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## Effect of herbicides on weed management in clusterbean (*Cyamopsis tetragonoloba* L.) under semi-arid condition of Rajasthan

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### Abstract

A field experiment was conducted at Agronomy farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur (Rajasthan) during *kharif*, 2022 on sandy loam soil with the objective to study the effect of herbicides in managing weed flora in clusterbean (*Cyamopsis tetragonoloba* L.). The present experiment consisting of 10 treatment combinations was laid out in Randomized Block Design with three replications.

Plant height, number of branches/plants, nodules/plant and dry matter accumulation of clusterbean was influenced significantly due to weed control measures. At 60 DAS and harvest stage, maximum dry matter accumulation was recorded with Pendimethalin 750 g/ha fb 1 hand weeding at 25 DAS which was significantly superior over rest of treatments and remained statistically at par with Pendimethalin +Imazethapyr (RM) 800 g/ha PE. Imazethapyr + Imazamox (RM) 40 g/ha POE was also significantly superior over weedy check and Pendimethalin 680 g/ha PE and remained statistically at par with Pendimethalin 750 g/ha PE, Imazethapyr 40 g/ha POE, Propaquizafop + Imazethapyr (RM) 125 g/ha POE and Imazethapyr + Imazamox (RM) 40 g/ha POE. Maximum number of pods/plant and seeds/pod, seed, straw and biological yield were recorded with Pendimethalin 750 g/ha PE + one hand weeding. Per cent increase in the seed yield of cluster bean over untreated to the tune of 107.14 and 98.51 per cent Pendimethalin 750 g/ha fb 1 hand weeding at 25 DAS and Pendimethalin +Imazethapyr (RM) 800 g/ha PE.

**Keywords:** Pendimethalin, imazethapyr, pods and seed yield

### Introduction

The word Guar (*Cyamopsis tetragonoloba* L.) represents its derivation from Sanskrit word "GAUAAHAR" which means cow fodder or otherwise fodder of the livestock. Guar commonly known as Clusterbean is a versatile and multipurpose under exploited leguminous vegetable crop of arid and semi-arid region belonging to the family Fabaceae or Leguminosae. The crop is grown for green fodder, fresh vegetable, green manuring, gum and seed purpose. 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 of galactomannan gum (19- 43% of the whole seed). Clusterbean is mainly cultivated for food as vegetables, feed and fodder. Its young pods are used as vegetables which are also known for cheap source of energy (16 Kcal), moisture (8 g), protein (3.2 g), fat (1.4 g), carbohydrate (10.8 g), vitamin-A (65.3 IU), vitamin-C (49 mg), calcium (57 mg) and iron (4.5 mg) for every 100g of edible portion. India is the major exporter of guar-gum to the world. India area of clusterbean is 3140.2 hectare, production is 1.5 m tonnes and productivity of 484 kg/ha. In Rajasthan state area and production of this crop is 593 hectare and 27.47 tonnes respectively. In Rajasthan state productivity this crop is 0.72 tonnes/ha.

Weeds pose most serious problem in legume crops because of the liberal use of farm yard manure, chemical fertilizers and frequent irrigations that help the weeds to grow vigorously. It has been well established that losses from weeds accounts for 45 per cent more than when compared to insect pests and diseases of about 30 and 20 per cent, respectively (Rao, 1983)<sup>[9]</sup>.

Jain and Singh 2000<sup>[5]</sup> stated that an unchecked weed growth in clusterbean caused 47 per cent reduction in seed yield. In order to obtain higher seed yield of clusterbean the crop should be kept free from weeds for the first 30 days after sowing. Weed control is an essential part of all crop production systems. Critical period of crop-weed competition in clusterbean is about 20 to 30 days after sowing, during this period, weeds reduce yield by competing with crops for water, nutrients, and sunlight (Gupta, 1984)<sup>[4]</sup>. Pre-emergence herbicides play a crucial role in weed control by preventing weed seeds from germinating and emerging along side clusterbean plants. They create a weed-free environment during the early stage of clusterbean growth, reducing competition for essential resources such as sunlight, water, and nutrients. The weed control not only improves clusterbean yields but also enhances crop quality (Tyagi *et al.* 2019)<sup>[12]</sup>.

### Materials and Methods

A field experiment entitled “effect of new herbicides in managing weed flora in clusterbean (*Cyamopsis tetragonoloba* L.)” was conducted during *kharif* season of the year 2022 at Research Farm, SGVU, Jaipur (Rajasthan). The experiment was conducted during *kharif* 2022-23 at Research Farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur (Rajasthan). Geographically, the study area is located at 75° 51'44" E longitude and 26°48'35" N latitude and altitude of 427 m above mean sea level. The treatments are weedy check, Pendimethalin 750/ha, Pendimethalin +Imazethapyr (RM) 800 g/ha PE, Pendimethalin 680 g/ha PE, Imazethapyr 40 g/ha POE, Propaquizafop + Imazethapyr (RM) 125 g/ha POE, Imazethapyr + Imazamox (RM) 40 g/ha POE, Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS, Propaquizafop 100 g/ha POE.

### Results and Discussion

The maximum dry matter was recorded with Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS which was statistically at par with Pendimethalin +Imazethapyr (RM) 800 g/ha PE. The per cent increase in dry matter production due to Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS and Pendimethalin +Imazethapyr (RM) 800 g/ha PE were 21.07 and 14.21 per cent over weedy check, respectively. This might be due to minimizing the competition with crop for space, light, nutrient and moisture with effective weed control measures. Thus reduce the competition and increase overall improvement in crop growth as reflected by plant dry matter accumulation. The results corroborate with the findings of Yadav *et al.* (2014)<sup>[13]</sup>, Singh *et al.* (2014)<sup>[12]</sup>.

The higher yield parameters (seed plant<sup>-1</sup> and pod plant<sup>-1</sup>) with herbicides might be due to better control of weeds as a result the crop to get sufficient quantity of nutrients, solar radiation, soil moisture and adequate space which allow better translocation of photosynthates to the sink portion. The findings of the present study were in corroboration with those reported by Kumar *et al.* (2001)<sup>[6]</sup> and Andhale and Kathmale (2019)<sup>[3]</sup>. Maximum

number of pods/plant and seed per pod were recorded with Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS which was at par Pendimethalin 750/ha, Pendimethalin +Imazethapyr (RM) 800 g/ha PE and Imazethapyr + Imazamox (RM) 40 g/ha POE. This is might be due to observed in weedy check plots due to heavy flushes of weeds during entire crop growth period and thereby caused severe more crop weed competition throughout the crop growth period for nutrients as well as moisture and thus. Similar result also reported by Meena *et al.* 2022<sup>[8]</sup>.

The minimum seed yield (583 kg /ha) was observed under Weed check. In applied treatment, the maximum seed yield was recorded with Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS which was significantly superior over the weedy check and Propaquizafop 100 g/ha POE and remained statistically at par with Pendimethalin 750/ha, Pendimethalin +Imazethapyr (RM) 800 g/ha PE, Pendimethalin 680 g/ha PE, Imazethapyr 40 g/ha POE, Propaquizafop + Imazethapyr (RM) 125 g/ha POE and Imazethapyr + Imazamox (RM) 40 g/ha POE. Per cent increased the seed yield of cluster bean in tune of 107.14 and 98.51 per cent Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS and Pendimethalin +Imazethapyr (RM) 800 g/ha PE over control. Significantly lower value of seed, stover and biological yield were recorded in treatment weedy check. This might be due to competition by weeds for space, light, nutrient and moisture resources, which made the crop plant inefficient to take up more moisture, nutrients and ultimately growth was adversely affected due to less supply of carbohydrates. A similar finding was observed by Singh and Chaudhary (1992)<sup>[11]</sup> and Malliswari *et al.* (2008)<sup>[7]</sup>.

Weedy check plots offered the maximum crop-weed index as a result of which caused a mean reduction of 52.92 per cent in grain yield of cluster bean in comparison to Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS treatment the maximum mean grain yield of 1208 kg/ha was obtained. This is might be due to weed seed damage caused by pre-emergence application of Pendimethalin + imazethapyr 1000 g ha<sup>-1</sup> and suppression of established plants of both narrow and broadleaved weeds by imazethapyr and its greater efficiency to retard cell division of meristems as a result of which weeds died very rapidly. Similar result also reported by Meena *et al.* 2022<sup>[8]</sup>.

Net returns in cluster bean were influenced to a great extent by different weed control treatments. Providing the highest net return of RS 52361/ha, Pendimethalin +Imazethapyr (RM) 800 g/ha PE excelled rest of the treatments. Imazethapyr + Imazamox (RM) 40 g/ha POE was observed as the next superior and best herbicidal treatment by fetching the net returns of RS 49164/ha. Pendimethalin +Imazethapyr (RM) 800 g/ha PE, Pendimethalin 750 g/ha *fb* 1 hand weeding at 25 DAS, Imazethapyr + Imazamox (RM) 40 g/ha POE and Pendimethalin 750/ha thus also increased it to the extent of 221.20, 218.21, 201.59 and 154.45 per cent, respectively over weedy check. These findings were in close vicinity with those reported by Regar *et al.* 2021<sup>[14]</sup>.

**Table 1:** Effect of herbicides on dry matter accumulation of clusterbean.

Treatments	Dry matter accumulation (g/plant)		
	30 DAS	60 DAS	At Harvest
Weedy check	6.12	14.69	16.61
Pendimethalin 750/ha	6.59	15.26	17.83
Pendimethalin +Imazethapyr (RM) 800 g/ha PE	6.88	15.63	17.21
Pendimethalin 680 g/ha PE	7.14	16.27	18.33
Imazethapyr 40 g/ha POE	7.59	16.67	18.81
Propaquizafop + Imazethapyr (RM) 125 g/ha POE	7.87	17.31	19.25
Imazethapyr + Imazamox (RM) 40 g/ha POE	8.07	17.68	19.83
Pendimethalin 750 g/ha <i>fb</i> 1 hand weeding at 25 DAS	8.35	18.45	20.12
Propaquizafop 100 g/ha POE	8.62	18.82	20.51
Weed free	8.89	19.58	21.66
S.Em±	0.22	0.50	0.55
CD (P= 0.05)	0.65	1.49	1.66

**Table 2:** Effect of Herbicides on yield attributes of clusterbean.

Treatment	No of pods/plant	No. of seeds/pod	Test weight (g)
Weedy check	12.13	7.30	25.35
Pendimethalin 750/ha	16.33	7.60	25.72
Pendimethalin +Imazethapyr (RM) 800 g/ha PE	17.67	7.89	26.29
Pendimethalin 680 g/ha PE	15.93	8.29	26.78
Imazethapyr 40 g/ha POE	15.67	8.64	27.31
Propaquizafop + Imazethapyr (RM) 125 g/ha POE	15.33	8.87	27.59
Imazethapyr + Imazamox (RM) 40 g/ha POE	16.33	9.08	27.92
Pendimethalin 750 g/ha <i>fb</i> 1 hand weeding at 25 DAS	18.00	9.39	28.37
Propaquizafop 100 g/ha POE	15.17	9.70	28.61
Weed free	18.33	10.02	29.71
S.Em+/-	0.55	0.25	1.46
CD (P= 0.05)	1.64	0.75	NS

**Table 3:** Effect of Herbicides seed, straw and biological yields of clusterbean (kg/ha).

Treatment	Yield (kg/ha)		
	Seed	Straw	Biological
Weedy check	583	1323	1907
Pendimethalin 750/ha	983	2133	3116
Pendimethalin +Imazethapyr (RM) 800 g/ha PE	1158	2428	3586
Pendimethalin 680 g/ha PE	900	1980	2880
Imazethapyr 40 g/ha POE	927	2072	2999
Propaquizafop + Imazethapyr (RM) 125 g/ha POE	1000	2159	3159
Imazethapyr + Imazamox (RM) 40 g/ha POE	1086	2502	3588
Pendimethalin 750 g/ha <i>fb</i> 1 hand weeding at 25 DAS	1208	2617	3825
Propaquizafop 100 g/ha POE	815	1881	2696
Weed free	1240	2763	4003
S.Em+/-	32	69	91
CD (P= 0.05)	96	206	270

**Table 4:** Effect of Herbicides on net return and B: C ratio of clusterbean

Treatment	Gross returns	Net returns	B : C ratio
Weedy check	39032	16302	0.72
Pendimethalin 750/ha	65210	41480	1.75
Pendimethalin +Imazethapyr (RM) 800 g/ha PE	76291	52361	2.19
Pendimethalin 680 g/ha PE	59850	36020	1.51
Imazethapyr 40 g/ha POE	61823	38143	1.61
Propaquizafop + Imazethapyr (RM) 125 g/ha POE	66254	42474	1.79
Imazethapyr + Imazamox (RM) 40 g/ha POE	72894	49164	2.07
Pendimethalin 750 g/ha <i>fb</i> 1 hand weeding at 25 DAS	80104	51874	1.84
Propaquizafop 100 g/ha POE	54726	30816	1.29
Weed free	82670	54565	1.94
S.Em+/-	1985	4389	-
CD (P= 0.05)	5897	13042	-

## Conclusion

Guar (*Cyamopsis tetragonoloba* L.) is a vital crop in arid regions, primarily valued for its fodder and guar gum. This study

emphasizes the importance of effective weed management to enhance yield. The use of pre-emergence herbicides, particularly Pendimethalin combined with Imazethapyr, significantly

improved dry matter production and seed yield. Maintaining a weed-free environment, especially in the first 30 days post-sowing, is crucial for maximizing crop productivity. These findings highlight the need for integrated weed management strategies to boost profitability and sustainability in guar cultivation, ultimately contributing to food security in challenging agricultural landscapes.

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