Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2018; 6(3): 817-820

Received: 21-03-2018
Accepted: 22-04-2018

Appala Raju K
Department of Entomology, Agricultural College, Bapatla, Guntur. Andhra Pradesh, India

Krishnayya PV
Department of Entomology, Agricultural College, Bapatla, Guntur. Andhra Pradesh, India

Sai Ram Kumar DV
Department of Entomology, Agricultural College, Bapatla, Guntur. Andhra Pradesh, India

Krishnaveni B
Rice Research Unit (RRU), Agricultural College Farm Campus, Bapatla, Guntur. Andhra Pradesh, India

Manoj Kumar V
Department of Plant Pathology, Agricultural College, Bapatla, Guntur. Andhra Pradesh, India

Correspondence
Appala Raju K
Department of Entomology, Agricultural College, Bapatla, Guntur. Andhra Pradesh, India

Screening of the recent rice varieties against leaf folder, *Cnaphalocrocis medinalis* Guenee (Pyralidae: Lepidoptera)

Appala Raju K, Krishnayya PV, Sai Ram Kumar DV, Krishnaveni B and Manoj Kumar V

Abstract
Studies on the response of twenty one rice varieties against rice leaf folder *Cnaphalocrocis medinalis* (Guenee) were conducted during *kharif* 2015 at the Agricultural college farm, Bapatla, Andhra Pradesh. The cumulative mean percent of leaf folder damage in twenty one rice varieties indicated that the lowest leaf damage was recorded in BPT-2231 (7.10%) and the highest damage was observed in BPT-5204 (18.20%) followed by BPT-2570 (16.90%). According to International Rice Research Institute (IRRI), Standard Evaluation System (SES) the ratings were given to the varieties against leaf folder damage. The varieties were categorized into ten resistant (under a rating of '1') eleven moderately resistant (under a rating of '3'). Highly resistant (under a rating of '0') and highly susceptible (under a rating of '9') varieties were not recorded.

Keywords: Rice leaf folder, IRRI, varieties, leaf folder percent damage

1. Introduction
Rice (*Oryza sativa* L.) belongs to the family of grasses (Poaceae), which is one of the most important cereal crops worldwide. It is the staple food for more than two billion people in developing countries [1]. In India, farmers grow many kinds of cereals in an area of 53.87 M ha with an annual production of 110.74 Mt. Among them, the rice is grown in an area of 44.6 M ha with an annual production of 90 M t, which constitutes 52 percent of total food grain production. In Andhra Pradesh, rice is grown in an area of 3.5 M ha with the production of 11.17 Mt [2]. Insect pests are the major biotic constraints in enhancing rice productivity that cause 20-30 percent losses every year, besides diseases and weeds. The warm and humid climate of the tropics is quite congenial for the outbreak of insect pests. Nearly 300 species of insect pests are attacking the paddy crop at various stages. Among the insect pests, only 23 species are causing notable damage [3].

Generally lepidopteran insect pests cause significant yield loss to crop plant. The rice leaf folder, *Cnaphalocrocis medinalis* (Guenee) (Lepidoptera: Pyralidae), is a predominant foliage feeder and one of the most destructive pests affecting in all the rice ecosystems in Asia. The yield loss is from 30 to 80 percent under epidemic condition [4]. The rice leaf folder, *C. medinalis*, earlier was considered as a minor pest, but now has assumed the major pest status in the entire country particularly in areas of high fertilizer usage. In conducive environment, this pest may cause severe damage at maximum tillering and flowering stages of the crop which may lead to 60 to 70 percent leaf damage with 50 percent of reduction in yield [5].

Second instar leaf folder larvae glue to the growing paddy leaves longitudinally for shelter and feed voraciously on green foliage which results in papery dry leaves. Feeding on paddy leaves often results instunting, curling or yellowing of plant green foliage. Severe infestations may annihilate the plant totally. Losses that incurred to the growing paddy crop are irrevocable [6]. The development and use of resistant varieties can be a better option to reduce the dependence on insecticides and also to obtain a sustainable rice production. The use of varietal resistance to control insect pests incurs no additional cost and is also free from the problems connected with the environmental pollution. As all the existing rice varieties are susceptible to rice leaf folder attack, it has become imperative to find out the resistance sources in rice germplasm in order to evolve new rice varieties resistant to rice leaf folder [7].

2. Materials and Methods

The nursery of all the test rice genotypes were raised in the wet land block in Agricultural College farm, Bapatla by adopting all the ANGRAU recommended package of practices like land preparation, manures, fertilizers and irrigation but without any plant protection measures to the nursery of rice genotypes. The main field was ploughed initially twice with tractor drawn cultivator after onset of the monsoon. Weeds and stubbles were removed. Puddling was done twice with the tractor drawn disc harrow after letting the water into the field. Then thorough levelling was done with the levelling plank.

Twenty one (21) varieties/advanced cultures including susceptible check (BPT-5204, Samba Mahsuri) (Table 1) of paddy collected from different agricultural research stations were raised under natural field conditions at the Agricultural college farm, Bapatla during *kharif* 2015. The nurseries were sown on well prepared raised beds. No plant protection coverage was provided to the test material to create optimum conditions for pest multiplication.

Table 1: The particulars of different varieties/advanced cultures used in the experiment

S. No.	Designation of variety/Advanced culture	Duration (days)	Grain type
1	BPT-2270 (Bhavapuri sannalu)	165	Medium slender
2	BPT-2570 (Advanced culture)	125	Medium slender
3	BPT-2605 (Advanced culture)	125	Medium slender
4	BPT-2295 (Advanced culture)	150	Medium slender
5.	BPT-2411 (Advanced culture)	145	Medium slender
6	BPT-2571 (Advanced culture)	135	Medium slender
7	BPT-2741 (Advanced culture)	125	Medium slender
8	BPT-2615 (Advanced culture)	120	Medium slender
9	BPT-2644 (Advanced culture)	140	Medium slender
10	BPT-2231 (Akshaya)	145-150	Medium slender
11	BPT-2590 (Advanced culture)	145	Medium slender
12	BPT-2595 (Advanced culture)	145-150	Medium slender
13	BPT-2660 (Advanced culture)	145	Medium slender
14	BPT-2593 (Advanced culture)	145	Medium slender
15	JGL-11727 (Pranahita)	135	Large slender
16	JGL-3844 (Jagityal Samba)	135	Medium slender
17	MTU-1061 (Indra)	150-155	Medium slender
18	NLR-3041 (Nellore Sona)	140	Medium slender
19	NLR-3042	145	Medium slender
20	RNR-15048 (TelanganaSona)	125	Medium slender
21	BPT-5204 (Samba Mahsuri)	150	Medium slender

2.1 Experiment lay out and transplantation

The experiment was laid out in randomized block design (RBD). A row length of 5 m was followed and each variety transplanted in 6 rows per each plot. A total of three replications and 63 plots were formulated. A total of 400 m² area was used for the screening. Transplantation was done with 30 days old seedlings. Line planting was adopted with a spacing of 25×15 cm (25 cm between the rows and 15 cm within the row) with the help of a marked rope. Two to three seedlings were planted per hill. Around the experimental field, one meter width of BPT-5204 was transplanted as bulk. Gap filling was done after one week to obtain uniform population in all the plots.

2.2 Agronomic practices

Weeding was done with manual labour at 15 and 30 days after transplantation and thereafter whenever necessary. The experimental field was maintained with 2 cm depth of water up to tillering stage. Then the water level was increased to 5 cm from post tillering stage to grain filling/maturity stage. Finally the field was completely drained ten days before harvesting. A recommended fertilizer dose of 120:60:60 kg of NPK/ha was applied to the experimental field in the form of urea, single super phosphate and muriate of potash, respectively. Nitrogen was applied in three split doses, *i.e.* at puddling as basal dose and remaining two doses each at tillering and panicle initiation stages as top dressing. Total amount of the phosphorus was applied at once as basal dose at the time of puddling. Potash was applied in two splits, once at puddling and then at panicle initiation stage.

2.3 Data collection

Observations were recorded from 30 DAT (Days After Transplanting) at every 15 days interval, from 10 randomly selected hills. To calculate the percent leaf damage by the leaf folder, total number of leaves and the number of damaged leaves were counted from each hill. Incidence of leaf folder was recorded on randomly selected 10 hills per test variety in each plot. The total and damaged leaves were counted on each test variety and percent leaf damage was calculated by using with the following formula.

$$\text{Leaf folder percent damage} = \frac{\text{Number of damaged leaves per hill}}{\text{Total number of leaves on the hill}}$$

Based on the damage rating and scale, the status of rice variety was determined by following International Rice Research Institute, Philippines (IRRI)'s Standard Evaluation System [8] for rice, as given below (Table 2).

Table 2: Rice leaf folder damage scoring scale used in the experiment

Leaf folder damage (%)	Scale	Status
0	0	Highly Resistant
1-15	1	Resistant
16-30	3	Moderately Resistant
31-50	5	Moderately susceptible
51-75	7	Susceptible
>75	9	Highly Susceptible

3. Results and Discussion

Varietal preference of rice leaf folder, *C. medinalis* in twenty one varieties was monitored in the Agricultural college farm, Bapatla, Andhra Pradesh during *kharif* 2015. The leaf folder damage was recorded at 30, 45, 60 and 75DAT. The analysis of variance of data regarding leaf infestation caused by *C. medinalis*, revealed a highly significant difference among the varieties and the results were presented (Table 3).

Table 3: Susceptibility-resistance status of different rice varieties against rice leaf folder, *Cnaphalocrosis medinalis*, *kharif* 2015

S. No.	Rice variety	Damage at					Susceptibility-Resistance Status	Damage Rating
		30 DAT	45 DAT	60 DAT	75 DAT	Mean		
1	BPT-2660	4.80^{de}	6.90^{e}	10.30^{b}	8.40^{b}	7.60^{c}	Resistant	1
2	BPT-2570	9.70^{a}	13.80^{ab}	20.90^{a}	23.30^{a}	16.90^{a}	Moderately Resistant	3
3	BPT-2270	8.10^{abc}	14.10^{ab}	19.70^{a}	22.80^{a}	16.20^{ab}	Moderately Resistant	3
4	BPT-2593	8.40^{ab}	15.40^{ab}	18.30^{a}	24.70^{a}	16.70^{a}	Moderately Resistant	3
5	BPT-2605	8.10^{ab}	12.10^{abcd}	19.00^{a}	23.80^{a}	15.70^{ab}	Moderately Resistant	3
6	BPT-2590	7.90^{abc}	12.30^{abc}	18.50^{a}	23.40^{a}	15.50^{ab}	Moderately Resistant	3
7	BPT-2295	7.30^{abcd}	13.70^{ab}	7.30^{a}	22.60^{a}	12.70^{b}	Resistant	1
8	BPT-2644	4.70^{de}	7.10^{e}	11.40^{b}	9.30^{b}	8.10^{c}	Resistant	1
9	BPT-2615	3.40^{e}	6.80^{e}	10.70^{b}	8.60^{b}	7.40^{c}	Resistant	1
10	BPT-2231	3.80^{e}	7.00^{e}	10.20^{b}	7.50^{b}	7.10^{c}	Resistant	1
11	BPT-2595	5.70^{bcde}	7.10^{e}	12.70^{a}	8.80^{b}	8.60^{c}	Resistant	1
12	RNR-15048	5.70^{bcde}	8.50^{cde}	9.90^{b}	9.30^{b}	8.30^{c}	Resistant	1
13	BPT-2571	8.50^{ab}	13.50^{ab}	19.00^{a}	22.50^{a}	15.90^{ab}	Moderately Resistant	3
14	JGL-3844	8.10^{abc}	13.20^{ab}	18.40^{a}	23.80^{a}	15.90^{ab}	Moderately Resistant	3
15	MTU-1061	7.50^{abcd}	12.00^{abc}	20.40^{a}	23.00^{a}	15.70^{ab}	Moderately Resistant	3
16	NLR-3042	8.50^{ab}	14.00^{ab}	18.70^{a}	23.10^{a}	16.10^{ab}	Moderately Resistant	3
17	NLR-3041	7.50^{abcd}	12.10^{bcd}	19.10^{a}	24.00^{a}	15.70^{ab}	Moderately Resistant	3
18	BPT-2411	5.40^{de}	7.90^{cde}	11.80^{b}	8.50^{b}	8.40^{c}	Resistant	1
19	JGL-11727	5.00^{cde}	6.90^{e}	10.00^{b}	8.50^{b}	7.60^{c}	Resistant	1
20	BPT-2741	5.40^{bcde}	7.60^{de}	9.50^{b}	9.20^{b}	7.90^{c}	Resistant	1
21	BPT-5204	10.40^{a}	16.40^{a}	21.10^{a}	24.80^{a}	18.20^{a}	Moderately Resistant	3
	'F' test	*	*	*	*	*	-	-
	Mean	6.85	10.88	15.09	17.14	6.85	-	-
	SEM	1.20	1.37	1.78	0.92	0.95	-	-
	CD (P=0.05%)	3.43	3.90	5.09	2.63	3.00	-	-
	CV %	14.20	13.00	14.00	7.00	10.53	-	-

Values with similar alphabets in each column do not vary significantly at 5% level

3.1 Percent leaf folder damage at 30 DAT

The mean percent leaf folder damage at 30 DAT was 6.80 percent with the highest leaf damage in BPT-5204 (10.40%), which was on par with BPT-2570 (9.70%) followed by the NLR-3042(8.50%), BPT-2571(8.50%) and BPT-2593 (8.40%). Lowest leaf damage was noticed in BPT-2615(3.40%), which was on par with BPT-2231(3.80%) followed by BPT-2660(4.80%) and BPT-2644(4.70%).

3.2 Percent leaf folder damage at 45 DAT

The mean percent leaf folder damage at 45 DAT was 10.88 percent with the highest leaf damage in BPT-5204 (16.40%), which was on par with BPT-2593 (15.40%), BPT-2270 (14.10%), NLR-3042 (14%), BPT-2570 (13.80%), BPT-2295 (13.70%), BPT-2571 (13.50%) and JGL-3844 (13.20%). The lowest leaf damage was noticed in BPT-2615(6.80%), which was on par with BPT-2660(6.90%), JGL-11727 (6.90%), BPT-2231 (7%), BPT-2595 (7.10%) and BPT-2644 (7.10%).

3.3 Percent leaf folder damage at 60 DAT

The mean percent leaf folder damage at 60 DAT was 15.09 percent with the highest leaf damage in BPT-5204 (21.1%), which was on par with BPT-2570 (20.90%),MTU-1061 (20.40%), BPT-2270 (19.70%), BPT-2593(18.30%), NLR-3041 (19.10%), BPT-2571 (19%), NLR-3042 (18.70%), BPT-2590 (18.50%),JGL-3844 (18.40%) and BPT-2593 (18.30%). The lowest leaf damage was noticed in BPT-2295 (7.30%), which was on par with BPT-2741 (9.50%), RNR-15048 (9.90%), JGL-11727 (10%), BPT-2231 (10.20%), BPT-2660(10.30%), BPT-2615 (10.70%), BPT-2644 (11.40%) and BPT-2411 (11.80%).

3.4 Percent leaf folder damage at 75 DAT

The mean percent leaf folder damage at 75 DAT was 17.14 percent with the highest leaf damage in BPT-5204 (24.8%), which was on par with BPT-2593(24.70%), NLR-3041 (24%), JGL-3844 (23.80%) BPT-2605 (23.80%) BPT-2590 (23.40%), BPT-2570 (23.30%), NLR-3042 (23.10%), BPT-2571 (22.50%), MTU-1061 (23%), BPT-2270 (22.80%), BPT-2295 (22.60%) andBPT-2571 (22.50%). The lowest leaf damage was noticed in BPT-2231 (7.50%), which was on par with BPT-2660 (8.40%), BPT-2411 (8.50%), JGL-11727 (8.50%), BPT-2615 (8.60%), BPT-2595 (8.80%), BPT-2741 (9.20%), RNR-15048 (9.30%) and BPT-2644 (9.30%).

3.5 Cumulative mean percent of leaf folder damage at 30, 45, 60 and 75 DAT

The percent leaf folder damage due to leaf folder on twenty one varieties of rice at different intervals (30, 45, 60 and 75 DAT) was summarized and given here under (Fig. 1). The differences in leaf folder damage among twenty one varieties were significant at different intervals. Data indicated that the leaf damage ranged between 7.10 to 18.20 percent. The highest leaf damage was observed in the varieties BPT-5204 (18.20%) followed by BPT-2570 (16.90%), which was on par with BPT-2593 (16.70%) followed by BPT-2270 (16.20%), NLR-3042 (16.10%), BPT-2571 (15.90%) and JGL-3844 (15.90%). The lowest incidence was noticed in BPT-2231 (7.10%), which was on par with BPT-2615 (7.40%), JGL-11727 (7.60%), BPT-2660 (7.60%), BPT-2741 (7.90%), BPT-2644 (8.10%), RNR-15048 (8.30%), BPT-2411 (8.40%) and BPT-2595 (8.60%).

All the twenty one varieties have come under two ratings *i.e.*,

ten varieties under a rating of 1 (resistant) and eleven varieties under a rating of 3 (moderately resistant). There were no highly resistant and highly susceptible varieties. These results were in accordance with [9] who reported that among different lines screened for rice leaf folder, most of the varieties were under a damage leaf scale (DLS) of 3, 5 and 7. Similarly [10] also reported that out of 20 varieties screened, except IR-36, all varieties were moderately resistant (scale 3) for leaf folder. These results also in accordance with [11] where TN-1 was the most susceptible variety and remaining 19 were moderately resistant.

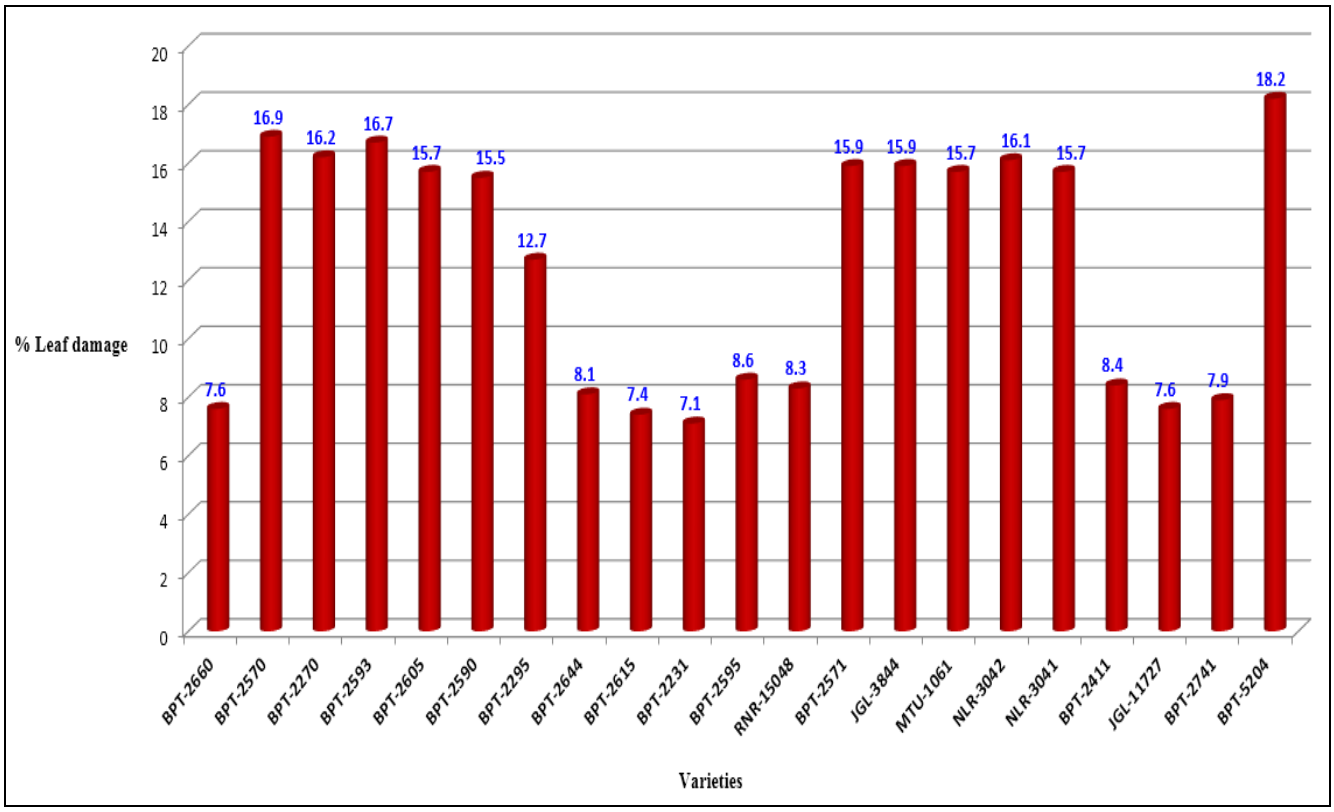

Fig 1: Percent damage of leaf folder, *Cnaphalocrosis medinalis* in different rice varieties, *kharif* 2015

4. Conclusion

Varietal preference of rice leaf folder *C. medinalis* among twenty one different varieties was analyzed during *kharif* 2015 at 30, 45, 60 and 75 DAT indicated that the twenty one varieties could record various levels of leaf folder damage. The mean percent leaf folder damage ranged from 7.10 to 18.20 with the highest leaf infestation in BPT-5204 and the lowest leaf damage in BPT-2231. Based on the percent leaf folder damage the varieties were given ratings according to Standard Evaluation System (IRRI)'s for rice. All the twenty one varieties come under two different ratings *i.e.*, ten varieties under a rating of 1 (resistant) and eleven varieties under a rating of 3 (moderately resistant). Highly resistant and highly susceptible varieties were not recorded.

5. Acknowledgments

The authors are thankful to Acharya N.G. Ranga Agricultural University for providing financial help during the course of study.

6. References

1. Food and Agriculture Organization of the United Nations. FAO Quarterly Bulletin of Statistics. 1995; 8:1-2.
2. Directorate of Economics and Statistics. Quarterly Statistical News Letter Government of Andhra Pradesh, Hyderabad. 2013; 16:12-13.
3. Pasalu IC, Katti G. Advances in eco-friendly approaches in rice IPM. Journal of Rice Research. 2006; 1(1):83-90.
4. Raveesh kumar G. Life cycle and abundance of rice leaf folder, *Cnaphalocrocis medinalis* (Guenee)-A Review. Journal of Natural Sciences Research. 2015; 5(15):103-105.
5. Kushwaha KS, Singh R. Leaf folder outbreak in Haryana. International Rice Research Newsletter. 1984; 9:1-20.
6. Yaspal Singh N, Sahu CM, Ghirtlahre SK, Painkra KL, Chandrakar G. Studies on the seasonal incidence of leaf folder, *Cnaphalocrocis medinalis* Guenee in midland SRI and noram transplanted rice eco system. International Journal of Tropical Agriculture. 2015; 33(2):547-551.
7. Rehman A, Saleem M, Ramzan M, Akram, M. Some bio-ecological studies on leaf folder: A major pest of rice in Pakistan. Proceedings of the International Seminar on rice crop. 2005; 10(3):262-274.
8. International Rice Research Institute. Standard Evaluation System for Rice III edition. IRRI, Los Banos, Philippines, 1980, 123.
9. Xu J, Qi-Xiang W, Jin-Cai W. Resistance of cultivated rice varieties to *Cnaphalocrocis medinalis* (Lepidoptera: Pyralidae). Journal of Economic Entomology. 2010; 103(4):1166-1171.
10. Thamarian M, Rosmini H. Rice resistance to leaf folder in tidal wet lands. International Rice Research Notes. 1993; 18(1):27.
11. Rathika M. Studies on the tri tropic interactions in rice leaf folder. M.Sc (Ag) Thesis. Tamila Nadu Agricultural University, Coimbatore, Tamil Nadu, 2008.