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Screening of Rice Genotypes Against Leaf Folder, *Cnaphalocrocis medinalis* (Guenee) in Direct Seeded Rice

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ABSTRACT

A field experiment on screening of rice genotypes was conducted at Agricultural College Farm, Bapatla during *kharif*, 2021-22 to find out the resistant genotypes against rice leaf folder,15 genotypes were selected including susceptible check TN 1. Among the 15 genotypes screened the per cent damage ware ranged from 9.04 to 31.24 with the highest per cent damage in TN 1 and the lowest was recoded in BPT 2411.Ten genotypes found to be resistant, four genotypes ware moderately resistant and one genotype was susceptible. Yield among the genotypes ranged from 3510 kg ha^{-1} (TN-1) to 5795 kg ha^{-1} (BPT 2411). All genotypes recorded significantly higher yield when compared to TN-1.

Keywords: *Moderately resistant, Rice Genotypes, Rice leaf folder, Resistant, Susceptible and Screening*.

Rice is the world's third most produced agricultural commodity, besides sugarcane and maize (FAO, 2017). With 148.5 million metric tonnes produced, India is the second largest producer behind China (Statista, 2021). In the year 2020-2021, India's total rice production is expected to be around 121 million metric tonnes. Andhra Pradesh comes in third place in terms of rice production, with 128.95 lakh tonnes production and 22 lakh hectares area in India.

A total of 52 per cent of global rice production is lost each year due to biotic causes. The attack of insect pest alone account for 21 per cent of the total losses (Yarasi *et al*, 2008). Pests alone limit rice output by roughly 30% in Asia (Heinrichs *et al*., 1978). Among insect pests the rice leaf folder (*Cnaphalocrocis medinalis*) was once considered as a minor pest, but it is now a major problem throughout the country. Under epidemic conditions, rice leaf folder can result from 30 to 80 per cent yield losses (Raveeshkumar, 2015).

Cultivation of insect pest resistant cultivars is one main technique for pest population management as an integrated pest management strategy under Indian low input farming system. Keeping the above points in view, the present study is aimed at screening rice pre release cultures for management of leaf folder in direct seeded rice.

Materials and methods

A field experiment on screening of rice pre released cultures was conducted at Agricultural College Farm, Bapatla during *kharif*, 2021 to find out the resistant sources against leaf folder. Fifteen rice genotypes 14 Pre release cultures and check (TN-1) developed at Agricultural Research Station (ARS), Bapatla were procured and evaluated.

The experiment was laid out in a simple Randomized Block Design (RBD) with fifteen treatments and two replications. Each entry was sown directly in two rows of two meter length with a spacing 20 cm×15 cm and a gap of one feet (30 cm) was maintained between each entry. Recommended fertilizer dose @ 120:60:40 NPK ha^{-1} was applied in the form of urea, single super phosphate and muriate of potash. No plant protection measures were provided to create optimum conditions for pest multiplication

Observations were recorded from 45 days after sowing at 15 days interval from 10 hills at random in each replication. To calculate per cent leaf folder damage total number of leaves and total number of infested leaves per hill were counted from each genotype. The per cent leaf folder damage was calculated using the formula

Leaf folder per cent damage =

$$\left(\frac{\text{Number of damaged leaves per hill}}{\text{Total numberof leaves}}\right) 100$$

The data obtained from various treatments were statistically analyzed using Analysis of Variance (ANOVA). The yield data of different genotypes was collected separately and subjected to statistical analysis (Gomez and Gomez, 1984) to test the significance.

Table 1. List of Pre release cultures selected for screening

S.no	Name of the genotype	Duration (days)	Source of supply
1	BPT 2231	145-150	ARS, Bapatla
2	BPT 2270	160-165	ARS, Bapatla
3	BPT 2295	150-155	ARS, Bapatla
4	BPT 2411	140-145	ARS, Bapatla
5	BPT 2595	150-155	ARS, Bapatla
6	BPT 2766	145-150	ARS, Bapatla
7	BPT 2776	150-155	ARS, Bapatla
8	BPT 2824	150-155	ARS, Bapatla
9	BPT 2841	135-140	ARS, Bapatla
10	BPT 2846	140-145	ARS, Bapatla
11	BPT 2848	140-150	ARS, Bapatla
12	BPT 2858	145-150	ARS, Bapatla
13	BPT 3136	140-145	ARS, Bapatla
14	BPT 5204	145-150	ARS, Bapatla
15	TN-1 (Susceptible check)	110-115	ARS, Bapatla

Based on the damage rating and scale, the status of rice pre release culture was determined by following International Rice Research Institute, Philippines (IRRI)'s Standard Evaluation System (SES), (1980) for rice, as given below

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

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

Results and discussion

2.1 Mean per cent leaf folder damage at 45 DAS

Data indicated that per cent leaf folder damage at 45 DAS ranged between 2.16 to 7.37. Among the genotypes BPT 2411 (2.16%) followed by BPT 2231 (2.83), BPT 2846 (2.84) BPT 2841 (2.86), BPT 2848 (2.89), BPT 2858 (3.03), BPT 3136 (3.19), BPT 2295 (3.61), BPT 2595 (3.61) varieties were statistically on par with each other. The

susceptible variety TN-1(7.37) has recorded highest per cent leaf folder damage.

4.2.2 Mean per cent leaf folder damage at 60 DAS

Per cent leaf folder damage at 60 DAS ranged between 4.57 to 26.04. Among the genotypes least damage was observed in BPT 2846 (4.57) followed by BPT 2411 (5.20), BPT 2231 (5.30), BPT 2824 (6.10), BPT 2766 (6.23), BPT 2841 (6.34), BPT 2595 (6.57), BPT 2776 (6.71) and all these varieties were statistically on par with each other. Genotypes having highest infestation were BPT 2858 (10.96), BPT 5204 (15.92) followed by TN-1 (26.04).

4.2.3 Mean per cent leaf folder damage at 75 DAS

Data at 75 DAS indicated that the per cent leaf folder damage was ranged between 7.78 to 35.80. Among the genotypes least damage was observed in BPT 2411 (7.78%) followed by BPT 2824 (8.80%), BPT 2231 (9.03%), BPT 2766 (9.24%), BPT 2841 (9.56%), BPT 2846 (10.00%), BPT 2776 (10.07%), BPT 2595 (10.84%), BPT 2848 (11.48%) and all these varieties were statistically on par with each other. Highest infestation was observed in TN-1 (35.80%) followed by BPT 5204 (22.44%).

4.2.4 Mean per cent leaf folder damage at 90 DAS

Data indicated that per cent leaf folder damage at 90 DAS was ranged between 12.59 to 42.08. Among the genotypes least damage was observed in BPT 2231 (12.59%), followed by BPT 2824 (13.08%), BPT 2766 (13.33%), BPT 2411 (14.02%), BPT 2841 (15.02%), BPT 2848 (15.14%), BPT 2595 (15.28%), BPT 2776 (15.32%), BPT 2846 (17.13%), BPT 2295 (18.75%) and all these varieties were statistically on par with each other. Highest infestation was observed in TN-1 (44.92%) followed by BPT 5204 (28.54%).

4.2.5 Mean per cent leaf folder damage at 105 DAS

Data indicated that per cent leaf folder damage at 105 DAS was ranged between 13.73 to 42.08. Among the genotypes least damage was observed in BPT 2776 (13.73%), followed by BPT 2766 (15.04%), BPT 2824 (15.37%), BPT 2841 (15.58%), BPT 2595 (15.75%), BPT 2411 (16.05%), BPT 2231(16.91%), BPT 2848 (18.43%), BPT 2846 (19.00%) and all these genotypes were statistically on par with each other. Highest infestation was observed in TN-1 (42.72%) followed by BPT 5204 (32.69%).

4.2.6 Cumulative mean per cent leaf folder damage among different genotypes

The cumulative leaf per cent damage of rice leaf folder among different genotypes revealed that mean damage ranged from 9.04 in BPT 2411 to 31.24 in TN1 variety. Leaf folder infestation initiated from 40 DAS and gradually increased upto 105 DAS. The least per cent leaf folder damage was observed in BPT 2411 (9.04%) followed by BPT 2231 (9.24%), BPT 2824 (9.49%), BPT 2766 (9.56%), BPT 2776 (9.82%), BPT 2841 (9.94%), BPT 2595 (10.39%), BPT 2846 (10.71%) and BPT 2848 (11.15%) these varieties were statistically on par with each other. The highest damage was observed in TN-1 (31.24%) followed by BPT 5204 (20.94%) and BPT 2858 (16.06%).

Among the 15 genotypes screened ten varieties *i.e.* BPT 2231, BPT 2295, BPT 2411, BPT 2595, BPT 276, BPT 2776, BPT 2824, BPT 2841, BPT 2846 and BPT 2848 were found to be resistant with damage scale of 1, four varieties *i.e.* BPT 5204, BPT 2858, BPT 3136 and BPT 2270 was found to be moderately resistant with damage scale of 3 and remaining 1 variety TN 1 was susceptible with damage scale of 5. There were no highly resistant and highly susceptible varieties among the fifteen genotypes. These results are in accordance with Kumari and Prasad (2021) who reported that Abhisek, C.R. Dhan 201, C.R. Dhan 304, PAC-801 and Suraksha were resistant and TN-1 as susceptible variety. Paramasiva *et al.* (2021) reported NLR 3542 as resistant variety and 25 other varieties as moderately resistant and TN-1 variety as most susceptible variety among the varieties screened.

Table 3. Per cent damage of different rice genotypes against rice leaf folder, *Cnaphalocrosis medinalis* under DSR field conditions during *kharif* 2021

S.NO	Genotypes	*per cent leaf damage at					MEAN
		45 DAS	60 DAS	75 DAS	90 DAS	105 DAS	
1	BPT 2231	2.83 (9.67)^{cd}	5.30 (13.29)^{efg}	9.03 (17.37)^{cde}	12.59 (20.63)^{c}	16.91 (24.28)^{cd}	9.24(17.04)
2	BPT 2270	4.29 (11.95)^{bc}	9.98 (18.37)^{cd}	15.53(23.16)^{bc}	21.80 (27.74)^{bc}	24.58 (29.72)^{bc}	15.24 (22.98)
3	BPT 2295	3.61 (10.92)^{cd}	8.93(17.38)^{cde}	14.28 (22.13)^{bcd}	18.75 (25.61)^{bc}	21.30 (27.49)^{cd}	13.27(20.57)
4	BPT 2411	2.16 (8.41)^{d}	5.20 (13.06)^{efg}	7.78 (16.00)^{de}	14.02 (21.92)^{c}	16.05(23.62)^{d}	9.04 (16.59)
5	BPT 2595	3.61 (10.91)^{cd}	6.57 (14.82)^{cdefg}	10.84 (19.11)^{cde}	15.28 (22.93)^{c}	15.75 (23.38)^{cd}	10.39 (18.21)
6	BPT 2766	3.97 (11.48)^{bcd}	6.23 (14.32)^{defg}	9.24 (17.64)	13.33 (21.33)^{c}	15.04 (22.82)^{d}	9.56 (17.52)
7	BPT 2776	4.27 (11.91)^{bc}	6.71 (14.97)^{cdefg}	10.07 (18.45)^{cde}	15.32 (22.97)^{c}	13.73 (21.74)^{d}	9.82 (18.00)
8	BPT 2824	4.11 (11.68)^{bcd}	6.10(14.15)^{defg}	8.80 (17.11)^{cde}	13.08(21.10)^{c}	15.37 (23.08)^{d}	9.49(17.82)
9	BPT 2841	2.86 (9.69)^{cd}	6.34 (14.49)^{defg}	9.56(17.95)^{cde}	15.02(22.53)^{c}	15.58 (23.24)^{d}	9.94(17.57)
10	BPT 2846	2.84 (9.51)^{cd}	4.57 (12.30)^{fg}	10.00(18.37)^{cde}	17.13 (24.39)^{c}	19.00(25.84)^{cd}	10.71 (18.08)
11	BPT 2848	2.89 (9.71)^{cd}	8.34(16.72)^{cdef}	11.48 (19.71)^{cde}	15.14(22.84)^{c}	18.43 (25.42)^{cd}	11.15(18.88)
12	BPT 2858	3.03 (10.01)^{cd}	10.96(19.27)^{c}	17.86 (25.00)^{bc}	22.62(28.40)^{bc}	25.82 (30.54)^{bc}	16.06 (23.62)
13	BPT 3136	3.19(10.29)^{d}	9.37 (17.82)^{g}	17.76(24.92)^{e}	21.17 (27.39)^{c}	24.58 (29.72)^{d}	15.21 (22.96)
14	BPT 5204	6.1 (14.22)^{ab}	15.92 (23.49)^{b}	22.44 (28.23)^{b}	28.54 (33.26)^{b}	32.69 (34.87)^{b}	20.94 (26.61)
15	TN1(check)	7.37(15.67)^{a}	26.04(30.67)^{a}	35.80(36.73)^{a}	44.92 (42.08)^{a}	42.72 (40.81)^{a}	31.24(33.19)
	SEm±	0.946	1.369	1.885	2.047	1.648	1.060
	Fcal	Sig	Sig	Sig	Sig	Sig	Sig
	CD (P= 0.05)	2.869	4.152	5.718	6.209	4.998	4.463
	CV%	12.22	11.67	12.89	11.48	8.77	11.66

*Figures in parenthesis are arc sine transformed values

Table 4. Susceptibility – resistance status of different rice genotypes against rice leaf folder, *Cnaphalocrosis medinalis* under DSR field conditions during *kharif* 2021

S.NO	Genotypes	MEAN	Susceptibility-Resistance Status	Damage rating
1	BPT 2231	9.24(17.04)	RESISTANT	1
2	BPT 2270	15.24 (22.98)	MODERATELY RESISTANT	3
3	BPT 2295	13.27(20.57)	RESISTANT	1
4	BPT 2411	9.04 (16.59)	RESISTANT	1
5	BPT 2595	10.39 (18.21)	RESISTANT	1
6	BPT 2766	9.56 (17.52)	RESISTANT	1
7	BPT 2776	9.82 (18.00)	RESISTANT	1
8	BPT 2824	9.49(17.82)	RESISTANT	1
9	BPT 2841	9.94(17.57)	RESISTANT	1
10	BPT 2846	10.71 (18.08)	RESISTANT	1
11	BPT 2848	11.15 (18.88)	RESISTANT	1
12	BPT 2858	16.06 (23.62)	MODERATELY RESISTANT	3
13	BPT 3136	15.21 (22.96)	MODERATELY RESISTANT	3
14	BPT 5204	20.94 (26.61)	MODERATELY RESISTANT	3
15	TN1 (check)	31.24 (33.19)	SUSCEPTIBLE	5

*Figures in parenthesis are arc sine transformed values

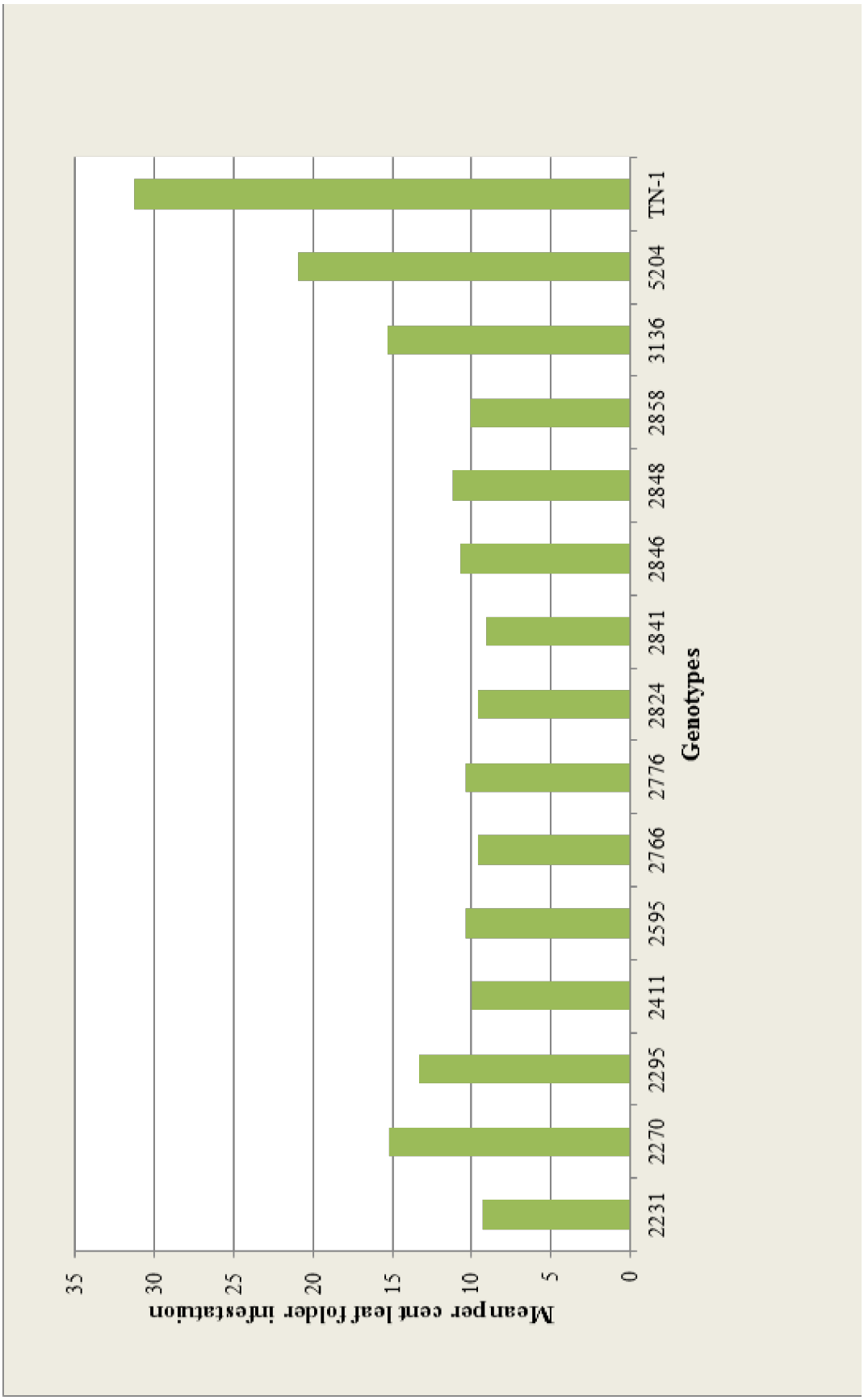

Fig 1. Per cent leaf folder infestation of different rice genotypes under DSR field conditions during *kharif*, 2021.

Yield (kg ha^{-1})

Data collected on yield was presented in the table 4.7. Among the 15 genotypes highest yield was recorded with 5795 kg ha^{-1} in BPT 2411 followed by BPT 2231 (5675 kg ha^{-1}), BPT 2824 (5540 kg ha^{1}), BPT 2766 (5435 kg ha^{-1}), BPT 2595 (5370 kg ha^{-1}), BPT 2846 (5355 kg ha^{-1}), BPT 2848 (5265 kg ha^{-1}), BPT 2295 (5160 kg ha^{-1}), BPT 2776 (5023 kg/ha^{-1}) which are also statistically on par with each other and all these varieties are found to be resistant. The lowest yield was recorded in TN-1 (3510 kg ha^{-1}) followed by BPT 5204 (4590 kg ha^{-1}), BPT 2841 (4790 kg ha^{-1}), BPT 2858 (4890 kg ha^{-1}), BPT 3136 (4920 kg/ha^{-1}) and BPT 2270 (4940 kg ha^{-1}). (Fig 4.8).

The mean per cent leaf folder damage was ranged from 9.04 (BPT 2411) to 31.24 (TN-1). Among the 15 screened genotypes, ten genotypes *i.e.* BPT 2411, BPT 2231, BPT 2824, BPT 2766, BPT 2776, BPT 2841, BPT 2595, BPT 2846, BPT 2848 and BPT 2295 were found to be resistant with damage scale of 1, four genotypes *i.e.* BPT 5204, BPT 2858, BPT 3136 and BPT 2270 were found moderately resistant with damage scale of 3 when compared to TN-1 which was susceptible with damage scale of 5.

Table 5. Yield of different genotypes under DSR field conditions during *kharif* 2021

Pre release culture	Mean per cent damage	Yield (kg ha^{-1})	Susceptibility-Resistance Status
BPT 2231	9.24	5675	R
BPT 2270	15.24	4940	MR
BPT 2295	13.27	5160	R
BPT 2411	9.04	5795	R
BPT 2595	10.39	5370	R
BPT 2766	9.56	5435	R
BPT 2776	9.82	5023	R
BPT 2824	9.49	5540	R
BPT 2841	9.94	4790	R
BPT 2846	10.71	5355	R
BPT 2848	11.15	5265	R
BPT 2858	16.06	4890	MR
BPT 3136	15.21	4920	MR
BPT 5204	20.94	4590	MR
TN-1 (control)	31.24	3510	S
SEm±	_	220.59	_
Fcal	_	Sig	_
CD (P= 0.05)	_	669.11	_
CV(%)	_	6.08	_

R=Resistant, MR=Moderately Resistant and S=Susceptible
Statistical analysis followed to test significance was DMRT

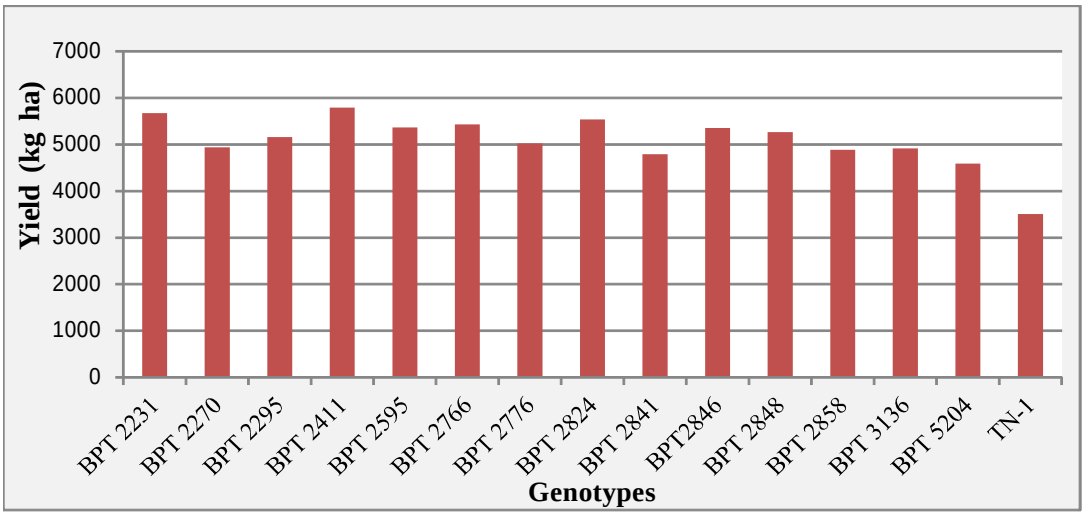

Fig 2. Yield of different genotypes under field conditions during *kharif* 2021

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