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Effect of different sowing dates and weed management on cluster bean (*Cyamopsis tetragonoloba* L.)

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Abstract
A field experiment was conducted at "Effect of Different Sowing Dates and Weed Management on Cluster Bean (*Cyamopsis tetragonoloba* L.)" conducted during *kharif 2024* at Agriculture farm, Suresh Gyan Vihar University, Jaipur on loamy sand soil. Sowing of clusterbean on 15th July recorded significantly plant height, dry matter accumulation, higher pods per plant, seed per pod, seed, straw and biological of clusterbean as compared to 30st July but remained statistically at pat with 1th July. The maximum plant height, dry matter accumulation, number of pods per plant, seed per pod, seed, straw and biological of clusterbean were recorded with pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE, which was statistically at par with weed free treatment. The maximum net return and B: C ratio recorded with sowing of clusterbean on 15th July as compared to 1st and 30th July. Pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE significantly increased net returns and B: C ratio compared to rest of weedy check, and remined statistically at par with weed free and Imazethapyr @100 g/ha.

Keywords: Clusterbean, weed, yield, return

Introduction
Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.], popularly known as guar, is a drought hardy and deep-rooted legume grown as feed, fodder, green manure, vegetable and seed in dry habitat of Rajasthan. The guar seed consists of three parts: the seed coat (14-17%), the endosperm (35-42%), and the germ (43-47%). Guar gum is derived from endosperm; this endosperm contains significant amounts off galactomannan gum (19- 43% of the whole seed) (Bhadoria *et al*., 2000) [2]. India is the largest producer of clusterbean contributing about 80% of the global clusterbean production. In India clusterbean is mainly grown in the dry region of Rajasthan, Gujarat, Haryana, Punjab, and to limited extent in Uttar Pradesh and Madhya Pradesh. Rajasthan is the major clusterbean producing state in the country ranking first with respect to both area (2.98 m ha) and production (1.61 m tonnes) with average productivity of 540 kg/ha (Anonymous 2023-24)).

Out of the several factors responsible for low productivity, sowing date plays an important role in increasing crop production. Ideal planting timing ensures efficient use of moisture, temperature, light etc. right from seed germination to final harvesting. Ali *et. al*. (2016) [1] concluded that temperature variations based on sowing date had a substantial impact on crop development, flowering time, pod formation, seed setting, total dry matter production, yield, and seed quality of garden pea. The delay in sowing beyond the optimal time resulted in drastic drop in the pod yield. Furthermore, a delay in sowing may prevent healthy vegetative growth of the crop and it may be exposed to high temperature during its later growth phases, resulting in forced maturity and low productivity. Adjustment of sowing date plays an important role in increasing crop production.

Season long competition with weeds in clusterbean causes severe yield reduction ranging from 29-48 per cent and severity may even be higher (70- 98%) depending on the weed infestation. The pre-emergence (PRE) herbicides like pendimethalin were found effective in controlling the weeds during early stages, but late flushes and escaped/ regenerated weeds in later stages, also hamper the crop yield to certain extent (Meena *et al*., 2022) [6]. This warrants the use of post

emergence (POE) herbicides for weed control. Imazethapyr applied in cluster bean has been observed to show adverse effect on the succeeding crop of mustard in the light soils of South-West Haryana, where cluster bean is a major crop. Therefore, keeping above facts in view an experiment entitled "Effect of Different Sowing Dates and Weed Management in Cluster Bean [*Cyamopsis tetragonoloba* (L.)]" has been planned to be conducted during *kharif* season of 2024-25 at Research Farm, School of Agriculture Suresh Gyan Vihar University, Jaipur.

Methods and Materials

The experiment was conducted during the *Rabi* season of 2023-24 at the Research Farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. Geographically, the experimental site is situated at 75°48'84" E longitude and 26°82'47" N latitude, falling within Agro-Climatic Zone III A (Semi-Arid Eastern Plain Zone) of Rajasthan. The experiment consisting date of sowing in main plot (1st July, 15th July and 30th July) and weed management in sub plot (Weedy check, weed free, Imazethapyr @100 g/ha and Pendimethalin 750 g PE *fb* Imazethapyr @ 70 g/ha PoE). The total fifteen treatment combinations were tested in split plot design with three replications.

Results and Discussion

Date of sowing

Sowing of clusterbean on 15th July recorded significantly higher pods per plant and seeds per pod as compared to 30st July but remained statistically at pat with 1th July. The reduction in yield attributes in delayed sowing might be due to decrease in cell-division and cell expansion and owing to their genetic variability (Palsaniya *et al*. 2016) [9]. This may be due to the fact that in early sowing temperature was optimal for plant growth and development, resulting in vigorous plants with long pods with more number of seeds per pod. These results are in agreement with the findings obtained by Mukherjee *et al*. (2013) [8].

The maximum seed, straw and biological yield were recorded with sowing of clusterbean on 15th July as compared to 30th July and remained statistically at par with sowing of clusterbean on 1st July. The per cent increased the straw yield with sowing of clusterbean on 15th and 1th July in tune of 16.25 and 4.69 per cent as compared to 30st July, respectively. This may be attributed to favorable soil moisture, temperature regimes, and rainfall distribution during the early monsoon period, which support better plant establishment, enhanced nutrient uptake, and prolonged vegetative growth (Rana *et al*. 2014 and Singh *et al*. 2019) [11, 13].

The per cent increased the net return with sowing of clusterbean on 15th and 1th July in tune of 26.49 and 7.71 per cent as compared to 30st July, respectively. The significantly higher economic returns associated with 15th July sowing can be attributed to the higher seed and straw yields recorded during this period, which directly contributed to increased gross income without a proportional rise in cost of cultivation (Rana *et al*. 2016 and Meena *et al*. 2020) [10, 7].

Weed management

The maximum number of pods per plant and seeds per pod were recorded with pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE, which was statistically at par with weed free treatment. The per cent increased the number of pods per plant with application of weed free, pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE and Imazethapyr @100 g/ha in tune of 17.81, 15.79 and 12.55 per cent over weedy check, respectively. his trend clearly shows that effective weed control significantly contributes to improved reproductive performance by minimizing crop-weed competition for essential resources such as nutrients, water, and light during critical growth stages. These findings are supported by Kumawat *et al*. (2017) [5].

The maximum seed yield (1154 kg/ha) was recorded with pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE, which was statistically at par with weed free treatment (1246 kg/ha). The increased seed and haulm yield and thereby biological yield were obviously the results of better weed management which rendered favourable conditions like increased availability of nutrients, moisture, light and other factors to the crop and resulted in higher yield of clusterbean. These findings corroborate with Meena *et al.* (2022) [6] and Singh *et al*. (2025) [13].

The highest net return of Rs 50419, 47845 and 42878 per hectare with weed free, 750 g PE fb Imazethapyr @ 70 g/ha PoE and Imazethapyr @100 g/ha, respectively. Highest benefit: cost ratio in clusterbean was obtained with pendimethalin 750 g PE fb Imazethapyr @ 70 g/ha PoE (1.93) followed by Weed free (1.80) and Imazethapyr @100 g/ha (1.70). The rationale for the greater net monetary return and B C ratio under weed management may be due to the low investment combined with a high economic yield. Meena *et al.* (2022) [6] and Reddy *et al.* (2021) [12].

Table 1: Effect of different sowing dates and weed management on yield attributes

Treatments	Yield attributes		
	Pods/plant	Seeds/pod	TW (g)
Date of sowing			
1st July	30.25	6.50	24.83
15th July	32.92	6.92	25.25
30th July	28.67	6.22	24.42
S.Em±	0.85	0.12	0.45
CD (p=0.05)	3.33	0.45	NS
Weed management			
Weedy Check	27.44	5.81	23.22
Weed Free	32.33	7.18	25.89
Imazethapyr @100 g/ha	30.89	6.52	24.56
Pendimethalin 750 g PE *fb* Imazethapyr @ 70 g/ha PoE	31.78	6.67	25.67
S.Em±	0.53	0.31	0.46
CD (p=0.05)	1.59	0.92	1.37

Table 2: Effect of different sowing dates and weed management on yields

Treatments	Yield (kg/ha)			HI (%)
	Seed	Straw	Biological	
Date of sowing				
1st July	982	2085	3067	32.09
15th July	1089	2326	3416	31.92
30th July	937	1987	2925	32.22
S.Em±	19	60	78	0.25
CD (p=0.05)	76	234	307	NS
Weed management				
Weedy Check	530	1096	1627	32.64
Weed Free	1246	2669	3915	31.82
Imazethapyr @100 g/ha	1081	2311	3392	31.86
Pendimethalin 750 g PE *fb* Imazethapyr @ 70 g/ha PoE	1154	2456	3610	31.97
S.Em±	35	67	101	0.28
CD (p=0.05)	103	201	300	NS

Table 3: Effect of different sowing dates and weed management on economics

Treatments	Economics (Rs/ha)		
	Gross return	Net return	B: C ratio
Date of sowing			
1st July	61740	36365	1.41
15th July	68569	43194	1.68
30th July	58936	33561	1.30
S.Em±	1281	1281	0.05
CD (p=0.05)	5030	5030	0.19
Weed management			
Weedy Check	33236	9686	0.41
Weed Free	78469	50419	1.80
Imazethapyr @100 g/ha	68028	42878	1.70
Pendimethalin 750 g PE *fb* Imazethapyr @ 70 g/ha PoE	72595	47845	1.93
S.Em±	2138	2138	0.08
CD (p=0.05)	6352	6352	0.25

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