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Screening of Different Genotypes of Pigeonpea (*Cajanus cajan* L. Millsp.) Against *Phytophthora drechsleri* f. sp. *cajani* Under Natural Epiphytotic Environment

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Pigeonpea is one of the major legumes and it is one of the most important among edible legumes of the world. Diseases are major constraints affecting both production and yield stability of pigeonpea (Kannaiyan and Nene, 1984). In India Fusarium wilt, sterility mosaic, Phytophthora blight and Phoma stem canker are considered most important diseases of pigeonpea causing extensive damage to the crop. Our study were based on screening resistant genotypes against Phytophthora blight of pigeonpea caused by *Phytophthora drechsleri* f. sp. *cajani* (Pdc). Seventy three genotypes were planted with susceptible check (ICP-7119). All genotypes were inoculated with *Phytophthora drechsleri* f. sp. *cajani* by knife cut method and data of lesion size were taken at two different time intervals. Out of 73 genotypes only five of them viz. WRG-220, GT-101, GAUT-001, BSMR-853, ICP-2376 were found fully resistant against infection of *Phytophthora drechsleri* f. sp. *cajani* (Pdc).

Keywords: Pigeonpea, Genotypes, *Phytophthora drechsleri f. sp. cajani,* Phytophthora blight

Pigeonpea is one of the important pulse crops in India. It plays a very significant role in Indian economy. Phytophthora blight disease of pigeonpea is very crucial factor responsible for decreased productivity of pigeonpea. The first suspected occurrence of PB on pigeonpea in India was reported in 1966 by Williams *et al.* (1968). Since then the disease has spread to most pigeonpea growing areas in Asia (Pal *et al.*, 1970; Williams *et al*., 1975), Africa, America (Kannaiyan *et al*., 1984), Australia (Wearing and Birch, 1988), Dominican Republic, Kenya, Panama and Puerto Rico (Nene *et al*., 1996). High susceptibility of presently grown cultivars to *Phytophthora drechsleri* f. sp. *cajani* is responsible for severe appearance of Phytophthora blight disease of pigeonpea. The only way to overcome this problem will be to 'stack' multiple resistances, based upon distinct mechanisms of action. Resistant source may be obtained by evaluating germplasms against *Phytophthora drechsleri* f. sp. *cajani*. Commonly used methods for screening of resistant germplasms include knife cut method.

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MATERIALS AND METHODS

Seventy three genotypes were planted in field of Institute of Agricultural Sciences, BHU, Varanasi, India in the month of July. One row of susceptible check (ICP-7119) was sown after every ten test rows to ensure enough inoculum. The seeds were sown at 10 cm distance in 3 meter rows. The row to row distance was 30 cm. All conventional agronomic practices were followed to keep the crop in good condition. When plant become 5 month old then 10 replications of each genotypes were inoculated with 15 mm mycelial disc of 12 days old culture (Knife cut method, Nene *et al.*, 1981) of *Phytophthora drechsleri* f. sp.

Table 1. Rating scale (1-9) for disease rating of Phytophthora blight of pigeonpea (Reddy *et al.*, 1991)

Rating	Reaction category	Phytophthora blight	
		Plant mortality(%)	Stem lesion type
1	Resistant	6-10	Lesion size 0.6-1 cm^2 ,smooth lesion
3	Moderately resistant	21-30	Lesion size more than 1 cm^2 , smooth lesions girdling the stem
5	Moderately susceptible	31-50	Lesion size 2 to 3 cm^2 ,smooth lesion with stem cracking
7	Susceptible	51-57	Lesion size 3 to 4 cm^2 , large lesions with cracking and girdling of the stem
9	Highly susceptible	Plant killed	Lesion size more than 4 cm^2 and plants killed

Table 2. Screening of genotypes by artificial inoculation (Knife cut method) under field conditions recorded 5 days after inoculation with *P. drechsleri* f. sp. *cajani* (KJ412453)

S. No.	Genotypes	Mean of lesion sizes (cm^2)	Disease reaction
1	WRG-222	2.9	MS
2	WRG-197	2.2	MS
3	PT-04-307	2.4	MS
4	PA-409	1.8	MR
5	ICP-7119	4.8	S
6	AKTE-11-1	4.3	S
7	NTL-900	2.7	MS
8	MA-6	3.8	S
9	ICP-7119	4.4	S
10	PA-406	3.2	S
11	IPAC-4	2	MS
12	IPAC-8	2.6	MS
13	IPA-204	3.3	S
14	ICP-7119	4.5	S
15	BAHAR	3.3	S
16	KPL-44	2.7	MS
17	IPA-8F	2.1	MS
18	IPA-15F	3.2	S
19	ICP-7119	4.7	S
20	KPL-43	2.8	MS
21	ICP-8863	1.8	MR
22	BRG-11-1	1.9	MR
23	BRG-1	2.2	MS
24	ICP-7119	4.7	S
25	BRG-2	1.9	MR
26	BRG-3	1.9	MR
27	WRG-220	0.6	R
28	CORG-9701	2.2	MS
29	ICP-7119	4.6	S
30	GT-101	0.6	R
31	GAUT-001	0.5	R
32	BSMR-736	2.9	MS
33	BSMR-853	0.6	R
34	ICP-7119	4.4	S
35	BDN-2	1.8	MR
36	BSMR-579	2.2	MS
37	BWR-133	2	MS
38	BSMR-2	2.3	MS
39	ICP-7119	4.6	S
40	BSMR-528	1.9	MR
41	JKM-189	2	MS
42	RVKT-260	1.8	MR
43	RVKT-261	1.9	MR
44	ICP-7119	4.3	S
45	ICP-2376	0.6	R
46	ICP-7119	4.6	S
47	ICPL-87119	1.7	MR
48	ICP-7119	4.8	S
49	ICPL-87091	1.9	MR
50	PALAE-1	2.4	MS
51	IPAC-68	2.5	MS
52	MAL-13	2	MS
53	ICP-7119	4.4	S
54	RVSA-07-24	1.8	MR
55	RVSA-07-31	2	MS
56	RVSA-07-10	1.9	MR
57	RVSA-07-29	2	MS
58	ICP-7119	4.5	S
59	RVSA-07-22	2	MS
60	WRP-1	2	MS
61	GRG-811	2.4	MS
62	GRG-333	2	MS
63	ICP-7119	4.6	S
64	GRG-2009	3.1	S
65	ST-3R	3.8	S
66	BRG-4	2.2	MS
67	BRG-11-1	3.6	S
68	ICP-7119	4.7	S
69	UPAS-120	3.1	S
70	WRG-232	2.2	MS
71	WRG-196	2.7	MS
72	WRG-224	2.7	MS
73	ICP-7119	4.8	S

cajani. The infected plants were counted after 5-10 days of inoculation.

RESULTS AND DISCUSSION

Mean of lesion size of each genotype at different time interval is described in Table 2 and Table3. The data of Table 4 revealed that among seventy three genotypes, none was found immune or disease free against *Phytophthora drechsleri* f. sp. *cajani*. Five genotypes namely WRG-220, GT-101, GAUT-001, BSMR-853, ICP-2376 showed resistant reaction against *Phytophthora drechsleri* f. sp. *cajani*; thirteen genotypes i.e. BSMR-528, PA-409, RVKT-260, RVKT-261, ICPL-87119, ICPL-87091, RVSA-07-24, RVSA-07-10, ICP-8863, BRG-11-1, BRG-2, BRG-3, BDN-2observed moderately resistant reaction; twenty seven genotypes namely WRG-222, WRG-197, PT-04-307, BSMR-2, JKM-189, NTL-900, IPAC-4, IPAC-8, PALAE-1, IPAC-68, MAL-13, IPA-8F, RVSA-07-31, KPL-43, RVSA-07-29, RVSA-07-22, WRP-1, GRG-811, GRG-333, BRG-1, CORG-9701, BRG-4, WRG-232, WRG-196, WRG-224, BSMR-579, BWR-133 expressed

Table 3. Screening of genotypes by artificial inoculation (knife cut method) under field conditions 10 days after inoculation with *P. drechsleri f. sp. cajani* (KJ412453)

S. No.	Genotypes	Mean of lesion sizes (cm^2)	Disease reaction
1	WRG-222	2.6	MS
2	WRG-197	2.5	MS
3	PT-04-307	2.4	MS
4	PA-409	1.8	MR
5	ICP-7119	5	S
6	AKTE-11-1	4.6	S
7	NTL-900	2.8	MS
8	MA-6	3.9	S
9	ICP-7119	4.7	S
10	PA-406	3.2	S
11	IPAC-4	2	MS
12	IPAC-8	2.6	MS
13	IPA-204	3.2	S
14	ICP-7119	5.1	S
15	BAHAR	3.5	S
16	KPL-44	4	S
17	IPA-8F	2.1	MS
18	IPA-15F	3.2	S
19	ICP-7119	5.1	S
20	KPL-43	2.8	MS
21	ICP-8863	1.8	MR
22	BRG-11-1	1.9	MR
23	BRG-1	2.9	MS
24	ICP-7119	4.9	S
25	BRG-2	1.9	MR
26	BRG-3	1.9	MR
27	WRG-220	0.6	R
28	CORG-9701	2.2	MS
29	ICP-7119	4.8	S
30	GT-101	0.6	R
31	GAUT-001	0.5	R
32	BSMR-736	4	S
33	BSMR-853	0.6	R
34	ICP-7119	4.9	S
35	BDN-2	1.8	MR
36	BSMR-579	2.2	MS
37	BWR-133	2	MS
38	BSMR-2	2.3	MS
39	ICP-7119	4.8	S
40	BSMR-528	1.9	MR
41	JKM-189	2	MS
42	RVKT-260	1.8	MR
43	RVKT-261	1.9	MR
44	ICP-7119	5	S
45	ICP-2376	0.6	R
46	ICP-7119	4.9	S
47	ICPL-87119	1.9	MR
48	ICP-7119	4.9	S
49	ICPL-87091	1.9	MR
50	PALAE-1	2.4	MS
51	IPAC-68	2.5	MS
52	MAL-13	2	MS
53	ICP-7119	5.2	S
54	RVSA-07-24	1.8	MR
55	RVSA-07-31	2	MS
56	RVSA-07-10	1.9	MR
57	RVSA-07-29	2	MS
58	ICP-7119	5	S
59	RVSA-07-22	2	MS
60	WRP-1	2	MS
61	GRG-811	2.4	MS
62	GRG-333	2	MS
63	ICP-7119	5.1	S
64	GRG-2009	3.1	S
65	ST-3R	4	S
66	BRG-4	2.2	MS
67	BRG-11-1	4	S
68	ICP-7119	4.9	S
69	UPAS-120	3.3	S
70	WRG-232	2.2	MS
71	WRG-196	2.7	MS
72	WRG-224	2.7	MS
73	ICP-7119	5	S

Table 4. Screening results of different genotypes under field conditions

Reaction	Number of genotypes	Lesion sizes (cm)	Genotypes
Disease Free/ Immune	**0**	No any lesion found on stem	_
Resistant	5	Lesion size 0.6-1 cm^2 , smooth lesion	WRG-220, GT-101, GAUT-001, BSMR-853, ICP-2376
Moderately resistant	13	Lesion size more than 1 cm^2 , smooth lesions girdling the stem	BSMR-528, PA-409, RVKT-260, RVKT-261, ICPL-87119, ICPL-87091, RVSA-07-24, RVSA-07-10, ICP-8863, BRG-11-1, BRG-2, BRG-3, BDN-2
Moderately susceptible	27	Lesion size 2 to 3 cm^2, with stem cracking smooth lesion	WRG-222, WRG-197, PT-04-307, BSMR-2, JKM-189, NTL-900, IPAC-4, IPAC-8, PALAE-1, IPAC-68, MAL-13, IPA-8F, RVSA-07-31, KPL-43, RVSA-07-29, RVSA-07-22, WRP-1, GRG-811, GRG-333, BRG-1, CORG-9701, BRG-4, WRG-232, WRG-196, WRG-224, BSMR-579, BWR-133
Susceptible	28	Lesion size more than 3 cm^2 , large lesions with cracking and girdling of the stem	AKTE-11-1, MA-6, ICP-7119, PA-406, IPA-204, BAHAR, KPL-44, IPA-15F, GRG-2009, ST-3R, BRG-11-1, BSMR-736,
UPA			S-120

moderately susceptible reaction while, twenty eight genotypes i.e. AKTE-11-1, MA-6, ICP-7119, PA-406, IPA-204, BAHAR, KPL-44, IPA-15F, GRG-2009, ST-3R, BRG-11-1, BSMR-736, UPA S-120 showed susceptible reaction against *Phytophthora drechsleri* f. sp. *cajani*.

This statement is in harmony with the experiment conducted by Kannaiyan *et. al.* (1981) in which a simple pot culture technique was used to screen 2,835 pigeon pea *(Cajanus cajan)* accessions and cultivars and seven *Atylosia* spp. for resistance to *Phytophthora drechsleri* f. sp. *cajani*. Seventy seven germplasm accessions, three cultivars, and two species of *Atylosia* were found to be resistant. The resistance of 75 of the accessions and cultivars was confirmed under field conditions. Similarly, Pande *et.al.* (2006) observed 122 lines (33 lines in wilt and sterility mosaic sick plot and 89 lines including wild *Cajanus* spp. in other fields), 33 were resistant and 61 moderately resistant, 21 moderately susceptible and 7 susceptible to Phytophthora blight of pigeonpea. Of the three wild *Cajanus species, Cajanus sericeus* was found resistant, *C. scarabaeoides* moderately resistant and *C. cajanifolius* susceptible to Phytophthora blight of pigeonpea.

CONCLUSION

Genotypes screening is done in field for checking the resistance of pigeonpea against *Phytophthora drechsleri* f. sp. *cajani* causing Phytophthora blight of pigeonpea. Seventy three genotypes were used for screening and inoculation was done by knife cut method on pigeonpea plants. The result shows that eighteen genotypes are either resistant or moderately resistant not showing any symptoms or very restricted symptoms of Phytophthora blight and could be used for developing resistant varieties against Phytophthora blight of pigeonpea.

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