Evaluation of Local, Improved and Hybrid Rice Varieties against Insect-Pests

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Abstract

Rice is the principal food crop of more than half of the world's population. Insect pests are the major constraints for increasing the crop productivity as there are about 100 insect species are recorded to be feeding on the crop among which 20 are considered to be major pests. In the present piece of research work 5 insect species namely Gundhi Bug- *Leptocorisa varicornis*, Whitebacked Plant Hopper- *Sogatella furcifera*, Case worm- *Nymphula depunctalis*, Leaf folder- and Yellow Stem Borer- *Scirpophaga incertulas* were found in the experimental fields.

KEYWORDS:- Leptocorisa varicornis, Sogatella furcifera, Nymphula depunctalis, Cnaphalocrocis medinalis Cnaphalocrocis medinalis

INTRODUCTION

The rice being the principal food crop of more than half the world's population. Asia accounts for about 90% of world's rice area and production. Among the rice growing countries, India has largest area under rice in the world (about 44.6 mha) i.e. 28% of the worlds area of production, and ranks second next to China. The share of India to the world's production is near about 22.1 percent. In Madhya Pradesh, the area under rice cultivation is 5144.6 million hectares with production of 5748.3 million tonnes with a productivity of 1-2 t /ha. When the global population is considered in terms of the number of rice consumers, the figure is estimated at around 2.4 billion out of this number over 95% are located in Asia, with East and South Asia accounting for 42% and 35%, respectively, of total world rice consumption. In the next two or so decades, the number of rice consumers is likely to rise to more than 4 billion. Much to this increase will be in Asia, although there will be increase in rice consumption in Africa and probably also in Latin America.

Rice is a crop of warm and humid environment which is also very conducive to pests, diseases and weeds. Consequently these pests cause severe crop losses. The extent of losses fluctuate widely depending on the prevailing factors of abundance of these pests in a particular year/season and the local agro-climatic conditions. Insect pests are major constraints for increasing the crop productivity in all ecosystems in the tropics. Approximately 100 insect species feed on rice and 20 of these are considered to be major pests. In rice, yield losses due to insect pests are estimated to be over 30% in India. (Cramer, 1967; Pathak and Dhaliwal; 1981.)

There has been a major rise in the status of several rice-pests in the recent past. This is primarily due to the changes in the plant type of rice, more intensive cropping system and increased use of fertilizers. Several pests such as leaf folder, case worm, army worm and cut worm have gained major importance these days. Gall midge, brown plant hopper, green leaf hoppers besides stem borers have become major problems. The challenge with the agricultural scientists to-day is to achieve

comprehensive and sustainable food and nutrition security despite increasing population and declining purchasing power.

MATERIALS & METHODS

The present piece of research work consists of a regular observation of the succession of insect pests on rice crops cultivated at Ajgaraha, Rewa (M.P.) fields in the seasons of 2011 & 2012. The observations were made regarding the incidence of insect pests, their spread, population, nature and type. The plant growth parameters were also taken into consideration during the experimental period.

Selection of fields for observation -

The fields of Ajgaraha, Rewa for making observations were selected taking in view that the information obtained should be the representative of the crop of the locality.

Type of Survey -

During the investigation both qualitative and quantitative surveys were done.

Qualitative survey -

In this type of survey, the insect pests and their natural enemies found in the field were preserved for identification. After identification the actual pests and their natural enemies were sorted out.

Quantitative survey -

The population of insect pests and the infested areas were recorded under this head.

Preservation of insect pests -

This is done as follows:

(a) Collection of pests - The insect pests were collected from the experimental fields with the help of hand nets, light trap etc.

(b) Killing of pests - Insect pests were killed with the help of killing bottles.

(c) Mounting of the pests - The killed insect pests were pinned up on the card sheet after injecting chloroform and dried in the oven. The information about the pest was written on the mounts under following heads-

1. Name of the insect
2. Name and age of host plant
3. Locality
4. Date of Collection

Observation of Pests

Ten spots in the selected rice fields were marked at diagonal line with the help of a quadrate of 0.5m x 0.5m size. This area was marked by using a quadrate by fixing bamboo sticks at the seedling stage of the crop. These marked areas were used for counting the number of insects without disturbing the crop plant in *situ*. As various insect pests damage the rice crop at various stages starting from the early seedling stage to maturity of crop different methodologies were adopted for counting their numbers.

Gundhi bug : *Leptocorisa varicornis* (Fabricius)

It starts to damage the crop after earhead formation, but visit of the bugs appears on the field quite earlier to panicle emergence. Therefore, numbers of bugs as

well as affected ear heads per unit were counted from panicle initiation to maturity stage of the crop with a fortnightly interval.

Plant hopper : *Sogatella furcifera* (Horvath) / White Backed Plant Hopper

For counting leaf/plant hoppers, glass frame method was used because the hoppers are found in uncountable numbers and they actively move from one place to other during their counting. The damage of hoppers is often common during early stage to maximum vegetative growth stage of crop. Therefore, counting of hoppers was started from 15 days after sowing/transplanting and then continued at an interval of 15 days till reproductive phase started.

Case worm : *Nymphula depunctalis* (Guenee)

Several foliage feeders viz. case worm damage the crop during entire growth period of crop. The counting of these insects was made at fortnightly intervals as and when appeared on the field of surveyed area.

Leaf folder : *Cnaphalocrocis medinalis* (Guenee)

Its damage also starts from early stage of crop to flowering stage. Therefore, its infestation was recorded by counting number of affected/damaged leaves or larvae per unit area at the interval of 15 days.

Stem borer : *Scirpophaga incertulas* (Walker)

Its infestation appears from the early stage of crop and continues till earhead formation. Hence number of damaged shoots/tillers (dead heart/white earhead) per unit area were counted at fortnightly intervals.

Use of light Trap:-

Light trap was used at rice-fields in Ajgaraha, Rewa. The population of insects trapped there during crop season were recorded.

The observations on crop were made and the characters were recorded from ten randomly marked plants at the time of maturity of the crop.

RESULTS AND DISCUSSION

The study of insect population on different rice varieties at various growth stages was studied in 2011 & 2012.

Mean number of nymphs and adults of gundhi bug/m^2 on various rice varieties at different growth stages are given in the Table No. 1.Its presence was not seen at 30DAS and thereafter its infestation increased severely at 45 to 105 DAS, growth stages. Again, its infestation declined till 105 DAS.

The incidence of gundhi bug was recorded earliest in Dehula, Lohnadi, Vandana and IR-201 in 45 DAS and it remained latest upto 105 DAS on Bhataphool, Lochai, Pusa basmati IR-36, IR-64, Pusa sugandha, PA 6201, KRH – 2 and PRH – 10. On 45 DAS the severity of their incidence was highest on Vandana (4.2/m^2) and lowest on Dehula (2.4/m^2). After 60 DAS the severity of their incidence was highest i.e. 17.25/m^2 on Vandana and 1.05/m^2 on JRH-4 the lowest. After 75 DAS Pusa basmati was recorded to be the highest infested variety i.e. 15.2/m^2 and PRH-10 having 3.95/m^2, being the lowest infected one. After 90 DAS Pusa basmati remained with highest incidence as 29.85/m^2 and JRH-4 as 3.2/m^2 as of the lowest incidence. After 105 DAS the highest incidence remained on Pusa basmati as 17.95/m^2 but the least occurrence was recorded on PA 6201 as 4.1/m^2.

Mean population of WBPH/m^2 on different rice varieties at various growth stages during the years (2011 and 2012) are given in Table No. 2.

Table:1 Numbers of population of gundhi bug (nymph/adult) on different rice varieties at various growth stages in the years 2011 & 2012.

Variety	Crop Growth Stage at DAS 2011							Crop Growth Stage at DAS 2012						
	15	30	45	60	75	90	105	15	30	45	60	75	90	105
Dehula	0.0	0.0	2.1	12.9	9.2	0.0	0.0	0.0	0.0	2.7	16.4	10.1	0.0	0.0
Newari	0.0	0.0	0.0	2.0	9.3	5.1	0.0	0.0	0.0	0.0	5.1	14.7	7.1	0.0
Bhantaphool	0.0	0.0	0.0	0.0	10.7	22.7	10.4	0.0	0.0	0.0	0.0	12.5	25.4	13.5
Lochai	0.0	0.0	0.0	0.0	6.0	17.2	9.5	0.0	0.0	0.0	0.0	10.1	19.7	11.4
Lohnadi	0.0	0.0	1.7	8.4	3.5	0.0	0.0	0.0	0.0	3.4	12.5	4.7	0.0	0.0
Pusa basmati	0.0	0.0	0.0	0.0	13.3	27.8	16.4	0.0	0.0	0.0	0.0	17.1	31.9	19.5
IR-36	0.0	0.0	0.0	0.0	11.2	25.3	10.2	0.0	0.0	0.0	0.0	13.3	27.1	16.3
IR-64	0.0	0.0	0.0	0.0	12.1	26.1	13.5	0.0	0.0	0.0	0.0	14.1	28.1	15.7
Vandana	0.0	0.0	3.3	14.7	12.4	0.0	0.0	0.0	0.0	5.1	19.8	16.1	0.0	0.0
IR- 201	0.0	0.0	3.5	12.7	9.1	0.0	0.0	0.0	0.0	4.1	16.7	10.4	0.0	0.0
Pusasugandha	0.0	0.0	0.0	0.0	12.2	24.7	10.3	0.0	0.0	0.0	0.0	14.2	26.5	12.7
PA- 6201	0.0	0.0	0.0	0.0	3.5	7.6	2.1	0.0	0.0	0.0	0.0	5.1	9.2	6.1
KRH-2	0.0	0.0	0.0	0.0	2.9	6.7	4.3	0.0	0.0	0.0	0.0	5.4	8.2	5.1
PRH – 10	0.0	0.0	0.0	0.0	3.6	7.4	4.5	0.0	0.0	0.0	0.0	4.3	7.6	4.9
JRH – 4	0.0	0.0	0.0	1.5	5.9	4.3	0.0	0.0	0.0	0.0	1.5	4.5	2.1	0.0
JRH – 5	0.0	0.0	0.0	1.2	5.1	3.4	0.0	0.0	0.0	0.0	1.9	5.4	4.2	0.0
SEM ±	-	-	0.179	0.311	0.679	0.481	0.464	-	-	0.301	0.444	0.668	0.673	0.503
CD (0.05)	-	-	0.518	0.900	1.962	1.390	1.541	-	-	0.871	1.282	1.931	1.944	1.454

It is evident from the data that the presence of WBPH was seen first time form early stage (30DAS) and then successively increased till 75 DAS.

WBPH was recorded on 30 DAS, the severity of its incidence was highest on Pusa basmati (7.45/m^2) and lowest on PRH-10 (1.45/m^2). After 45 DAS the severity of its incidence was highest i.e. 23.35/m^2 on Pusa basmati and 5.55/m^2 on PRH-10, the lowest. After 60 DAS Pusa basmati was recorded to be the highest infested variety i.e. 8.6/m^2 and JRH-5 i.e. 2.2/m^2, the lowest infested one. After 75 DAS Pusa basmati remained with highest incidence as 3.4/m^2 and PA 6201 having 0.45/m^2 occurrence as of the lowest incidence variety.

Mean number of caterpillars/m^2 of rice case worm on different rice varieties at various growth stages during the years 2011-2012 at experimental site are given in Table No. 2.

It is evident from the data that the occurrence of this pest was increased at 30DAS growth stage and then declined gradually till 75 DAS.

Case worm was recorded on 30 DAS. The severity of its incidence was highest on Pusa basmati (5.35/m^2) and lowest on JRH-4 (0.6/m^2). After 45 DAS the severity of their incidence was highest i.e. 8.75/m^2 on Pusa basmati and 1.85/m^2 on JRH-4, the lowest. After 60 DAS Pusa basmati was recorded to be the highest infested variety i.e. 2.3/m^2 and KRH-2 and JRH-4 having 0.15. /m^2 the became lowest infested ones.

Table: 2 Numbers of population of WBPH on different rice varieties at various growth stages in the years 2011 & 2012.

Variety	Crop Growth Stage at DAS 2011							Crop Growth Stage at DAS 2012						
	15	30	45	60	75	90	105	15	30	45	60	75	90	105
Dehula	0.0	2.7	9.4	3.3	1.2	0.0	0.0	0.0	3.7	11.1	4.1	2.1	0.0	0.0
Newari	0.0	2.9	9.2	3.2	1.1	0.0	0.0	0.0	3.6	10.2	4.3	1.6	0.0	0.0
Bhantaphool	0.0	3.0	11.2	3.5	1.5	0.0	0.0	0.0	2.9	9.9	3.9	1.7	0.0	0.0
Lochai	0.0	3.1	10.1	3.0	1.3	0.0	0.0	0.0	3.0	11.2	5.6	1.9	0.0	0.0
Lohnadi	0.0	2.8	10.7	2.9	1.0	0.0	0.0	0.0	3.6	12.5	5.7	1.8	0.0	0.0
Pusa basmati	0.0	6.7	21.2	8.1	3.1	0.0	0.0	0.0	8.2	25.5	9.1	3.7	0.0	0.0
IR-36	0.0	4.2	19.1	5.1	2.1	0.0	0.0	0.0	5.4	22.1	7.1	2.3	0.0	0.0
IR-64	0.0	5.3	18.2	5.2	2.0	0.0	0.0	0.0	6.1	22.4	6.2	2.5	0.0	0.0
Vandana	0.0	5.4	18.1	6.1	1.7	0.0	0.0	0.0	5.5	23.9	8.3	2.6	0.0	0.0
IR- 201	0.0	4.5	17.7	6.2	1.9	0.0	0.0	0.0	5.7	22.2	6.9	2.7	0.0	0.0
Pusa sugandha	0.0	5.5	19.1	6.3	1.6	0.0	0.0	0.0	5.9	22.5	7.2	2.5	0.0	0.0
PA- 6201	0.0	1.3	5.3	2.1	0.2	0.0	0.0	0.0	1.7	6.1	3.3	0.7	0.0	0.0
KRH-2	0.0	1.6	5.4	2.3	0.5	0.0	0.0	0.0	1.8	7.1	3.2	0.9	0.0	0.0
PRH – 10	0.0	1.4	4.4	2.1	0.6	0.0	0.0	0.0	1.5	6.7	2.9	0.8	0.0	0.0
JRH – 4	0.0	1.1	4.1	3.2	0.1	0.0	0.0	0.0	2.0	6.8	2.7	1.1	0.0	0.0
JRH – 5	0.0	1.2	4.3	1.6	0.2	0.0	0.0	0.0	1.9	6.9	2.8	1.2	0.0	0.0
SEM ±	-	0.296	0.327	0.255	0.142	-	-	-	0.268	0.431	0.200	0.151	-	-
CD (0.05)	-	0.857	0.946	0.737	0.411	-	-	-	0.774	1.246	0.580	0.437	-	-

Table: 3 Numbers of caterpillars of rice case worm on different rice varieties at various growth stages in the years 2011 & 2012.

Variety	Crop Growth Stage at DAS 2011							Crop Growth Stage at DAS 2012						
	15	30	45	60	75	90	105	15	30	45	60	75	90	105
Dehula	0.0	1.4	3.7	0.4	0.0	0.0	0.0	0.0	2.1	4.5	1.0	0.0	0.0	0.0
Newari	0.0	1.6	3.0	0.6	0.0	0.0	0.0	0.0	2.3	3.9	1.0	0.0	0.0	0.0
Bhantaphool	0.0	2.1	3.6	0.5	0.0	0.0	0.0	0.0	2.6	3.7	1.1	0.0	0.0	0.0
Lochai	0.0	2.2	3.8	1.0	0.0	0.0	0.0	0.0	2.9	4.0	1.6	0.0	0.0	0.0
Lohnadi	0.0	1.7	3.4	0.3	0.0	0.0	0.0	0.0	2.6	3.6	0.8	0.0	0.0	0.0
Pusa basmati	0.0	4.2	7.4	2.1	0.0	0.0	0.0	0.0	6.5	10.1	2.5	0.0	0.0	0.0
IR-36	0.0	2.7	6.3	1.3	0.0	0.0	0.0	0.0	4.3	7.1	1.7	0.0	0.0	0.0
IR-64	0.0	3.0	5.1	1.1	0.0	0.0	0.0	0.0	4.5	8.4	1.4	0.0	0.0	0.0
Vandana	0.0	2.9	6.2	1.2	0.0	0.0	0.0	0.0	5.2	9.6	1.6	0.0	0.0	0.0
IR- 201	0.0	2.5	4.7	1.1	0.0	0.0	0.0	0.0	4.3	7.2	1.7	0.0	0.0	0.0
Pusasugandha	0.0	2.9	6.9	1.3	0.0	0.0	0.0	0.0	4.2	8.5	1.9	0.0	0.0	0.0
PA- 6201	0.0	0.4	1.5	0.1	0.0	0.0	0.0	0.0	1.1	2.5	0.3	0.0	0.0	0.0
KRH-2	0.0	0.6	1.3	0.2	0.0	0.0	0.0	0.0	1.0	2.7	0.1	0.0	0.0	0.0
PRH – 10	0.0	0.3	1.5	0.5	0.0	0.0	0.0	0.0	1.2	3.1	0.6	0.0	0.0	0.0
JRH – 4	0.0	0.5	1.6	0.1	0.0	0.0	0.0	0.0	0.7	2.1	0.2	0.0	0.0	0.0
JRH – 5	0.0	0.1	1.7	0.0	0.0	0.0	0.0	0.0	1.3	2.2	0.0	0.0	0.0	0.0
SEM ±	-	0.294	0.434	0.159	-	-	-	-	0.264	0.419	0.179	-	-	-
CD (0.05)	-	0.849	1.254	0.459	-	-	-	-	0.764	1.210	0.518	-	-	-

Table: 4 Numbers of population of Leaf folder on different rice varieties at various growth stages in the years 2011 & 2012

Variety	Crop Growth Stage at DAS 2011							Crop Growth Stage at DAS 2012						
	15	30	45	60	75	90	105	15	30	45	60	75	90	105
Dehula	0.0	2.6	6.2	4.1	0.1	0.0	0.0	0.0	5.1	10.2	6.0	2.7	0.0	0.0
Newari	0.0	2.1	6.1	3.1	0.2	0.0	0.0	0.0	5.3	10.7	6.2	2.9	0.0	0.0
Bhantaphool	0.0	3.7	7.1	4.3	0.3	0.0	0.0	0.0	6.1	13.3	7.1	3.1	0.0	0.0
Lochai	0.0	1.9	5.9	3.7	0.0	0.0	0.0	0.0	5.7	13.1	6.9	3.0	0.0	0.0
Lohnadi	0.0	2.7	5.8	4.1	0.5	0.0	0.0	0.0	5.9	12.9	6.7	1.9	0.0	0.0
Pusa basmati	0.0	5.7	12.7	6.2	1.2	0.0	0.0	0.0	8.9	19.7	11.3	5.2	0.0	0.0
IR-36	0.0	4.1	8.6	5.1	0.6	0.0	0.0	0.0	6.7	15.5	9.1	4.1	0.0	0.0
IR-64	0.0	4.6	7.9	5.6	0.7	0.0	0.0	0.0	6.9	15.9	8.2	3.7	0.0	0.0
Vandana	0.0	4.7	8.7	5.8	0.8	0.0	0.0	0.0	7.1	16.1	9.3	4.4	0.0	0.0
IR- 201	0.0	3.9	7.7	4.9	0.6	0.0	0.0	0.0	6.8	15.8	8.7	4.0	0.0	0.0
Pusa sugandha	0.0	4.4	9.1	4.9	0.9	0.0	0.0	0.0	7.2	17.1	9.7	4.7	0.0	0.0
PA- 6201	0.0	1.2	2.1	1.7	0.0	0.0	0.0	0.0	2.1	8.1	3.9	1.7	0.0	0.0
KRH-2	0.0	1.1	2.4	1.9	0.0	0.0	0.0	0.0	2.3	7.9	3.7	1.6	0.0	0.0
PRH – 10	0.0	1.3	2.0	1.0	0.0	0.0	0.0	0.0	2.5	7.6	3.1	1.4	0.0	0.0
JRH – 4	0.0	1.0	1.7	0.7	0.0	0.0	0.0	0.0	1.9	8.0	2.9	1.0	0.0	0.0
JRH – 5	0.0	0.2	1.9	1.0	0.0	0.0	0.0	0.0	2.6	7.6	3.0	1.8	0.0	0.0
SEM ±	-	0.239	0.166	0.139	0.135	-	-	-	0.295	0.156	0.197	0.118	0.118	-
CD (0.05)	-	0.690	0.479	0.401	0.391	-	-	-	0.854	0.452	0.569	0.341	0.341	-

Table: 5 Numbers of damaged shoot (dead heart/white earhead) by yellow stem borer on different rice varieties at various growth stages in the years 2011 & 2012.

Variety	Crop Growth Stage at DAS 2011							Crop Growth Stage at DAS 2012						
	15	30	45	60	75	90	105	15	30	45	60	75	90	105
Dehula	0.0	0.2	1.1	1.7	1.2	0.0	0.0	0.0	0.8	1.4	2.1	0.7	0.0	0.0
Newari	0.0	0.7	1.5	2.1	0.3	0.0	0.0	0.0	0.9	1.8	2.4	0.6	0.0	0.0
Bhantaphool	0.0	0.5	1.3	1.8	0.6	0.1	0.0	0.0	0.7	1.8	2.6	0.9	0.2	0.0
Lochai	0.0	0.6	1.0	1.2	0.7	0.0	0.0	0.0	0.8	1.6	2.0	0.9	0.1	0.0
Lohnadi	0.0	0.8	1.4	2.0	0.5	0.0	0.0	0.0	1.0	1.9	2.3	0.3	0.0	0.0
Pusa basmati	0.0	2.2	2.9	4.0	2.2	0.3	0.0	0.0	2.9	4.2	6.6	2.9	0.7	0.0
IR-36	0.0	1.1	2.1	3.1	1.6	0.1	0.0	0.0	2.1	3.2	4.1	2.1	0.3	0.0
IR-64	0.0	1.2	2.1	3.2	1.5	0.0	0.0	0.0	1.9	2.7	3.7	2.1	0.1	0.0
Vandana	0.0	1.3	2.4	3.3	1.7	0.0	0.0	0.0	2.6	2.9	3.5	2.4	0.0	0.0
IR- 201	0.0	1.5	2.2	3.5	1.5	0.0	0.0	0.0	2.2	2.3	3.8	2.1	0.0	0.0
Pusa sugandha	0.0	1.6	2.1	3.0	1.8	0.2	0.0	0.0	2.7	3.6	5.1	2.6	0.3	0.0
PA- 6201	0.0	0.1	0.4	1.3	0.2	0.0	0.0	0.0	0.3	0.7	1.5	0.0	0.0	0.0
KRH-2	0.0	0.2	0.3	1.5	0.3	0.0	0.0	0.0	0.4	0.5	1.7	0.1	0.0	0.0
PRH – 10	0.0	0.2	0.3	1.4	0.0	0.0	0.0	0.0	0.3	0.9	1.6	0.0	0.0	0.0
JRH – 4	0.0	0.3	0.7	1.6	0.0	0.0	0.0	0.0	0.1	0.5	1.4	0.0	0.0	0.0
JRH – 5	0.0	0.1	0.4	1.3	0.3	0.0	0.0	0.0	0.2	0.8	1.9	0.1	0.0	0.0
SEM ±	-	0.113	0.161	0.185	0.099	0.052	-	-	0.118	0.123	0.209	0.146	0.041	-
CD (0.05)	-	0.328	0.467	0.536	0.286	0.151	-	-	0.341	0.536	0.603	0.422	0.120	-

Leaf folder was recorded on 30 DAS the severity of their incidence was highest on Pusa basmati (7.3/m^2) and lowest on JRH-4 (1.45/m^2). After 45 DAS the severity of their incidence was highest i.e. 16.2/m^2 on Pusa basmati and 4.75/m^2 on JRH-5, the lowest. After 60 DAS Pusa basmati was recorded to be the highest infested variety i.e. 8.75 and JRH-4 i.e. 1.8/m^2, the lowest infested one. After 75 DAS Pusa basmati remained with highest incidence as 3.2/m^2 and JRH-4 as 0.5/m^2, as having the lowest incidence.

Mean number of damaged shoots (dead heart/white earhead) m2 by yellow stem borer on different rice varieties at various growth stages during the years 2011-2012 are given in Table No. 5.

It is evident from the data the damage by stem borer was observed in the crop from very early stage i.e. 30 DAS which gradually increased till 75 DAS. Thereafter, a little reduction in the damage was noted at 90 DAS.

On 30 DAS the severity of the incidence of stem borer was highest on Pusa basmati (2.55/m^2) and lowest on JRH-5 (0.15/m^2). After 45 DAS the severity of its incidence was highest i.e. 3.55/m^2 on Pusa basmati and 0.4% on PA6201 and KRH-2, the lowest. After 60 DAS Pusa basmati was recorded to be the highest infested variety having. 5.3/m^2 and PA 6201 having 1.4/m^2 incidence, being the lowest infested one. After 75 DAS Pusa basmati remained with highest incidence as 2.55/m^2 and PA6201 as 0.1/m^2, the lowest incidence. After 90 DAS the highest incidence remained on Pusa basmati as 0.5/m^2 but least occurrence was recorded on Lochai and IR-64 as 0.05/m^2.

CONCLUSION

Rice is a basic food crop for a large proportion of the world's population. Consequently, it is receiving major attention in the current efforts to improve the world food situation. Rice crop has relatively a larger number of insect pests especially in tropical region, as the crop is attacked by pests right from the time of sowing till it is harvested. John (1981) reported that inadequate crop protection in India causes annual losses more than 36 percent by insects alone. Insect pests are the major biotic constraints to rice yields. Population of insect is governed by a number of abiotic and biotic factors (Emmel 1976). Variety favourable for the development of the insects is also one of the factors (Kennedy 1965). The green leafhopper is a serious pest of rice and is widely distributed in the rice growing tracts of India (Anjaneyulu and Chakrabarti 1977). Usually, leafhopper is a more serious problem in high fertiliser responsive semi-dwarf varieties (Misra and Kulshrestha 1971) as compared to the indigenous tall varieties (Dutt and Biswas 1979). Shrivastava *et.al* (1986) studied the effect of plant age of different cultivars for the build up of green leafhoppers.

It has been reported that age of the plant does not influence the population of *N.cincticeps* significantly (Anonymous 1968). 60 and 90 day-old plants were more conducive for *N. virescens* as compared to other stages similar to that was observed by Cheng and Pathak (1971) and Rao (1977).

In India Brown Planthopper (BPH), *Nilaparvata lugens* (Stal) has been reported to cause extensive yield losses, in Andhra Pradesh, Kerala, Tamil Nadu and West Bengal (Kalode and Viswanathan, 1976)

Considering the pest and disease constraints affecting the productivity of rice in different agro-climatic condition/zones various strategies have been evolved to improve and sustain the productivity of rice; and for effective control of pests and diseases.

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