

Resistance to Phytophthora Blight in the Improved Pigeonpea Lines at ICRISAT, Patancheru, India

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Phytophthora blight (PB) (*Phytophthora drechsleri* Tucker f. sp. *cajani*, Kannaiyan et al.) of pigeonpea (*Cajanus cajan* (L.) Millsp.) is a disease of endemic importance. Continuous rains and waterlogging in the seedling stage of the crop favour PB epidemics, resulting in up to 100% crop loss. Characteristic symptoms of the disease are water-soaked lesions on the leaves and slightly sunken lesions on stems and petioles. Lesions girdle the stem and the foliage dries up. The disease was first reported in 1968 at the research farm of the Indian Agricultural Research Institute (IARI) by Williams et al. (1968). Later Kannaiyan et al. (1984) reported its widespread occurrence in several parts of India.

During the 2005 rainy season, unusual and well-distributed rains (about 460 mm in 31 days) were experienced throughout the Deccan Plateau (DP). Periodical monitoring of the pigeonpea crop at the research farm of the International Crops Research Institute for Semi-Arid Tropics (ICRISAT), Patancheru during July-August indicated widespread prevalence of PB. This prompted us to conduct a structured survey of pigeonpea fields at the ICRISAT farm, with the specific objectives of quantifying the incidence of PB on improved and wild pigeonpea lines, and identifying lines with multiple resistance to PB, wilt (*Fusarium udum* Butler) and sterility mosaic (SM; pigeonpea sterility mosaic virus).

The survey was conducted between the fourth week of July and fourth week of August, 2005 when the crop was in active vegetative growth stage (30–45 days old). A total of 15 fields were surveyed, of which seven (RM 3B-1, RM 3B-2, RP 7, RP 17, RL 33, RL 17 and RCW 18B) were Alfisol and eight (BR 1A, BP 14A, BP 14B, BP 14C, BP5, BP1 and BM 15E) Vertisol. Additionally, a Vertisol field BIL 7B is a wilt and sterility mosaic

screening nursery. A total of 33 lines in wilt and SM sick plot and 89 lines including wild *Cajanus* spp. were observed for PB incidence and severity. In each line three (1 × 1m) quadrates were randomly selected and infected plants were counted in each.

The percentage of PB incidence was calculated based on infected and total number of plants (Chauhan et al. 2002). Based on disease incidence levels the lines were categorized as resistant ($\leq 10\%$ incidence), moderately resistant (10.1–20.0%), moderately susceptible (20.1–40.0%), and susceptible (40.1–100%).

Varying levels of disease incidence were recorded among the improved lines. Of the 122 lines observed (33 lines in wilt and SM 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 PB. Of the three wild *Cajanus* species, *Cajanus sericeus* was found resistant, *C. scarabaeoides* moderately resistant and *C. cajanifolius* susceptible to PB (Table 1).

All the 33 lines observed in BIL 7B (wilt and SM sick plot) were resistant to PB and SM and only 28 of these were resistant to wilt (Table 2). Wilt susceptible check, ICP 2376 and SM susceptible check ICP 8863 also showed resistance to PB. However, these improved multiple disease resistant lines require some more testing across seasons and locations to confirm their resistance to PB, wilt and SM. There is also a need to vigorously screen wild *Cajanus* species to identify resistance sources against these diseases for strengthening the pigeonpea breeding program.

References

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Table 1. Phytophthora blight (PB) incidence of selected pigeonpea lines at ICRISAT farm, Patancheru, India, during 2005 rainy season.

Genotypes	Number of entries	PB incidence (%)	Disease reaction ¹
AWR 74/16, Azad, Bandapaleru, <i>C. sericeus</i> , HPL 24-47, ICP 11376-5, ICP 11975, ICP 12730, ICP 12751, ICP 12755, ICPL 20093, ICPL 20096, ICPL 20099, ICPL 20100, ICPL 20101, ICPL 20104, ICPL 20105, ICPL 20109, ICPL 20114, ICPL 20115, ICPL 20122, ICPL 20124, ICPL 20125, ICPL 20126, ICPL 20127, ICPL 20128, ICPL 20135, ICPL 20136, ICPL 93179, ICPL 99044, KPBR 80-2-1, KPBR 80-2-2-1, KPL 96053	33	≤10.0	Resistant
BDN 2010, BSMR 846, <i>C. scarabaeoides</i> , DA 11, ICP 11174, ICP 12749, ICP 12759, ICP 14819, ICP 5357, ICP 6919, ICP 7870, ICP 8863, ICP 9174, ICP 9879, ICPH 2308, ICPH 2899, ICPL 20092, ICPL 20094, ICPL 20097, ICPL 20098, ICPL 20102, ICPL 20103, ICPL 20106, ICPL 20110, ICPL 20113, ICPL 20116, ICPL 20119, ICPL 20120, ICPL 20129, ICPL 20131, ICPL 20132, ICPL 20134, ICPL 20137, ICPL 20138, ICPL 87091, ICPL 87119 (Asha), ICPL 94062, ICPL 94068, ICPL 96053, ICPL 96058, ICPL 96061, IIPR lines (2032, 2033, 2035), IPA 40, JJ 65, JK cms 2A, JKPH 6101, KPBR 80-2-4, KPL 44, MAL 13, MAL 15, MAL 23, MAL 3, MA-S-DEO-74, PR 5149, PT 1037, TK 040174, V 102, V 71A, V 71B	61	10.1–20.0	Moderately resistant
ICP 12746, ICP 12942, ICP 13799, ICP 13828, ICP 6903, ICP 7035 (Kamica), ICP 8102, ICP 8610, ICP 9150, ICP 9576, ICPH 2363, ICPH 2364, ICPH 2671, ICPH 2898, ICPL 20107, ICPL 20123, ICPL 20130, ICPL 88034, ICPL 88039, MAL 20, UPAS 120	21	20.1–40.0	Moderately susceptible
<i>C. cajanifolius</i> , ICP 80194, ICPA 2039, ICPA 2052, ICPA 2068, ICPL 332, ICPL 85023 (Lakshmi)	7	>40.0	Susceptible

1. [Resistant (≤10.0), Moderately resistant (10.1–20.0%), Moderately susceptible (20.1–40.0%), and Susceptible (40.1–100%)].

Table 2. Reaction of pigeonpea genotypes to Phytophthora blight (PB), wilt and sterility mosaic (SM) at ICRISAT, Patancheru, India, 2005–06.

SL No.	Genotypes	Source	PB incidence (%)	Wilt incidence (%)	SM incidence (%)
1.	ICPL 20100	ICRISAT	4.0	14.7	0.0
2.	ICPL 20135	ICRISAT	4.7	2.7	0.0
3.	ICPL 20125	ICRISAT	5.2	0.0	1.3
4.	ICPL 20115	ICRISAT	5.8	0.0	1.4
5.	KPBR 80-2-2-1	IIPR, India	5.9	2.6	0.0
6.	<i>C. sericeus</i>	ICRISAT	6.0	1.3	0.0
7.	ICP 11975	ICRISAT	6.0	2.6	0.0
8.	ICPL 20124	ICRISAT	6.0	12.6	0.0
9.	ICPL 20096	ICRISAT	6.6	0.0	1.7
10.	AWR 74/16	IIPR, India	6.7	5.3	0.0
11.	ICP 12730	ICRISAT	6.7	22.6	0.0
12.	KPBR 80-2-1	IIPR, India	6.7	5.9	0.0
13.	KPL 96053	IIPR, India	6.7	0.0	0.0
14.	ICPL 20127	ICRISAT	6.8	2.1	4.6
15.	ICPL 20104	ICRISAT	7.2	9.8	0.0
16.	ICPL 20099	ICRISAT	7.4	0.0	0.0
17.	Azad	IIPR, India	7.5	55.5	0.0
18.	ICPL 20105	ICRISAT	7.6	2.1	0.0
19.	HPL 24-47	IIPR, India	7.7	20.4	9.2
20.	ICPL 20122	ICRISAT	8.1	4.9	6.7
21.	Bandapaleru	IIPR, India	8.4	1.4	0.0
22.	ICPL 20126	ICRISAT	8.4	5.9	7.0
23.	ICPL 20136	ICRISAT	8.8	3.1	9.3
24.	ICPL 20109	ICRISAT	8.9	5.4	5.7
25.	ICP 11376-5	ICRISAT	9.1	0.0	0.0
26.	ICP 12755	ICRISAT	9.1	0.0	0.0
27.	ICPL 20101	ICRISAT	9.1	3.6	5.4
28.	ICPL 20128	ICRISAT	9.2	4.7	1.7
29.	ICP 12751	ICRISAT	9.3	1.4	0.0
30.	ICPL 20114	ICRISAT	9.4	6.3	2.1
31.	ICPL 99044	ICRISAT	9.4	0.0	0.0
32.	ICPL 93179	ICRISAT	9.8	1.4	0.0
33.	ICPL 20093	ICRISAT	10.0	3.4	3.0
34.	ICP 2376 ²	ICRISAT	8.4	98.3	–
35.	ICP 8863 ³	ICRISAT	1.6	14.1	89.9

1. [Resistant (≤ 10.0), Moderately resistant (10.1–20.0%), Moderately susceptible (20.1–40.0%), and Susceptible (40.1–100%).]

2. Wilt susceptible check.

3. Sterility mosaic susceptible check.