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SCREENING OF MUNGBEAN GERMPLASM FOR RESISTANCE TO *MUNGBEAN YELLOW MOSAIC VIRUS*

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ABSTRACT

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The experiment was carried out at the Regional Agricultural Research Station, Bangladesh Agriculture Research Institute, Rahmatpur, Barisal to screen mungbean germplasms against *Mungbean Yellow Mosaic Virus* (MYMV) during the period of January-May, 2012 late rabi season under natural epiphytotic condition. The experimentation comprised of 102 mungbean germplasms including resistant and susceptible check were used in this experiment. At flowering stage, out of 102 germplasm/varieties 5, 13, 18, 21, 13, 16, 12, 4 and 0 germplasm/varieties and at maturity stage 0, 18, 22, 26, 13, 9, 8, 6 and 0 germplasm/varieties were graded as no Infection (I^0), 1-5% plants tissue infection (I), highly Resistant (HR), resistant (R), moderately resistant (MR), tolerant (T), moderately tolerant (MT), susceptible (S) and highly susceptible (HS) reaction, respectively. Among the less MYMV infected 18 mungbean lines, ACC-12840014 gives highest yield (2888 kg/ha) followed by VC-1007A (2844 kg/ha) and VO-1319 (B-G) (2788 kg/ha). The two lines ACC-12840014 and VO-1319 (B-G) completed by short duration of 66 and 64 days compare to check of 67.50 and 64.50 days. So, the lines ACC-12840014, VC-1007A and VO-1319 (B-G) were recommended as MYMV tolerant/resistant genetic material.

***Key words**: mungbean, MYMV, screening, yield*

INTRODUCTION

Mungbean (*Vigna radiata* L. wilczek) is one of the most important pulse crops in Bangladesh. The agro-ecological conditions of this country suit its cultivation. Due to its short duration nature it is well fitted as a cash crop in between the major cropping seasons. It is grown in three seasons in a year in Bangladesh and more than 70% mungbean area is concentrated in the three southern districts *viz.* Patuakhali, Barisal and Noakhali within AEZ 13 and 18, and Patuakhali alone occupies about 30% area. It is important pulse crops having global economic importance as a dietary ingredient of the balanced food menu. The present production of mungbean does not meet the current consumption requirement for the people of Bangladesh. The daily per capita consumption of all pulses in our country is only 10 g compared to 45 g in India (FAO 2002). Considering the nutrient value, mungbean is the best of all pulses (Khan 1985). The mungbean plant are also capable of fixing atmospheric nitrogen (222 kg/ha) through symbiotic relationship with *Rhizobium* in the root nodule of the crop. Pulses are good source of carbohydrate, fat, minerals and vitamins. Pulse protein lacks S containing amino acids but rich in lysine content, which are supplemented by cereal proteins. Sprouted pulse seeds (Mungbean, Chickpea) are rich in vitamin B, C and enzyme and easily digestible pulse crops cover the area of about 6.74 lakh ha and production about 1.50 lakh ton and mungbean occupies 1.63 lakh ha. It contributes 24.18% of total pulse area and 20.95% production in the country (Krishi diary, 2012). There are many constraints responsible for the low yield of mungbean. Among those, diseases are considered to be the most important. A total of twenty diseases of mungbean have been recorded in Bangladesh (Bakr and Rashid, 2007). Of which four diseases are major in field and two are in storage. YMV, CLS, Powdery mildew and Leaf rot are the major diseases found in the field. MYMV is the most important and damaging diseases of mungbean that incurred significant yield reductions every year in Bangladesh (Jalaluddin and Shaikh, 1981). *Mungbean Yellow Mosaic Virus* (MYMV) may cause 63% yield loss (Bakr 1994). The disease causes significant losses to mungbean (*Vigna radiata*) crops in India, lead to huge agro-economical losses worldwide, and are subjects of immense concern. The present work is supporting work to develop the resistant/tolerant line(s) from some indigenous and exotic origin. In this view of point the study of research work was undertaken to find out the resistant/tolerant sources of mungbean germplasms against MYMV under coastal eco-system and to find out the yield attribute of different mungbean germplasm against MYMV.

MATERIALS AND METHODS

The experiment was carried out at experimental field of Regional Agricultural Research Station (RARS), Rahmatpur, Barisal during the period from January, 2012 to May, 2012 in order to study the severity of the diseases MYMV on tested germplasm of Mungbean and their yield performances. The experiment was conducted in Randomized Complete Block Design (RCBD) with two replications. The size of the individual plot was 1.0 m^2 (2 m × 0.5 m). The distance between the block was 50 cm. The row length was 3 m and width was 25 cm. Seeds were treated with Provax-200 @ 2.5 gm/kg seed as seed borne infection/disease mitigation measures. Fertilizers were applied at the time of final land preparation as per recommended doses. Intercultural operation was done in order to maintain the normal hygienic condition of crop growth. Weeding was performed three times during the growing period of the crop while 20, 35 and 50 days after sowing. Insecticide 'Karate

(0.2%) and Dacis (0.2%) was applied for controlling pod borer and thrips of mungbean after completing of data collection.

Mungbean Yellow Mosaic Virus infection severity on mungbean was recorded from each plot at flowering stage and maturity stage. Data of *Mungbean Yellow Mosaic Virus* (MYMV) disease was scored 0-8 scoring scale according to Malik (1992). Data were recorded on the following parameters, Days to maturity, Plant height (cm), Number of branch/plant, Pod length (cm), Number of pods/plant, Number of Seeds/Pod (10 pods), 100 seeds weight (g), Yield (kg/ha). The collected data were analyzed statistically. Analysis of variance and LSD test were done to find out the significant difference among the treatment means.

RESULTS AND DISCUSSION

Disease reaction of *Mungbean Yellow Mosaic Virus* on mungbean at flowering and maturity stage during January - May 2012

The tested mungbean germplasms/varieties showed wide variation in reaction to MYMV disease under field condition at different growth stage. The sensitivity of the tested mungbean germplasms/varieties increased with the increase in age of the plants. The tendency of prevalence of MYMV was as follows: flowering stage > maturity stage. But this tendency was not always a regular pattern to all the germplasms/varieties. Some materials are sensible at flowering stage. Moreover, the tested germplasms/verities showed variation in tolerance/resistance in the experimental period. These findings corroborate with the findings of other researches like Shyam Singh and Awasthi (2004), and Gill (1999).

In flowering stage, out of 102 lines/varieties a number of 5, 13, 18, 21, 13, 16, 12 and 4 lines/varieties were showed no Infection, 1-5% plants parts infection (I), Highly Resistant (HR), Resistant (R), Moderately Resistant (MR), Tolerant (T), Moderately Tolerant (MT) and Susceptible (S) reaction, respectively (Fig. 1). In this stage, any infection was not occurred in 5 lines *viz*. VC-6773 (B-G), VC-6960 -88, VC-3960-89, VC-1089 A, ACC-12840014, and 1-5% plant parts infection was in lines *viz.* ACC-12870021, VC-6367 (55-97), VC-6372 (45-8-1), VC-1007 A, VC-6173 (B-32), VO-1319 (B-G), VC-2566 A, VC-1160, GK-57, GK-48, GK-63, GK-40, GK-24, Local variety, BARI Mungbean-6 were observed during flowering stage. These findings corroborate with the findings of other researches like Shyam Singh and Awasthi (2004), and Gill 1999.

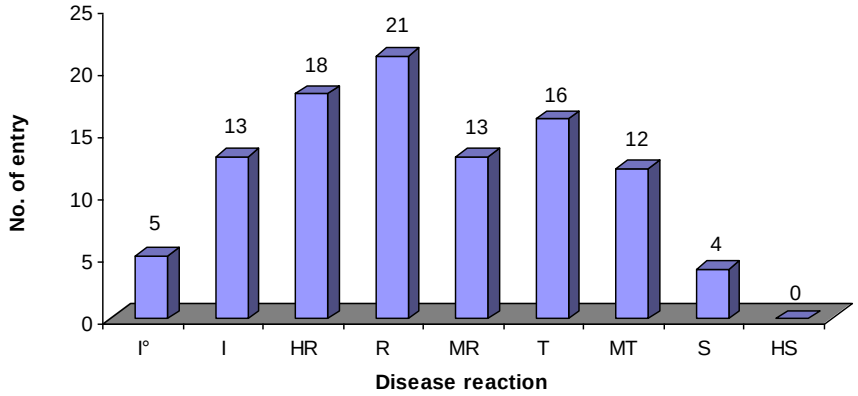

Fig. 1. Performance of 102 mungbean genotypes resistant to MYMV under field condition at flowering stage

In maturity stage, out of 102 lines/varieties of mungbean a number of 0,18, 22, 26, 13, 9, 8, and 6 lines were graded as no infection, 1-5% plants parts infection (I), Highly Resistant (HR), Resistant (R), Moderately Resistant (MR), Tolerant (T), Moderately Tolerant (MT) and Susceptible (S) reaction, respectively (Fig. 2). The 18 lines showed 1-5% plant parts infected were VC-6773 (B-G), VC-6960 -88, VC-3960-89, VC-1089 A, ACC-12840014, ACC-12870021, VC-6367 (55-97), VC-6372 (45-8-1), VC-1007 A, VC-6173 (B-32), VO-1319 (B-G), VC-2566 A, VC-1160, GK-57, GK-48, GK-63, GK-40, GK-24. This is in accordance with the findings of Khattak *et al.* (2000). They evaluated fourteen MYMV susceptible F_3 progenies from a cross NM 92 X VC 1560D showed significant differences for MYMV disease infection.

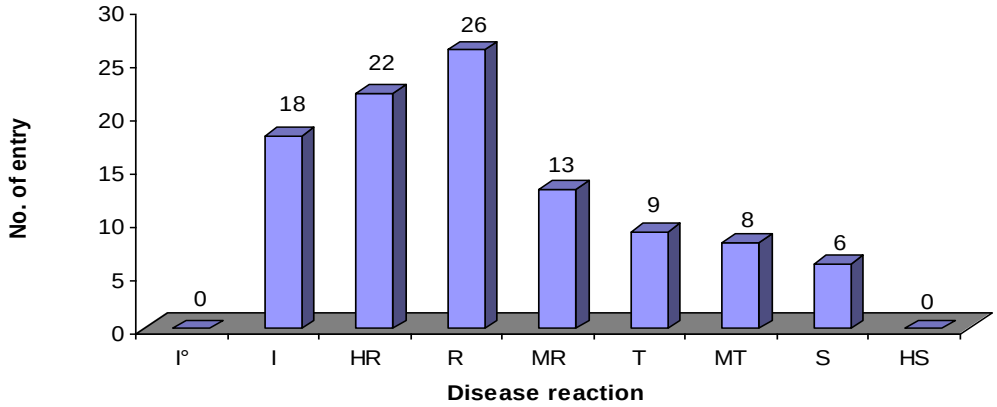

Fig. 2. Performance of 102 mungbean genotypes resistant to MYMV under field condition at maturity stage

Iqbal *et al*. (2011) screened 100 mungbean germplasm and reported that four genotypes/lines i.e. 014043, 014133, 014249, 014250 were found as resistant. Eight were moderately resistant and 30 were moderately susceptible. Remaining 30 accessions were classified as susceptible and 43 as highly susceptible accessions. Karim *et al*. (2007) evaluated 60 advanced lines were evaluated against MYMV, which were collected from PRC, Ishurdi and BARI Mungbean-2 and BARI Mungbean-4 were used as check variety. Among the test lines only 10 lines performed better in respect of disease tolerance of which nine showed susceptible and only one showed moderately susceptible in reaction and rest of the lines were highly susceptible in the field condition. Afzal *et al*. (2004) reported that higher resistances to yellow mosaic have been demonstrated in the modern varieties like BARI Mungbean-5, BARI Mungbean-6, BINA Mungbean-5, BU Mung-1 and BU Mung-2.

Performance of selected 18 mungbean germplasm/varieties in yield and yield contributing characteristics during late rabi season of 2012

From the result, there was a marked variation at days to 1st flowering, 50% flowering and maturity in different mungbean lines/varieties. Some lines/varieties were given early flowering and early maturity and some lines/varieties took more duration of 1st flowering, 50% flowering and maturity. Under the study long duration line was recorded in VC-1007 (69.50 days) followed by VC-3960-89 (69.00 days) and GK-24 (68.50 days) (Table 1). Short duration was recorded in VC-6173(B-32) (59.50 days) followed by VC-1089 A (61.00 days) and GK-40 (61.50 days). The findings were agreed with the findings of Anon. (2009).

Table 1. Days to 1st flowering, days to 50% flowering, days to maturity, plant height and no. of branch/plant of mungbean germplasm/varieties under field condition during late rabi, 2012

Name of germplasm/variety	Days to 1st flowering	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branch/plant
VC-6773 (B-G)	51.00 a-d	58.00 ab	63.50 ab	42.00 bcd	2.33 bcd
VC-6960-88	54.00 abc	62.00 ab	68.00 ab	33.90 f	2.17 bcd
VC-3960-89	56.00 a	62.50 ab	69.00 ab	39.55 c-f	1.32 e
VC-1089 A	46.50 d	55.50 ab	61.00 ab	41.72 b-e	2.38 bcd
ACC-12840014	54.00 abc	60.00 ab	66.00 ab	43.60 abc	2.30 bcd
ACC-12870021	51.00 a-d	58.50 ab	64.50 ab	45.25 abc	1.78 cde
VC-6367 (55-97)	52.00 abc	58.50 ab	64.50 ab	36.60 def	2.90 ab
VC-6372 (45-8-1)	49.00 cd	57.50 ab	63.50 ab	47.00 ab	1.65 de
VC-1007 A	53.50 abc	63.00 a	69.50 a	36.50 def	1.80 cde
VC-6173 (B-32)	50.00 bcd	54.00 b	59.50 b	34.07 f	2.25 bcd
VO-1319 (B-G)	50.00 bcd	58.00 ab	64.00 ab	40.95 cde	2.70 ab
VC-2566 A	51.50 a-d	59.00 ab	65.00 ab	36.30 def	2.25 bcd
VC-1160	51.00 a-d	58.00 ab	63.50 ab	41.80 b-e	2.70 ab
GK-57	49.50 cd	56.50 ab	62.00 ab	35.90 ef	1.80 cde
GK-48	50.00 bcd	56.50 ab	62.50 ab	36.25 def	2.70 ab
GK-63	53.00 abc	57.50 ab	63.00 ab	34.50 f	3.20 a
GK-40	49.00 cd	55.50 ab	61.50 ab	36.83 def	2.83 ab
GK-24	56.00 a	62.50 ab	68.50 ab	40.75 cde	2.65 ab
Local (Sus. ck.)	55.00 ab	61.50 ab	67.50 ab	49.15 a	2.40 bcd
BARI Mungbean-6	52.00 abc	58.50 ab	64.50 ab	42.30 bcd	2.45 bc
LSD (0.05)	7.425	4.388	8.460	5.24	0.65
CV (%)	7.58	4.05	6.26	6.30	13.41

The tested 18 lines/varieties were showed significant difference in plant height and the tallest plant was recorded in Local variety followed by VC-6372 (45-8-1), ACC-12870021 (45.25 cm), and ACC-12840014 (43.60 cm). The shortest plant was recorded in VC-6960-88 followed by VC-6173 (B-32) (34.05 cm) and GK-63 (34.50 cm) (Table 1). Similar result was found by Anon. (2009), Aktar (2011). Venkateswarlu and Rajan (1991) reported that out of 6 entries the tallest (39.80 cm) plant was found in $BMXK_2$-03000 line followed by $BMXK_2$-03005-4.

There had an appreciable variation among number of branch of plant. The maximum number of branch per plant was found in GK-63 followed by VC 6367 (55-97) (2.90), GK-40 (2.83), VO-1319 (B-G) (2.70), VC 1160 (2.70) and GK-24 (2.65). The minimum number of branch per plant was counted in VC-3960-89 followed by VC-6372 (45-8-1) (1.65), ACC-12870021 (1.78) VC-1007A and GK-57 (1.80) (Table 1). The findings of Aktar (2011) support the findings of the present study.

Minimum number of pod was recorded in GK-24 and VC-6372 (45-8-1) followed by ACC-12840014 (14.45) and VC-2566A (14.60) (Table 2). Maximum number of pod per plant was observed in VC-1160 followed by VC-1089A (16.70) and GK-48 (16.50). The presenting findings agree to those of Khalil (1989), Dharmalingam and Basu (1993), and Aktar (2011). Among the entries $BMXK_2$-03005-4 gave higher number of pods/plant. The more number of pods (27.20 pods/plant) found in the combination $S_2 \times E_4$ i.e. February 01, 2011 with $BMXK_2$-03005-4 line.

Table 2. No. of pod/plant, length of pod (cm), no. of seed /pod, 100 seed weight (g) and yield (kg/ha) of mungbean germplasm/varieties under field condition during late rabi, 2012

Name of germplasm/variety	No. of pod/plant	Length of pod (cm)	No. of seed /pod	100 seed weight (g)	Yield (kg/ha)
VC-6773 (B-G)	14.80 bcd	8.85 bc	9.80 c-f	4.80 cd	413 j
VC-6960-88	16.20 abc	9.39 ab	9.40 def	5.20 abc	825 f
VC-3960-89	16.05 abc	8.91 bc	10.15 b-f	5.00 bc	1419 d
VC-1089 A	16.70 ab	9.90 a	10.50 a-d	4.00 ef	1975 c
ACC-12840014	14.45 cd	6.68 gh	9.90 c-f	3.40 gh	2888 a
ACC-12870021	15.80 a-d	7.31e-h	10.80 abc	3.05 h	2131 c
VC-6367 (55-97)	16.20 abc	7.77 ef	8.90 fg	4.05 ef	1075 e
VC-6372 (45-8-1)	13.90 d	7.37 e-h	9.35 def	5.40 ab	1131 e
VC-1007 A	14.70 bcd	7.78 ef	9.85 c-f	4.90 c	2844 a
VC-6173 (B-32)	14.60 cd	8.76 bcd	8.85 fg	4.20 e	1100 e
VO-1319 (B-G)	16.20 abc	6.87 fgh	10.65 a-d	3.70 fg	2788 a
VC-2566 A	14.60 cd	6.85 fgh	9.10 efg	3.70 fg	506 ij
VC-1160	17.30 a	7.63 efg	11.40 ab	4.20 e	2350 b
GK-57	16.05 abc	6.39 hi	9.65 c-f	3.50 gh	619 ghi
GK-48	16.50 abc	7.24 e-h	10.30 a-e	3.50 gh	563 hij
GK-63	14.80 bcd	7.16 e-h	10.10 b-f	4.40 de	650 f-i
GK-40	14.70 bcd	7.43 efg	9.65 c-f	4.05 ef	719 fgh
GK-24	13.90 d	8.15 cde	11.50 a	4.25 e	788 fg
Local (Sus. ck.)	15.80 a-d	5.65 i	8.00 g	2.00 i	1063 e
BARI Mungbean-6	15.70 a-d	7.85 def	9.00 efg	5.60 a	2056 c
LSD (0.05)	1.75	0.878	1.158	0.44	173.50
CV (%)	5.42	5.45	5.62	5.07	5.94

From the present study, pod length ranged from 5.65 to 9.90 while the lowest pod length was recorded in Local variety followed by GK-57 (6.39 cm) and the highest pod length was recorded in VC-1089A followed by VC-6960-88(9.39 cm).

Under the present investigation, lowest number of seed per pod was recorded in Local variety followed by VC-6173 (B-32) (8.85) and VC-6367 (55-97) (8.90) while highest number of seed per pod was recorded in GK-24 followed by VC-1160 (11.40) (Table 2). The 100 seed weight under different lines/verities ranged from 2.00g to 5.60 g while highest weight was recorded in BARI Mungbean-6 followed by VC-6372 (45-8-1) (5.40 g) and VC-6960-88 (5.20g) and lowest 100 seed weight was recorded in Local variety followed by ACC-12870021 (3.050 g) and ACC-12840014 (3.400 g) (Table 2). Babu *et al.* (1984) reported that infection of *V. radiata* plants by MYMV caused significant reduction in number of pods/plant, seed yield and 1000 seed weight. These findings support the present study. Yield performance of mungbean among the lines/varieties it was found that the maximum yield (2888 kg/ha) was recorded in ACC-12840014 followed by VC-1007A (2844 kg/ha) and the minimum yield (412.5 kg/ha) was recorded in VC-6773 (B-G) followed by VC-2566A (506.3 kg/ha) (Table 2). Khattak *et al.* (2000) conducted an experiment of fourteen MYMV susceptible F_3 progenies from a cross NM 92 X VC 1560D showed significant differences for MYMV disease infection, yield and yield components.

CONCLUSION

With the findings of the present study it may be concluded that the line ACC-12840014 (2888 kg/ha), VC-1007A (2844 kg/ha) and VO-1319 (B-G) (2788 kg/ha) gave higher yield and less infected by MYMV. The two lines ACC-12840014 and VO-1319 (B-G) found short crop duration compare to check. Thus, the line ACC-12840014 may be released as a variety of mungbean after further investigation for southern region of Bangladesh.

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