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IDENTIFICATION OF SOURCE OF RESISTANCE IN MUNG BEAN GERMPLASM AGAINST CHARCOAL ROT DISEASE

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A B S T R A C T

In order to identify sources of genetic resistance in mungbean against charcoal rot disease caused by *Macrophomina phaseolina* (Tassi) Goid, fifty advance lines were evaluated under natural field conditions under randomized complete block design (RCBD). No advance line was found immune while five (13989, 14047, 14095, 14100, 14112 were highly resistant. Ten advance lines (13961, 13962, 13984, 14069, 14090, 14102, 14103, 14114, 14118, 14125) showed resistant and eight advance lines (13983, 13986, 13987, 14009, 14019, 14084, 14097, 14120) expressed moderately resistant and eleven (13966, 13976, 13994, 14015, 14078, 14092, 14104, 14105, 14113, 14117, 14124) exhibited moderately susceptible response. Twelve advance lines (13968, 13970, 13972, 13991, 13992, 13995, 14017, 14043, 14045, 14053, 14079, 14101) showed susceptible response and three advance lines (14066, 14072, 14076) expressed high susceptibility response towards disease.

Keywords: *Macrophomina phaseolina, Vigna radiata*, Screening, Resistance

INTRODUCTION

Mungbean (*Vigna radiata* L. Wilczek) is well known pulse crop of Pakistan which forms a major source of dietary proteins of high biological value, energy, minerals and vitamins (Bashir, 2004). The area under mungbean cultivation is 137 thousand hectares with annual production of 77.1 thousand tons in Pakistan (Anonymous, 2011). A number of diseases attack on mungbean crop but charcoal rot caused by *Machrophomina pheseolina* is the most destructive disease that reduce yield up to 60%. The fungus attack on underground part of the plant and its pycnidia appeared on the stem at ground level. Infected seedlings show reddish brown discolorations on the stem that become dark brown or black (Kendig *et al.,* 2000; Baird *et al*., 2003). Selection of resistant varieties is a suitable method to control the disease. For this purpose, screening is short term process as compared to produce resistance in plant because it takes long time to incorporate R gene in plant (Agrios, 2004). Resistance and tolerance both can improve the host fitness; resistance does so by reducing infection, whereas tolerance does so by reducing the fitness loss under infection (Strauss and Agarwal, 1999). The plant variety that has resistance or tolerance to diseases makes it possible to avoid or lessen the use of chemicals. Charcoal rot may inflict heavy losses to the crop and the present cultivars are susceptible to this disease, therefore, this study was initiated to evaluate available germplasm resistance to charcoal rot.

MATERIALS AND METHOD

Mungbean germplasm was collected from gene Bank of National Agriculture Research Centre (NARC) Islamabad. Fifty advance lines were sown in experimental area of Department of Plant Pathology, University of Agriculture Faisalabad, Pakistan under randomized complete block design (RCBD) The plantation was done with the help of Dibbler. The length of row was 3 m with plant to plant (P×P) 15cm and row to row(R×R) 30 cm distance. Data regarding disease incidence was taken with one week

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interval after the disease appearance by using disease rating scale designed by Haseeb (2011). According to this scale 0% = immune, 1-10% = Highly resistant, 11-30% = Resistance, 31-40% = Moderately resistant, 41-50 = moderately susceptible, 51-70 % = Susceptible and 71-100% = Highly susceptible.

The disease incidence was calculating by using formula;

$$Disease\ incidence\ \% = \frac{Total\ infected\ plants}{Total\ plants\ observed} \times 100$$

RESULTS AND DISCUSSION

Disease symptoms appeared after 20 days of sowing on the collar region of plants. Initially fungus attacked on underground parts of the plants. Infected seedlings showed reddish brown discoloration on the stem. The infected green pods were primarily turned into blue-green, and then turned brown to reddish. When infection occurred on mature and dry pods, they turned into white to gray colour. Infected pods became narrow, deformed and thin. The most prominent symptom was the sudden wilting and drying of the whole plant. No advance line was found immune while five (13989, 14047, 14095, 14100, 14112 were highly resistant. Ten advance lines (13961, 13962, 13984, 14069, 14090, 14102, 14103, 14114, 14118, 14125) showed resistant and eight advance lines (13983, 13986, 13987, 14009, 14019, 14084, 14097, 14120) expressed moderately resistant and eleven (13966, 13976, 13994, 14015, 14078, 14092, 14104, 14105, 14113, 14117, 14124) exhibited moderately susceptible response. Twelve advance lines (13968, 13970, 13972, 13991, 13992, 13995, 14017, 14043, 14045, 14053, 14079, 14101) showed susceptible response and three advance lines (14066, 14072, 14076) expressed high susceptibility response towards disease (Table1 and 2).

In our country, increase in population is a serious threat for the food sector. There is a great need to meet the requirements and demands in food sector. Attack of diseases is hazardous for the edible crops. Selection of resistant variety is a suitable method to control the disease. For this purpose, screening is short term process as compared to produce resistance in plant because it takes long time to incorporate R gene in plant (Agrios, 2004). Screening is a good tool by which we can check the capability of a plant against pathogen and can identify resistant varieties of mungbean germplasm to decrease the level of disease incidence. There were very few varieties which have been reported resistant against soil borne pathogens (Pastor and Abawi, 1988). In these varieties two dominant complementary genes were identified which expressed resistance against *M. phaseolina* (Olaya, 1995). Khan and Shuaib (2007) evaluated twenty nine genotypes of mungbean to charcoal rot and reported that twelve genotypes were highly resistant, whereas five (40504, NCM 257-5, 40457, NCM 251-4, 6368-64-72) genotypes exhibited resistant and six expressed moderately resistant response toward disease.

Table. 1. Degree of resistance/ susceptibility of mugbean germplasm against charcoal rot disease.

Sr. No.	Advance lines	Disease Incidence (%)	Response
1	13989	7.28 ab	H R
2	14047	10.68 z	H R
3	14095	5.10 b	H R
4	14100	9.48 za	H R
5	14112	8. 01 a	H R
6	13961	17.74 wx	R
7	13962	23.96 u	R
8	13984	18.52 w	R
9	14069	29.50 s	R
10	14090	16.10 x	R
11	14103	11.04 z	R
12	14114	13.45 y	R
13	14118	26.28 tu	R
14	14125	27.49 st	R
15	13983	21.19 v	M R
16	13986	40.14 o	M R

Continue…

17	13987	37.97 op	M R
18	14009	38.63 op	M R
19	14019	36.51 pq	M R
20	14084	33.56 r	M R
21	14097	38.01 op	M R
22	14120	33.10 r	M R
23	13966	42.97 n	M S
24	13976	47.84 kl	M S
25	13994	35.06 qr	M S
26	14015	45.67 lm	M S
27	14078	44.13 mn	M S
28	14092	48.61 k	M S
29	14104	42.54 n	M S
30	14105	49.07 k	M S
31	14113	48.81 k	M S
32	14117	70.86 bc	M S
33	14124	55.74 ij	M S
34	13968	58.32 gh	S
35	13970	61.25 f	S
36	13972	60.84 f	S
37	13991	63.65 e	S
38	13992	56.86 hi	S
39	13995	66.85 d	S
40	14017	69.65 c	S
41	14043	55.00 ij	S
42	14045	65.30 de	S
43	14053	55.44 ij	S
44	14079	53.82 j	S
45	14101	59.63 fg	S
46	14032	76.71 a	H S
47	14066	71.39 bc	H S
48	14072	78.24 a	H S
49	14076	72.31 b	H S
50	14066	73.45 b	H S

*Mean values sharing similar letters do not differ significantly as determined by LSD at 5% level of probability.

HR = Highly resistant; R = Resistant; MR = Moderately resistant; MS = Moderately susceptible; S = Susceptible; HS = Highly susceptible.

Table 2. Summary of the genetic potential of mungbean germplasm against charcoal rot Disease.

Sr. No.	DI (%)	Response	Advance Lines
1	0	Immune	-
2	1-10	Highly Resistance	13989,14047,14095,14100,14112,
3	11-30	Resistance	13961,13962, 13984, 14069, 14090, 14102,14103, 14114, 14118, 14125
4	31-40	Moderately Resistance	13983,13986,13987,14009,14019,14084,14097,14120
5	41-50	Moderately Susceptible	13966,13976, 13994, 14015, 14078, 14092, 14104, 14105, 14113, 14117, 14124
6	50-70	Susceptible	13968,13970,13972, 13991, 13992, 13995, 14017, 14043,14045, 14053, 14079, 14101
7	71-100	Highly Susceptible	14066, 14072,14076, 14032

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