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Screening of Urdbean (*Vigna mungo* L.) Germplasm for Resistance to Charcoal Rot Disease

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Abstract: In order to identify sources of genetic resistance against charcoal rot disease in urdbean caused by ***Macrophomina phaseolina*** (Tassi) Goid, 71 germplasm accessions were evaluated by paper towel technique under Laboratory conditions. It was observed that 6 genotypes (45718, 45719, 45721, 45731, VH9440034-1 and VH9440034-7) were highly resistant, whereas 7 were resistant and 10 were moderately resistant. Sixteen genotypes were tolerant whereas rest of the accessions was susceptible or highly susceptible. The paper towel technique proved to be were and efficient for identification of resistance in urdbean for charcoal rot disease. Resistance observed in this experiment will also be confirmed under field conditions in future.

Key words: Urdbean, germplasm, accessions, charcoal rot, resistant sources, paper towel technique

Introduction

Urdbean (***Vigna mungo*** L.) is an important summer season pulse crop of Pakistan. The low yield (504 Kg ha^{-1}) of this crop is due to several biotic and abiotic factors (Anonymous, 2001). Among the biotic factors, charcoal rot caused by ***Macrophomina phaseolina*** (Tassi) Goid, is of prime importance in reducing crop yield. It is one of the most important diseases of field crops in arid regions of the world (Hoes, 1985). This fungal pathogen causes seedling blight, stem rot and pod rot and has more than 500 plant species as a host range (Sinclair, 1982) whereas 67 host species of this pathogen have been reported from Pakistan (Mirza and Qureshi, 1982; Shehzad ***et al.***, 1988).

Due to soil-borne nature of the pathogen, control strategies other than host resistance are not much effective and economical. Although, losses due to charcoal rot have been reported in sunflower and some other crops but such information are not available in case of urdbean crop (Orellana, 1970; Tikhonov ***et al.***, 1976). Similarly, varietal screening against this disease in sunflower (Mirza ***et al.***, 1982; Hafeez and Ahmad, 2001) and sesame (Mirza ***et al.***, 1986) in Pakistan has been reported but such information are lacking in case of urdbean.

Since charcoal rot may inflict heavy losses to the crop in the country and the present cultivars are susceptible to this disease, therefore, this study was initiated to evaluate available urdbean germplasm for identification of resistant sources to breed disease resistance cultivars.

Materials and Methods

Seventy one urdbean germplasm lines were obtained from gene bank of Plant Genetic Resources Institute, NARC, Islamabad and screened against ***M. phaseolina*** by blotter paper technique (Nene ***et al.***, 1981). Ten surface sterilized seeds (5 min. in 2.5% sodium hypo chlorite) of each accession were sown in thermopore tumblers containing sterilized sand. Pure culture of ***M. phaseolina*** was obtained on potato dextrose agar medium from infected urdbean plants collected from the experimental plots of National Agricultural Research Centre, Islamabad. Culture of the fungus was multiplied on 100 ml potato dextrose broth in 250 ml flasks and incubated as stationary culture for 10 days at 25°C. Mycelial mats of the flasks were added in the sterilized water at the rate of two flacks in 100 ml, macerated in a Warring blender for 5 min. Fresh inoculum was used after every ten blotters each containing 10 seedlings.

Seven days after sowing, the seedlings were uprooted and roots were carefully washed in running tap water and then rinsed in sterilized water. Roots of ten seedlings of each test accession were dipped in the inoculum with an up and down movement for about ten seconds and placed side by side on a paper towel. Each paper towel was then folded, covering the roots and leaving the green tops outside. Control plants were dipped in sterile, distilled water.

Paper towels were then kept one over the other in heaps of 5 on a tray and placed in the incubator at 30±2°C for 7 days with 12 h artificial light per day. Paper towels were kept moist by adding sterile water as needed. Seedlings were examined for the extent root damage using a 0-9 rating scale (Nene ***et al.***, 1981).

Results and Discussion

Results of the present study revealed considerable variation towards disease reaction among urdbean germplasm lines (Table 1). Mainly three types of disease response i.e., resistant, tolerant and susceptible were observed (Table 2). It was observed that 6 genotypes were highly resistant, whereas 7 genotypes were resistant and 10 were moderately resistant. Sixteen genotypes were observed to be tolerant whereas rest of the accessions was susceptible to highly susceptible. Dreshka ***et al.*** (1974) evaluated one hundred and sixty three genotypes of mungbean to charcoal rot by paper towel technique and reported that only one genotype (11160a) was moderately resistant, whereas in our study a fairly high number of resistant accessions were observed. The resistant accessions can be used as source to develop resistant cultivars in urdbean breeding programme.

Table 1: Frequency distribution of urdbean accessions in various disease reaction groups

Disease rating	Disease reaction	No. of accessions	% of total
0	Highly resistant (HR)	6	8.45
1	Resistant (R)	7	9.86
3	Moderately resistant (MR)	10	14.08
5	Moderately susceptible (MS)	16	22.53
7	Susceptible (S)	15	21.13
9	Highly susceptible (HS)	17	23.94

Table 2: Number of urdbean accessions followed under each reaction group

Reaction groups	Accessions
HR	45718, 45719, 45721, 45731, VH9440034-1, VH9440034-7
R	45821, 45822, 45618, 45729, 45701, VH9440039-2, Mash-3
MR	46394, 45399, 45623, 45722, 45730, 45405, 45406, 98CM-522, VH9440034-9, VH9440039-4,
MS	45393, 45396, 45817, 45823, 45727, 45408, 45809, 45810, 45812, 45815, 45816, VH9440034-2, Mash-97, VH9440039-1, 98CM-525, VH9440023-2,
S	45395, 45398, 45818, 45825, 45827, 45828, 45723, 45725, 45726, 45728, 45732, 45404, 45811, 98CM-523, Mash-1
HS	45400, 45819, 45820, 45824, 45826, 45724, 45412, 45808, 45813, 45814, VH9440039-3, VH9440034-8, VH9440034-6, 98CM-524, VH9440034-3, VH9440023-1, 9092

It was observed from the present study that charcoal rot at seedling stage caused high level of infection to a large number of accessions, thus it is suggested that a large number of germplasm lines may be screened at seedling stage with this technique to save time and labour. The genotypes those exhibited resistance are suggested to be screened under field conditions to confirm the level of resistance at adult plant stage. Screening with the help of this technique not only save the resources, time and labour but it can be applied at any time and anywhere because screening under field is tedious job. The validity of paper towel technique had already been confirmed in case of charcoal rot of mungbean (Dreshka ***et al.***, 1973).

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