

Outbreak of Phytophthora Blight of Pigeonpea in the Deccan Plateau of India, 2005

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Andhra Pradesh, Karnataka and Maharashtra are the major pigeonpea-growing states in the Deccan Plateau (DP) of India. The area under pigeonpea in Andhra Pradesh is estimated to be around 0.42 million ha with a production of about 0.19 million tonnes, while in Karnataka it is grown on 0.49 million ha with a production of 0.26 million tonnes (Dharamraj et al. 2004). Of these three states, Maharashtra has the maximum area (1.02 million ha) with a production of about 0.77 million tonnes (<http://agricoop.nic.in/>). Diseases such as wilt (*Fusarium udum* Butler) and sterility mosaic (SM Virus) are the important biotic factors limiting its production in the DP.

Phytophthora blight (PB) caused by *Phytophthora drechsleri* Tucker f. sp. *cajani* (Pal et al.) Kannaiyan et al. has been reported infrequently as a minor disease from DP. However, it is an important production constraint in Northeastern India particularly in low lying, poorly drained fields (Kannaiyan et al. 1984; Mishra and Shukla 1987 and Chauhan et al. 2002). Cloudy weather accompanied by intermittent rains followed by mean temperatures $25\pm 1^{\circ}\text{C}$ favours PB infection and development. In the DP, pigeonpea is sown during June–July, a period that coincides with the onset of monsoon, when wet weather prevails.

In 2005 rainy season in the months of July–August when the pigeonpea crop was 30–45 days old, exceptionally heavy rains (about 460 mm) were experienced at ICRISAT, Patancheru, Andhra Pradesh, India. These rains were also widespread in the DP, especially in the states of Maharashtra and Karnataka. In our regular monitoring of pigeonpea fields at ICRISAT farm we noticed widespread

incidence of PB. Hence, a structured survey of pigeonpea fields was initiated to assess the incidence of PB at ICRISAT farm during this season. A total of 15 pigeonpea fields (7 Alfisol and 8 Vertisol fields) were surveyed and in each field, based on the availability, 2 to 35 entries were observed for PB incidence. Mean disease incidence was upto 33.9% among genotypes grown in Alfisols and upto 26.7% in the genotypes grown in Vertisol fields (Table 1).

Concurrent reports of a disease similar to PB were also received from farmers' fields in the neighboring states of Karnataka and Maharashtra. This gave the impetus to conduct a structured survey of pigeonpea-growing areas in these states of DP. The main objective of the survey was to quantify the incidence of PB in the DP. Additionally, attempts were made to collect the information on the incidence of PB in pigeonpea grown in different soil types and cropping systems. In collaboration and consultation with scientists from National Agricultural Research System (NARS), a proforma was developed to collect information on disease incidence, cropping systems, cultivars, agronomical practices and field history. The survey was conducted in August 2005. Scheduled and unscheduled stops were made after every 10–15 km. Three (1 × 1 m) quadrates were randomly selected in each field and, based on total number of plants and plants showing PB symptoms, disease incidence in the sampled field was calculated. Disease incidence of individual fields was used to calculate the PB incidence of each district and the state. Results thus obtained in surveyed states are summarized as follows:

Andhra Pradesh

Twenty nine villages in 16 talukas under four districts (Rangareddy, Mehboobnagar, Nizamabad and Medak) were surveyed. The crop was 45–60 days old at the time of survey. A range of pigeonpea cultivars, Asha (ICPL 87119), Maruti (ICP 8863), LRG 30, and Local were found grown in surveyed villages. All the surveyed fields (Alfisol and Vertisol) were well drained without any water stagnation. Pigeonpea was grown in a range of

Table 1. Phytophthora blight incidence (%) in Alfisol and Vertisols at ICRISAT farm, Patancheru, India, 2005.

Soils type	No. of fields surveyed	Disease incidence (%)	
		Range	Mean
Alfisols	7	16–59.4	33.9
Vertisols	8	13–46.8	26.7

cropping systems, from sole crop to intercropped; however, the predominant cropping system was pigeonpea intercropped with sorghum/maize. Substantial differences were not found in PB incidence with respect to soil types (Table 2). However, higher disease incidence (16.4%) was recorded in intercropping system in comparison to sole crop (10.0%). No visible difference in the mean incidence of PB was recorded among improved (14.9%) and local (13.8%) varieties grown by the farmers.

Karnataka

In all, 60 villages in 10 taluks under two districts (Gulbarga and Bidar) were surveyed. The crop was 30–60 days old at the time of survey. Maruti (ICP 8863), Gulyal Local, Benur Local, Guttali, Black Tur and Local were the common pigeonpea cultivars grown in surveyed villages. Most of the Alfisol fields were low lying with water stagnation for long periods. The predominant cropping system was sole crop or intercropped with sorghum/pearl millet. Substantial differences were not found in PB incidence with respect to cropping system and varieties grown. Mean disease incidence in the intercrop (15.6%) was at par with sole (16.0%) cropping system. Similarly, no differences were recorded among improved (12.3%) and local (11.9%) varieties grown by the farmers. However, substantial differences were recorded in PB incidence with respect to soil types (Table 2). Disease incidence was high (31.5%) in Alfisols as compared to Vertisols (11.0%).

Maharashtra

One hundred and one villages in 26 talukas under six districts (Osmanabad, Latur, Bead, Parbhani, Hingoli and Nanded) were surveyed. The crop was 45–60 days old at the time of survey. A range of pigeonpea cultivars, Maruti (ICP 8863), BSMR 736, BSMR 853, BDN 1, BDN 2, BDN 7, Gulyal Local, Black Tur, Parbhani White, Kishan, Payola, Pandri Tur and Local were found grown in surveyed villages. All the surveyed fields (Alfisol and Vertisol) were well drained without any water stagnation. The predominant cropping system in the surveyed districts was pigeonpea intercropped with soybean/cotton. Substantial differences were not found in PB incidence with respect to soil types, cropping system and varieties grown. Mean disease incidence among Alfisols (18.3%) was slightly lower than in Vertisols (19.2%) (Table 2). Similarly among cropping systems, disease incidence was slightly less in intercrop (19.8%) than sole (21.4%) crops. No difference in disease incidence was recorded in improved (21.7%) and local (21.1%) varieties grown by farmers. However, widespread incidence of PB was recorded in all the districts surveyed irrespective of soil type, cropping system and varieties grown.

High incidence of PB in Alfisol fields in the state of Karnataka may be due to topography and low lying nature of surveyed fields. Moreover, the drainage system was very poor in these fields, resulting in water stagnation due to heavy rains in August. These field

Table 2. Phytophthora blight incidence (%) in Alfisol and Vertisols in major pigeonpea-growing areas of Andhra Pradesh, Karnataka and Maharashtra in Deccan Plateau, India, 2005.

States	Disease incidence (%)			
	Alfisols		Vertisols	
	Range	Mean	Range	Mean
Andhra Pradesh ¹	5.3–22.8	14.1	10.1–21.3	14.0
Karnataka ²	12.6–50.3	31.5	10.6–11.4	11.0
Maharashtra ³	8.1–25.7	18.3	13.2–30.7	19.2

1. Based on four districts (Rangareddy, Mehboobnagar, Nizamabad and Medak), sixteen mandals and 29 villages. The major soil type was Vertisols.

2. Based on two districts (Gulbarga and Bidar), 10 talukas and 60 villages. The major soil type was Vertisols.

3. Based on six districts (Osmanabad, Latur, Bead, Parbhani, Hingoli and Nanded), 26 talukas and 101 villages. The major soil type was Vertisols.

conditions were optimal for the development and rapid spread of the fungus. Low incidence of PB in both Alfisol and Vertisol fields in Andhra Pradesh and Maharashtra was attributed to the higher elevation and proper drainage system of the surveyed fields.

The survey of 190 farmers' fields in the three states revealed that PB was widespread irrespective of soil types, cropping systems and genotypes. Its incidence was higher in the low-lying fields than well drained fields. High incidence of PB in individual fields could be due to low level of field topography and poor soil surface drainage which favored the multiplication and spread of inoculum of *P. drechsleri* (Singh & Chauhan 1985).

Widespread resurgence of PB in DP in the current season is a matter of serious concern. The heavy unpredictable rains during July and August rendered the crop vulnerable to PB attack. However, it is still not clear how and where the PB pathogen *P. drechsleri* survives and causes epidemics in pigeonpea in the DP. Also our survey indicates that the pigeonpea cultivars grown by farmers do not have adequate levels of resistance to PB, at least in the three states surveyed in DP. Differential sowings and differential growth duration varieties were also in cultivation. A detailed analysis of the factors responsible for the widespread incidence of PB is, however, necessary.

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