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Field evaluation of pigeonpea (*Cajanus cajan*) genotypes against fusarium wilt to disease resistance

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Abstract

The pigeonpea germplasms/genotypes were evaluated to identify the sources of resistance to Fusarium wilt disease. The *F. udum* is host specific to pigeonpea and can survive in soil under wilted plant stubble for a long period. The best way of wilt management is by growing resistant varieties. Out of 54 screened genotypes, twenty one genotypes viz. BDN2001-6, BRG2-7, CORG2004-01, CORG990013, H2000-37, H2000-47, IPC7119, IPC8863, IPA14F, JKM186, JKM197, JKM204, JKM205, JKM209, KAWR11, KAWR91, NTL30, PT02-25, PT02-5, PT11-39, and PUSA2005-1 were found resistant, 15 moderately resistant, 13 tolerant, 4 moderately susceptible and 1 genotype were highly susceptible against fusarium wilt. The most susceptible variety Bahar showed 80 per cent wilting.

Keywords: Pigeonpea, *Fusarium*, germplasm, resistant

Introduction

Pigeonpea [*Cajanus cajan* (L.) Millsp.], also referred to as red gram or *arhar*, is a perennial shrub, with its centre of origin located in India. It is an important grain legume crop predominantly grown in the Indian subcontinent as an important source of dietary protein. In India, production of Pigeonpea was 42.54 Lac tones on area of 44.31 Lac ha with yield of 960 kg/ha (Anonymous, 2018) [1]. It is also cultivated in other parts of the world, including sub-Saharan Africa, Latin America, the Caribbean and South-East Asia. Its cultivation is increasing in semi-arid areas because of the crop's ability to thrive under prolonged drought and in degraded lands (Upadhyaya *et al.*, 2012) [11]. The crop is mainly grown as annual using cultivars with different durations to maturity: 90 days (Short), 120 days (Medium) and 180 days (Long). It is cultivated as a perennial crop in several regions of India. The shift of pigeonpea cultivation from the traditional *kharif* season to pre *rabi* September sowing in north Bihar has not only shown an increased production potential of this important pulse crop but have also opened altogether a new possibilities in land use pattern of the rain fed areas of Bihar and adjoining states. Fresh pods are consumed as a vegetable; dried mature grains are used for cooking or in processing. Among the several factors responsible for reduction yield and quality deterioration of pigeonpea in India, diseases occupy a vital place. Among the diseases, wilt disease caused by *Fusarium udum* Butler, is the most destructive soil and seed born disease of pigeonpea in India leading to heavy production losses. The disease since been reported from Bangladesh, Ghana, Grenada, Indonesia, Kenya, Malawi, Mauritius, Tanzania, Thailand, Trinidad, Uganda and Zambia. In India it is the most serious problem all over the Pigeonpea growing states especially in U.P., M.P., Bihar and Maharashtra. In the epiphytotic conditions, disease incidence was recorded 15-25 per cent in general and up to 50 per cent (Butler, 1910) [2]. In Bihar and Uttar Pradesh, 5-10 per cent losses in standing crop are common feature every year (Singh, 2006) [10].

Materials and Methods

Seeds of fifty four genotypes of Pigeonpea were obtained from the Department of Genetics and Plant Breeding, N.D. University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) and IIPR, Kanpur. The genotypes were screened under artificial conditions (Sick plot technique) using the methods described by Nene *et al.*, (1982) [5].

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The plots (Sick soil) showed over 90 per cent wilt incidence in susceptible cultivar Bahar of Pigeonpea were used for screening the test varieties. After germination, observations were recorded regularly up to 60 days for the appearance of wilt symptoms and severity. The disease was recorded using 1-9 scale for the wilt disease of Pigeonpea as described in Table 1.

Table 1: Disease rating scale for fusarium wilt (Nene *et al.*, 1981) ^[6]

S. No.	Scale	Description	Disease reaction
1.	1	No symptoms on any plant	Resistant
2.	3	10% or less mortality	Moderately
3.	5	11-20% mortality	Tolerant
4.	7	20-50% mortality	Moderately susceptible
5.	9	51% or more mortality	Susceptible

Results and Discussion

Fifty four genotypes of Pigeonpea were screened for their reaction to *Fusarium udum* by sick plot technique. It is evident from the result presented in table 2. Out of 54 genotypes, twenty one genotypes *viz.* BDN2001-6, BRG2-7, CORG2004-01, CORG990013, H2000-37, H2000-47, IPC7119, IPC8863, IPA14F, JKM186, JKM197, JKM204, JKM205, JKM209, KAWR11, KAWR91, NTL30, PT02-25, PT02-5, PT11-39 and PUSA2005-1 were found resistant, 15 moderately resistant, 13 tolerant, 4 moderately susceptible and 1 genotype was highly susceptible to fusarium wilt. The most susceptible variety Bahar showed 80 per cent wilting. Sharma *et al.*, (2012) ^[9] also reported that the largest portion of variability for chickpea wilt incidence was accounted by genotypes (54.4%), followed by G × E (36.7%), and E (8.9%). Yadav *et al.*, (2003) ^[12] has been screened out the genotypes ICP 8859, ICP 8860, ICP 8863 AWR 74/15 and in Banda Palera were resistant to fusarium wilt in sick plot and water culture techniques used for screening, respectively. Dominant control of FW resistance was also reported by a number of workers (Mahesh *et al.*, 2006; Changaya *et al.*, 2012; Saxena *et al.*, 2012; Prabhavathi and Ramappa, 2018) ^[4, 3, 7].

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