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Effect of Sowing Dates on Yield and Yield Components of Mashbean Varieties

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Abstract: All the parameters i.e., days to emergence, days to flowering, days to physiological maturity, number of pods per plant, number of seeds per pod, 100-seeds weight, biological yield, grain yield were significantly affected by sowing dates. Less days to emergence (6.6), less days to flowering (40) and less days to physiological maturity (75.7) were recorded. Biological yield was maximum for June 15 (6000 kg ha^{-1}) followed by July 01(5439 kg ha^{-1}). Number of pods per plant, number of seeds per pod, 100-seeds weight (g), grain yield (kg ha^{-1}) got highest value of 30.2, 5.1, 4.26 and 825 respectively for July 01 sowing. Effect of the various mashbean varieties was significantly different for number of pods per plant, number of seeds per pod, biological yield and grain yield. Among these parameters highest number of pods per plant (20.6) for NARC Mash-1, higher number of seeds per pod (4.9) for NARC Mash-3, greatest biological yield (4400 kg ha^{-1}) for NARC Mash-4 and more grain yield (557.1 kg ha^{-1}) for NARC Mash-1. Interaction between varieties and sowing dates did not significantly affect any parameter. It may be concluded that July 01 sowing date and NARC Mash-1 variety appeared to be suitable for irrigated condition of Peshawar valley.

Key words: Mashbean, sowing dates, varieties, yield components, yield

Introduction

Mashbean (Urd) or black gram [*Vigna mungo* (L.) Hepper] belongs to family Leguminoseae and is widely cultivated in Pakistan. Being leguminous, it demands less nitrogen fertilizer, and it fits well in different crop rotation systems to maintain the fertility level of the soil. Rapid population growth and low production especially of legumes and cereals have enhanced the problem of food scarcity. Potential yield of mashbean can be achieved through optimum use of inputs and agronomic practices. Among the various agronomic practices, optimum sowing date and best variety are of primary importance for potential yield.

Chaudhary *et al.* (1989) reported that delay in sowing on successive dates decreased yields and 100-seeds weight. Reddy *et al.* (1991) reported that urdbeans (*Vigna mungo*) Cv. T9, UG 218, PU 19 and PU 30 produced mean seed yields of 0.64, 0.63, 0.17 and 0.05 t ha^{-1} when sown at the beginning of July, mid July, the end of July and mid August, respectively. Yield averaged 0.04-0.41, 0.03-0.25 and 0.09-1.29 t ha^{-1} in 1985, 1986 and 1987, respectively; differences between years were attributed to the amount and distribution of rainfall. Renganayaki and Sreerengasamy (1992) evaluated twenty black gram [*Vigna mungo*] genotypes grown during summer at Coimbatore. Highest yielding varieties were Agra Black and M12/3 (6.12 and 7.55 g $plant^{-1}$, respectively). Chaudhury *et al.* (1994) observed *Vigna mungo* cultivars, delaying sowing after 6 July decreased seed yield. Cv. Type 9, UG 218, Pant U 19 and UPU 9-40-4 gave mean seed yields of 0.84, 0.82, 0.83 and 0.75 t ha^{-1}, respectively. UG 218 gave the tallest plants whereas Type 9 had the highest number of trifoliate leaves and gave the highest DM per plant. Kasundra *et al.* (1995), reported maximum pods $plant^{-1}$, clusters $plant^{-1}$, pods $cluster^{-1}$, seeds pod^{-1}, pod length, 100-seeds weight and seed yield for beginning of July than end of July.

Mittal (1999) considering both the reduced disease incidence and increased yield, the second fortnight in June is proposed as the optimum time for sowing black gram in the region. Amanullah and Hatam (2000) planted ten black bean (*Vigna mungo*) germplasm lines and reported significant variation for yield and yield components. Naeem *et al.* (2000) reported variation in plant height, biological yield, pods per plant, seeds per pod, 100-grains weight and harvest index for various *Vigna mungo* cultivars. Sharma *et al.* (2000) remarked wide variability among various lines cultivars: some of them were superior to the check(s) for different character(s); he further reported that days to emergence, days to flowering, days to maturity, yield and yield components were different for various date of sowing. Singh and Singh (2000) reported that grain yield and N uptake were higher in plants sown on 24 July than that of 29 August; he also reported disparity in varieties. Patel and Munda (2001) evaluate the growth pattern and yield potential of five cultivars (T-9, PU-19, PDU-1, DPU-88-1 and DPU-88-31) of black gram. The number of pods per plant was highest with T-9 (47.6) and lowest in PU-19 (33.3).

Keeping in view the importance of these factors a field experiment was conducted with the aim to identify suitable sowing date and best mashbean variety under irrigation conditions.

Materials and Methods

An experiment to evaluate the effect of sowing dates on agronomic traits and yield of mashbean [*Vigna mungo* (L.) Hepper] varieties was conducted at Malakandher Research Farm during summer 2001. The crop was sown under normal irrigated conditions. A basal dose of DAP was applied @ 100 Kg ha^{-1}. The experiment was laid out in RCB design with split plot arrangements. Sowing dates were allotted to main plots and varieties were allotted to sub plots. Each sub plot consisted of 8 rows 5 m long, with row-to-row spacing of 37.5 cm, seeded at the rate of 30 kg ha^{-1}. The sowing was done on six different dates started from June 01 to August 15 with 15 days interval i.e., June 01 and 15; July 01 and 15; August 01 and 15. Four varieties namely NARC Mash-1, NARC Mash-2, NARC Mash-3 and NARC Mash-97 were included in the experiment. Observations were recorded days to emergence, days to flowering, days to physiological maturity, number of pods per plant, number of seeds per pod, 100-seeds weight, biological yield and grain yield.

Results and Discussion

Days to emergence: Data regarding days to emergence (Table 1) shows that with delay in sowing emergence enhanced. Maximum days to emergence (8.8) were recorded for June 01, and minimum days to emergence (6.6) for August 01 (Sharma *et al.*, 2000).

Days to 50 % flowering: Maximum days to 50 % flowering (62.2) were recorded for June 01, and minimum days to 50 % flowering (40) for August 01 (Table 2). Flowering was enhanced as the sowing was delayed and also early sowing had late flowering and the seed sown on August 15 do not flowered (Sharma *et al.*, 2000).

Days to physiological maturity: Maximum days to physiological maturity (98.7) were recorded for June 01 and minimum days to physiological maturity (75.7) for August 01 (Table 3). Early physiological maturity was noticed with late sown plots. There were no significant differences among various varieties and interaction of sowing dates with varieties.

Number of pods per plant: Maximum number of pods per plant (30.2) was recorded in plots sown on July 01, while minimum number of pods per plant (9.4) for August 01 sowing (Table 4). These results are in likeness with that of Kasundra *et al.* (1995).

Table 1: Days to emergence of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	8.2	8.5	9.0	9.5	8.8a
June 15	8.0	8.2	8.5	8.2	8.2a
July 01	7.0	7.2	7.0	6.7	7.0b
July 15	6.5	7.7	6.2	7.0	6.8b
August 01	6.75	7.0	6.0	6.5	6.6b
August 15	7.0	6.7	6.5	7.5	6.9b
Means	7.2	7.5	7.2	7.6	

LSD value (0.05) for sowing dates = 0.6655

Table 2: Days to 50% flowering of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	62.2	62.0	62.5	62.2	62.2a
June 15	60.0	59.0	58.2	58.0	58.8b
July 01	48.2	49.5	48.2	48.7	48.7c
July 15	44.7	45.0	43.5	45.2	44.6d
August 01	40.2	40.5	39.0	40.2	40.0e
August 15*	-	-	-	-	-
Means	51.1	51.2	50.3	50.9	

LSD value (0.05) for sowing dates = 1.34

Table 3: Days to physiological maturity of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	99.0	99.0	97.5	99.2	98.7a
June 15	91.0	89.5	89.2	88.7	89.6b
July 01	84.5	82.5	84.5	83.7	83.8c
July 15	77.0	77.7	78.0	77.7	77.6d
August 01	76.5	75.0	77.2	74.0	75.7e
August 15*	-	-	-	-	
Means	85.60	84.75	85.30	84.70	

LSD value (0.05) for sowing dates = 1.11

Table 4: Number of pods per plant of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	14.5	11.5	12.5	12.7	12.8c
June 15	23.5	18.7	20.2	24.5	21.7b
July 01	32.2	27.7	29.5	31.2	30.2a
July 15	23.2	20.2	21.7	23.0	22.1b
August 01	9.7	7.7	10.0	10.2	09.4d
August 15*	-	-	-	-	-
Means	20.6 a	17.2 c	18.8 b	20.3 a	

LSD value (0.05) for sowing dates = 1.72 and for varieties = 1.52

Table 5: Number of seeds per pod of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	4.2	3.8	4.5	4.7	4.1c
June 15	4.9	4.3	4.7	4.5	4.6b
July 01	5.2	4.5	5.3	5.5	5.1a
July 15	4.8	4.6	5.0	4.8	4.8b
August 01	4.6	4.4	5.1	4.8	4.7b
August 15*	-	-	-	-	-
Means	4.8a	4.3b	4.9a	4.9a	

LSD value (0.05) for sowing dates = 0.23 and for varieties = 0.31

Table 6: 100-seeds weight (g) of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	4.00	3.88	3.70	3.74	3.83b
June 15	4.32	4.29	4.04	4.32	4.24a
July 01	4.42	4.26	4.26	4.10	4.26a
July 15	3.95	3.97	3.73	3.85	3.87b
August 01	2.70	2.39	2.66	2.94	2.67c
August 15*	-	-	-	-	-
Means	3.88	3.76	3.68	3.79	

LSD value (0.05) for sowing dates = 0.2399

Table 7: Biological yield (kg ha^{-1}) of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	4639.7	4472.7	5147.8	5140.1	4850c
June 15	6146.1	5683.2	6100.2	6069.0	6000a
July 01	5927.4	4835.3	5467.2	5528.0	5439b
July 15	4409.7	3677.8	4479.8	4852.8	4355d
August 01	3344.7	2765.0	2932.4	3114.6	3039e
August 15	1764.3	1973.0	1762.3	1696.5	1790f
Means	4372.0a	3901.0b	4309.0a	4400.0a	

LSD value (0.05) for sowing dates = 449.5 and for varieties = 298.0

Table 8: Grain yield (kg ha^{-1}) of mashbean varieties as affected by planting dates

Planting dates	Varieties				
	Mash-1	Mash-2	Mash-3	Mash-97	Means
June 01	344.5	251.7	310.2	303.8	302.5c
June 15	634.1	472.5	508.3	588.3	550.0b
July 01	927.0	689.5	813.8	869.9	825.0a
July 15	567.5	452.9	572.2	569.5	540.5b
August 01	312.6	287.3	240.1	272.2	278.1c
August 15*	-	-	-	-	-
Means	557.1a	430.8c	489.0b	520.8ab	

LSD value (0.05) for sowing dates = 80.35 and for varieties = 40.04
*: At this date the crop do not flowered, so the data of flowering and flowering related data would be missing
Means followed by different letters differ significantly at $P < 0.05$

Among the varieties highest number of pods per plant (20.6) were recorded for NARC Mash-1 followed by 20.3 pods per plant for NARC Mash-97. Minimum of 17.2 pods per plant were recorded for NARC Mash-2. This might be due to differences in genetic potential of varieties as Ahmad *et al.* (2000) also recorded variation among different varieties.

Number of seeds pod^{-1}: Sowing dates and varieties significantly influenced number of seed per pod (Table 5). Seed pod^{-1} showed almost the similar pattern as was observed for pods plant^{-1} as seed pod^{-1} decreased before and after July 01 sowing. Maximum number of seeds per pod (5.1) was recorded in plots sown on July 01while minimum number of seeds per pod (4.3) for June 01 sowing (Kasundra *et al.*, 1995). Among the varieties maximum number of seeds per pod (4.94) was recorded for NARC Mash-3 while minimum number of seed per pod (4.3) for NARC Mash-2. The variation in varieties for number of seed per pod is confirmed by Patel and Munda (2001) who evaluated five cultivars of mashbean and found that there was difference in number of seed per pod.

100-seeds weight: Sowing dates were significantly affected by 100-seeds weight. Maximum 100-seeds weight of 4.26 g was

recorded for July 01 sowing, and minimum of 2.67 g for August 01 sowing(Table 6). These results is in conformity with that of Chaudhary *et al.* (1989) who observed decrease in 100-seeds weight with delay in sowing. Mashbean varieties did not show any considerable difference for 100-seeds weight. The interaction of sowing dates with mashbean varieties was also non significant.

Biological yield: Various planting dates and varieties significantly influenced the biological yield while their interaction was non significant (Table 7). Plots sown on June 15 resulted in highest biological yield of 6000 kg per hectare. As sowing was delayed, biological yield also decreased. The lowest biological yield (1790 kg ha^{-1}) was noted in plots sown on August 15. The probable reason for it could be that early-planted crop had sufficient time for its growth and development. NARC Mash-97 gave maximum biological yield (4400 kg ha^{-1}) although it was at par with NARC Mash-1 (4372 kg ha^{-1}) and NARC Mash-3. Minimum biological yield (3901 kg ha^{-1}) was for NARC Mash-2. These differences can be related to the genetic potential of the varieties as confirmed by Chaudhury *et al.* (1994).

Grain yield: Grain yield (Table 8) followed the pattern those observed in pods $plant^{-1}$, seed pod^{-1} as grain yield decreased in both before and after July 01 sowing. Planting dates and varieties significantly influenced the grain yield. The highest grain yield of 825 kg ha^{-1} was recorded in plots sown on July 01. Sowing before and after July 01, decreased grain yield. The lowest grain yield (278.1 kg ha^{-1}) was observed in plots sown on August 15, which was at par with yield of August 01 (302.5 kg ha^{-1}). The results reported by Reddy *et al.* (1991) and Mittal (1999) also support July 01, as an optimum sowing date for maximum yield of the crop. NARC Mash-1 produce maximum grain yield (557.1 kg ha^{-1}) followed by NARC Mash-4 (520.8 kg ha^{-1}) and minimum grain yield (430.8 kg ha^{-1}) was for NARC Mash-2. Differences in production potential for different varieties are supported by Renganayaki and Sreerengasamy (1992), Amanullah and Hatam (2000) and Sing and Sing (2000). Sowing dates with mashbean varieties interacted non-significantly.

In conclusion, July 01 sowing date and NARC Mash-1 variety is appropriate for irrigated condition of Peshawar valley and comparable environment everywhere.

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