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Screening of Rice Entries against Rice Leaf Folder, *Cnaphalocrosis medinalis* (Guenee) under Controlled Condition

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ABSTRACT

Forty two rice entries were screened against rice leaf folder under controlled conditions at Agricultural College Farm, Bapatla during *kharif* 2018. Among them sixteen entries were moderately resistant, twenty one entries were moderately susceptible and three entries were susceptible to leaf folder with damage rating of 3, 5 and 7 respectively. Lowest mean per cent leaf folder damage of 10.30 per cent was recorded in BPT 3034 exhibiting resistance to leaf folder and highest mean per cent leaf damage of 48.63 per cent was recorded in BPT 3059 indicating susceptibility to rice leaf folder. Whereas the resistant check (W-1263) recorded 6.31 per cent leaf damage and susceptible check (TN-1) recorded 51.45 per cent leaf damage withdamage rating of 1 and 9respectively.

Key words: *Controlled condition, Rice leaf folder.*

Earlier rice leaf folder, *Cnaphalocrosis medinalis* was considered as minor pest of rice crop. But now it has assumed the major pest status (Nanda *et al* 2000). Leaf damage of 60 to 70 per cent by this pest at maximum tillering and flowering stage leads to 80 per cent yield reduction. Usually second instar larvae of rice leaf folder stitches and glues the growing rice leaves longitudinally for its shelter and starts feeding the green foliage, which leads to the papery dry leaves, stunting, curling or yellowing of green foliage (Yaspal *et al*. 2015).

The use of varietal resistance to control insect pests provides no additional cost and is also free from the problems connected with the environmental pollution. As all the existing commercial 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 (Rehman *et al*., 2005).

MATERIAL AND METHODS

A total of 42 entries were transplanted in three replications at Agricultural College Farm, Bapatla during *kharif* 2018 in randomized block design (RBD). Line planting was adopted with a spacing of 20×15 cm (20 cm between the rows and 15 cm between plants) with the help of marked rope. Two to three seedlings were planted per hill and gap filling was done after one week to get uniform population. After 25 DAT entries were covered with the nylon net after destruction of the other pests and natural enemies present over there. The main aim of covering with net was to get the complete expression of infestation by the rice leaf folder under controlled conditions and to avoid the influence of other pest and natural enemies on leaf folder under the particular area. Leaf folder adults were collected from the neighbouring field and nearby farmers fields and were released in to the netted area. One hundred adults were released twice at 40 DAT and 60 DAT inside the net and entries were subjected to 'No' choice test.

Data was collected from each entry in ten randomly selected hills on total number of leaves and number of damaged leaves by rice leaf folder larvae was started from 40 DAT onwards at ten days interval *i.e.,* ten days after release of adults into the net. By using the below mentioned formula the per cent leaf damage was calculated

$$\text{Leaf folder per cent damage} = \frac{\text{Number of damaged leaves}}{\text{Total number of leaves per hill}} \times 100$$

By using below given damage rating and scale developed by International Rice Research Institute, Phillipines (IRRI)'s standard evaluation system for rice, the varieties were graded for resistance.

Leaf folder damage (%)	Scale	Status of variety
0	0	Highly resistant
1 ? 10	1	Resistant
11 ? 20	3	Moderately resistant
21 ? 35	5	Moderately susceptible
36 ? 50	7	Susceptible
51 ? 100	9	Highly susceptible

Table 1. Susceptibility-Resistance rating of different rice entries against rice leaf folder, *Cnaphalocrosismedinalis* under controlled condition, *kharif* 2018.

Sl. No.	Rice entries	LEAF FOLDER DAMAGE (%)								S/R Ratio	Damage Rating
		40 DAT	50 DAT	60 DAT	70 DAT	80 DAT	90 DAT	100 DAT	Mean		
1	BPT 2270	3.53 (12.04)	12.55 (20.83)	11.56 (20.05)	21.18 (26.65)	18.18 (24.78)	17.37 (24.25)	10.11 (18.86)	13.49 (26.58)	MR	3
2	BPT 2601	6.44 (15.44)	26.58 (29.72)	27.32 (30.12)	31.75 (32.39)	29.56 (31.29)	26.14 (29.48)	15.69 (23.12)	23.35 (30.14)	MS	5
3	BPT 2787	4.57 (13.35)	18.20 (24.80)	17.17 (24.12)	23.20 (27.84)	22.13 (27.22)	19.46 (25.60)	12.93 (21.12)	16.81 (27.98)	MR	3
4	BPT 2795	5.89 (14.85)	24.76 (28.72)	24.30 (28.47)	27.40 (30.16)	27.24 (30.08)	21.18 (26.65)	12.51 (20.80)	20.47 (29.23)	MR	3
5	BPT 2798	6.40 (15.40)	27.59 (30.26)	27.11 (30.01)	28.41 (30.69)	29.21 (31.11)	20.25 (26.08)	14.35 (22.17)	21.90 (29.70)	MS	5
6	BPT 2808	6.92 (15.93)	30.41 (31.72)	29.92 (31.47)	29.42 (31.22)	31.19 (32.11)	22.23 (27.28)	14.51 (22.28)	23.51 (30.18)	MS	5
7	BPT 2845	7.44 (16.44)	33.24 (33.12)	32.73 (32.87)	30.43 (31.73)	33.17 (33.09)	24.56 (28.62)	16.33 (23.56)	25.41 (30.74)	MS	5
8	BPT 2849	7.96 (16.94)	36.06 (34.46)	35.54 (34.22)	31.44 (32.24)	35.14 (34.03)	19.60 (25.69)	11.12 (19.70)	25.27 (30.57)	MS	5
9	BPT 2850	8.48 (17.42)	38.89 (35.75)	38.34 (35.51)	32.45 (32.74)	37.12 (34.95)	24.89 (28.80)	13.15 (21.28)	27.62 (31.25)	MS	5
10	BPT 2855	9.00 (17.89)	41.71 (37.00)	41.15 (36.76)	33.46 (33.23)	39.09 (35.84)	21.39 (26.78)	16.53 (23.69)	28.91 (31.60)	MS	5
11	BPT 2856	9.52 (18.35)	44.54 (38.21)	43.96 (37.96)	34.47 (33.71)	41.07 (36.72)	17.07 (24.06)	9.67 (18.48)	28.61 (31.33)	MS	5
12	BPT 2858	5.41 (14.33)	29.09 (31.05)	30.50 (31.77)	37.24 (35.01)	43.23 (37.65)	33.09 (33.05)	19.67 (25.73)	28.32 (31.41)	MS	5
13	BPT 2861	9.61 (18.43)	32.84 (32.93)	25.02 (28.87)	34.10 (33.54)	26.27 (29.55)	27.81 (30.38)	17.55 (24.37)	24.74 (30.63)	MS	5
14	BPT 2863	14.01 (21.92)	15.06 (22.68)	14.59 (22.34)	21.47 (26.83)	21.40 (26.78)	19.47 (25.60)	10.18 (18.92)	16.60 (28.06)	MR	3
15	BPT 2865	1.68 (9.27)	21.47 (26.82)	21.78 (27.01)	28.27 (30.62)	37.93 (35.32)	23.62 (28.08)	18.38 (24.91)	21.88 (29.41)	MS	5
16	BPT 2871	7.54 (16.53)	22.81 (27.61)	19.10 (25.37)	25.58 (29.18)	21.43 (26.80)	21.28 (26.71)	12.11 (20.48)	18.55 (28.67)	MR	3
17	BPT 2874	17.12 (24.09)	38.44 (35.55)	42.79 (37.46)	49.43 (40.21)	52.32 (41.34)	37.04 (34.91)	29.39 (31.20)	38.07 (33.95)	S	7
18	BPT 2875	0.95 (7.90)	20.69 (26.35)	19.31 (25.51)	24.48 (28.57)	23.96 (28.28)	21.39 (26.78)	18.57 (25.03)	18.48 (28.33)	MR	3
19	BPT 2932	5.22 (14.11)	18.17 (24.77)	15.10 (22.70)	22.18 (27.25)	20.15 (26.03)	16.87 (23.92)	13.05 (21.21)	15.82 (27.64)	MR	3
20	BPT 2935	3.00 (11.32)	15.37 (22.90)	17.61 (24.41)	19.45 (25.59)	21.80 (27.02)	23.58 (28.06)	20.42 (26.19)	17.32 (28.09)	MR	3
21	BPT 2936	7.71 (16.70)	22.10 (27.20)	22.49 (27.43)	37.46 (35.11)	29.56 (31.29)	23.32 (27.91)	14.30 (22.13)	22.42 (29.85)	MS	5
22	BPT 2938	2.14 (10.03)	10.45 (19.14)	11.54 (20.03)	16.43 (23.63)	16.57 (23.72)	15.51 (23.00)	10.08 (18.83)	11.82 (25.79)	MR	3
23	BPT 2946	3.82 (12.43)	11.42 (19.94)	11.61 (20.09)	17.14 (24.10)	15.78 (23.18)	15.32 (22.86)	9.00 (17.90)	12.01 (25.98)	MR	3
24	BPT 2947	2.60 (10.74)	10.64 (19.31)	15.18 (22.76)	18.37 (24.90)	19.19 (25.43)	20.61 (26.31)	16.77 (23.85)	14.77 (27.08)	MR	3

Sl. No.	Rice entries	LEAF FOLDER DAMAGE (%)								S/R Ratio	Damage Rating
		40 DAT	50 DAT	60 DAT	70 DAT	80 DAT	90 DAT	100 DAT	Mean		
25	BPT 2949	10.35 (19.06)	10.35 (19.06)	13.28 (21.38)	19.73 (25.77)	21.22 (26.68)	16.66 (23.78)	9.83 (18.62)	14.49 (27.17)	MR	3
26	BPT 2956	8.29 (17.24)	32.65 (32.83)	28.52 (30.75)	32.22 (32.62)	40.69 (36.55)	30.35 (31.69)	27.13 (30.02)	28.55 (31.64)	MS	5
27	BPT 2958	11.51 (20.01)	19.90 (25.87)	18.21 (24.81)	22.19 (27.26)	23.66 (28.10)	21.92 (27.09)	14.67 (22.40)	18.87 (28.90)	MR	3
28	BPT 3018	9.30 (18.16)	17.11 (24.08)	20.22 (26.07)	29.52 (31.27)	22.31 (27.32)	26.10 (29.46)	20.52 (26.25)	20.73 (29.46)	MS	5
29	BPT 3025	8.35 (17.30)	23.86 (28.22)	21.88 (27.07)	26.19 (29.51)	25.49 (29.13)	22.89 (27.66)	18.60 (25.05)	21.04 (29.56)	MS	5
30	BPT 3031	12.62 (20.88)	21.98 (27.13)	22.96 (27.70)	26.43 (29.64)	30.54 (31.79)	24.41 (28.53)	22.85 (27.64)	23.11 (30.28)	MS	5
31	BPT 3034	0.83 (7.64)	5.26 (14.16)	9.58 (18.40)	10.86 (19.49)	13.54 (21.58)	15.06 (22.67)	16.97 (23.99)	10.30 (24.85)	R	1
32	BPT3036	13.80 (21.77)	38.67 (35.65)	32.72 (32.87)	39.87 (36.19)	40.53 (36.48)	37.45 (95.10)	21.88 (27.07)	32.13 (32.60)	MS	5
33	BPT 3038	6.56 (15.56)	37.31 (35.04)	38.71 (35.67)	47.87 (39.58)	43.29 (37.68)	36.56 (34.69)	27.70 (30.32)	34.00 (32.83)	MS	5
34	BPT 3041	16.43 (23.63)	23.45 (27.98)	23.96 (28.27)	36.75 (34.78)	27.36 (30.14)	24.05 (28.33)	20.90 (26.49)	24.70 (30.75)	MS	5
35	BPT3042	9.02 (17.91)	9.12 (18.00)	12.27 (20.61)	19.31 (25.51)	23.94 (28.26)	12.69 (20.94)	6.38 (15.37)	13.25 (26.51)	MR	3
36	BPT 3049	10.61 (19.28)	41.53 (36.92)	38.62 (35.63)	42.87 (37.50)	46.86 (39.17)	33.07 (33.04)	29.61 (31.32)	34.74 (33.13)	MS	5
37	BPT 3058	7.44 (16.44)	44.45 (38.17)	42.44 (37.31)	47.40 (39.39)	61.82 (44.88)	38.50 (35.58)	24.65 (28.66)	38.10 (33.65)	S	7
38	BPT 3059	2.40 (10.43)	65.40 (46.15)	53.89 (41.95)	65.60 (46.22)	65.97 (46.35)	53.27 (41.71)	33.86 (33.42)	48.63 (35.37)	S	7
39	BPT 3060	16.11 (23.41)	19.12 (25.38)	20.98 (26.53)	24.70 (28.69)	31.20 (32.12)	21.07 (26.59)	20.78 (26.41)	21.99 (29.96)	MS	5
40	BPT 5204	10.52 (19.21)	20.87 (26.47)	19.00 (25.31)	30.94 (31.99)	23.70 (28.13)	21.65 (26.94)	20.98 (26.53)	21.10 (29.61)	MS	3
41	W 1263	0.00 (5.66)	3.85 (12.46)	5.79 (14.74)	8.72 (17.64)	9.78 (18.58)	8.94 (17.84)	7.07 (16.07)	6.31 (22.43)	R	1
42	TN 1	28.08 (30.52)	39.49 (36.02)	48.89 (39.99)	57.98 (43.49)	68.24 (47.13)	61.87 (44.90)	55.60 (42.60)	51.45 (36.54)	HS	9
	Mean	16.33	28.34	28.39	31.04	31.52	28.27	24.14			
	SEM	0.89	1.13	1.08	1.33	1.1	1.16	1.05	0.45		

Figures in parenthesis are arc sine transformed values
DAT: days after transplanting,
S/R: Susceptibility-Resistant,
R: resistant, MR: Moderately resistant,
MS: Moderately Susceptible,
S: Susceptible and
HS: Highly Susceptible

RESULTSANDDISCUSSION

Per Cent Leaf Damage under Controlled Condition

Observation at 40 days after transplanting

The data revealed that, seven entries (BPT 2863, BPT 2874, BPT 2958, BPT 3031, BPT 3036, BPT 3041 and BPT 3060) recorded damage rating between 11.51 to 17.12, thirty three entries (BPT 2270, BPT 2601, BPT 2787, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2849, BPT 2850, BPT 2855, BPT 2856, BPT 2858, BPT 2861, BPT 2865, BPT 2871, BPT 2875, BPT 2932, BPT 2935, BPT 2936, BPT 2938, BPT 2946, BPT 2947, BPT 2949, BPT 2956, BPT 3018, BPT 3025, BPT 3034, BPT 3038, BPT 3042, BPT 3049, BPT 3058, BPT 3059 and BPT 5204) recorded below ten per cent and resistant check W-1263 recorded zero per cent whereas susceptible check TN-1 recorded 28.08 per cent leaf damage.

Observation at 50 days after transplanting

The results revealed that, six entries (BPT 2938, BPT 2947, BPT 2949, BPT 3034, BPT 3042 and W-1263) recorded damage ranging between 3.85 to 10.64 per cent, eleven entries (BPT 2270, BPT 2787, BPT 2863, BPT 2875, BPT 2932, BPT 2935, BPT 2946, BPT 2958, BPT 3018, BPT 3060) recorded between 11.42 to 20.87 per cent leaf damage, fourteen entries (BPT 2601, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2858, BPT 2861, BPT 2865, BPT 2871, BPT 2936, BPT 2956, BPT 3025, BPT 3031 and BPT 3041) were between 21.47 to 33.24 per cent leaf damage, ten entries (BPT 2849, BPT 2850, BPT 2855, BPT 2856, BPT 2874, BPT 3036, BPT 3038, BPT 3049, BPT 3058 and TN-1) were between 36.06 to 44.54 per cent and remaining one entry (BPT 3059) with 65.40 per cent leaf damage.

Observation at 60 days after transplanting

The observations at 60 days after planting revealed that two entries BPT 3034 and resistant check recorded 9.58 and 5.79 per cent leaf damage respectively, sixteen entries (BPT 2270, BPT 2787, BPT 2863, BPT 2871, BPT 2875, BPT 2932, BPT 2935, BPT 2938, BPT 2946, BPT 2947, BPT 2949, BPT 2958, BPT 3018, BPT 3042, BPT 3060 and BPT 5204) recorded damage ranging between 11.54 to 20.98 per cent leaf damage, fifteen entries (BPT 2601, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2849, BPT 2858, BPT 2861, BPT 2865, BPT 2936, BPT 2956, BPT 3025, BPT 3031, BPT 3036 and BPT 3041) were between 21.78 to 35.54 per cent damage, seven entries (BPT 2850, BPT 2855, BPT 2856, BPT 2874, BPT 3038, BPT 3049, BPT 3058 and susceptible check TN-1) were between 38.34 to 48.89 per cent damage and one entry BPT 3059 with 53.89 per cent damage.

Observation at 70 days after transplanting

The data revealed that, two entries *i.e.,* W-1263 and BPT 3034 recorded leaf folder damage of 8.72 and 10.86 respectively, six entries (BPT 2935, BPT 2938, BPT 2946, BPT 2947, BPT 2949 and BPT 3042) recorded per cent leaf damage ranging between 16.43 to 19.73, twenty four entries (BPT 2270, BPT 2601, BPT 2787, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2849, BPT 2850, BPT 2855, BPT 2856, BPT 2861, BPT 2863, BPT 2865, BPT 2871, BPT 2875, BPT 2932, BPT 2956, BPT 2958, BPT 3018, BPT 3025, BPT 3031, BPT 3060 and BPT 5204) recorded per cent leaf damage ranging between 21.18 to 34.47, eight entries (BPT 2858, BPT 2874, BPT 2936, BPT 3036, BPT 3038, BPT 3041, BPT 3049 and BPT 3058) recorded damage between 36.75 to 49.43 per cent and remaining two entries *viz.,* susceptible check TN-1 and BPT 3059 recorded 57.98 and 65.60 per cent leaf damage.

Observation at 80 days after transplanting

The results revealed that, six entries (BPT 2270, BPT 2932, BPT 2938, BPT 2946, BPT 2947 and BPT 3034) recorded damage ranging between 13.54 to 20.15 per cent, twenty two entries (BPT 2601, BPT 2787, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2849, BPT 2861, BPT 2863, BPT 2871, BPT 2875, BPT 2935, BPT 2936, BPT 2949, BPT 2958, BPT 3018, BPT 3025, BPT 3031, BPT 3041, BPT 3042, BPT 3060 and BPT 5204) were between 21.40 to 35.14 per cent leaf damage, nine entries (BPT 2850, BPT 2855, BPT 2856, BPT 2858, BPT 2865, BPT 2956, BPT 3036 and BPT 3049) were between 37.12 to 46.86 per cent leaf damage. Resistant check W-1263 recorded 9.78 per cent damage, whereas BPT 3058, BPT 3059 and TN-1 recorded 61.82, 65.97 and 68.24 per cent damage respectively.

Observation at 90 days after transplanting

The data revealed that thirteen entries (BPT 2270, BPT 2787, BPT 2798, BPT 2849, BPT 2856, BPT 2863, BPT 2932, BPT 2938, BPT 2946, BPT 2947, BPT 2949, BPT 3034 and BPT 3042) recorded damage ranging between 12.69 to 20.61 per cent, twenty two entries (BPT 2601, BPT 2795, BPT 2808, BPT 2845, BPT 2850, BPT 2855, BPT 2858, BPT 2861, BPT 2865, BPT 2871, BPT 2875, BPT 2935, BPT 2936, BPT 2956, BPT 2958, BPT 3018, BPT 3025, BPT 3031, BPT 3041, BPT 3049, BPT 3060 and BPT 5204) recorded leaf damage between 21.07 to 33.09 per cent, four entries (BPT 2874, BPT 3036, BPT 3038 and BPT 3058) recorded leaf damage between 36.56 to 38.50 per cent and resistant check, W-1263 recorded 8.94 per cent damage whereas BPT 3059 and susceptible check TN-1 recorded 53.27 and 61.87 per cent damage respectively.

Observation at 100 days after transplanting

The data revealed that eight entries (BPT 2270, BPT 2856, BPT 2863, BPT 2938, BPT 2946, BPT 2949, BPT 3042 and W-1263) recorded damage ranging between 6.38 to 10.18 per cent, twenty five entries (BPT 2601, BPT 2787, BPT 2795, BPT 2798, BPT 2808, BPT 2845, BPT 2849, BPT 2850, BPT 2855, BPT 2858, BPT 2861, BPT 2865, BPT 2871, BPT 2875, BPT 2932, BPT 2935, BPT 2936, BPT 2958, BPT 3018, BPT 3025, BPT 3034, BPT 3041 and BPT 5204) recorded leaf damage between 11.12 to 20.98 per cent, eight entries (BPT 2874, BPT 2956, BPT 3031, BPT 3036, BPT 3038, BPT 3049, BPT 3058 and BPT 3059) were between 21.88 to 33.86 per cent damage and susceptible check TN-1 recorded 55.60 per cent leaf damage.

Mean per cent leaf folder damage under controlled condition

Among 42 entries screened under controlled conditions 15 entries namely BPT 2938 (11.82 %), BPT 2946 (12.01%), BPT 3042 (13.25 %) BPT 2270 (13.49 %), BPT 2949 (14.49 %), BPT 2947 (14.77 %), BPT 2932 (15.82 %), BPT 2863 (16..60 %), BPT 2787 (16.81 %), BPT 2935 (17.32 %), BPT 2875 (18.48 %), BPT 2871 (18.55 %), BPT 2958 (18.87 %), BPT 2795 (20.47 %) and BPT 3018 (20.73 %) showed moderately resistant to rice leaf folder with the damage rating of 3. Twenty one entries *viz.,* BPT 3025 (21.04 %), BPT 5204 (21.10 %), BPT 2865 (21.88 %), BPT 2798 (21.90 %), BPT 3060 (21.99 %), BPT 2936 (22.42 %), BPT 3031 (23.11 %), BPT 2601 (23.35 %), BPT 2808 (23.51 %), BPT 3041 (24.70 %), BPT 2861 (24.74 %), BPT 2849 (25.27 %), BPT 2845 (25.41 %), BPT 2850 (27.62 %), BPT 2858 (28.32 %), BPT 2956 (28.55 %), BPT 2856 (28.61 %), BPT 2855 (28.91 %), BPT 3036 (32.13 %), BPT 3038 (34.00 %) and BPT 3049 (34.74 %), showed moderately susceptibility to rice leaf folder with damage rating of 5. Remaining three entries *viz.,* BPT 2874, BPT 3058 and BPT 3059 with 38.07, 38.10 and 48.63 per cent leaf damage respectively were showed susceptibility to rice leaf folder with damage rating of 7 and resistant check W-1263 (6.31 %) and BPT 3034 (10.30 %) recorded with damage rating of 1 (resistant), whereas susceptible check TN-1 (51.45 %) with damage rating 9 (highly susceptible).These findings were in accordance with Ahmad *et al*. (2016), who reported that among 26 rice entries, variety PK-8893-4-1-3-1come under rating 3 (moderately resistant), seven entries under rating 5 (moderately susceptible), eleven entries under rating 7 (susceptible) and seven entries under rating 9 (highly susceptible) for rice leaf folder under green house condition.

CONCLUSION

Among Forty two rice entries screened, fifteen entries were come under a rating 3 (moderately resistant), twenty one entries under rating 5 (moderately susceptible) three entries were under rating 7 (susceptible), two entries under damage rating 1 (resistant) and one entry (susceptible check) under damage rating 7 (susceptible).

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