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RESEARCH ARTICLE

METHOD FOR EARLY SCREENING OF *FUSARIUM* WILT IN PIGEONPEA
[*CAJANNS CAJAN* (L.) MILLSP]

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ABSTRACT

Pigeonpea [*Cajanus cajan* (L.) Millsp] is one of the important grain legume and is a rich source of protein. Though India ranks first in production, the productivity of pigeonpea is very low because of its vulnerability to a number of biotic stresses. Among these stresses the *Fusarium* wilt caused by *Fusarium udum* (Butler) is the most important limiting factor and is prevalent in all pigeonpea growing areas. Three methods namely root tip inoculation, piercing method and disease sick plot method were attempted. The first two methods were carried out at green house, Institute of Biotechnology (IBT), Professor Jaya Shankar Telangana State Agricultural University (PJ TSAU), Hyderabad, during *Kharif* 2013, and the third method was carried out at (Agriculture research station) ARS, Tandur during *Kharif* 2013. In all the three methods, the disease was observed and the levels of disease resistance/susceptibility among the RILs were comparable except for the difference in the total number of days taken for the complete expression of disease symptoms. In case of disease sick plot method, it took 150-180 days whereas in case of root tip inoculation a maximum of 60 days were sufficient for complete expression of disease symptoms and it took around 90-120 days in case of piercing method. Hence root tip inoculation method is ideal, as it takes less time for expression of the disease and hence it is possible to take up multiple screenings within a single season. This would also aid in effective and quicker identification of resistant and susceptible RILs for further crop improvement applications without waiting for next season. This is the first report, indicating that mechanical inoculation of *Fusarium udum* (Butler) by root tip inoculation is more effective method than other two methods for screening this disease.

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INTRODUCTION

Pigeonpea [*Cajanus cajan* (L.) Millsp] is one of the important grain legume and is known for rich source of protein. It contains 22-24% protein, which is almost twice the protein in wheat and thrice that of rice. *Fusarium* wilt caused by *Fusarium udum* (Butler) is a fungal disease prevalent in all the pigeonpea growing areas, but is more severe in the Indian subcontinent. *Fusarium* wilt is most destructive disease of pigeon pea. In more severe disease conditions the crop loss is up to 100% (Kannaiyan and Nene, 1981), whereas in India the yield loss is up to 97,000 ton per year (Saxena et al., 2002) Year after year the problem due to *Fusarium* wilt is becoming severe resulting in crop loss up to 25-100% depending on the stage of the crop at which it is affected.

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So there is a need to identify resistance source to *Fusarium* wilt in a limited time, in this prospective the present study was undertaken for the identification of quick screening method in selecting resistant sources to *Fusarium* wilt in pigeon pea.

MATERIALS AND METHODS

In the present study, attempts were made towards early screening of *Fusarium* wilt on 188 F₆ RILs developed from cross involving a susceptible parent ICPL-332 and a resistant parent ICPL-20096 (Varshney et al., 2010). Screening was attempted by three methods namely, root tip inoculation, piercing methods in the green house at the Institute of Biotechnology, Hyderabad, during *Kharif* 2013, and the disease sick plot method was carried out at Agricultural Research Station (ARS), Tandur during *Kharif* 2013. For root tip inoculation and piercing the culture was multiplied from potato dextrose agar (PDA Fig.1a) by inoculating it in potato



Fig-1a



Fig-1b



Fig-1c

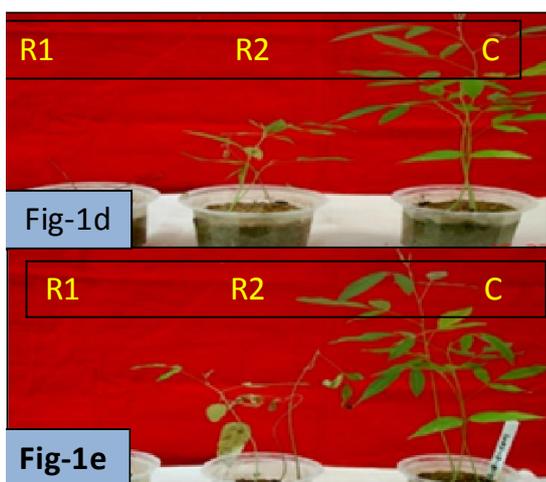


Fig-1d

Fig-1e

Fig. 1. (1a) - Multiplication of *Fusarium udum* on popato dextrose agar. (1b) - Multiplication of *Fusarium udum* on popato dextrose broth. (1c) - Disease sick plot screening at Tandur. (1d) - Piercing at IBT, green house. (1e) - Root tip inoculation at IBT, green house

dextrose broth (PDB Fig-2b) in a rotator shaker at 120 rpm at 25-28°C. 4 cm long root tips of 12 days old seedlings were cut off to facilitate the entry of the pathogen into the host and were dipped in the inoculum suspension (6×10^5 spores/ml) for 1-2 minutes. The disease incidence was recorded up to 120 days in the green house and up to 180 days in the disease sick plot at Tandur.

RESULTS AND DISCUSSION

Disease incidence for *Fusarium wilt* was recorded in all the three methods using a common disease score calculated from infected plants to the total number of plants inoculated represented as percent disease incidence (PDI). The observed PDI values and the level of disease incidence was comparable in all the three methods with difference in the days taken for the complete expression of the disease. In *Fusarium wilt* sick plot method, complete expression of the disease was observed after 150 – 180 (Fig-1c) days of sowing, whereas in the case of piercing and root tip inoculation it took 120 (Fig-1d (R2)) and 60 (Fig-1e (R1)) days respectively. So, root tip method is an effective method for the identification of resistant source in less time span.

Conclusion

This is the first report, indicating that mechanical inoculation of *Fusarium udum* (Butler) by root tip inoculation is more effective method than other two methods (*Fusarium wilt* sick plot, piercing method) for screening this disease. This present study will also aid in effective and quicker identification of resistant and susceptible RILs for further crop improvement applications without waiting for next season. As the construction of *Fusarium wilt* sick plot takes 4-5 years, by employing root tip inoculation procedure one can effectively screen resistance source in less time and also one can prevent more land being contaminated by *Fusarium udum* (Butler).

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