

Screening of germplasm of pigeonpea against phytophthora stem blight

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ABSTRACT

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is very important and old pulse crop, which is used in various ways. Its main use is in the form of Dal (split seed) in the Indian diet. The phytophthora stem blight caused by *Phytophthora drechsleri* f.sp. *cajani* is the third potentially important disease of pigeonpea crop after wilt and sterility mosaic wherever crop is grown during *Kharif* season mostly in northern parts of India. The present investigation was undertaken with an objective to develop disease resistant material by screening of pigeonpea germplasm against phytophthora stem blight. A screening trail was conducted by employing forty pigeonpea germplasms, in which Only one germplasm namely ERG-65 was found resistant, however, 27 germplasms included HY-3C, KPL44, MA-06, Vipula 42, WRP-1, Pusa-992, BDN-711, RVSA-07-22, AL-1593, RVSA-07-10, GAUT-001, BSMR-853, BSMR-2, JICM-189, BSMR-579, BSMR-571, RVKT-260, KPL-43, AL-1798, RVKT-261, CORG-9701, GT-101, BRG-2, AKT-8811, RVSA-7-29, ICPL-8863, and ICPL-87119 were found moderately resistant. Resistant germplasm namely ERG-65 may be utilized as a resistant donor in developing resistant variety against the phytophthora stem blight.

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INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp.] commonly known as red gram or Arhar is a major grain legume crop of the country. In India pigeonpea is the second most important food legume crop after chickpea. It occupies about 3.90 million ha with a production of 3.17 million tonnes and productivity 813 kg/ha. It accounts for about 11.8 per cent of the total pulse area and 17 per

cent of total pulse production of the country. In Uttarakhand still it is very less in fact about 4 thousand ha area with a production of 3 thousand tonnes and productivity 750 kg/ha. It is multipurpose crop, being grown not only for grain but also for fuel and fodder (Nene and Shiela, 1990). Phytophthora stem blight caused *Phytophthora drechsleri* Tucker f.sp. *cajani* was first reported in India by (Williams *et al.*, 1968).

Since then, the disease has been identified in several pigeonpea growing areas and has been considered as third potentially important disease of pigeonpea in India (Kannaiyan *et al.*, 1984). However, It is the most important production constraint in North-eastern part of the India (Mishra and Shukla 1987 and Chauhan *et al.*, 2002). The characteristic symptoms of the disease appears as brown to dark brown distinctly marked lesions on base of the stem or above it. These lesions increase in size and girdle the stem causing drying and death of affected plants (Plate 1, A). At times knots are formed on the stem at the base of soil surface which is cracked later and stem or branches may break at lesion site with wind or other forces. White to pinkish brown fungal growth may appear on blighted area under congenial weather conditions (Plate 1, B).

The most effective way to manage *Phytophthora* stem blight would be to develop resistant cultivars. Keeping in view, the all facts introduced above and importance of the disease 40 germplasms of pigeonpea including check (ICP-7119) were evaluated to find out the resistance source which may further be exploited in resistant breeding programme.

MATERIAL AND METHODS

Germplasms (40 Numbers given in Table 1) were sown in two rows in plot of 5 meter row length in a three replications in sick plot at NEBCRC Pantnagar during two successive seasons *i.e.* 2012-13 and 2013-14. Pathogenic culture was multiplied on pigeonpea infusion agar (infusion from 40 g pigeonpea seed: 20 g agar and distilled water 1000 ml) as per need of artificial inoculation. The stem of one month old plants were inoculated at base by rubbing small amount of mycelial mass with finger with 10 days old culture. The field was flooded with water immediately after inoculation. One month later after the first inoculation, disease free plants were re-inoculated to minimize the chances of escapes and maintain the humidity of the field. The effectiveness of the inoculation was also monitored by planting the susceptible cultivar ICP-7119 after every 10 test rows. The final observations were recorded after 20, 30, and 40 days of second inoculation on the basis of a 0-9 point susceptibility scale as per IBPGR and ICRISAT Descriptors 1993 and expressed as five categories, 0-10 per cent as Resistant, 10.1-30 per cent as moderately resistant, 30.1-50 per cent as tolerant, 50.1-70 per cent

as moderately susceptible and 70.1-90 per cent as susceptible genotype (Nene *et al.*, 1981). Per cent of PSB susceptibility (PSB incidence %) was calculated as follows:

$$\text{Phytophthora stem blight incidence \%} = \frac{\text{Number of PSB infected plants}}{\text{Total number of plants}} \times 100$$

RESULTS AND DISCUSSION

The data presented in (Table 1 and 2) revealed that, only one germplasm namely ERG-65 (7.5%) was found resistant and twenty seven germplasms included HY3C, KPL44, MA-06, Vipula 42, WRP-1, Pusa-992, BDN-711, RVSA-07-22, AL-1593, RVSA-07-10, GAUT-001, BSMR-853, BSMR-2, JICM-189, BSMR-579, BSMR-



Plate A : *Phytophthora* stem blight of pigeonpea



Plate B : White fungal growth on cracked lesion of stem

Table 1 : Pigeonpea germplasms showing disease incidence against Phytophthora stem blight

Sr. No.	Germplasms	Pooled disease incidence (%)	Sr. No.	Germplasm	Pooled disease incidence (%)
1.	HY3C	15.79 (23.176)	21.	RVSA-07-22	17.15 (24.46)
2.	WRG53	58.62 (49.88)	22.	AL1593	10.71 (19.09)
3.	ERG65	7.50 (15.87)	23.	BRG-10-2	95.45 (78.17)
4.	KPL44	13.64 (21.66)	24.	RVSA-07-10	25.81 (30.51)
5.	IPA204	31.03 (33.84)	25.	GAUT-001	20.00 (26.55)
6.	MA-06	11.63 (19.90)	26.	BSMR-853	17.50 (24.71)
7.	Vipula 422	19.05 (25.87)	27.	BSMR-528	72.00 (58.06)
8.	WRP-1	14.58 (22.43)	28.	BSMR-2	23.81 (29.19)
9.	Pusa992	13.64 (21.66)	29.	JICM189	11.11 (19.45)
10.	BDN711	19.05 (25.87)	30.	ICP-7119	92.11 (73.76)
11.	BRG-11-1	82.61 (65.37)	31.	GT-101	20.00 (26.55)
12.	BSMR-579	20.5 (26.92)	32.	BRG-2	25.00 (29.99)
13.	BSMR-571	24.00 (29.59)	33.	AKT-8811	22.22 (28.12)
14.	RVKT-260	21.88 (27.88)	34.	RVSA-7-29	20.51 (26.91)
15.	BRG-1	70.37 (57.07)	35.	ICPL-8863	21.62 (27.70)
16.	BRG-3	53.49 (47.00)	36.	ICPL-87091	52.00 (46.14)
17.	KPL-43	18.18 (25.23)	37.	ICPL-87119	26.83 (31.19)
18.	AL-1798	13.1 (21.26)	38.	BSMR-736	50.62 (45.35)
19.	RVKT-261	14.58 (22.43)	39.	C. platycarpus	52.86 (46.64)
20.	CORG-9701	23.08 (28.70)	40.	C. scaraboides	50.33 (45.18)
C.D. (P=0.05)		1.72, (H S)	C.D. (P=0.05)		1.72, (H S)

Figures in parenthesis are angular transformed values

R-Resistant, MR-Moderately resistant, T- Tolerance, MS-Moderately susceptible, S-Susceptible

Table 2 : Pigeonpea germplasms showing categories against Phytophthora stem blight

Sr. No.	Germplasm reactions (Categ.)	Range of incidence (%)	Germplasms	Number
1.	Resistance	0-10	ERG-65	01
2.	Moderately resistant	10.1-30	HY3C, KPL44, MA-06, Vipula 42, WRP-1, Pusa-992, BDN-711, RVSA-07-22, AL-1593, RVSA-07-10, GAUT-001, BSMR-853, BSMR-2, JICM-189, BSMR-579, BSMR-571, RVKT-260, KPL-43, AL-1798, RVKT-261, CORG-9701, GT-101, BRG-2, AKT-8811, RVSA-7-29, ICPL-8863, and ICPL-87119	27
3.	Toletant	30.1-50	IPA-204	01
4.	Moderately susceptible	50.1-70	BRG-3, ICPL-87091, BSMR-736, C. platycarpus, C. scaraboides, WRG-53	06
5.	Susceptible	70.1-90	BRG-11-1, BRG-1, BSMR-528, ICP-7119 and BRG-10-2	05

571, RVKT-260, KPL-43, AL-1798, RVKT-261, CORG-9701, GT-101, BRG-2, AKT-8811, RVSA-7-29, ICPL-8863, and ICPL-87119 were found moderately resistant. Nevertheless, among 27 moderately resistant germplasms, 3 germplasms, AL-1593 (10.71), JICM-189 (11.11) and MA-06 (11.63) were found statistically at par to one another and very close to resistant reaction.

One genotype IPA-204 was observed to maintain the level of tolerance and remaining 11 germplasms (Table 2) were found as moderately susceptible to

susceptible category. In a very limited screening (Pal *et al.*, 1970), had been identified three pigeonpea lines as a moderately resistant. Similar work has also been done and reported by (Kannaiyan *et al.*, 1981; Sharma *et al.*, 1995 and Pande *et al.*, 2006).

Conclusion :

On the basis of results, it is concluded that resistant germplasm namely ERG-65 may be used as a resistant donor in developing resistant variety against the

phytophthora stem blight and 3 germplasms, AL-1593 (10.71), JICM-189 (11.11) and MA-06 (11.63) were found very close to resistant reaction may further screened by inter crossing with other cultivar in resistant breeding programme.

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