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Identification for resistant sources against dry root rot in black gram germplasm (*Vigna mungo* L.)

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Abstract
Dry root rot caused by *Macrophomina phaseolina* (Tassi) Goid, is the most destructive disease and causes severe losses in yield of most of pulses, where the climate is relatively dry and warm condition. It appears generally during late flowering and podding stage and infected plant appeared completely dried. The present study was carried out to identify the sources of genetic resistance to dry root rot in blackgram. The disease screening was carried out during late rabi-season 2017-18 under natural field condition by growing seventy five blackgram germplasm lines. None of the accession found to be immune to dry root rot, however, three genotypes such as IPU-96-6, IC-16511, and NO-5131 found to be resistant and seventeen genotypes found to be moderately resistant to dry root rot under natural field conditions. The genotypes identified as resistant to dry root rot are of great significance and could be utilized in future breeding programme of blackgram to develop dry root rot resistant cultivars.

Keywords: Blackgram, germplasm, dry root rot, resistance sources

Introduction
Blackgram (*Vigna mungo* (L.) Hepper), popularly known as urdbean or mash, is a grain legume domesticated from *V. mungo* var *silvestris*. Blackgram, is the fourth important pulse crop cultivated in India. It is cultivated in about 3.24 million hectares with a production of. 46 million tonnes and productivity 525 kg per hectare (AICRP on MULLaRP 2016) [1]. India is the largest producer and consumer of blackgram in the world. The major constraints in achieving higher yield are lack of exploitable genetic variability, absence of suitable ideotype for different cropping system, poor harvest index, susceptibility to biotic and abiotic stresses. Dry root rot caused by *Macrophomina Phaseolina* (*Rhizoctonia bataticola)* is the most destructive disease and causes severe losses in yield of pulses and recently gaining lot of importance in the changed scenario of climatic conditions (Mamta Sharma, 2015) [4]. Dry root rot disease in blackgram is becoming a major threat for blackgram cultivation especially during rabi/spring season. Its severity could be enhanced by different physiological and ecological factors such as low soil moisture and high temperature (Sowmya, 2015) [7].
The dry root rot symptoms are most commonly observed in chickpea during post-flowering stage which include drooping and chlorosis of petioles and leaflets, initially confined to top leaves of the plant. Leaves and stems of affected plants are usually straw coloured and in some cases, the lower leaves and stems are brown. The tap root turns black with signs of rotting and is devoid of most of the lateral and finer roots. The dead roots are quite brittle and show shredding of the bark and tip of the root is easily broken leaving the lower portion of the tap root in the soil when plants are uprooted. Dark minute sclerotial bodies can be seen on the roots exposed and inner side of the bark or when split open at the collar region vertically (Mamata Sharma *et al*., 2015).
Chemical control of dry root rot is not effective as pathogen has a broad host range and survives in soil for longer periods in the form of sclerotia. There is a need to identify resistance sources against dry root rot in blackgram. The present investigation was conducted with an aim to identify the resistant/tolerant genotype against dry root rot disease in black gram.

Materials and methods
The present experiment was undertaken to assess the magnitude of resistance to dry root rot. The experiment was laid out in randomised block design with two replication at Indian

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Each genotype in each replication consisted of 4 m length. Plant to plant distance within the row was kept at 10cm. Observations on per cent dry root rot incidence for each genotype were recorded in each replication and the disease reaction of the genotypes was quantified on the basis of their mean percent disease incidence as per scale used for dry root rot in pulses (Nagamma *et al.*, 2015) [6]. (Table.1)

Result and discussion

Use of plant protection chemicals to control the disease is an age old practice in the plant disease management. But managing the disease by means of resistant genotype is an effective and safest means of disease management. In the present investigation, seventy five genotypes of black gram comprises advance breeding lines, land races and released cultivars were screened for dry root rot disease under natural field condition during rabi/spring season 2017-18. Dry root disease recently is becoming a major threat to production of blackgram during *rabi*/spring season especially under paddy fallow areas. The incidence of dry root rot severity was observed in the field under natural conditions and the results are presented in Table 1 & 2. Results of the present study revealed higher genotypic variations towards disease reaction among the black gram germplasm (Table. 2). None of the accession found to be immune to dry root rot, however, three genotypes such as IPU-96-6, IC-16511, and NO-5131 found to be resistant and seventeen genotypes found to be moderately resistant to dry root rot under natural field conditions. It is evident from the results that most of the black gram genotypes found susceptible to dry root disease (70%). Similar results also observed earlier in different pulses (Choudhary *et al*., 2011, Sowmy, 2015, Mamta Sharma, 2015) [4]. Choudhary *et al*., (2011) [2] screened twenty five germplasm lines of mungbean against dry root rot and three genotypes were found to be resistant against dry root rot such as MSJ-118, KM-4-44 and KM-4-59 and resistant genotypes had higher root and shoot length.

Jayalaxmi *et al*. (2008) [3] screened 12 chickpea cultivars from different sources and four genotypes were found resistant and two were moderately susceptible to dry root rot disease. Mishra *et al.* (2005) [5] have tested 470 germplasm lines are found KG-86 KWR-4, KWR-108 and KWR-277 as a resistant genotype. Nagamma *et al.* (2012) screened for resistance against *Macrophomina phaseolina (tassi) goid* causing dry root rot in chickpea. Only thirteen entries *viz.*,GNG 1958 (AVT-2), GNG 1999, CSJ 303, BG 3004, CSJ 753, RSG 888, Phule G 04305, IPCK 07-62, RVSSG 12, HK 08-212, Phule G 09305, AKG 2002-1K and ICCV 08317 showed resistant reactions under field condition. Dry root rot disease was difficult to manage by chemicals as reported by earlier workers. Management can be made feasible and cost effective by identification of new resistant sources to dry root rot in pulses. The present study further substantiates the lack of highly and stable sources of resistance to dry root rot among the cultivated genotypes of black gram. The genotypes identified as resistant to dry root rot are of great significance and could be utilized in breeding programme for the development of disease resistant genotypes in black gram.

Table 1: Frequency distribution of blackgram germplasm in different disease reaction groups.

Rating	Category	Per cent disease incidence	No. of accessions	% of total
0	Immune	0 %	0	0
1	Resistant	1-10 %	3	4.00
3	Moderately resistant	11-20 %	17	22.67
5	Moderately susceptible	21-30 %	22	29.33
7	Susceptible	31-50 %	25	33.33
9	Highly susceptible	More than 50 %	8	10.67

Table 2: Dry root rot reaction of blackgram germplasm during 2017-18.

Reaction groups	Accessions
Immune	Nil
Resistance	IPU-96-6, IC-16511, NO-5131
Moderately resistance	NG-2119, IC-10766, IPU-99-88, IPU-95-13, IPU-98-36, U-3108, PGRU-95-16-1, NAU-1, T-9/43, PU-19, STY-2287, PantU-3, IPU-99-123, BG-369, BGP-28, IC-21001, IPU-99-23
Moderately susceptible	UH-99-149, IPU-99-40, PU-99-2, IPU-99-79, MASH-1-1, TU-9910293, PGRU-95-18, PU-19A, DVST-34, IPU-99-95, NO-7668-413, DGG-5, IPU-90-32-1, LBG-20, UG-14-14, UPU-97-10, UBG-04-003, PGRU-95-16-2, PGRU-1, IPU-99-147, IPU-94-1, WBU-1372
Susceptible	PLU-28, UH-80-26, IPU-91-7, PPU-8, STY-2868, IPU-94-2, Uttara, IPU-90-32, IPU-99-31, PLU-1, UH-85-15, PantU-40, UPM-02-18, BPG-0067-1, BIG-0067-1, TU-91-2, PU-30, UH-32-3, URD-8831, SPS-5, Lam-Urd-2, MASH-114, Barbanki local, MASH-1008, Lam-Urd-1
Highly susceptible	MASH-479, IPU-2-43, MASH-338, MASH-391, IPU-94, MASH-218, DBGV-5, DU-1

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