

Correlation of incidence of leaf folder with weather parameters at different varieties is presented in Table 4.

Correlation of incidence of leaf folder with weather parameters at 30 DAT revealed significant positive correlation with T max (r = 0.984**), RH-I (r = 0.524*), BSS (r = 0.871**) and canopy temperature (r = 0.882**) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.534*), RH-II (r = -0.388), GDD (r = -0.667*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 45 DAT revealed significant positive correlation with T max (r = 0.788*), RH-I (r = 0.172), BSS (r = 0.946**) and canopy temperature(r = 0.534*) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.632*), RH-II (r = -0.523*), GDD (r = -0.434) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 60 DAT revealed significant positive correlation with T max (r = 0.664*), RH-I (r = 0.687*), BSS (r = 0.345) and canopy temperature (r = 0.868**) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.545*), RH-II (r = -0.223), GDD (r = -0.689*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 75 DAT revealed significant positive correlation with T max (r = 0.888**), RH-I (r = 0.823**), BSS (r = 0.862**) and canopy temperature (r = 0.992**) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.895**), RH-II (r = -0.773*), GDD (r = -0.789*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 90 DAT revealed significant positive correlation with T max (r = 0.713*), RH-I (r = 0.764*), BSS (r = 0.728*) and canopy temperature (r = 0.527*) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.396), RH-II (r = -0.603*), GDD (r = -0.853**) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at harvest revealed significant positive correlation with T max (r = 0.884**), RH-I (r = 0.818**), BSS (r = 0.666*) and canopy temperature (r = 0.972**) indicated increase in T max and BSS increased infestation of leaf folder. However, significant negative correlation of leaf folder incidence was noticed with Tmin (r = -0.989**), RH-II (r = -0.214), GDD (r = -0.897**) and indicated increase in these parameters decreased infestation of leaf folder.

b) Incidence of brown plant hopper

Correlation analysis of incidence of brown plant hopper with weather parameters at different varieties is presented in Table 4.

Correlation of incidence of brown plant hopper with weather parameters at 30 DAT revealed significant positive correlation with T max (r = 0.628*), RH-I (r = 0.524*), BSS (r = 0.833**) and canopy temperature (r = 0.422) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.530*), RH-II (r = -0.165), GDD (r = -0.523*) and indicated increase in Tmin, RH-II, GDD and decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 45 DAT revealed significant positive correlation with T max (r = 0.878**), RH-I (r = 0.978**), BSS (r = 0.743*) and canopy temperature (r = 0.614*) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.245), RH-II (r = -0.628*), GDD (r = -0.664*) and indicated increase in Tmin, RH-II, GDD and decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 60 DAT revealed significant positive correlation with T max (r = 0.942**), RH-I (r = 0.335), BSS (r = 0.865**) and canopy temperature (r = -0.746*) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.867**), RH-II (r = -0.497), GDD (r = -0.858**) and indicated increase in Tmin, RH-II, GDD and decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 75 DAT revealed significant positive correlation with T max (r = 0.791*), RH-I (r = 0.641*), BSS (r = 0.455) and canopy temperature (r = 0.545*) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.351), RH-II (r = -0.888**), GDD (r = -0.923**) and indicated increase in Tmin, RH-II, GDD and decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 90 DAT revealed significant positive correlation with T max (r = 0.683*), RH-I (r = 0.864**), BSS (r = 0.523*) and canopy temperature (r = 0.876**) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.567*), RH-II (r = -0.703*), GDD (r = -0.853**) and indicated increase in T min, RH-II, GDD and decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at harvest revealed significant positive correlation with T max (r = 0.734*), RH-I (r = 0.825**), BSS (r = 0.515*) and canopy temperature (r = -0.953**) indicated increase in T max and RH-I, BSS, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.685*), RH-II (r = -0.570*), GDD (r = -0.664*) and indicated increase in T min, RH-II, GDD and decreased infestation of brown plant hopper.

Table 4: Correlation between weather parameters and pests of paddy on variety IET-13549 (Bhogawati)

Particular		Leaf folder						Brown plant hopper				
Weather Parametrs	**30DAT**	**45DAT**	**60DAT**	**75DAT**	**90DAT**	**At harvest**	**30DAT**	**45DAT**	**60DAT**	**75DAT**	**90DAT**	**At harvest**
Tmax	0.984**	0.788*	0.664*	0.888**	0.713*	0.884**	0.628*	0.878**	0.942**	0.791*	0.683*	0.734*
Tmin	-0.534*	-0.632*	-0.545*	-0.895**	-0.396	-0.989**	-0.530*	-0.245	-0.867**	-0.351	-0.567*	-0.685*
RH-I	0.524	0.172	0.687*	0.823**	0.764*	0.818**	0.524*	0.978**	0.335	0.641*	0.864**	0.825**
RH-II	-0.388*	-0.523*	-0.223	-0.773*	-0.603*	-0.214	-0.165	-0.628*	-0.497	-0.888**	-0.703**	-0.570*
BSS	0.871**	0.946**	0.345	0.862**	0.728*	0.666*	0.833**	0.743*	0.865**	0.455	0.523*	0.515*
Canopy temp.	0.882**	0.534*	0.868**	0.992**	0.527*	0.972**	0.422	0.614*	0.746*	0.545*	0.876**	0.953**
GDD	-0.667*	-0.434	-0.689*	-0.789*	-0.853**	-0.897**	-0.523*	-0.664*	0.858**	-0.923**	-0.853**	-0.664*

* significant at 5%levels

** significant at 1%levels

On variety PhuleRadha

a) Incidence of leaf folder

Correlation analysis of incidence of leaf folder with weather parameters at different varieties is presented in Table 5.

Correlation of incidence of leaf folder with weather parameters at 30 DAT revealed significant positive correlation with T max (r = 0.984**), RH-I (r = 0.464), BSS (r = 0.636*) and canopy temperature (r=0.758*) indicated increase in Tmax increased infestation of leaf folder. However, significant negative correlation was noticed with T min(r = -0.515*), RH-II (r = -0.388), GDD (r = -0.705*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 45 DAT revealed significant positive correlation with T max (r = 0.723*), RH-I (r = 0.642*), BSS (r = 0.715*) and canopy temperature (r = 0.985**) indicated increase in T max increased infestation of leaf folder. However, significant negative correlation was noticed with Tmin (r = -0.366), RH-II (r = -0.649*), GDD (r = -0.517*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 60 DAT revealed significant positive correlation with T max(r = 0.672*), RH-I (r = 0.839**) BSS (r = 0.995**) and canopy temperature (r = 0.969**) indicated increase in Tmax increased infestation of leaf folder. However, significant negative correlation was noticed with Tmin (r = -0.895**), RH-II (r = -0.699*), GDD (r = -0.981**) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 75 DAT revealed significant positive correlation with T max(r = 0.925**), RH-I (r = 0.615*), BSS (r = 0.753*) and canopy temperature(r = 0.753*) indicated increase in Tmax increased infestation of leaf folder. However, significant negative correlation was noticed with Tmin (r = -0.315), RH-II (r = -0.827**), GDD (r = -0.574*) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at 90 DAT revealed significant positive correlation with T max (r = 0.815**), RH-I (r = 0.443), BSS (r = -0.862**) and canopy temperature(r = 0.678*) indicated increase in Tmax increased infestation of leaf folder. However, significant negative correlation was noticed with Tmin (r = -0.772*), RH-II (r = -0.526*), GDD (r = -0.868**) and indicated increase in these parameters decreased infestation of leaf folder.

Correlation of incidence of leaf folder with weather parameters at harvest revealed significant positive correlation with T max (r = 0.751*), RH-I (r = 0.642*), BSS (r = 0.671*) and canopy temperature (r = 0.645*) indicated increase in Tmax increased infestation of leaf folder. However, significant negative correlation was noticed with Tmin (r = -0.669*), RH-II (r = -0.891**), GDD (r = -0.647*) and indicated increase in these parameters decreased infestation of leaf folder.

b) Incidence of brown plant hopper

Correlation analysis of incidence of brown plant hopper with weather parameters at different varieties.

Correlation of incidence of brown plant hopper with weather parameters at 30 DAT revealed significant positive correlation with Tmax (r = 0.822**), RH-I (r = 0.824**), BSS (r = 0.936**) and canopy temperature (r = 0.437) indicated increase in Tmax and RH-I canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.793*), RH-II (r = -0.759*), GDD (r = -0.582*) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 45 DAT revealed significant positive correlation with T max (r = 0.684*), RH-I (r = 0.971**), BSS (r = 0.782*) and canopy temperature (r = 0.351) indicated increase in T max and RH-I, canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.388), RH-II (r = -0.603*), GDD (r = -0.678*) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 60 DAT revealed significant positive correlation with Tmax (r = 0.742*), RH-I (r = 0.262), BSS (r = 0.780*) and canopy temperature (r = 0.656*) indicated increase in T max and RH-I canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.870**), RH-II (r = -0.597*), GDD (r = -0.776*) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 75 DAT revealed significant positive correlation with T max (r = 0.859**), RH-I (r = 0.649*), BSS (r = 0.945**) and canopy temperature (r = 0.895**) indicated increase in T max and RH-I canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.451), RH-II (r = -0.588*), GDD (r = -0.829**) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at 90 DAT revealed significant positive correlation with Tmax (r = 0.714*), RH-I (r = 0.528*), BSS (r = 0.643*) and canopy temperature (r = 0.883**) indicated increase in Tmax and RH-I canopy temperature increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.546*), RH-II (r = -0.886**), GDD (r = -0.745*) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Correlation of incidence of brown plant hopper with weather parameters at harvest revealed significant positive correlation with Tmax (r = 0.936**), RH-I (r = 0.714*), BSS (r = 0.887**) and canopy temperature (r = 0.664*) indicating increase in T max and RH-I, canopy temperate increased infestation of brown plant hopper. Further, significant negative correlation was observed with Tmin (r = -0.639*), RH-II (r = -0.934**), GDD (r = -0.936**) and indicated increase in Tmin, RH-II and GDD decreased infestation of brown plant hopper.

Table 5: Correlation between weather parameters and pests of paddy on variety RDN-99-1 (PhuleRadha)

	Leaf folder						Brown plant hopper					
Weather Parametrs	**30DAT**	**45DAT**	**60DAT**	**75DAT**	**90DAT**	**At harvest**	**30DAT**	**45DAT**	**60DAT**	**75DAT**	**90DAT**	**At harvest**
Tmax	0.984**	0.723*	0.672*	0.925**	0.815**	0.751*	0.822**	0.684*	0.742*	0.859**	0.714*	0.936**
Tmin	-0.515*	-0.366	-0.895**	-0.315	-0.772*	-0.669*	-0.793*	-0.388	-0.870**	-0.451	-0.546*	-0.639*
RH-I	0.464	0.642*	0.839**	0.615*	0.443	0.642*	0.824**	0.971**	0.262	0.649*	0.528*	0.714*
RH-II	-0.388	-0.649*	-0.699*	-0.827**	-0.526*	-0.891**	-0.759*	-0.603*	-0.597*	-0.588*	-0.886**	-0.934**
BSS	0.636*	0.715*	0.995**	0.753*	0.862**	0.671*	0.936**	0.782**	0.780*	0.945**	0.643*	0.887**
Canopy temp.	0.758*	0.985**	0.969**	0.753*	0.678*	0.645*	0.437	0.351	0.656*	0.895**	0.883**	0.664*
GDD	-0.705*	-0.517*	-0.981**	-0.574*	-0.868**	-0.647*	-0.582*	-0.678*	-0.776*	-0.829**	-0.745*	-0.936**

* significant at 5%levels
**significant at 1%levels

Conclusions

Pest incidence and pest intensity (%) was lower in higher incidence with IET-13549 (Bhogawati) and RDN-99-1 (PhuleRadha). Pest Incidence and pest intensity (%) was more with fertilizer levels of 75% RDF through straight fertilizers and lower with fertilizer through Urea DAP briquette form (57:29:00)+50KgK_2O. There was positive correlation between maximum temperature, morning relative humidity, BSS and canopy temperature and incidence of leaf folder, stem borer and brown plant hopper but negative correlation with minimum temperature, evening relative humidity, growing degree day.

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