Reprint **ISSN 1991-3036 (Web Version)**

International Journal of Sustainable Crop Production (IJSCP)

(*Int. J. Sustain. Crop Prod.*)

Volume: 17 **Issue: 1** **February 2022**

Int. J. Sustain. Crop Prod. 17(1): 13-16 (February 2022)

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An International Scientific Research Publisher

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ISSN-1991-3036 (Online)
Int. J. Sustain. Crop Prod. 17(1):13-16(February 2022)

GROWTH AND YIELD OF MUNGBEAN MUTANTS IN DIFFERENT LOCATIONS

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Accepted for publication on 05 January 2022

ABSTRACT

Islam MT, Rahman MS (2022) Growth and yield of mungbean mutants in different locations. *Int. J. Sustain. Crop Prod.* 17(1), 13-16.

Mutants are the sources of variation and new varieties. The experiments were carried out with six mutants of mungbean *viz*. MI-12, MM-1, MM-11, MM-2, MM-5 and MM-8 along with Binamoog-8 in different locations of Bangladesh during March-May 2021to find out the mutants with high yield and short duration. The experiments were laid out following a randomized block design with three replications. The mutant MI-12 and MM-8 produced taller plants. MM-5 and MM-8 had more branches and leaves. The highest seed yield was found in MM-8 followed by MM-5 in all the locations. But growth duration was lower (63-64 days) in MM-5 than MM-8 (72-73 days).

Key words*: mungbean, growth, yield, crop duration, location*

INTRODUCTION

Mungbean (*Vigna radiata* L. Wilczek) is one of the most important pulse crops. It has yield potential of around 2000 kg ha^{-1} but productivity is low 821 kg ha^{-1} (BBS 2019). Mungbean yield is predetermined by the potential of a given variety and the environment. Optimum temperature for potential yield of mungbean lies between 28-30^{o}C (Poehlman 1991). High temperature affects mungbean yield. High temperature (36^{o}C) at pre-flowering and flowering stages decreases photosynthetic rate, biomass and yield in mungbean (Islam 2018; Islam 2015; Islam and Razzaque, 2010). In Bangladesh, mungbean is cultivated in winter and summer and both low and high temperature affects its growth and yield. Summer varieties are often facing high temperature (34-38^{o}C) during April-May. Pulse crops are generally cultivated during the dry season, when water deficit or unavailability of soil moisture is a common occurrence (Islam and Razzaque, 2007; Islam *et al*. 2006; Islam *et al*. 2005). Soil moisture is an essential requirement which regulates physiological growth processes and yield of plants. However, different crop cultivars have different ability to respond to drought conditions in terms of growth and development. Amelioration of drought environment through management practices like irrigation, mulching etc. are costly involvement and sometimes quite impossible for the poor economic conditions of the farmers. The best alternative is thus developing/screening of drought tolerant cultivars for the moisture deficit areas of the country. In general, mungbean is a source of high-quality protein which can be consumed as whole grains, dhal, or sprouted form and is an excellent complement to rice in respect to balanced human nutrition. In addition to being the prime source of human food and animal feed, it plays an important role in maintaining the soil fertility by enhancing the soil physical properties and fixing atmospheric nitrogen (Naik *et al*. 2020). The experiments were conducted to find out the mungbean mutants with high yield and short duration.

MATERIALS AND METHODS

The mungbean mutants were developed in the project "Developing plant ideotype of lentil, mungbean, sesame and tomato for high yield, quality and stress tolerance under changing climate" of Crop Physiology Division, BINA, Mymensingh. Preliminary yield trial was conducted with thirteen selected mutants along with Binamoog-8 at BINA Sub-station Ishurdi and Magura in 2018. Advanced yield trials were conducted with selected six mutants at BINA Sub-stations Ishurdi and Magura and farmers' field at Ishurdi and Magura in 2020 and zonal yield trial at BINA Sub-station Magura and farmers' field at Magura and Barisal in 2021. The six mutants of mungbean were MI-12, MM-1, MM-11, MM-2, MM-5, MM-8 and a check variety Binamoog-8. The experiments were laid out following a randomized block design with three replications having a unit plot size 4m × 5m. Row to row and plant to plant distances were 30 cm and 5-7 cm, respectively. Recommended doses of fertilizers were used. Proper cultural practices were done as and when necessary. Data on morphological, yield and yield attributes were recorded at harvest from 10 randomly selected plants in each plot and yield was taken from whole plot and converted into ton ha^{-1}.

RESULTS AND DISCUSSION

Results revealed that almost all the studied parameters were significantly different among the genotypes (Table 1-9). The mutant MI-12 and MM-8 produced taller plants and MM-2 produced the shorter (Table 7-9). MM-5 and MM-8 had more branches and leaves. MM-8 showed the highest number of pods $plant^{-1}$. Higher 1000-seed weight was found in MI-12 and MM-1 whereas lower in MM-8. The highest seed yield was found in MM-8 followed by MM-5 in all the locations (Table 7-9).The results are agreed with many authors (Naik *et al*. 2020; Islam 2018; Islam 2015; Islam and Razzaque, 2007). But growth duration was lower (63-64 days) in MM-5 than MM-8 (72-73 days). So, the mutants MM-5 and MM-8 may be released as varieties.

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Table 1. Variation in seed yield and yield components of mungbean mutants conducted at BINA Sub-station Ishurdi during March to May 2018

Variety/ Mutants	Plant height (cm)	Branches plant^{-1} (no.)	Pod length (cm)	Pods plant^{-1} (no.)	Seeds pod^{-1} (no.)	Seed weight plant^{-1} (g)	Seed Yield (kg ha^{-1})	% maturity at 1stharvest
MM-1	56.20	1.40	11.27	21.13	11.27	5.93	1779	88.56
MM-2	50.53	0.77	9.50	24.80	9.50	5.18	1554	85.52
MM-3	49.67	1.57	11.53	25.93	11.53	3.49	1047	57.44
MM-4	42.47	1.33	10.90	17.60	10.90	3.07	921	81.16
MM-5	37.20	1.40	11.33	22.13	11.33	5.88	1764	85.40
MM-6	45.00	1.50	9.47	19.07	9.47	4.88	1464	80.67
MM-7	48.80	0.80	11.13	26.47	11.13	4.42	1326	61.45
MM-8	42.13	0.97	9.97	20.40	9.97	6.06	1818	83.00
MM-9	45.47	0.97	10.67	17.80	10.67	4.75	1425	76.82
MM-10	46.33	1.07	10.17	18.70	10.17	4.12	1236	85.75
MM-11	47.40	1.00	10.93	18.38	10.93	5.21	1563	80.52
MM-12	54.60	0.77	11.10	18.07	11.10	5.93	1779	79.81
MM-13	57.90	1.07	11.63	17.13	11.63	4.75	1425	93.48
Binamoog-8	55.20	1.40	11.33	16.63	11.33	5.07	1521	82.05
$LSD_{0.05}$	3.03	0.3	0.72	1.29	ns	0.72	216	2.41

Table 2. Yield and yield components of mungbean mutants conducted at BINA Sub-station Magura during March to May 2018

Variety/ Mutants	Plant height (cm)	Branches plant^{-1} (no.)	Pod length (cm)	Pods plant^{-1} (no.)	Seeds pod^{-1} (no.)	Seed weight plant^{-1} (g)	Seed yield (kg ha^{-1})	% maturity at 1st harvest
MM-1	54.0	1.27	8.62	45.23	12.40	4.71	1413	65.32
MM-2	54.7	2.37	7.61	47.63	11.63	6.12	1836	87.19
MM-3	47.5	2.42	8.21	39.95	11.70	6.25	1875	81.38
MM-4	44.1	2.33	8.27	26.47	12.00	7.62	1286	91.82
MM-5	40.9	2.20	8.85	42.07	11.90	5.94	1782	71.50
MM-6	47.7	2.00	8.19	39.37	12.31	5.49	1647	77.60
MM-7	51.7	2.00	7.62	42.00	12.20	5.84	1752	80.44
MM-8	38.4	1.87	8.87	40.13	11.50	7.64	2292	85.71
MM-9	46.5	2.13	9.16	38.07	11.59	6.41	1923	80.10
MM-10	48.2	1.40	7.62	39.20	11.77	4.37	1311	90.69
MM-11	49.7	2.20	9.15	41.53	11.80	7.03	2109	84.08
MM-12	65.7	2.67	8.66	58.33	11.53	6.75	2025	79.01
MM-13	58.0	1.93	8.71	50.20	12.57	6.64	1992	79.42
Binamoog-8	69.0	1.33	7.71	40.33	11.80	5.50	1650	50.73
$LSD_{0.05}$	2.52	0.32	1.01	2.75	ns	0.79	237	2.64

Table 3. Yield and yield components of mungbean mutants at Ishurdi Sub-station in 2020

Mutants	Plant height (cm)	Branch plant^{-1} (no.)	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1} (no.)	Seed wt. m^{-2}(g)
MM-1	48bc	1.33b	21.6b	8.7a	11.0bc	256a
MM-2	46c	1.78a	21.1b	7.4b	10.9c	218c
MM-5	47c	1.03c	15.2d	8.4a	11.1abc	257a
MM-8	51a	1.95a	23.8a	6.7bc	11.9a	194d
MM-11	44d	1.05c	17.8c	8.7a	11.8ab	254a
MI-12	52a	1.18bc	17.3c	8.3a	11.4abc	243b
Binamoog-8	49b	1.25bc	17.6c	6.4c	10.5c	219c

In a column, the figure(s) with similar/without letter(s) do not differ significantly by DMRT at $P \leq 0.05$

Table 4. Yield and yield components of mungbean mutants at Ishurdi farmer's field in 2020

Mutants	Plant height (cm)	Branch plant^{-1} (no.)	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1}(no.)	Seed wt. m^{-2}(g)
MM-1	45c	1.43a	12.6bc	7.6ab	10.7c	242a
MM-2	43d	1.08bc	11.5cd	7.6ab	11.1bc	206c
MM-5	44cd	0.68d	12.5bc	7.7ab	11.2bc	248a
MM-8	56a	0.75d	10.9d	7.7a	10.9bc	190d
MM-11	48b	0.68d	10.7d	7.5bc	10.8bc	245a
MI-12	45c	0.95c	14.8a	7.4c	12.0a	228b
Binamoog-8	55a	1.20b	12.9b	7.4c	11.5ab	200c

In a column, the figure(s) with similar/without letter(s) do not differ significantly by DMRT at $P \leq 0.05$

Table 5. Yield and yield components of mungbean mutants at Magura on-station in 2020

Mutants	Plant height (cm)	Branch plant^{-1} (no.)	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1} (no.)	Seed wt. m^{-2}(g)
MM-1	56b	2.30a	24.73a	8.3bc	11.73	251a
MM-2	46cd	2.07a	26.4a	8.0c	13.07	180d
MM-5	44d	1.37c	12.47b	8.8b	12.60	202c
MM-8	70a	1.73b	29.13a	6.8d	11.93	218b
MM-11	49c	1.00d	16.93b	10.0a	12.07	170e
MI-12	60b	2.20a	25.27a	8.5bc	11.87	225b
Binamoog-8	70a	2.13a	27.93a	7.9c	12.47	200c

In a column, the figure(s) with similar/without letter(s) do not differ significantly by DMRT at P ≤ 0.05

Table 6. Yield and yield components of mungbean mutants at Magura farmer's field in 2020

Mutants	Plant height (cm)	Branch plant^{-1} (no.)	Pods plant^{-1} (no.)	Pod length (cm)	Seeds pod^{-1} (no.)	Seed wt. m^{-2}(g)
MM-1	50c	2.17b	20.7b	8.5a	11.8a	238ab
MM-2	50c	2.50a	22.3a	7.4b	11.1bc	175d
MM-5	50c	2.20b	19.9b	8.5a	12.0a	224bc
MM-8	63b	2.53a	22.6a	7.6b	12.1a	253a
MM-11	48c	2.13b	17.5c	8.2a	11.4ab	233bc
MI-12	68a	2.53a	16.4c	8.4a	11.7ab	239ab
Binamoog-8	62b	2.17b	20.8b	6.8c	10.6c	218c

In a column, the figure(s) with similar/without letter(s) do not differ significantly by DMRT at P ≤ 0.05

Table 7. Morphological attributes and yield of mungbean genotypes at BINA Sub-station, Magura in 2021

Genotypes	Plant height (cm)	Branch plant^{-1} (no.)	Leaf plant^{-1} (no.)	Pod plant^{-1} (no.)	Seed pod^{-1} (no.)	Seed wt. plant^{-1} (g)	Crop duration (days)	1000 seed wt. (g)	Yield (t ha^{-1})
Binamoog-8	29.27bc	0.47b	23.60b	14.60b	5.54b	7.29b	65.67c	32.533e	1.83c
MI-12	35.93ab	0.73ab	25.87b	10.93cde	5.35c	7.64ab	66.67c	44.8ab	1.74d
MM-1	28.60bc	0.53b	27.33b	9.93e	5.18d	7.76ab	65.67c	45a	1.69e
MM-11	30.40bc	0.67b	24.20b	10.17de	4.80f	7.42ab	74.00a	40.833c	1.59g
MM-2	24.80c	0.93ab	26.40b	11.40cd	4.98e	7.40ab	75.33a	38.567d	1.64f
MM-5	30.73bc	1.00ab	25.20b	11.83c	5.93a	8.01a	63.67d	43.233b	1.95b
MM-8	39.40a	1.67a	41.47a	20.50a	5.94a	6.20c	72.00b	27.233f	1.98a
CV (%)	13.39	61.42	21.57	5.86	1.41	4.95	1.11	2.28	0.85

Values having common letter(s) in a column do not differ significantly at 5% level as per DMRT

Table 8. Morphological attributes and yield of mungbean genotypes at farmer's field, Magura in 2021

Genotypes	Plant height (cm)	Branch plant^{-1} (no.)	Leaf plant^{-1} (no.)	Pod plant^{-1} (no.)	Seed pod^{-1} (no.)	Seed wt. plant^{-1} (g)	Crop duration (days)	1000 seed wt. (g)	Yield (t ha^{-1})
Binamoog-8	47.87b	0.87a	22.53a	15.53b	11.20a	5.56b	65.33c	32.00e	1.84b
MI-12	54.73a	0.00c	16.67b	11.20cd	10.77a	5.37c	66.00c	44.57a	1.76c
MM-1	49.13ab	0.47b	21.07a	10.53d	11.20a	5.28c	65.67c	44.80a	1.69d
MM-11	46.87b	0.07c	16.20b	10.17d	11.90a	4.87d	73.67a	40.70c	1.58e
MM-2	40.27c	0.67ab	21.13a	11.37cd	11.43a	4.96d	75.33a	38.20d	1.62e
MM-5	45.60bc	0.93a	23.13a	12.10c	11.37a	5.86a	64.00c	42.70b	1.93a
MM-8	45.07bc	0.47b	21.13a	20.47a	10.77a	5.93a	71.33b	26.93f	1.96a
CV (%)	7.07	39.25	11.80	5.60	5.86	1.39	1.65	2.27	1.18

Values having common letter(s) in a column do not differ significantly at 5% level as per DMRT

Table 9. Morphological attributes and yield of mungbean genotypes at BINA Sub-station, Barisal in 2021

Genotypes	Plant height (cm)	Branch plant^{-1} (no.)	Leaf plant^{-1} (no.)	Pod plant^{-1} (no.)	Seed pod^{-1} (no.)	Seed wt. plant^{-1} (g)	Crop duration (days)	1000 seed wt. (g)	Yield (t ha^{-1})
Binamoog-8	49.2b	1.13abc	15.35b	7.91a	10.93bc	5.52b	66.00c	32.97e	1.82b
MI-12	47.367c	0.73bc	11.03c	8.10a	10.73bc	5.32c	64.33cd	44.97a	1.75c
MM-1	48.767b	1.33ab	10.83c	7.81a	10.53c	5.19c	63.67d	45.50a	1.69d
MM-11	43.833d	0.60bc	11.03c	6.91b	10.93bc	4.95d	70.33b	41.07c	1.58f
MM-2	44.2d	0.53bc	11.40c	7.82a	11.00bc	4.90d	71.33ab	39.10d	1.62e
MM-5	46.667c	0.47c	11.38c	8.08a	12.00a	5.97a	63.33d	43.73b	1.94a
MM-8	52.033a	1.80a	18.87a	6.56b	11.27b	5.85a	72.67a	27.53f	1.95a
CV (%)	0.97	49.06	4.25	4.41	3.38	1.80	1.56	1.76	0.72

Values having common letter(s) in a column do not differ significantly at 5% level as per DMRT

CONCLUSION

The highest seed yield was found in MM-8 followed by MM-5 in almost all the locations. But growth duration was lower (63-64 days) in MM-5 than MM-8 (72-73 days). These two mutants may be released as varieties.

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