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Yield performance of mungbean varieties under different sowing dates

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ABSTRACT

In order to investigate the effect of different sowing dates on yield of mungbean varieties, field experiments were conducted at Research farm of CCSHAU Regional Research Station; Rohtak during kharif 2021 and 2022. The soil of the experimental field was sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen, medium in available phosphorus and high in available potassium. The experiment was laid out in split plot design with three dates of sowing viz. 25th June, 10th July and 25th July in main plot and four varieties viz. MH1142, MH 318, MH 421 and MH 1703 in sub plot replicated thrice. Overall results depicted that mungbean sown on 25th June took significantly higher number of days to attain flowering and maturity as compared to delayed sowing of 25th July. Mungbean sown on 25th June produced taller plants with higher number of branches /plant, number of pods /plant, number of seeds/ pod and biological yield. The crop sown on 25th June being at par with 10th July produced significantly higher seed yield than 25th July sown mungbean. Different mungbean varieties failed to influence days taken to flowering, but mungbean varieties MH 1703 and MH 1142 took higher number of days to attain maturity while MH 318 took least number of days to attain maturity. Among all the mungbean varieties tallest plants were recorded in MH 1142 (51 cm) which was significantly taller than rest three varieties. The number of pods /plant was recorded highest in mungbean variety MH 1142 which was significantly higher than MH 1703 but at par with mungbean variety MH 318. However, number of branches /plant, yield attributes (Number of seeds/ pod and 100 seed wt) and seed yield were significantly higher in mungbean variety MH 1703 followed MH 1142 while mungbean variety MH 318 recorded lowest seed yield. Highest biological yield and harvest index was observed in variety MH 1703. Delayed sowing of MH 1703 from 25th June to 10th July reduced the seed yield by 3.10 % and to 25th of July by 6.76 %.

Key words: *Mungbean, Sowing date, Varieties, Phenology, Yield*

Introduction

Mungbean (*Vigna radiata L.*) is a leguminous pulse crop which provide food for humans and feed for livestock, along with providing these benefits legume crops also improve soil fertility (Baddeley *et al*., 2013). It contains isoflavonoids having estrogen and antioxidant activities that is used in prevention of many diseases such as cancer; it also exhibits antimicrobial and insecticidal activities (Sheteawi and Tawfik, 2007). Mungbean can also avert land degradation and improves crop production and livestock rearing while sustaining the ecosystem (Chattha *et al*., 2017).

In the changing scenario of different abiotic and biotic stress, the agronomic practices must be optimized for ensuring the higher yield (Hassan *et al*., 2020). Agro-ecological conditions play a major role

in the determination of sowing time of mungbean. Similarly, optimum sowing date in mungbean may vary from variety to variety (Sarkar *et al.,* 2004). Planting time and biofertilizer inoculation is of paramount importance and it has a significant effect on growth, development and yield of legumes (Asghar *et al.,* 2006; Rani *et al.,* 2016; Muhsin *et al*., 2021 and Shweta *et al.,* 2021). The sowing date of mungbean significantly varies among varieties; so proper sowing times should be adopted in order to get higher productivity. The early sowing enhances final yield and biomass production owing to an increase in grain weight and other production traits. The decrease in the growth cycle due to late sowing reduced the interception of radiations that decreases the accumulation of total dry matter and consequently leads to poor yield (Vega and Hall, 2002). Selection of the cultivar and appropriate sowing date is very essential to attain yield (Jan *et al.,* 2002). Different varieties of mungbean respond differently to sowing dates and growing season. Thus, for different varieties of mungbean there should be varied optimum sowing dates. After identifying high yielding cultivars, sowing at optimum dates can result in higher yields (Ali and Gupta, 2012). Therefore, the present study was conducted to determine the effect of variable sowing dates and varieties on performance of mungbean.

Materials and Methods

Field experiments were carried out during *kharif* season of 2021 and 2022 at Research farm of Chaudhary Charan Singh Haryana Agricultural University Regional Research Station, Rohtak. The goal of this experiment was to investigate the effect of four different varieties of mungbean and date of sowing on phenology, growth and yield parameters of mungbean. The experiment was laid out in split plot design with three date of sowing viz. 25th June, 10th July and 25th July in main plot and four varieties viz. MH1142, MH 318, MH 421 and MH 1703 in sub plot replicated thrice. The climate of Rohtak (28°40' N latitude and 76° 13' E longitude) is classified as subtropical monsoon, mild and dry winter, hot summer and sub-humid which is mainly dry with very hot summer and cold winter except during monsoon season when moist air of oceanic origin penetrates into the area. The hot weather season starts from mid March to last week of the June followed by the South West monsoon which lasts up to September. The transition period from September to November forms the post monsoon season. The normal annual rainfall in Rohtak district is about 592 mm spread over 23 days. The South West monsoon sets in the last week of June and withdraws towards the end of September and contributes about 84% of the annual rainfall. July and August are the wettest months. 16% of the annual rainfall occurs during the non monsoon months in the wake of thunder storms and western disturbances. The soil nitrogen and phosphorus status before sowing was 123 kg N and 18.62 kg P_2O_5 ha^{-1} respectively. Experimental field was prepared thoroughly by ploughings two times and one planking followed by pre-sowing irrigation. Four mungbean varieties as per treatment were sown on 25th June, 10th July and 25th July 2021. Full dose of phosphorus and nitrogen were applied as basal dose at the time of sowing. The other agronomic practices from sowing to till the crop harvesting like irrigation, insect-pests control and weed control measures were done as per recommended package of practices of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The phenophases like flowering and maturity of all the four mungbean varieties sown at different dates were noted by regular field inspection method. Data on five randomly selected tagged plants from each plot in each replication were recorded on different quantitative characters viz. Plant height (cm), number of branches/ plant, pods/ plant, seeds/pod and 100 seed weight. For recording test weight of mungbean grain samples were taken from the produce of each treatment and 100 grains were counted and were dried in oven at 60 ^{o}C for 48 hours. After drying, they were weighed and mean weight of 100 grains was noted as test weight.

Results and Discussion

Effect on phenology

The critical analysis of data in Table 1 reveal that significant effect of date of sowing was observed on occurrence of various phenophases of mungbean varieties. Mungbean sown on 25th June took significantly higher number of days to attain flowering and maturity as compared to delayed sowing of 25th July. Various mungbean varieties failed to influence days taken to flowering. But Mungbean varieties MH 1703 and MH 1142 took higher number of days to attain maturity while MH 318 took least number

of days to attain maturity which might be attributed to the differences in their genetic makeup. The differential behaviour of varieties of mungbean in relation to their maturity period appears to be genetically governed. Siddique *et al.* (2006) also reported variation in days taken to maturity in different mungbean genotypes. These results are in conformity with the findings of Sethi *et al.* (2016).

Effect on growth parameters

The data pertaining to growth parameters of mungbean under different treatments is presented in Table 1. Perusal of data reveals that mungbean sown on 25th June produced taller plants with higher number of branches /plant. The reason for increased *plant height* in early *sown crop* may be the enhanced vegetative development of crops due to favourable weather conditions.

With the delay in sowing, significant reduction in plant height was observed which might be due to delayed germination and early maturity of the crop. Sethi *et al.* (2016) also reported reduction in plant height with the delay in sowing time of chickpea. Among all the mungbean variety tallest plants were recorded in MH 1142 (51 cm) which was significantly taller than rest three varieties. However number of branches /plant was significantly higher in mungbean variety MH 1703 followed MH 1142. Variation in number of branches per plant and plant height among varieties is mostly due to the differences in their genetic makeup.

Effect on yield attributes and yield

Perusal of data in Table 2 reveals that mungbean

Table 1. Effect of different date of sowing on phenology and growth of mungbean varieties

Treatments	Days to flowering (DAS)	Days to maturity (DAS)	Plant height (cm)	Number of branches / plant	Number of Pods / plant
Date of sowing					
25th June	37	62	44	3.33	25
10th July	36	61	43	2.66	24
25th July	34	59	39	2.66	23
S. Em±	0.40	1.25	1.31	0.06	0.72
C.D. (P=0.05)	1.27	3.79	3.42	0.20	2.07
Variety					
MH 1703	37	62	40	3.33	25
MH 318	34	59	39	3.00	24
MH 421	36	60	41	2.33	22
MH 1142	35	62	48	2.66	25
S. Em±	0.45	0.88	1.12	0.05	0.78
C.D. (P=0.05)	NS	2.70	3.35	0.15	2.35

Table 2. Effect of different date of sowing on yield traits of mungbean varieties

Treatments	Number of Seeds/ pod	100 seed wt (g)	Seed Yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)
Date of sowing					
25th June	9.96	4.31	1023	3989	25.65
10th July	9.84	3.75	1014	3796	26.71
25th July	9.60	4.15	951	3879	24.52
S.Em±	0.28	0.31	2.98	33.11	0.40
CD (P=0.05)	NS	0.94	9.05	99.83	1.22
Variety					
MH 1703	10.24	4.33	1059	3970	26.68
MH 318	9.46	3.81	952	3935	24.21
MH 421	9.34	4.29	951	3753	25.34
MH 1142	10.16	3.85	1021	3894	26.23
S.Em±	0.32	0.26	4.45	29.90	0.38
CD (P=0.05)	NS	0.81	13.38	91.24	1.45

sown on 25th June recorded higher number of pods /plant and number of seeds/ pod of mungbean varieties. The reason for better yield attributes in early *sowing* may be the enhanced vegetative development of crops due to favourable weather conditions. Among all the sowing dates 100 seed weight of mungbean was recorded highest in 25th June sown crop. Similarly, the crop sown on 25th June being at par with 10th July produced 7.57 % higher seed yield than 25th July sown mungbean. Biological yield was recorded highest in 25th June sown crop (3989 kg ha^{-1}) which was significantly higher than rest two sowing dates. Harvest index was also affected significantly by date of sowing. It varies from 24.52to 25.65 % and was highest in 10th July sown crop.

A close look of the pooled data in Table 1 reveals that mungbean varieties differed significantly among themselves in respect of yield contributing characters and yield (Table 1 and 2). Mungbean variety MH 1703 was ranked first in terms of seed yield followed in order of MH 1142, MH 421 and MH 318. The number of pods /plant was recorded highest in mungbean variety MH 1142 which was significantly higher than MH 1703 but at par with mungbean variety MH 318. Yield attributes (Number of seeds/ pod and 100 seed wt) and seed yield were significantly higher in mungbean variety MH 1703 followed MH 1142. Genotypic variation in 100-seedweight was also observed by Borah (1994) among 15 genotypes in mungbean. Mungbean variety MH 421 being at par with MH 318 recorded lowest seed yield which was the consequence of lowest numbers of pods/plant, number of seeds/ pod and lower 100-seed weight. Among all the mungbean varieties, highest harvest index was observed in MH 1703 (26.68 %) which was at par with MH 421 and MH 1142 but significantly higher than MH 318. Similarly Siddique *et al*. (2006) reported that mungbean varieties differed significantly in yield related traits resulting in seed yield differences. The differences among the varieties might be due to their genetic constituents. These findings closely resembles to those obtained by Siddique *et al.* (2006), Mondal (2004) and Patil *et al.* (2003).

Interaction effect of date of sowing and varieties on seed yield

A perusal of data (Table 3) indicates the significant interaction between date of sowing and varieties on the seed yield of mungbean. With all the varieties, delay in sowing reduced the seed yield of mungbean. Delay in sowing time significantly reduced the seed yield of all the mungbean varieties. In case of 25th June date of sowing, mungbean variety, MH 1703 (1095 kg ha^{-1}) recorded higher seed yield followed by mungbean variety MH 1142 (1032 kg ha^{-1}). Similarity mungbean variety MH 1173 (1061 kg ha^{-1}) being at par with MH 1142 (1055 kg ha^{-1}) recorded highest seed yield when sown on 10th July.

Lowest seed yield under late sown condition (25th July) was recorded in mungbean variety MH 318 (891 kg ha^{-1}) followed by mungbean variety MH 421 (914 kg ha^{-1}). Seed yield reduction with delay in sowing was comparatively higher in variety MH 318 where 8.52 % lesser seed yield was recorded when sowing was delayed from 10th July to 25th July. In mungbean variety MH 1142 seed yield reduction due to delayed sowing from 10th July to 25th July was 7.98 % and in MH 1703 it was only 3.91 %. Mungbean variety MH1703 at all the dates of sowing recorded highest seed yield. In 25th June and 10th July sowing dates lowest seed yield was recorded in MH 421 and in 25th July sown crop lowest yield was recorded in MH 318.

Conclusion

Overall, the study suggests that mungbean should be sown upto 10th July to get the maximum produc-

Table 3. Interaction effects of date of sowing on seed yield (kg ha^{-1}) of mungbean varieties

Date of sowing	Varieties				
	MH 1703	MH 318	MH 421	MH 1142	Mean
25th June	1095	991	974	1032	1023
10th July	1061	974	965	1055	1014
25th July	1021	891	914	977	951
Mean	1059	952	951	1021	

C.D. (p =0.05) Variety at same level of date of sowing = 12.23
C.D. (p =0.05) Date of sowing at same level of variety = 14.76

tion as mungbean sown on 25th June being at par with 10th July produced 7.57 % higher seed yield than 25th July sown crop. Among varieties, MH 1703 appears to be well adapted to the agro-ecological conditions of the Rohtak district and yielded 3.72 %, 11.24 % and 11.35 % higher seed yield than MH1142, MH 318 and MH421 respectfully. Delayed sowing of MH 1703 from 25th June to 10th July reduced the seed yield by 3.10 % and to 25th of July by 6.76 %.

Conflict of Interest- None

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