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New sources of genotypes against leaf spot and powdery mildew diseases in Greengram

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Abstract

Green gram genotypes/germplasms were evaluated to identify the sources of resistance to leaf spot and powdery mildew diseases. Screening was done under natural field conditions at Regional Agricultural Research Station (RARS), Warangal, Telangana State, India. The experimental material consisted fifty seven AICRP and state twenty one Green gram entries with one check during Kharif-2017 and 19 AICRP and 12 state green gram entries with a check during Rabi-2017, which were screened against the major diseases at RARS, Warangal. Out of one hundred twelve Green gram entries, eight entries *viz.*, VGG 16-055, VGG 16-036, LGG 607, Pusa 9072, VBN(Gg)2, MGG 385, VGG 15-030 and VGG 16-027 were moderately resistant to *Cercospora* leaf spot disease; two (TM-96-2 and TARM -1) entries were found highly resistant to powdery mildew Disease. Resistant's can be exploited to develop high yielding varieties of green gram by breeding.

Keywords: Germplasms, resistance, leaf spot, powdery mildew diseases, greengram

Introduction

Greengram crop is a major pulse crop of Telangana State. The less production of Green gram is mainly attributed to low genetic yield potentiality, indeterminate growth habit, canopy architecture, low partitioning efficiency, cultivation in marginal land, biotic and abiotic stresses. Among biotic stresses, leaf spot and powdery mildew are major diseases and have been found to appear in the epiphytotic form thereby causing immense loss in farmers' field of Telangana State.

Cercospora leaf spot was first known to be occurred in Delhi, India (Munjal *et al.*, 1960)^[18] and is prevalent in all parts of the humid tropical areas of India, Bangladesh, Indonesia, Malaysia, Philippines, Taiwan as well as Thailand (Pandey *et al.*, 2009)^[19]. It becomes severe in the wet season causing 0.0% to 100.0 per cent yield loss (Quebral and Cagampang, 1970; Amin and Singh, 1987; Grewal, 1988; Iqbal *et al.*, 1995; Pandey *et al.*, 2009)^[21, 1, 9, 12, 19]. Powdery mildew occurs across India and Southeast Asian countries and becomes severe in dry season causing 9.0% to 50.0 per cent yield loss (Reddy *et al.*, 2008; Pandey *et al.*, 2009)^[26, 19]. The powdery mildew occurs throughout the year under favorable conditions and it is more severe in late sown kharif crop. A factor limiting breeding progress is that selection for powdery mildew resistance is confined to the cool-dry season on mungbean (Chankaew *et al.*, 2013)^[6].

Numerous attempts have been made for the identification of resistant sources against these diseases (Basandrai *et al.*, 1999, 2003, 2011a; Iqbal *et al.*, 2004; Rajee and Rao, 2002; Reddy *et al.*, 1994a, 2001 and 2008)^[3, 4, 5, 13, 22, 23, 27, 26] of Green gram.

Depending upon the temperature and humidity, these diseases spread rapidly in susceptible varieties. In Telangana state, it is cultivated in all most districts but prominently grown in Warangal, Khammam, Medak, Mahaboobnagar, Karimnagar, Nalgonda, Nizamabad and Rangareddy districts. Cultivation of resistant genotypes is an effective and cheaper method to combat the disease. Hence, several genotypes need to be screened to identify the source of resistance. Hence, an attempt was made to identify resistant genotypes against *Cercospora* leafspot and Powdery mildew diseases in Green gram.

Materials and Methods

Trial was conducted in a Randomized Block Design (RBD) with two replications during Kharif-2017 and Rabi 2017 at RARS, Warangal, Telangana State. Germplasms were planted in two rows of 4 meter length with row spacing of 40 cm and 10 cm between plants. Recommended agronomic practices were followed.

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Evaluation for leaf spot disease incidence on Green gram

Seventy eight Green gram and thirty three green gram germplasms were evaluated under natural environmental field conditions at RARS, Warangal during Kharif-2017 and Rabi-

2017. The trial was laid out in RBD with two replications. Based on the disease incidence, genotypes are categorized for their reaction to leaf spot disease as detailed, according to Mayee and Datar (1986)^[17] on Greengram

Disease Scale	Per cent Leaf area coverage	Description	Reaction
0	0	No Symptom on the leaf	Immune (I)
1	<1	Lesions small, pin head sized, covering less than 1% leaf area	Resistant (R)
3	1-10	Lesions 1-2 mm in diameter, covering 1-10% of the leaf area	Moderately Resistant(MR)
5	11-25	Lesions enlarged but not coalescing covering 11-25% of the leaf area	Moderately Susceptible (MS)
7	26-50	Lesions coalescing covering 26-50% of leaf area.	Susceptible (S)
9	>50	Above 50% leaf area covered by large coalescing lesions defoliation of leaves.	Highly Susceptible (HS)

Evaluation for powdery mildew disease incidence on Green gram

Seventy eight Green gram and thirty three green gram germplasms were evaluated under natural environmental field

conditions at RARS, Warangal during Kharif-2017 and Rabi-2017. The trial was laid out in RBD with two replications.

Powdery mildew on Green gram and Black gram (0-5 Scale -Gawande and Patil, 2003)^[7].

Disease Scale	Per cent Leaf area coverage	Description	Reaction
0	0	Plants free from infection	Highly Resistant (HR)
1	1-10	Plant showing traces up to 10% infection on leaves, stem free from infection	Resistant (R)
2	10.1- 25	Slight infection with thin coating of powdery growth on leaves covering 10.1-25 per cent leaf area, slight infection on stem, pods usually free	Moderately Resistant (MR)
3	25.1-50	Dense powdery coating covering covering 25.1 to 50% leaf area, moderate infection on stems, slight infection on pods	Moderately Susceptible (MS)
4	50.1-75	Dense powdery coating covering 50.1 to 75% leaf area, stem heavily and pods moderately infected. Infected portion turns greyish	Susceptible (S)
5	>75	Severe infection with dense powdery growth, covering more than 75% area of the whole plant including pods, plants resulting in premature defoliation and drying	Highly Susceptible (HS)

Results and Discussion**Greengram****Leaf spot disease incidence****Kharif -2017**

Leaf spot disease incidence seventy eight in Green gram germplasms lines was from 7% to 95%. Based on the mean disease incidence of both replications during Kharif-2017, Five entries namely VGG 16-055, VGG16-036, LGG-607, MGG-395 and MGG-402 were found moderately resistant, three entries viz., BM-4, MGG-360 and TM-96-2 was moderately susceptible and remaining entries were susceptible and highly susceptible to leaf spot disease (Table 1 and Table2).

Rabi -2017

Thirty three green gram germplasms were evaluated under natural environmental field conditions at RARS, Warangal during Rabi-2017. The trial was laid out in RBD with two replications.

Leaf spot disease incidence thirty three nine in Green gram germplasms lines was from 9% to 90%.

The mean disease incidence of both replications during rabi-2017, six entries viz., Pusa-9072, VBN(Gg)2, MGG-385, VGG-15-030, VGG-16-027 and LGG-460 were found moderately resistant, twenty entries viz., TARM 1, CO 6, COGG 13-39, VGG 16-036, VGG 16-055, AGG 35, MGG-387, NVL-722, OBGG-56, OBGG-57, OBGG-58, LGG 450, LGG 460, Kopergaon, MGG-385, ML 818, MGG-388, LGG 607, MUM-2 and MLGG-17-5 were moderately susceptible and remaining entries were susceptible and highly susceptible to leaf spot disease (Table3 and Table4).

Among the sixty-five genotypes, one genotype LGG-460 was found highly resistant while GM-02-08, GM-02-13 and GM-03-03 were categorized into resistant (D. L. Yadav *et al*, 2014)^[31].

Out of 696 germplasms screened against leaf spot disease, 15 lines viz., (ML5, 443, 453, 515, 610, 611, 613, 682, 688, 713, 728, 735, 746, 759 and 769) were found resistant to leaf spot disease (Singh *et al.*, 2004)^[28]. Jameel Akhtar *et al.*, (2014)^[14] reported four genotypes viz., AKM 9910, IPM 02-5, ML 1299 and SML 668 were resistant to Cercospora leaf spot disease in Green gram.

Out of sixty three Green gram entries, only one KMP-13 was moderately resistant to Cercospora leaf spot disease (Vijaya Bhaskar, 2017)^[30].

Out of sixteen Green gram entries, only two entries viz., VC – 6153 and B - 20 were tolerance to Cercospora leaf spot disease (Hasan *et al.*, 2017)^[11].

A field screening was undertaken to evaluate various mungbean genotypes against Cercospora leaf spot disease, only five entries namely: LGG 460, VGG 15-029, VGG 15-030, OBGG 58 and ANM 12-02 genotypes were found to be promising to leaf spot disease at Berhampur (Bal *et al*, 2019)^[2].

Powdery mildew disease incidence**Kharif -2017**

Powdery mildew disease incidence in seventy eight Greengram germplasms lines was from 2% to 25%. Based on the mean disease incidence of both replications during Kharif-2017, one entry TM-96-2 was found highly resistant, sixty

eight entries were found resistant and remaining entries were susceptible to powdery mildew disease (Table 1 and Table2).

Rabi -2017

Powdery mildew disease incidence in thirty three Greengram germplasm lines was from 0% to 92%. Based on the mean disease incidence of both replications during rabi-2017, one entry TARM 1 was found highly resistant; two entries viz., Pusa 9072 and COGG 13-39 were found resistant; six entries viz., VG-15-030, VG-16-027, LGG-460, MUM-2, MLGG-17-6 and SML-32 were found moderately resistant and remaining entries were susceptible to powdery mildew disease (Table 3 and Table4).

Out of 374 accessions, six entries of Green gram were found to be highly resistant viz., BL 849, BL 865, LM1668, PBM, PMB 63 and AKM 8803 (Divya Ramakrishnan *et al.*, 2014) [7]. Similarly Jameel Akhtar *et al.*, (2014) [14] found 13 genotypes viz., KGS 83, MH 96-1, Pusa 572, GS 33-5, AKM

99-4, GS 21-5, COGG 936, ML 1299, TMB 47, HUM 1, MH 429, MH 429 and MH 530 were highly resistant reaction to powdery mildew disease in Green gram. Several sources of resistance to Powdery mildew disease in mungbean have been reported (Hartman *et al.*, 1993 and Reddy *et al.*, 1994b) [10, 24]. Genetic studies using different resistance sources revealed different modes of inheritance (Reddy *et al.*, 1994a; Reddy, 2009; Sorajjapinun *et al.*, 2005 and Kasettranan *et al.*, 2009) [23, 25, 29, 15], suggesting that there are different mechanisms or genes conferring resistance to powdery mildew disease.

Out of sixty three Green gram entries, only three entries viz., KMP-36, KMP-39 and KMP-41 were found highly resistant to powdery mildew disease (Vijaya Bhaskar, 2017) [30].

Twenty genotypes of mungbean germplasm were evaluated, only two lines (PDM-11 and PANT MUNG-5) were found resistant against Powdery Mildew disease (Kirti Pawar *et al.*, 2019) [16].

Table 1: Screening of Green gram cultures against Leaf spot and Powdery Mildew Diseases – Kharif-2017 (AICRP entries)

S. No.	Entry Name	Leaf Spot disease			Powdery Mildew disease		
		% Leaf area Coverage	0-9 scale	Reaction	% Leaf area Coverage	0-5 scale	Reaction
1	BM 4	20	5	MS	4	1	R
2	NVL 855	60	9	HS	3	1	R
3	AKM 8802	70	9	HS	3	1	R
4	AKM 12-28	80	9	HS	2	1	R
5	AKM 12-24	75	9	HS	7	1	R
6	ML 2479	42	7	S	8	1	R
7	ML 818	82	9	HS	21	2	MR
8	SML 1808	78	9	HS	5	1	R
9	SKNM 1504	60	9	HS	22	2	MR
10	SKNM 1502	42	7	S	24	2	MR
11	VGG 16-055	8	3	MR	6	1	R
12	VGG 16-036	9	3	MR	7	1	R
13	LGG 607	7	3	MR	8	1	R
14	LGG 460	22	5	HS	5	1	R
15	LBG 450	80	9	HS	4	1	R
16	Pant M 4	82	9	HS	8	1	R
17	Pant M 6	84	9	HS	9	1	R
18	PM 14-3	46	7	S	2	1	R
19	PM 14-11	84	9	HS	18	2	MR
20	COGG 13-39	46	7	S	20	2	MR
21	COGG 13-19	48	7	S	24	2	MR
22	COGG 912	90	9	HS	3	1	R
23	KM 2355	40	7	S	4	1	R
24	KM 2241	90	9	HS	6	1	R
25	Type 44	85	9	HS	8	1	R
26	K 851	82	9	HS	9.0	1	R
27	Pusa -1772	84	9	HS	6	1	R
28	Pusa- 1771	46	7	S	5	1	R
29	Pusa -0672	90	9	HS	3	1	R
30	RMG 1087	80	9	HS	2	1	R
31	RMG 1092	76	9	HS	8	1	R
32	RMG 1097	70	9	HS	4	1	R
33	NDMK16-324	75	9	HS	5	1	R
34	SVM 6133	72	9	HS	8	1	R
35	NMK 15-08	80	9	HS	7	1	R
36	MDGGV 18	82	9	HS	6	1	R
37	JLM302-46	84	9	HS	4	1	R
38	JAUM 0936	86	9	HS	3	1	R

Table 1: count.....

S. No.	Entry Name	Leaf Spot disease			Powdery Mildew disease		
		% Leaf area Coverage	0-9 scale	Reaction	% Leaf area Coverage	0-9 scale	Reaction
39	MH 2-15	84	9	HS	2	1	R
40	MH 1142	70	9	HS	6	1	R
41	MH 1323	76	9	HS	8	1	R

42	IPM 02-14	70	9	HS	9	1	R
43	IPM 02-3	72	9	HS	8	1	R
44	IPM 512-1	90	9	HS	4	1	R
45	IPM 14-7	90	9	HS	5	1	R
46	IPM 312-19	92	9	HS	10	1	R
47	IPM 312-20	90	9	HS	8	1	R
48	OBGG 56	80	9	HS	6	1	R
49	OBGG 58	82	9	HS	5	1	R
50	IGKM 2016-1	85	9	HS	9	1	R
51	Kopergoan	88	9	HS	8	1	R
52	TMB 126	90	9	HS	10	1	R
53	DGG 7	91	9	HS	8	1	R
54	MGG 387	90	9	HS	5	1	R
55	IPM 410-9	85	9	HS	7	1	R
56	RMB 12-07	84	9	HS	24	2	MR
57	Barabanki Local	90	9	HS	8	1	R
58	WGG-42(Check)	95	9	HS	10	1	R

[Highly Resistant (HR), Resistant(R), Moderately Resistant (MR), Susceptible(S), Moderately Susceptible (MS), Highly susceptible (HS)]

Table 2: Screening of Green gram cultures against Leaf spot and Powdery Mildew Diseases- Kharif-2017 (Station entries)

S. No	Name of the Entry	Leaf Spot disease			Powdery Mildew disease		
		% Leaf area Coverage	0-9 scale	Reaction	% Leaf area Coverage	0-5 scale	Reaction
1	MGG-295	70	9	HS	8	1	R
2	MGG-388	76	9	HS	6	1	R
3	MGG-429	80	9	HS	9	1	R
4	MGG-434	82	9	HS	5	1	R
5	MGG-389	84	9	HS	8	1	R
6	MGG-444	88	9	HS	6	1	R
7	WGG-37	90	9	HS	9	1	R
8	MGG-399	91	9	HS	10	1	R
9	MGG-351	92	9	HS	24	2	MR
10	MGG-359	76	9	HS	25	2	MR
11	MGG-360	25	5	MS	10	1	R
12	MGG-385	50	7	S	8	1	R
13	MGG-395	9	3	MR	7	1	R
14	MGG-402	10	3	MR	8	1	R
15	TM-96-2	25	5	MS	0	0	HR
16	MGG-387	90	9	HS	10	1	R
17	MGG-417	88	9	HS	7	1	R
18	LGG-460	90	9	HS	6	1	R
19	LGG-450	50	7	S	10	1	R
20	WGG-37	86	9	HS	10	2	R
21	WGG-42 (C)	96	9	HS	8	1	R

[Highly Resistant (HR), Resistant(R), Moderately Resistant (MR), Susceptible(S), Moderately Susceptible (MS), Highly susceptible (HS)]

Table 3: Screening of Green gram cultures against Leaf spot and Powdery mildew diseases–Rabi-2017 (AICRP entries)

S. No	Name of the Entry	Leaf Spot disease			Powdery Mildew disease		
		% Leaf area Coverage	0-9 scale	Reaction	% Leaf area Coverage	0-5 scale	Reaction
1	Pusa-9072	10	3	MR	10	1	R
2	TARM 1	25	5	MS	0	0	HR
3	CO 6	25	5	MS	75	4	S
4	VBN (Gg)2	10	3	MR	50	3	MS
5	MGG -385	9	3	MR	48	3	MS
6	VGG- 15-030	10	3	MR	25	2	MR
7	COGG -13-39	24	5	MS	10	1	R
8	VGG- 16-027	10	3	MR	24	2	MR
9	VGG- 16-036	23	5	MS	50	3	MS
10	VGG -16-055	22	5	MS	48	3	MS
11	AGG- 35	25	5	MS	74	4	S
12	MGG-387	23	5	MS	72	4	S
13	NVL-722	20	5	MS	80	5	S
14	OBGG-56	24	5	MS	84	5	S
15	OBGG-57	19	5	MS	87	5	S
16	OBGG-58	20	5	MS	90	5	S
17	LGG- 450	23	5	MS	92	5	S
18	LGG- 460	24	5	MS	86	5	S
19	Kopergaon	25	5	MS	90	5	S
20	WGG-42 (Check)	50	7	S	75	4	S

[Highly Resistant (HR), Resistant(R), Moderately Resistant (MR), Susceptible(S), Moderately Susceptible (MS), Highly susceptible (HS)]

Table 4: Screening of Green gram cultures against Leaf spot and Powdery mildew diseases – Rabi-2017(Station entries)

S. No	Name of the Entry	Leaf Spot			Powdery Mildew		
		% Leaf area Coverage	0-9 scale	Reaction	% Leaf area Coverage	0-5 scale	Reaction
1	LGG-460	10	3	MR	24	2	MR
2	MGG-385	25	5	MS	73	4	S
3	Kopergoan	22	5	MS	75	4	S
4	ML- 818	20	5	MS	70	4	S
5	MGG-388	23	5	MS	50	3	MS
6	LGG 607	25	5	MS	48	3	MS
7	MUM-2	22	5	MS	24	2	MR
8	SML-32	49	7	S	20	2	MR
9	MLGG-17-6	50	7	S	22	2	MR
10	MLGG-17-5	24	5	MS	49	3	MS
11	WGG-2	90	9	HS	50	3	MS
12	WGG-37	50	7	S	75	4	S
13	WGG-42 (C)	48	7	S	72	4	S

[Highly Resistant (HR), Resistant(R), Moderately Resistant (MR), Susceptible(S), Moderately Susceptible (MS), Highly Susceptible (HS)]

Conclusions

Five entries viz., VGG 16-055, VGG16-036, LGG-607, MGG-395 and MGG-402 were found moderately resistant to leafspot disease in Kharif and six entries viz., Pusa-9072, VBN(Gg)2, MGG-385, VGG-15-030, VGG-16-027 and LGG-460 were found moderately resistant to leaf spot disease in Rabi season.

One entry TM-96-2 was found resistant to powdery mildew in kharif season. One entry TARM1 was found resistant and Kopergaon entry was found moderately susceptible to powdery mildew in rabi season.

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