INNSPUB

International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print), 2222-5234 (Online)
http://www.innspub.net
Vol. 16, No. 2, p. 40-44, 2020

RESEARCH PAPER OPEN ACCESS

Physiological response of mungbean for grain yield and yield components under normal and late planting conditions

Muhammad Imran Khan[1*], Amina Batool[1], Waheed Arshad[1], Ali Nawaz[1], Muhammad Zeeshan[2], Shiraz Ali[2], Manzoor Hussain[2], Ghulam Nabi[2], Saadia[3]

[1]*Barani Agricultural Research Station, Fatehjang, Pakistan*

[2]*Groundnut Research station Attock, Pakistan*

[3]*Gram Breeding Research Sub Station Attock, Pakistan*

Key words: *Vigna radiata*, Sowing dates, Nodulated roots, Growth, Grain yield.

http://dx.doi.org/10.12692/ijb/16.2.40-44 Article published on February 05, 2020

Abstract

Mungbean (*Vigna radiata* L.) is a leguminous crop having capability of fixing atmospheric nitrogen through specific bacteria present in nodulated roots. To study the physiological response of mung bean (*Vigna radiata* L.), an experiment was conducted at Barani Agricultural Research Station, Fatehjang to examine five Mungbean genotypes *viz.*, AZRI Mung 2006, NM 2006, Chakwal Mung 2006, Chakwal Mung 97 and NCM 209 under normal and late sowing dates. Data on mungbean growth, development and grain yield were recorded from twenty randomly selected plants. Among all these varieties, AZRI-Mung 2006 ranked first in terms of yield (715.28 kg/ha) followed by Chakwal Mung 2006 (678.12 kg/ha), NM-2006 (632.45 kg/ha), Chakwal Mung 97 (598.11 kg/ha) and NCM-209 (537.29 kg/ha). Maximum grain yield 687.11 kg/ha was obtained under normal condition as compared to 411.43 kg/ha under late sowing condition. AZRI-Mung 2006 was found consistent under both planting condition while NCM-209 showed sensitivity under late sowing condition.

* **Corresponding Author:** Muhammad Imran Khan ✉ imran.arid1984@gmail.com

Introduction

Mungbean (*Vigna radiate* L.) is grown mainly for its edible seeds which are cooked, fermented, roasted, sprouted and milled. In Pakistan, mungbean seeds like other pulses are split in a mill, separated from the husk, and cooked as "daal". Mungbean is also used in making soups, curries, noodles, bread and sweets; the seeds roasted with spices are also very popular. Mungbean is easily digestible and high in protein which averages 22-24%. Mung bean is one of the important Kharif pulses of Pakistan. It is also grown during spring season mainly in southern Punjab and Sindh province. Punjab is the major mung bean growing province that alone accounted for 88% area and 85% of the total mung bean production. Cultivation is concentrated in the districts of Layyah, Bhakkar, Mianwali and Rawalpindi. It is mainly grown in Kharif season (July-October). Although it is grown in different crop rotations, about 75% cultivation follows mung bean - wheat crop rotation. With the development of short duration and uniform maturing varieties, mung bean can be fitted in various cropping systems. It is also grown during spring season mainly in southern Punjab and Sindh province. Punjab is the major mungbean growing province that alone accounted for 88% area and 85% of the total mungbean production. Besides all other agronomic practices and improved high yielding varieties, proper sowing time in Mungbean crop is most important parameter to obtain maximum yield (Singh *et al.,* 2010; Ali and Gupta, 2012). While low crop yield caused by late sowing may be due to un-favourable environmental conditions (Miah *et al.,* 2009). Specific sowing dates may vary for different Mungbean varieties and ultimately maximum crop yield can be obtained (Reddy, 2009).

Keeping in view, all these factors affecting Mungbean yield, this study was conducted at the station to screen high yielding Mungbean varieties and optimum sowing time to obtain maximum yield of Mungbean crop.

Materials and methods

This study was conducted at Barani Agricultural Research Station, Fatehjang, Attock, Pakistan during kharif season 2017. This experiment was comprised of five Mungbean varieties i.e. AZRI Mung 2006, NM 2006, Chakwal Mung 2006, Chakwal Mung 97 and NCM 209 that were sown at two different sowing dates i.e. 10 July (normal sowing time) and 10 August (late sowing time). The experiment was planned in Randomized Complete Block design with three replications having plot size 4.8 m^2. The temperature range and rainfall during the Kharif season were 40°C to 21°Cand 700 mm respectively. All the standard agronomic practices for Mungbean crop were timely applied after land preparation. Optimum seed rate 20 kg/ha for normal sowing time while 30 kg/ha for late sowing due to rainfed conditions. Three manual weeding were practiced in both normal and late sowing i.e. 15, 30 and 45 days after crop sowing. Data regarding yield related traits were recorded from twenty randomly selected plants from each plot, while grain and straw yield was obtained after harvesting each plot. Analysis of variance for each trait was performed by Statistical Tool (Statistix 8.1) by using Critical difference 5% probability.

Results and discussion

Data regarding various yield related traits in mungbean like plant height (cm), pods per plant, grains per pod and grain yield (kg/ha) were showed in Table 1 under normal and late sowing conditions. The data revealed that mean plant height (42.7 cm) decreases with delay in sowing time as compared to normal planting (58.4 cm). Similar findings were reported by Farz*et al.,* 2006 and Singh *et al.,* 2013 in mungbean. Whereas, mungbean varieties also showed significant variation among themselves regarding plant height (Singh *et al.,* 2010). AZRI-Mung 2006 was found tallest variety (54.3 cm) followed by NM-2006 (50.2 cm), Chakwal Mung 2006 (45.5 cm), and Chakwal Mung 97 (49.2 cm), while lowest plant height was observed in NCM 209 (47.5 cm). Better economic crop yield mainly depends upon duration of photosynthetic process and improved genetic potential of varieties (Reddy 2009). Better plant height leads to more dry matter accumulation and ultimately high grain yield under normal planting

condition (Algan, 2011). Number of pods per plant were also influenced by mungbean varieties and normal and late sowing conditions. Data in the Table 1 revealed that more number of pods per plant were observed under normal sowing (19.4) condition as compared to late planting (12.7) whereas, among mungbean varieties, maximum pods/plant were found in AZRI-Mung 2006 (14.85), followed by NCM 209 (13.21) Chakwal Mung 2006 (13.11) and NM 2006 (12.63). Lowest pods/plant was reported in Chakwal Mung 97 (11.16). Interaction effects for pods per plant were significant in terms of mungbean varieties and different sowing time. Patil *et al.,* 2003 also reported similar findings regarding pods/plant.

Table 1. Effect of sowing dates on growth and yield of Mungbean varieties.

Treatments	Plant height (cm)	Pods per plant	Grains per pod	Grain yield (g/plot)
Sowing dates				
Normal	58.4	19.4	11.2	412.23
Late	42.7	12.7	8.4	275.33
CV (%)	4.1	2.3	1.2	6.4
LSD (0.05)	7.23	4.5	2.7	130.24
Varieties				
AZRI-Mung 2006	54.3a	14.85a	10.2a	423.12a
NM-2006	50.2b	12.63bc	10.6a	405.11b
ChakwalMung 2006	45.5c	13.11b	10.9a	378.31c
ChakwalMung 97	49.2b	11.16c	9.6a	342.18d
NCM 209	47.5bc	13.21b	10.1a	295.21e
CV (%)	5.2	1.4	1.2	5.6
LSD (0.05)	2.47	1.54	4.56	15.26

The results indicated that mungbean varieties did not exhibit any significant variation regarding grains per pods, whereas grains per pod were influenced by sowing time. Normal sowing time resulted in more grains per pod (11.2) and less grains per pod (8.4) in late planting condition. While mungbean varieties showed non-significant range of grains per pod (9.6 to 10.9) which were also discussed by Miah *et al.,* 2009. The data in Table 1 indicated that grain yield (g/plot) obtained under normal condition (412.23) was significantly higher than late planting (275.33). It revealed that crop yield was also affected due to delay in planting date. Mungbean varieties showed significant differences in terms of grain yield like AZRI Mung 2006 (423.12) followed by NM 2006 (405.11), Chakwal Mung 2006 (378.31) and Chakwal Mung 97 (342.18) while lowest grain yield was reported in NCM 209 (295.21). These results revealed that higher grain yield under normal sowing conditions was based on more number of pods/plant and grains/pod (Sarkar *et al.,* 2004).

The results regarding overall grain yield of Mungbean varieties were presented in Table 2. The data revealed that higher grain yield was obtained under normal planting conditions (687.11 kg/ha) as compared to late sowing (411.43 kg/ha). This grain yield data under both sowing conditions revealed that more yield in normal sowing was also based on yield related traits. Similar finding were also reported by Singh *et al.*, 2010 and Singh *et al.,* 2013. Whereas Mungbean varieties showed variations regarding grain yield in which AZRI-Mung 2006 produced maximum grain yield (715.28 kg/ha) followed by NM 2006 (678.12 kg/ha), Chakwal Mung 2006 (632.45 kg/ha) and Chakwal Mung 97 (598.11 kg/ha) while lowest grain yield was reported in NCM 209 (537.29 kg/ha) (Soomro, 2003). This response of Mungbean varieties were also reported by Sadeghipour, 2008.This study revealed thatin order to obtain higher grain yield,

crop growth and development is very important along with efficient use of photosynthesis.

The data regarding biological yield also revealed that normal sowing produced higher biological yield (2632 kg/ha) than under late sowing condition (1972 kg/ha) (Reddy 2009 and Brar *et al.,* 2017).Significant differences were observed in mungbean varieties regarding biological yield like Chakwal Mung 2006 showed higher biological yield (2465 kg/ha) followed by NCM 209 (2321 kg/ha), AZRI mung 2006 (2183 kg/ha), Chakwal Mung 97 (2106 kg/ha) and NM-2006 (2047 kg/ha). Whereas, data regarding straw yield revealed that normal sowing showed higher starw yield (2027 kg/ha) which was significantly different from late sowing (1265 kg/ha), while mungbean varieties also showed variations for straw yield like Chakwal Mung 2006 produced maximum straw yield (1754 kg/ha) followed by NCM 209 (1656 kg/ha), AZRI mung 2006 (1567 kg/ha) and Chakwal Mung 97 (1466 kg/ha) while lowest grain yield was reported in NM 2006 (1408 kg/ha).

Table 2. Effect of sowing dates on grain yield and yield related traits of Mungbean varieties.

Treatments	Biological yield (kg/ha)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index
Sowing dates				
Normal	2632	687.11	2027	1.22
Late	1972	411.43	1265	1.32
CV (%)	9.3	7.1	8.7	1.2
LSD (0.05)	431.21	124.32	321.22	1.43
Varieties				
AZRI-Mung 2006	2183c	715.28a	1567c	1.82a
NM-2006	2047d	678.12b	1408d	1.31a
ChakwalMung 2006	2465a	632.45c	1754a	1.12a
ChakwalMung 97	2106c	598.11d	1466d	0.92a
NCM 209	2321b	537.29e	1656b	1.27a
CV (%)	7.6	9.1	6.9	1.4
LSD (0.05)	80.21	34.17	90.42	0.67

Data regarding harvest index revealed that non-significant variation existed between mungbean varieties. The variety AZRI-Mung 2006 showed maximum harvest index (1.82) followed by NM 2006 (1.31), NCM-209 (1.27), Chakwal Mung 2006 (1.12) while lowest harvest index was reported in Chakwal Mung 97 (0.97).Whereas, late sowing condition showed more harvest index (1.32) as compared to normal planting condition (1.22). This less harvest index observed under normal planting might be due to increased temperature and more rainfall during cropping season (Singh *et al.,* 2010). Similar results regarding harvest index were also reported by Sarkar *et al.,* 2004. The greater biological and grain yield observed in mungbean varieties under normal planting conditions revealed that there is positive relation between growth, development and ultimate yield of varieties (Sadeghipour*et al.,* 2008).

Conclusion

This study was based on two years experiments sown at farm. According to recommendations of study, significant variations were noted for all yield related traits under both normal and late planting conditions. Increase plant height, number of pods per plant, grains per pod under normal sowing condition ultimately resulted in more grain yield in mungbean varieties. Based on present study, it was recommended that to obtain better mungbean production under rainfed areas of Pakistan during kharif season, normal planting time ranges from second week to 3rd week of July would be most

beneficial. Besides planting time, selection of suitable mungbean varieties having disease tolerance and high yielding capacity should also be recommended for rainfed areas of Pakistan. Among these five mungbean varieties that were studied, AZRI Mung 2006, NM 2006 and Chakwal Mung 2006 showed positive association regarding yield related traits under normal planting conditions and these mungbean varieties should be recommended for general cultivation in rainfed areas of Pakistan to improve mungbean yield.

References

Ali M, Gupta S. 2012. Carrying capacity of indian agriculture: Pulse crops. Current Science **102,** 874-881.

Algan N, Celen AE. 2011. Evaluation of mungbean (Vignaradiata L.) as green manure in Aegean conditions in terms of soil nutrition under different sowing dates. African Journal of Agricultural Research **6,** 1744-1749.
http://dx.doi.org/10.5897/AJAR10.486

Brar NS, Kumar A, Kumar B. 2017. Performance of summer mungbean (*Vignaradiata* L.) under different sowing time at farmersfield. International Journal Current Microbiology and Applied Sciences **6(8),** 2211-2219.
https://doi.org/10.20546/ijcmas.2017.608.260

Farz RA, Iqbal J, Bakhsh MAAHA. 2006. Effect of sowing dates and planting pattern on growth and yield of mungbean (Vignaradiata L.). Cv. M-6. International Journal Agriculture and Biology **8,** 63-65.

Miah MAK, Anwar MP, Begum M, JuriamiAS Islam MA. 2009. Influence of sowing date on growth and yield of summer mungbean varieties. Journal Agriculture & Social Science **5,** 73-76.

Patil BL, Hegde VS, Saliath PM. 2003.Studies on genetic divergence over stress and non-stress environment in mungbean. Indian Journal of Geneticsand Plant Breeding **63**, 76-77.

Reddy AA. 2009. Pulses production technology. Status and way forward. Economic & Political Weekly **44,** 73-80.

Sadeghipour O. 2008. Response of mungbean varieties to different sowing dates. Pakistan Journal of Biological Sciences **11,** 2048-50.
http://dx.doi.org/10.3923/pjbs.2008.2048.2050

Sarkar MAR, Kabir MH, Begum M, Salam MA. 2004. Yield performance of mungbean as affected by planting date, variety and plant density. Journalof Agronomy **3**, 18-24.
http://dx.doi.org/10.3923/ja.2004.18.24

Singh, Guriqbal, Sekhan HS, Hari Ram, Gill KK, Sharma P. 2010. Effect of date of sowing on nodulation, growth, thermal requirement and grain yield of kharifmungbean genotypes. Journal of Food Legumes **23,** 132-134.

Singh AK, Kumar P, Chandra N. 2013. Studies on seed production of mungbean (*Vignaradiate*) sown at different dates. Journal of Environmental Biology **34,** 1007-1011.

Soomro NA. 2003. Response of mungbean genotypes to different dates of sowing in kharif season under rainfed condition. Asian Journalof Plant Sciences **2**, 377-379.
http://dx.doi.org/10.3923/ajps.2003.377.379