*Available online at* www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.7017

**ISSN: 2582 – 2845**

*Ind. J. Pure App. Biosci.* (2019) *7*(6), 322-326

Indian Journal of Pure & Applied Biosciences

*Research Article*

# Screening of Pigeonpea Genotypes against Dry Root Rot Incited by *Rhizoctonia bataticola* (Taub.) Butler under Glass House Condition

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Received: 3.10.2019 | Revised: 15.11.2019 | Accepted: 23.11.2019

## ABSTRACT

*Pigeonpea [Cajanus cajan (L.) Millsp.] is second most important legume crop after chickpea in India and it is predominantly grown during the Kharif season both as a sole and intercrop under wide range of agro-ecological situations. The crop is suffers from several diseases among them, dry root rot incited by Rhizoctonia bataticola is the major threat in pigeonpea cultivation. Attempts were made to find out resistance source by screening 33 genotypes comprising of released and MLT lines under glass house condition at MARS, Raichur by using paper towel technique. Out of 33 genotypes screened, 11 showed resistant reaction viz., GRG-177, GRG-811, TS-3R, ICP-14832, BDN-2008-8, GRG-820, AGL-1666, AGL-1919, AGL-2013, ICP-8793 and AGL-1603. Whereas AKT-9913, GRG-2013, GRG-222, BDN-2008-1, Maruti, ICP-7223, GRG-444 and ICP-88039-1 grouped as moderately resistant and remaining 13 genotypes viz., GRG-151, GRG-152, NTL-900, ICPL-14001, ICP-16264, GRG-140, ICP-13673, GRG-111, ICP-11320, ICP-13101 TDRG-33, AGKL-2249 and ICPL-99050 were susceptible to dry root rot disease.*

***Keywords:*** *Pigeonpea, Dry root rot, Screening, Genotypes, Resistance*

## INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millspaugh] is one of the major food legume crop of the tropics and sub-tropics, which is mainly eaten in the form of split pulse as 'dal'. Despite its main use as de-hulled split peas, the use of immature seeds is very common as fresh vegetable in some parts of India such as Gujarat, Maharashtra and Karnataka. Besides this, in the most of the areas of tribal states, the use of pigeonpea as green vegetable is very common (Saxena et al., 2010).

Pigeonpea is grown in many countries of Asia, Eastern and Southern Africa, Latin America and Caribbean countries. Globally, it is cultivated in an area of 4.92 million ha (m ha) with an annual production of 3.65 (mt) and productivity of 898 kg/ha (http://www.icrisat.org).

**Cite this article:** Maruti, Savitha, A.S., Ajithkumar, K., Sunkad, G., & Amaresh, Y.S. (2019). Screening of Pigeonpea Genotypes against Dry Root Rot Incited by *Rhizoctonia bataticola* (Taub.) Butler under Glass House Condition, *Ind. J. Pure App. Biosci. 7*(6), 322-326. doi: http://dx.doi.org/10.18782/2582-2845.7017

India has the largest acreage under pigeon pea (3.90 m ha) with a total production and productivity of 2.89 mt and 741 kg/ha, respectively (DAC 2011).

Although the crop is cultivated over a large extent, it is known to infected and damaged by several biotic factors which are considered as major yield limiting factors of pigeonpea production. Amongst biotic factors, damage due to weeds, insects and diseases are more important. Pigeonpea is known to be affected by more than 200 different pathogens, among few are economically important and wide spread causing heavy losses *viz.*, wilt caused by *Fusarium udum*, *Phytopthora* blight by *Phytophthora drechsleri* f. sp. *cajani*, pigeonpea sterility mosaic disease caused by Tenui virus and dry root rot caused by *Rhizoctonia bataticola* (Taub.) Butler (*Macrophomina phaseolina* (Tassi) Goid). The pathogen is most important soil borne fungus causing disease in most of agricultural crops including pigeon pea (Kaur et al., 2012) where, the climate is relatively dry and warm. The pathogen infects the crop during flowering and premature podding stages and infected plant shows completely dried and the appearance root system of the diseased plant is extensively rotting with most of the lateral roots are completely destroyed and finally rotten roots are brittle and minute sclerotial bodies are also reported in the cavity of pith region (Pande et al., 2004). Chemical management is not effective as *R. bataticola* is having broad host range including pulses and other agriculture crops belonging to 100 families around the world (Mihail & Taylor, (1995) and Pande et al. (2004). Pathogen survives in the form of sclerotia up to 10 months in the soil in the absence of the host plants under prevailing favourable dry conditions. It causes huge economic losses ranging from 10-100 per cent (Nene et al., 1979) and Smita et al. (2015). When off season summer crop is taken particularly in black soil. Hence the disease management is very difficult through using different effective fungicides, but to a limited extent and also it is not economical. The frequent application of fungicides to the soil has caused environmental hazards including water and soil pollution resulting in destroying of non-target beneficial microorganisms in soil. Recently, the biological management and use of host plant resistant varieties are considered as more practicable approach and effective method to combat the root rot disease in pigeonpea under field condition.

## MATERIALS AND METHODS

Thirty three genotypes comprising of released varieties and MLT lines (Table. 1) were screened under glass house condition at MARS, Raichur during *Kharif* 2015 by using paper towel technique (Nene et al., 1981). Screening of pigeonpea genotypes was carried out for 15 days old pigeonpea seedlings of grown in sterilized sand were uprooted and roots were dipped in the inoculum for 1 min. (The inoculum was mass multiplied on potato dextrose broth medium by inoculating with actively growing *R. bataticola* culture incubated for 9 days at 28 ˚C in a stationary condition. Fungal mat from two flasks macerated in 100 ml of sterile distilled water was used as inoculum). Inoculated seedlings were placed in folded moist blotting paper by covering root and spacing half of the shoot portion and then incubated at 35 $^{o}$ C with 12 hrs. photoperiod. The experiment was conducted in completely randomized block design (CRBD) with three replications and repeated twice, where an equal number of seedlings inoculated with sterile water served as control. Disease severity was categorized nine days after inoculation by using 1 - 3 rating scale [1- 1 to 10 % seedling infected (Resistant) 2 - 11 to 30 % seedling infected (Moderately resistant) and 3 - >30 % seedling infected (susceptible)] (Anon., 2016).

## RESULTS AND DISCUSSION

A total of 33 pigeonpea genotypes were screened for their reaction to dry root rot under glass house condition (Table 1 and Plate 1). Out of 33 genotypes screened, 11 showed resistant reaction *viz*., GRG-177, GRG-811, TS-3R, ICP-14832, BDN-2008-8, GRG-820, AGL-1666, AGL-1919, AGL-2013, ICP-8793 and AGL-1603. Whereas AKT-9913, GRG-2013, GRG-222, BDN-2008-1, Maruti, ICP-7223, GRG-444 and ICP-88039-1 showed moderately resistant reaction and remaining 13 genotypes *viz.*, GRG-151, GRG-152, NTL-900, ICPL-14001, ICP-16264, GRG-140, ICP-13673, GRG-111, ICP-11320, ICP-13101 TDRG-33, AGKL-2249 and ICPL-99050 recorded susceptible reaction.

Effective method for managing soil borne disease of crop plants is possible through resistant varieties which are most economical, inexpensive and eco-friendly for resource poor farmers in comparison to chemicals. The cost of cultivation with respect to disease/pest resistant varieties was found to be less in comparison to other methods. Further, the resistant variety is always one of the best ways and will go a long way not only in reducing loss due to disease but also in avoiding fungicidal toxicity and soil pollution.

In the present study, it was observed that temperature during the month of October-November was very high with high moisture stress in the regions of North Eastern Karnataka which led to higher incidence of dry root rot in severe form. Abawi and Pastor Corrales (1990) and Diaz (1992) suggested that high temperature and moisture stress favours the *M. phaseolina* incidence, where the sclerotial stage of the fungus is *R. bataticola.*

The susceptibility of pigeonpea genotypes to *R. bataticola* might be due to the higher activity of pectin trans-eliminase and polygalactouronate trans-eliminase and reduced activity of these enzymes in resistant genotypes might be responsible for the resistant reaction as observed by Srivastava (1987) and Lokesha and Benagi (2006).

**Table 1: Reaction of pigeonpea genotypes against *R. bataticola* under glasshouse condition**

| Sl. No. | Genotypes | Grade | Per cent disease Incidence | Reaction |
|---|---|---|---|---|
| 1 | GRG-177 | 1 | 8.20 | R |
| 2 | GRG-151 | 3 | 44.32 | S |
| 3 | GRG-152 | 3 | 45.10 | S |
| 4 | NTL-900 | 3 | 47.54 | S |
| 5 | ICPL-14001 | 3 | 56.40 | S |
| 6 | AKT-9913 | 2 | 26.32 | MR |
| 7 | ICP-16264 | 3 | 42.62 | S |
| 8 | GRG-2013 | 2 | 24.20 | MR |
| 9 | GRG-140 | 3 | 38.14 | S |
| 10 | GRG-222 | 2 | 18.53 | MR |
| 11 | BDN-2008-1 | 2 | 22.60 | MR |
| 12 | GRG-811 | 1 | 8.21 | R |
| 13 | TS-3R | 1 | 8.18 | R |
| 14 | Maruthi | 2 | 16.70 | MR |
| 15 | ICP-7223 | 2 | 22.21 | MR |
| 16 | ICP-13673 | 3 | 34.30 | S |
| 17 | GRG-111 | 3 | 38.20 | S |
| 18 | GRG-444 | 2 | 26.60 | MR |
| 19 | ICP-13101 | 3 | 37 | S |
| 20 | ICP-88039-1 | 2 | 14 | MR |
| 21 | ICP-14832 | 1 | 9 | R |
| 22 | BDN-2008-8 | 1 | 8.5 | R |
| 23 | GRG-820 | 1 | 7.4 | R |
| 24 | AGL - 1666 | 1 | 8.2 | R |
| 25 | AGL – 1919 | 1 | 8.6 | R |
| 26 | TDRG - 33 | 3 | 38.40 | S |
| 27 | AGL- 2013 | 1 | 9 | R |
| 28 | PRIL –B -136 | 2 | 24.40 | MR |
| 29 | ICP – 11320 | 3 | 42.24 | S |
| 30 | ICP - 8793 | 1 | 8.94 | R |
| 31 | AGL - 1603 | 1 | 8.65 | R |
| 32 | AGKL - 2249 | 3 | 38.20 | S |
| 33 | ICPL - 99050 | 3 | 40.40 | S |

Note: R- Resistant, MR- Moderately resistant, S- susceptible

**A. Fifteen days old pigeonpea seedlings** **B. Inoculated seedlings placed in moist blotter paper**

**Plate. 1. Screening of pigeonpea genotypes against dry root rot by paper towel method (A-B)**

## CONCLUSION

In this study we may finally concluded as Pigeonpea genotypes i.e., GRG-177, GRG-811, TS-3R, ICP-14832, BDN-2008-8, GRG-820, AGL-1666, AGL-1919, AGL-2013, ICP-8793 and AGL-1603 varieties can be used as a resistant source to *R. bataticola.*

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