Mysore J. Agric. Sci., 57 (1) : 220-228 (2023)

Resistance Response of Local Landraces and Advanced Rice Genotypes to Paddy Caseworm, *Nymphula depunctalis* (Guenee) under Field Condition

PANDIT[1], L. VIJAYKUMAR[2], M. THIPPAIAH[3], B. SHIVANNA[4], C. N. LAKSHMINARAYANA REDDY[5] AND R. KRISHANAMURTHY[6]

[1,3&4]Department of Agricultural Entomology; [5]Department of Plant Pathology, [6]Department of Soil Science, College of Agriculture, UAS, GKVK, Bengaluru - 560 065

[2]Department of Agricultural Entomology, College of Agriculture, V.C. Farm, Mandya

e-Mail : jatagondapandit@gmail.com

AUTHORS CONTRIBUTION

PANDIT : Conceptualization, investigation, draft preparation and analysis;

L. VIJAYKUMAR: Conceptualization, framing research proposal and data curation ;

M. THIPPAIAH & B. SHIVANNA: Data curation and draft correction;

C. N. LAKSHMINARAYANA REDDY & R. KRISHANAMURTHY : Supervision and draft correction

Corresponding Author :

PANDIT

Dept. of Agril. Entomology, College of Agriculture, UAS, GKVK, Bengaluru

Received : August 2022

Accepted : October 2022

ABSTRACT

Field screening was carried out on fifty landraces and 38 AVT (advanced varietal trail) rice genotypes compared with resistant and susceptible check, against paddy caseworm, *Nymphula depunctalis* (Guenee) at the Agriculture College V. C. Farm Mandya, in two seasons, during late *kharif* 2020 and *summer* 2021. The mean per cent leaf damage by paddy caseworm on different genotypes was evaluated at 30 and 50 days after transplanting (DAT) in two seasons and the genotypes were categorized into resistant or susceptible based on the standard evaluation system for rice (SES-IRRI). Out of 50 land races, 20 land races were reacted as resistant by recording up-to 1 per cent of leaf damage, 9 genotypes showed moderately resistant reaction by recording 1-10 per cent leaf damage, 13 genotypes reacted as moderately susceptible (11-25 % leaf damage) and 8 genotypes have shown susceptible reaction with 26-50 per cent leaf damage. Likewise, among AVT genotypes, 12 genotypes found resistant with less than 1 per cent leaf damage, 14 genotypes reacted as a moderately resistant by recording up-to 10 per cent leaf damage and only 11 genotype was found moderately susceptible (11-25 % leaf damage). None of the landraces and AVT rice genotypes found highly resistant or highly susceptible against paddy caseworm.

Keywords : Screening, Local landraces and AVT genotypes, Paddy caseworm

RICE (*Oryza sativa* Linn.) is the staple food of more than half of the world's population (Kulagod *et al.,* 2011). Rice belongs to the genus Oryza, family 'Poaceae' (Gramineae), it contributes about 40 per cent of the total food grain production. More than 92 per cent of the world's rice is produced and consumed in Asia. Rice covers about one-fourth of the total cropped area and provides food for more than half of the Indian population. United Nations designated the year 2004 as the 'International Year of Rice' because of its importance. Asia's rice production mainly depends on irrigated rice fields, which produce 75 per cent of all rice harvested, and it provides bout 700 calories day^{-1} person^{-1} for about 3000 million people living mostly in developing countries (Sangeetha and Baskar, 2015).

In India, rice is being grown in an area of 43.66 m ha with an annual production of 118.87 mt and productivity of 2722 kg ha^{-1}, and it is the second-largest producer and consumer of rice after China in the world. In Karnataka Rice is being cultivated in an area of 1.18 m ha with a production of 3.63 mt and productivity of 3.07 t ha^{-1} (Anonymous., 2020). India ranks first in area and production, and is majorly cultivated in West Bengal, Andhra Pradesh, Tamil Nadu, Orissa, Chhattisgarh, Punjab, Uttaranchal, Bihar, Uttar Pradesh, Haryana and Assam.

In modern agriculture, high-yielding rice varieties are extensively grown with the use of fertilizers and manures. Such a cultivation pattern of rice accidentally or inadvertently offers infestation of a large number of insect pests, which results in severe loss in crop yields. (Neeta *et al.,* 2013). The rice crop is subjected to the persistent pressure of more than 100 different insect species (Khan & Pathak, 1987) and 20 of them are of major economic significance (Pathak & Khan, 1994).

Rice is attacked by several insect pests from nursery to harvest, which cause severe yield loss across the countries. In India, the major constraints of rice production is the occurrence of insect pests at various stages of crop growth. Among the insect pests, the most important and widely distributed pest species are stem borer (Scirpophaga incertulas Walker), planthoppers, (BPH, WBPH and GLH) and defoliators like, leaf folder (Cnaphalocrocis medinalis Guenée), paddy caseworm (Nymphula depunctalis Guenee) and rice horned caterpillar (Melanitis leda ismene Cramer) (Salim, 2002). The average yield loss in rice due to various insects pest estimated to be 31.5 per cent in Asia (Pathak & Khan, 1994).

Caseworm (Nymphula depunctalis Guenee) is a sporadic pest of rice and found in water stagnant condition. The first sign of caseworm is the characteristic cut leaves; the leaf blades are cut as if it is cut by scissors. Cut leaf sections are used by the larvae to make their protective tubular cases. Cut leaf blades naturally roll up into a tube, which the larvae attach with silk (Shepherd *et al.,* 1995). During the outbreak of leaf folder and caseworm, a yield reduction of 30 per cent was reported from severely damaged fields. So far, chemical control is the only practical method available for the farmer for its management and as the damage caused by insect pests is highly visible to farmers, it triggers them to go for toxic insecticide application.

Growing resistant variety plays a major role in the management of insects, especially in low input farming situations of India. It is also highly compatible with all other methods of pest management. Keeping this in view, the present study was undertaken to screen the genotypes for resistance to paddy caseworm under field conditions.

Material and Methods

The studies on field evaluation of local landraces and AVT (advance varietal trials) rice genotypes, for resistance against paddy caseworm in rice was carried out by comparing with BR-6255 and TN-1 as a standard resistant and susceptible check, at 'A' bock, College of Agriculture, V.C. Farm, Mandya, UAS, GKVK, Karnataka during *kharif* 2020 and summer 2021.

Sources of Materials : A total of 50 local landraces of rice (Table 2) along with advanced rice genotypes (AVT), (Table 3) were collected from Zonal Agricultural Research Station, V.C. Farm Mandya and sown separately, for evaluation. The seedlings of landraces and AVT genotypes with 25 days old have been transplanted in 2 rows of 25 hills with the spacing 20 × 15 cm between rows and plants, respectively. Each entry was raised as per package of practice, except the plant protection measures (Anonymous, 2016). To enhance the incidence, a steady water level of 5 inches was maintained and 30 per cent excess urea was applied in the experimental field (Kulagod *et al.,* 2011).

The observation on a number of damaged leaves (white horizontal scrapping) was recorded from randomlly10 hills in each test entry, on 30 and 50 days after transplanting (DAT) following the method developed by International rice research institute, Los Banos, Philippines (Anonymous, 2013). The mean per cent leaf damage of two season, was calculated in each entry and it was converted to 0-8 scale using the standard evaluation system (SES) for rice (Anonymous, 2013). Based on the level of infestation, rice genotypes were grouped into different resistance categories for interpretation (Table 1).

Statistical Analysis : The data set on per cent leaf damage by paddy caseworm was subjected to Microsoft excel for tabulation of data and calculation of simple mean and standard deviation.

TABLE 1

The standard evaluation system for paddy caseworm in rice (IRRI, 2013)

Scale	Damaging rate	Resistance category
0	No Scrapping	Highly Resistant
1	Less than 1%	Resistant
3	1-10 %	Moderately Resistant
5	11-25 %	Moderately susceptible
7	26-50 %	Susceptible
9	51-100 %	Highly Susceptible

RESULTS AND DISCUSSION

In the present investigation, on a resistance-susceptibility test, a total of 50 local landraces and 38 AVT of rice were screened for per cent leaf damage by paddy caseworm during *kharif* 2020 and Summer 2021 and were grouped into different resistance categories based on 0-8 scale using by standard evaluation system (SES) for rice.

In *Kharif* 2020

Results revealed that, among 50 local landraces studied, the per cent leaf damage of paddy caseworm was recorded varied from 0.20 ± 0.09 to 47.10 ± 10.12 per cent, similarly the per cent leaf damage recorded among 38 AVT genotypes, varied from *i.e.,* minimum to maximum mean per cent of leaf damage were noticed 0.12 ± 0.11 to 31.10 ± 15.07 (Table 2 & 3) respectively.

Among local landraces screened, none of varieties were found Highly Resistant (HR) with score '0' *viz.*, no per cent leaf damage. The Minimum per cent leaf damage was recorded Kari kagga (0.20) with score 1 and Resistance category, whereas resistant check *i.e.,* BR-6255 recorded 0.37 per cent leaf damage, among local landraces, 20 varieties showed resistance, 9 were moderately resistant, 13 moderately susceptible and 8 susceptible and highest per cent leaf damage was found in Navara (47.10) as compared with susceptible check *viz.,* TN-1 (42.07%) (Table 2 and fig. 1) respectively.

Among the AVT genotypes evaluated, here also, none of the genotypes showed highly resistant reaction but in AVT- 11 (0.12) recorded least per cent leaf damage & it is less than standard resistant check (BR-6255). Overall, 12 genotypes showed resistance with leaf damage ranging from 0.12 to 0.56 per cent. Further 14 genotypes showed moderately resistant reaction with 3.52 to 10.49 per cent damage. The moderately susceptible reaction was ranged from 11.92 to 16.14 per cent leaf damage. Whereas, one of the AVT genotypes *i.e.,* AVT-IM-6 reacted as susceptible with 31.10 per cent leaf damage which less than the susceptible check and none of AVT genotypes reacted as highly susceptible (Table 3 and Fig. 2).

In Summer 2021

During summer 2021, the leaf damage among the local landraces screened varied from 0.40 ± 0.99 to 59.73 ± 0.77 per cent in Karikagga and Kundipullana respectively. And where in 38 AVT rice genotypes screened, the per cent leaf damage varied between 0.45 ± 0.30 and 35.21 ± 13.56 per cent in AVT-IM-4and AVT-IM-6, wherein resistant and susceptible check *i.e.,* BR-6255 and TN-1, the per cent leaf damage was recorded from 0.72 ± 0.55 and 53.65 ± 5.23 and some of these evaluated genotype *i.e.,* Karikagga, Nagaland paddy, AVT-IM-4 and AVT-IM-7, *etc.,* which shown under resistant category less than resistant check variety respectively, (Table 2 & 3).

Out of 50 landraces screened, during summer 2021, none of them were found highly resistant. Whereas some landraces showed resistant reaction with range of 0.40 to 0.98 per cent leaf damage and majority of landraces were found to be moderately resistant with leaf damage ranging from 3.97 to 9.51 per cent in Rajbhoga and Talasiva. 13 landraces showed moderately susceptible reaction with ranged from 14.82 to 22.79 per cent leaf damage in Mapilai samba 1 and Neermullare. The landraces *viz.,* Jig madike, Chinaponna -2, Kalaieera, Aishwarya and Kana kunja recorded 28.75, 28.85, 35.05, 36.22 and 39.91 per cent damage respectively and were categorized as susceptible. Navara, Krishnaleela and Kundipullan of variety was recorded as Highly susceptible with greater than 50 per cent leaf damage respectively (Table 2 and Fig. 3).

TABLE 2

Screening of different local landraces of rice to paddy caseworm (*N. depunctalis*) under field condition, *kharif* 2020 and summer 2021

Genotypes	Per cent of leaf damage			Score	Resistance Category
	Kharif 2020 (Mean ± SD)	Summer 2021 (Mean ± SD)	Mean		
Kavekantak	0.38 ± 0.92	0.57 ± 1.99	0.47	1	R
GK-5	16.72 ± 2.27	18.09 ± 7.55	17.41	5	MS
Gangadale	0.42 ± 0.13	0.59 ± 1.47	0.50	1	R
Talasiya	5.41 ± 2.66	9.51 ± 2.2	7.46	3	MR
Neermulka	0.49 ± 0.88	0.87 ± 0.93	0.71	1	R
Karimundaga	0.23 ± 0.87	0.73 ± 1.73	0.48	1	R
Manjula sona	17.24 ± 0.91	19.53 ± 0.74	18.38	5	MS
Naweli	0.33 ± 0.66	0.81 ± 0.89	0.57	1	R
Jig madike	27.02 ± 0.77	28.75 ± 0.9	27.88	7	S
Game	22.37 ± 0.73	21.95 ± 0.5	22.16	5	MS
Khushiadhikshan	0.53 ± 0.89	0.66 ± 0.83	0.86	1	R
Kalajeera	28.74 ± 0.67	35.05 ± 0.68	31.89	7	S
Rahodaya	5.72 ± 0.73	7.35 ± 0.82	6.54	3	MR
Chinaponna 2	24.4 ± 0.99	28.85 ± 0.76	26.62	7	S
Neermullare	16.39 ± 0.82	22.79 ± 0.73	19.59	5	MS
Aishwarya	32.21 ± 0.95	36.22 ± 0.79	34.21	7	S
Marabattu-2	0.30 ± 0.92	1.04 ± 0.70	0.67	1	R
Krishnaleela	43.81 ± 0.28	53.78 ± 0.84	48.79	7	S
Tagarli	7.89 ± 0.65	8.56 ± 0.53	8.22	3	MR
Malgudi sanna 2	0.47 ± 0.72	1.17 ± 0.75	0.82	1	R
Kaggali keerana	21.67 ± 0.68	21.58 ± 0.74	21.62	5	MS
Bangara gandu	16.62 ± 0.69	18.66 ± 0.77	17.64	5	MS
Kana kunja	34.31 ± 0.87	39.91 ± 0.94	37.11	7	S
Kundipullan	36.52 ± 1.88	59.73 ± 0.77	48.12	7	S
PSB 87	19.63 ± 0.71	22.04 ± 0.77	20.83	5	MS
Nirga samba	0.57 ± 0.39	1.19 ± 0.54	0.88	1	R
Bangara kale	20.03 ± 0.75	21.85 ± 0.63	20.94	5	MS
Jenugudu	0.52 ± 1.27	0.98 ± 1.79	0.75	1	R
Kalakoli	0.76 ± 1.25	0.45 ± 0.71	0.60	1	R
Black sticky	15.74 ± 0.82	22.76 ± 0.67	19.25	5	MS
Chinaponni	9.05 ± 0.6	7.41 ± 0.84	8.23	3	MR
Volbogsugandha	9.61 ± 0.63	8.56 ± 0.79	9.08	3	MR
Punkattkodi-1	8.25 ± 1.04	6.79 ± 0.52	7.52	3	MR
Punkattkodi-2	0.24 ± 1.04	1.51 ± 2.11	0.85	1	R
Murkanna sanna	0.48 ± 1.07	0.96 ± 1.73	0.72	1	R
Dunda	9.11 ± 1.51	8.69 ± 0.97	8.9	3	MR

Genotypes	Per cent of leaf damage			Score	Resistance Category
	Kharif 2020 (Mean ± SD)	Summer 2021 (Mean ± SD)	Mean		
Mapilai samba 1	14.81 ± 1.28	14.82 ± 2.37	14.82	5	MS
GK-1	0.25 ± 0.99	0.64 ± 1.08	0.44	1	R
Mapilai samba 2	0.4 ± 0.70	0.49 ± 1.35	0.46	1	R
Puttabatta 2	0.31 ± 0.53	0.58 ± 0.15	0.60	1	R
Nagaland paddy	0.36 ± 0.21	0.52 ± 1.55	0.44	1	R
Narali	0.41 ± 1.04	0.67 ± 1.29	0.54	1	R
Raj bhoga	7.49 ± 2.38	3.97 ± 2.05	5.73	3	MR
Nalibatta	14.2 ± 3.92	18.28 ± 5.89	16.24	5	MS
Sanbag	15.38 ± 4.24	17.89 ± 6.3	16.64	5	MS
That jasmine	9.05 ± 2.81	10.58 ± 8.36	9.81	3	MR
Navara	47.10 ± 10.12	52.68 ± 8.4	49.89	7	S
Kyasare 1	0.35 ± 1.12	0.60 ± 1.55	0.47	1	R
Adribatta	15.16 ± 8.33	20.71 ± 10.03	17.93	5	MS
Kari kagga	0.20 ± 0.09	0.40 ± 0.99	0.30	1	R
BR-2655(Resistant check)	0.37 ± 0.23	0.72 ± 0.55	0.54	1	R
TN-1 (Susceptible)	42.07 ± 3.23	53.65 ± 5.23	47.86	7	S

DAT - Days after transplanting; Score= 0- Highly resistant (HR) (0 % leaf damage); 1- Resistant (R) (Less than 1 % Leaf damage); 3- Moderately resistant (MR) (1-10 % leaf damage); 5- Moderately susceptible (MS) (11-25 % leaf damage); 7-Susceptible (S) (26-50 % leaf damage); 8- Highly susceptible(HS) (51-100 % leaf damage) (IRRI, 2013)

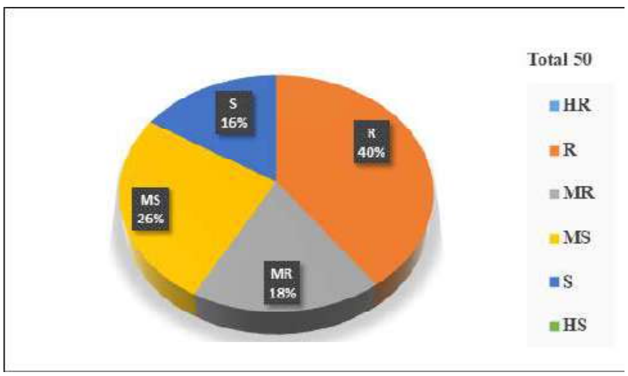

Fig. 1 : Per cent of genotypes under different resistance category (local landraces)

Among AVT genotypes, none of them showed a highly resistant reaction, 7 genotypes showed resistance reaction with 0.45 to 0.85 per cent damage, 10 genotypes were found moderately resistant against caseworm damage (7.18 to 10.21%). 10 genotypes were found to show moderately susceptible reactions with range from 14.46 to 22.09 per cent leaf damage, respectively. Further, only one genotype (Nattijaddu) showed a susceptible reaction (31.13 %) and none of them were found highly susceptible (Table 3 and Fig. 4)

Among the evaluated local landraces and AVT genotypes, the majority of the genotypes categorized into resistant, moderately resistant and few genotypes showed moderately susceptible in *kharif* 2020 and summer 2021, which was compared with resistant and susceptible check.

The overall mean of per cent leaf damage of both seasons were recorder and categorized into resistant to susceptible category, the majority of the genotypes *viz.,* 20 local landraces and 12 AVT were found Resistant, 9 and 14 local and AVT genotype under moderately resistant, whereas moderately susceptible *i.e.,* 13 and 11 local landraces and AVT genotypes were recorded, none of varieties were found Highly Resistant and Highly Susceptible and these compared with by using resistant and susceptible check *i.e.,* BR-6255 and TN-1, these varieties used as resistant and susceptible check for screening against leaf folder

TABLE 3

Screening of AVT rice genotypes to paddy caseworm (*N. depunctalis*) under field condition, *kharif* 2020 and summer 2021

Genotypes	Per cent of leaf damage			Score	Resistance Category
	Kharif 2020 (Mean ± SD)	Summer 2021 (Mean ± SD)	Mean		
AVT-IM-2	4.3 ± 3.71	7.56 ± 3.79	5.19	3	MR
AVT-IM-16	16.14 ± 5.54	16.24 ± 8.49	12.64	5	MS
AVT-IM-11	0.12 ± 1.63	1.31 ± 1.13	0.71	1	R
AVT-IM-15	5.2 ± 3.15	8.02 ± 4.45	5.46	3	MR
AVT-IM-24	10.49 ± 4.72	14.11 ± 5.57	9.77	3	MR
AVT-IM-19	3.8 ± 4.37	10.81 ± 6.81	6.32	3	MR
AVT-IM-3	10.34 ± 4.91	13.09 ± 8.21	9.45	3	MR
AVT-IM-6	31.1 ± 15.07	35.21 ± 13.56	27.13	7	S
AVT-IM-22	14.77 ± 6.98	22.09 ± 6.58	14.61	5	MS
AVT-IM-5	0.31 ± 1.31	0.70 ± 0.56	0.50	1	R
AVT-IM-20	0.32 ± 0.99	0.85 ± 1.15	0.58	1	R
AVT-IM-4	0.28 ± 1.75	0.45 ± 0.3	0.36	1	R
AVT-IM-17	0.36 ± 0.67	0.55 ± 1.11	0.45	1	R
AVT-IM-18	3.52 ± 3.34	7.84 ± 4.63	4.9	3	MR
AVT-IM-7	0.22 ± 0.36	0.49 ± 1.55	0.35	1	R
AVT-IM-9	13.19 ± 8.36	14.24 ± 8.07	11.93	5	MS
AVT-IM-10	0.24 ± 0.17	1.08 ± 1.33	0.66	1	R
AVT-IM-28	12.49 ± 8.53	15.14 ± 8.34	12.05	5	MS
AVT-1 IM-2	11.92 ± 7.91	15.08 ± 10.85	11.63	5	MS
AVT-30	14.01 ± 10.25	15.66 ± 10.53	13.3	5	MS
AVT-8	5.68 ± 4.06	7.68 ± 6.51	5.81	3	MR
AVT-14	5.32 ± 3.38	10.59 ± 4.85	6.43	3	MR
AVT-25	0.25 ± 0.11	1.25 ± 1.58	0.75	1	R
AVT-27	4.2 ± 2.8	8.5 ± 6.97	5.17	3	MR
AVT-12	5.44 ± 4.51	9.01 ± 5.5	6.32	3	MR
AVT-13	13.75 ± 8.12	16.63 ± 7.68	12.83	5	MS
Nattijaddu	28.57 ± 14.46	31.13 ± 8.9	24.72	5	MS
Hanasu	3.98 ± 2.98	7.18 ± 5.74	4.71	3	MR
BPT-5204	13.77 ± 8.67	14.46 ± 8.96	12.3	5	MS
Ative	8.15 ± 4.37	10.21 ± 5.18	7.58	3	MR
GMS-1	0.38 ± 0.22	0.50 ± 1.64	0.44	1	R
Halaga	15.29 ± 8.48	16.14 ± 8.52	13.3	5	MS
Masali	5.59 ± 3.7	8.77 ± 8.58	6.02	3	MR
Kavame	15.74 ± 3.19	20.52 ± 9.88	13.15	5	MS
Kaje jaya	7.62 ± 1.76	9.51 ± 6.77	6.29	3	MR
Bili halaga	0.56 ± 1.69	1.23 ± 1.24	0.89	1	R
MO-21 (Prathiksha)	0.51 ± 1.45	1.14 ± 1.59	0.82	1	R
MO-4	0.56 ± 0.91	0.81 ± 1.52	0.68	1	R

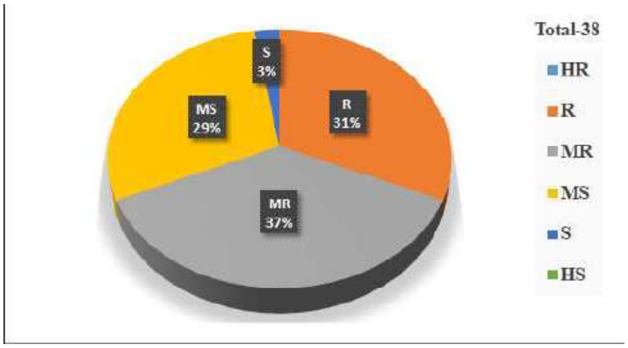

Fig. 2 : Per cent of genotypes under different resistance category (AVT genotypes)

by early authors, in this case also used and which shown same reaction.

These variations might be due to differences in the host plant resistance mechanisms among the genotypes, selective pressure on insects due to feeding and also influence local weather parameters *viz.,* Rainfall, RH and Temperature respectively.

There are no reports about this genotypes against paddy caseworm, however, early some authors reported for leaf folder, in present study evaluated for paddy caseworm, these some of genotypes also shown resistant to caseworm, which indicates that, these evaluated genotypes have multiple resistant.These results are in close agreement with the early reports of Sandeepkumar *et al.* (2021), Monika (2021), Girish *et al.* (2015) and Thorat *et al.* (2020) where, the authors have categorized most of the evaluated genotypes under resistant and moderately resistant categories and few genotypes were found to show moderately susceptible, susceptible and highly susceptible reactions whereas, none of the genotypes were completely free from leaf damage by leaf folder.

Subsequently, many rice researchers screened different germplasm lines in the field under natural populations by using SES and identified a few cultivars with resistance to paddy caseworm, like, Tripathi and Saxena (2013) who carried out for evaluation of local, improved and hybrid varieties of rice for insect pest complex which include paddy caseworm in rewa region during 2006-08 and Regmi *et al.* (2017) the findings revealed that the lowest population of leaf folder, caseworm and grasshopper was recorded in Radha-4 variety followed by Ramdhan and Sabitri variety even had a higher preference of insect pest but yield loss was minimum, among evaluated varieties. The varietal susceptibility was evaluated by Rao and Padhi (1984) with up to 21 cultivars in wet seasons 1979 and 1980 under out break levels of insect infestation in the field at Central Rice Research Institute, Cuttack, among evaluated cultivars, C. 62-10 was resistant while 15 others were moderately.

Likewise, in another study by Singh *et al.* (2015) the leaf damage reported from 1.98 to 26.37 per cent. Out of 60 genotypes evaluated, 18 genotypes were found resistant and 24 moderately resistant & none of them were susceptible and highly susceptible. Similarly, Raju *et al.* (2018) tested 21 rice genotypes and reported 10 major resistant rice genotypes and 11 reacted as moderately resistant against leaf folder. Where, the results of Pandey *et al.* (2018) revealed that, out of 97 genotypes evaluated 6 genotypes were no infestation *i.e.,* Highly resistant, 88 genotypes recorded Resistant with 1-10 per cent damage, whereas only one genotype reported as Moderately resistant with 11-30 per cent damage, respectively.

This variation in the per cent of leaf damage range, which was reported by earlier authors might be due to differences in the resistance mechanisms among the varieties, selective pressure on insects due to feeding and local climatic conditions.

Growing resistant variety is an important tactic accepted by the farmers for the effective management of insect pests. In the present study, a precise method was followed for the assessment of resistance to caseworm, N. depunctalis, was investigated by using SES method. These present findings showed that most of genotypes are under resistant and moderately resistant category. The genotypes like, Kari kagga, Karimundaga, Kavekantak, AVT-IM-7 and AVT-IM-4, *etc.,* which show resistant and are less than the resistant check, in present studies. The mechanism of resistant should be found out & it can be used as donor parent and further can be that utilized in breeding programmer for transfering the resistant gene to commercial & high yielding varieties in order to develop resistantance against insect pests.

Acknowledgement : The authors are thankful to Science and Engineering Research Board (SERB), Department of Science and Technology, Ministry of Science and Technology, Government of India under the Grant No. EEQ/2017/000484/26/3/2018 for providing funding and laboratory facilities. The authors are also thankful to University of Agricultural Science, GKVK, Bengaluru and PG students of Agricultural College, V.C. Farm, Mandya for their help.

References

Anonymous, 2013, Standard evaluation system for rice. International rice research institute, Los Bonas, Philippines.

Anonymous, 2016, Package of practices for higher yield, University of Agricultural Sciences, Bangalore, Karnataka, India, pp. : 423.

Anonymous, 2020, http://www.agricoop.nic.in

Girish, V. P., Hegde, M. and Balikai, R. A., 2015, Screening of rice genotypes against leaf folder, *Cnaphalocrosis medinalis* (Guenee). *Int. J. Agric. Stat. Sci.,* **11** (1) : 255 - 257.

Khan, Z. R. and Pathak, M. D., 1987, Prospects of host plant resistance in rice against major insect pests and diseases. In: International Plant Protection: Focus on the Developing World. Vol. I. E. D. Magallona (ed.) Proceedings of the 11th International Congress of Plant Protection, Manila, Philippines, pp. : 510 - 519.

Kulagod, S. D., Hegde, M. G., Nayak, G. V., Vastrad, A. S. and Hugar, P. S., 2011, Influence of fertilizer on the incidence of insect pests in paddy. *Karnataka J. Agric. Sci.,* **24** (2) : 241 - 243.

Monika, B. K., 2021, Studies on species complex, mechanism of resistance and management of leaf folders in rice. *M.Sc. Thesis* (Unpub), Univ. Agric. Sci., Bangalore.

Neeta, M., Geeta, C., Dinseh, P. and Amitabh, M., 2013, Army worm - A serious sporadic insect pest of rice in rewa region of Madhya Pradesh. *Ind. J. Appl. Res.,* **3** (9) : 489 - 490.

Pandey, V. K., Kar, S. and Gupta, A. K., 2018, Screening of indigenous rice (*Oryza sativa* L.) against gall midge, stem borer, leaf folder, insect pest and leaf blast brown spot disease in bastar region. *Bioscan,* **13** (2) : 569 - 573.

Pathak, M. D. and Khan, Z. R., 1994, Insect pests of rice. *International Rice Research Institute,* UPLB, Philippines.

Raju, K. A., Krishnayya, P. V., Kumar, S. R. and Kumar, V. M., 2018a, Screening of the recent rice varieties against leaf folder, *Cnaphalocrocis medinalis* Guenee (Pyralidae : Lepidoptera). *J. Entomol. Zool. Stud.,* **6** (3) : 817 - 820.

Rao, P. S. P. and Padhi, G., 1984, Varietal susceptibility to rice case worm Nymphula depunctalis Guenee and its behaviour. *Oryza,* **21** (3) : 157 - 162.

Regmi, R., Karki, D., Pudasaini, K., Dhungana, I., Ojha, M. S., Pokhrel, B., Pokharel, P. and Aryal, A., 2017, Varietal screening of rice against leaf folder (*Cnaplocrosis medinalis* guenee), caseworm (Nymphula depunctalis guenee) and grasshopper (Hieroglyphus banian fabricius) damage under field condition in chitwan, Nepal. *Journal of Agriculture and Forestry University,* **1** : 79 - 87.

Saddamhusen Alase, Nagaraja, A., Pramesh, D. and Prasannakumar, M. K., 2021, Influence of weather parameters on false smut disease development in rice. *Mysore J. Agric. Sci.,* **55** (4) : 320 - 325.

Salim, M., 2002, Final technical DFID project report. Tillage by nutrient interaction in rice-wheat system, NARC, Islamabad. pp. : 13 - 25.

Sandeepkumar, Yadav, D., Sharma, K., Yadav, S., Vijaykumar, L. and Deeksha, M. G., 2021, Screening of rice landraces and their morpho-biochemical basis of resistance against Cnaphalocrocis medinalis, *Ind. J. Agri. Sci.,* **91** (3) : 50 - 55.

SANGEETHA, C. AND BASKAR, P., 2015, Influence of different crop establishment methods on productivity of rice. *Agri. Review,* **36** (2) : 113 - 124.

SHEPARD, B. M., BARRION, A. T. AND LITSINGER, J. A., 1995, Rice-feeding insects of tropical asia. International Rice Research Institute, Manila, Philippines. pp. : 228.

SHIVUKUMARA, VIJAYKUMAR, L., KITTURMATH, M. S. AND SHIVANNA, B., 2022, Mechanism of host plant resistance in rice genotypes against brown planthopper. *Mysore J. Agric. Sci.,* **56** (2) : 345 - 352.

SINGH, V. K., GUPTA, P., SINGH, R. AND SINGH, 2015, Field evaluation of rice germplasm against leaf folder, Cnapalocrocis medinalis guenee under irrigated condition. *Ann. Plant Soil Res.,* **17** : 565 - 567.

THORAT, S. S., GANGWAR, R. K., PARMAR, M. B., PRAJAPATI, D. B., KACHA, D. J. AND PAMPANIYA, A. G., 2020, Field screening of different genotypes against yellow stem borer and leaf folder in rice. *Extended Summaries,* pp. : 685 - 687.

TRIPATHI, K. AND SAXENA, A., 2013, Evaluation of local, improved and hybrid rice varieties against insect pests in district Rewa (M. P.), India, *Int. J. Sci. and Res. Pub.,* **11** (3) : 2250 - 225.