Research Article

Optimizing Mung Bean (*Vigna radiata* L.) Productivity: Cultivar Performance and Sowing Date Effects on Yield and Agronomic Traits

Maliha Habib[1], Muhammad Iqbal Jakhro[2*], Saba Habib[3] and Mukesh Kumar Soothar[4]

[1]Department of Botany, Sardar Bahadur Khan Women's University, 87300, Quetta, Pakistan; [2]PARC-Balochistan Agriculture Research and Development Centre (BARDC), Quetta, 87300, Pakistan; [3]Department of Chemistry, Sardar Bahadur Khan Women's University, Quetta, 87300, Pakistan; [4]College of Natural Resources and Environment, Northwest AandF University, Yangling, Shaanxi 712100, China.

Received | July 10, 2025; **Accepted** | August 14, 2026; **Published** | November 02, 2026
***Correspondence** | Muhammad Iqbal Jakhro, PARC-Balochistan Agriculture Research and Development Centre (BARDC), Quetta, 87300, Pakistan; **Email:** mijakhro@parc.gov.pk, iqbal.jakhro@gmail.com
Citation | Habib, M., M.I. Jakhro, S. Habib and M.K. Soothar. 2026. Optimizing mung bean (*Vigna radiata* L.) productivity: Cultivar performance and sowing date effects on yield and agronomic traits. *Pakistan Journal of Agricultural Research,* 39(4): 62-71.
DOI | https://dx.doi.org/10.17582/journal.pjar/2026/39.4.62.71
Keywords | Agro-climatic, Comparative analysis, Growth and yield, Mung bean, Sowing schedule, Yield attributes

Copyright: 2026 by the authors. Licensee ResearchersLinks Ltd, England, UK.
This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

Supplementary Table S1A: *Mean data of plant population plot^{-1} of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	565.3	566.3	568.7	563.0	566.3	565.9 a
Bahawalpur	562.7	565.0	564.3	562.3	563.7	563.6b
NM -11	558.7	558.0	560.0	561.7	558.3	559.3 c
Mean	562.2	563.1	564.3	562.3	562.8	

Source	SE±	LSD 0.05	CV
Varieties (A)	1.5362	3.2045	----
Sowing Dates (B)	3.1970	----	1.20
Interaction	3.4351	----	0.75

Supplementary Table S1B: *Analysis of variance for plant population per plot^{-1} as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	89.38	44.689		
Sowing date	4	25.91	6.478	0.14	0.9621
Error replication x sowing date	8	367.96	45.994		
Varieties	2	336.04	168.022	9.49	0.0013
Sowing date x Varieties	8	66.62	8.328	0.47	0.8625
Error	20	354.00	17.700		
Total	44	1239.91			

Supplementary Table S2A: *Mean data of plant height of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	29.1	32.6	28.1	26.8	26.7	28.7 a
Bahawalpur	27.1	29.9	26.0	25.0	25.1	26.6 b
NM -11	24.4	27.6	24.1	23.1	22.7	24.4 c
Mean	26.9 b	30.0 a	26.1 b	25.0 c	24.8 c	

Source	SE±	LSD 0.05	CV
Varieties (A)	0.3203	0.6681	----
Sowing Dates(B)	0.3428	0.7905	2.72
Interaction	0.7162	----	3.30

Supplementary Table S2B: *Analysis of variance for plant height (cm) affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	0.716	0.3582		
Sowing date	4	160.158	40.0394	75.72	0.0000
Error replication x sowing date	8	4.230	0.5288		
Varieties	2	138.359	69.1796	89.92	0.0000
Sowing date x Varieties	8	2.201	0.2751	0.36	0.9308
Error	20	15.387	0.7693		
Total	44	321.051			

Supplementary Table S3A: *Mean data of pods per plant of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	16.0	17.7	15.2	14.4	13.3	15.3 a
Bahawalpur	13.5	14.5	12.8	12.4	11.7	14.1 b
NM -11	14.8	16.3	13.8	13.3	12.5	13.0 c
Mean	14.8 b	16.2 a	13.9 c	13.4 d	12.5 e	

Source	SE±	LSD 0.05	CV
Varieties (A)	0.1571	0.3277	----
Sowing Dates(B)	0.1835	0.4232	2.75
Interaction	0.3513	----	3.04

Supplementary Table S3B: *Analysis of variance for number of pods per plant^{-1} as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	0.052	0.0260		
Sowing date	4	69.774	17.4436	115.10	0.0000
Error replication x sowing date	8	1.212	0.1516		
Varieties	2	41.076	20.5380	110.95	0.0000
Sowing date x Varieties	8	2.375	0.2969	1.60	0.1861
Error	20	3.702	0.1851		
Total	44	118.192			

Supplementary Table S4A: *Mean data of pods size of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	7.7	7.9	7.3	6.6	6.5	7.2 b
Bahawalpur	7.2	7.7	6.9	5.8	5.8	6.7 c
NM -11	8.4	9.0	8.0	7.5	7.5	8.1 a
Mean	7.8 b	8.2 a	7.4 c	6.6 d	6.6 d	

Source	SE±	LSD 0.05	CV
Varieties (A)	0.0860	0.1794	----
Sowing Dates(B)	0.0967	0.2229	2.80
Interaction	0.1923	----	3.21

Supplementary Table S4B: *Analysis of variance for pods size (cm) as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	0.03820	0.01910		
Sowing date	4	0.22652	0.05663	1.38	0.3227
Error replication x sowing date	8	0.32824	0.04103		
Varieties	2	1.72243	0.86122	11.16	0.0006
Sowing date x Varieties	8	0.07561	0.00945	0.12	0.9976
Error	20	1.54309	0.07715		
Total	44	3.93410			

Supplementary Table S5A: *Mean data of seed index of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	4.6	4.8	4.6	4.5	4.6	4.6 b
Bahawalpur	5.0	5.1	5.0	4.9	4.9	5.0 a
NM -11	4.5	4.6	4.5	4.3	4.6	4.5 b
Mean	4.7	4.8	4.7	4.6	4.7	

Source	SE±	LSD 0.05	CV
Varieties (A)	0.1014	0.2116	----
Sowing Dates(B)	0.0955	----	4.30
Interaction	0.2268	----	5.90

Supplementary Table S5B: *Analysis of variance for seed index (100 weight) as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	13262	6631		
Sowing date	4	1501162	375291	100.49	0.0000
Error replication x sowing date	8	29877	3735		
Varieties	2	1484007	742004	102.47	0.0000
Sowing date x Varieties	8	26287	3286	0.45	0.8738
Error	20	144830	7241		
Total	44	3199425			

Supplementary Table S6A: *Mean data of biological yield of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	2818.0	3165.4	2744.2	2587.7	2596.7	2782.4 a
Bahawalpur	2617.7	2894.1	2519.4	2414.2	2423.1	2573.7 b
NM -11	2338.4	2640.7	2311.4	2221.9	2176.9	2337.9 c
Mean	2591.3b	2900 a	2525 b	2407.9c	2398.9c	

Source	SE±	LSD 0.05	CV
Varieties (A)	31.073	64.817	----
Sowing Dates(B)	28.808	66.432	2.38
Interaction	69.481	----	3.32

Supplementary Table S6B: *Analysis of variance for biological yield (kg ha^{-1}) as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	0.1080	0.05400		
Sowing date	4	17.5569	4.38922	104.37	0.0000
Error replication x sowing date	8	0.3364	0.04206		
Varieties	2	14.2720	7.13600	128.71	0.0000
Sowing date x Varieties	8	0.6858	0.08572	1.55	0.2038
Error	20	1.1089	0.05544		
Total	44	34.0680			

Supplementary Table S7A: *Mean data of seed yield of three mung bean cultivars evaluated during the year under five different sowing dates at ARI Quetta.*

Varieties	T1	T2	T3	T4	T5	Mean
AZRI-06	782.4	868.9	747.7	701.2	653.2	750.7 a
Bahawalpur	658.7	708.8	624.8	603.2	572.1	633.5 c
NM -11	715.3	785.0	668.5	644.6	605.4	683.7 b
Mean	718.8b	787.6a	680.3c	649.6d	610.2e	

Source	SE±	LSD 0.05	CV
Varieties (A)	8.4487	17.624	----
Sowing Dates(B)	10.304	23.762	3.17
Interaction	18.892	----	3.36

Supplementary Table S7B: *Analysis of variance for seed yield (kg ha^{-1}) as affected by different sowing dates.*

Source of variation	DF	SS	MS	F value	Probability (5%)
Replications	2	2	1.2		
Sowing date	4	165960	41490.1	86.83	0.0000
Error replication x sowing date	8	3823	477.8		
Varieties	2	103659	51829.3	96.81	0.0000
Sowing date x Varieties	8	5604	700.5	1.31	0.2949
Error	20	10707	535.3		
Total	44	289755			



Supplementary Figure S1: *A field experiment at ARI during Kharif Season.*