

Effect of Weed Control Practices on Weed Dry Weight, Nutrient Uptake and Yield of Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.] under Rainfed Condition

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ABSTRACT

Imazethapyr, quizalofop-P-ethyl, pendimethalin and alachlor at 0.1, 0.06, 1.0 and 2.0 kg/ha, respectively, alone and with hand weeding 40 DAS were compared with one and two hand weeding against mixed weed flora in clusterbean. All the weed control treatments significantly reduced the dry weight of complex weed flora, although they differed in their effect on monocot and dicot weeds. Imazethapyr alone and with hand weeding 40 DAS effectively controlled both monocot and dicot weeds, while quizalofop-ethyl controlled only monocot weeds. Uninterrupted weed growth depleted 108.5 kg N, 15.8 kg P and 151.6 kg K/ha, while such losses were lowest with two hand weeding 20 and 40 DAS. Highest grain yield was obtained with weed free check (1840 kg/ha) followed by two hand weeding (1720 kg/ha) and imazethapyr 100 g/ha+hand weeding 40 DAS (1711 kg/ha) and it was significantly higher than all other treatments. Maximum uptake of N (133.8 kg/ha), P (32.5 kg/ha) and K (135.1 kg/ha) by clusterbean was recorded in two hand weeding (20 and 40 DAS), while in weedy check plots N, P and K uptake by crop was 40.6, 9.8 and 41.1 kg/ha, respectively.

Key words : Clusterbean, imazethapyr, quizalofop, pendimethalin, alachlor, hand weeding

INTRODUCTION

Clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.], popularly known as 'Guar', is grown during rainy season in semi-arid and arid regions of India for various purposes viz., vegetables, green fodder, green manuring and seeds. In the recent years, besides its conventional uses, it has emerged as an industrial crop, due to presence of galactomannan (gum) in its endosperm, which is around 30-35% of seed weight. A wide-ranging yield reduction in the crop on account of weeds is well documented. Therefore, there is a need to create an environment that is detrimental to weeds and favourable to crops. Hence, weed control needs to be restored during initial period of crop growth. Hand weeding is a traditional and effective method of weed control, but it is very costly so it was felt necessary to evaluate pre- and post-emergence herbicides which can be the best alternative to traditional practices.

MATERIALS AND METHODS

A field experiment was carried out at Instructional Farm, Rajasthan College of Agriculture, Udaipur during

kharif 2010. The soil of experimental site was clay loam in texture, medium in available N (285.0 kg/ha), P (20.42 kg/ha), K (230.90 kg/ha), medium in organic carbon content (0.78%) and slightly alkaline in reaction with pH 8.1. The experiment comprised 12 treatment combinations [weedy check, weed free check, one hand weeding 40 DAS, two hand weeding (20 and 40 DAS), imazethapyr 100 g/ha 20 DAS, quizalofop-P-ethyl 60 g/ha 20 DAS, pendimethalin 1.0 kg/ha PE and alachlor 2.0 kg/ha PE alone and each in combination with one hand weeding 40 DAS]. These treatments were evaluated under randomized block design with three replications. Clusterbean variety RGC 936 was sown 22 July 2010 at 30 x 10 cm row and plant to plant spacing with a seed rate of 20 kg/ha. Weed dry weight at harvest was recorded by placing a quadrat of 0.25 m² at two random selected spots in each plot and the samples were then kept in oven at 70°C till constant weight. Weed control efficiency (WCE) was computed on the basis of dry matter of monocot and dicot weeds. Phytotoxicity of different treatments on crop in terms of epinasty, hyponasty, necrosis, vein clearing and wilting, etc. was visually observed on 0-10 scale. The nutrient uptake by crop and weeds was computed by using the following formula :

$$\text{Nutrient uptake by crop/}=\frac{\text{Nutrient content in crop/weeds (\%)} \times \text{Total dry weight of crop/weeds (kg/ha)}}{\text{weeds (kg/ha)}} \times 100$$

RESULTS AND DISCUSSION

Major Weed Flora

The important weeds during the experimentation were *Amarathus viridis*, *Amaranthus spinosus*, *Commelina benghalensis*, *Parthenium hysterophorus*, *Trianthema portulacastrum*, *Cynodon dactylon*, *Cyperus rotundus*, *Echinochloa colona* and *Echinochloa crus-galli*. Respective intensity of these weeds was 5.0, 6.5, 13.9, 12.3, 15.0, 8.0, 6.5, 27.4 and 5.4%.

Weed Dry Weight

All the weed control treatments significantly reduced dry matter accumulation of monocot, dicot and total weeds except quizalofop-ethyl 60 g/ha 20 DAS which could not reduce dry matter of dicot weeds significantly compared to weedy check (Table 1). The minimum dry matter of monocot (21.0 g/m²), dicot (30.6 g/m²) and total weeds (51.6 g/m²) was recorded under two hand weedings 20 and 40 DAS, while the respective values for these parameters under unweeded treatment were 276.4, 294.5 and 570.9 g/m². Two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS were found at par in reducing the dry weight production of monocot, dicot and total weeds. Integration of each herbicide with one

hand weeding (40 DAS) recorded significant reduction in the dry matter of monocot, dicot as well as total weeds compared to herbicide applied alone. The per cent reduction in weed dry matter production due to two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS was 90.9 and 89.4, 92.4 and 89.8, and 89.6 and 88.9 of monocot, dicot and total weeds, respectively compared to weedy check. Results so obtained are in close conformity with the findings of Dhaker *et al.* (2009).

Weed Control Efficiency (WCE)

The efficiency of treatments at harvest based on weed dry weight fluctuated to a great extent under the influence of various weed control treatments. The highest weed control efficiency was recorded under weed free check (Table 1). Among other weed control treatments, weed control efficiency was highest under two hand weedings 20 and 40 DAS (90.9%) followed by imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS (89.4%).

Nutrient Uptake by Weeds

All weed control treatments significantly reduced N, P and K uptake by monocot and dicot weeds as well as total uptake by the weeds compared to weedy check

Table 1. Effect of different weed control treatments on weed dry weight and weed control efficiency

Treatments	Weed dry weight (g/m ²)			Weed control efficiency (%)
	Monocots	Dicots	Total	
Weedy check	276.4	294.5	570.9	0
Weed free check	0.0	0.0	0.0	100
One HW 40 DAS	43.7	54.3	98.0	83
Two HW 20 and 40 DAS	21.0	30.6	51.6	91
Imazethapyr 100 g/ha 20 DAS	41.7	54.1	95.8	83
Imazethapyr 100 g/ha 20 DAS+HW 40 DAS	28.1	32.5	60.6	89
Quizalofop 60 g/ha 20 DAS	51.3	282.2	333.6	41
Quizalofop 60 g/ha 20 DAS+HW 40 DAS	32.9	49.3	82.172	85
Pendimethalin 1.0 kg/ha PE	49.3	63.7	113.0	80
Pendimethalin 1.0 kg/ha PE+HW 40 DAS	36.3	44.2	80.5	86
Alachlor 2.0 kg/ha PE	48.2	62.9	111.1	80
Alachlor 2.0 kg/ha PE+HW 40 DAS	37.7	48.5	86.3	85
LSD (P=0.05)	9.3	13.2	15.1	-

(Table 2). The minimum total N, P and K uptake by weeds was observed in two hand weedings 20 and 40 DAS followed by imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS and quizalofop-ethyl 60 g/ha 20 DAS+hand weeding 40 DAS which were found at par with each other. Total N uptake by the weeds was minimum under two hand weedings 20 and 40 DAS which was 10.8 and 30.5% lower than imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS and quizalofop-ethyl 60 g/ha 20 DAS+hand weeding 40 DAS, respectively. Two hand weedings (20 and 40 DAS) and

imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS tended to decrease P uptake by monocot weeds by 92.7 and 90.2, by dicot weeds 89.7 and 89.8 and by total weeds 91.1 and 89.9 per cent, respectively, compared to weedy check. Data further indicated that two hand weedings (20 and 40 DAS) tended to decrease K uptake by 92.6, 89.9 and 90.9% by monocot, dicot and total weeds, respectively, compared to weedy check. Reduced nutrient uptake by weeds under the influence of different weed control measures have also been reported by Chhokar *et al.* (1997).

Table 2. Effect of different weed control treatments on N, P and K uptake (kg/ha) by weeds and crop and yield of clusterbean

Treatments	Nitrogen		Phosphorus		Potassium		Yield (kg/ha)	
	Weeds	Crop	Weeds	Crop	Weeds	Crop	Seed	Haulm
Weedy check	108.5	40.6	15.8	9.8	151.6	41.1	518.3	1478.2
Weed free check	0.0	142.1	0.0	34.5	0.0	139.2	1840.0	4181.4
One HW 40 DAS	18.8	98.5	2.7	23.8	26.6	99.5	1258.8	3072.0
Two HW 20 and 40 DAS	9.9	133.8	1.4	32.5	13.7	135.1	1720.0	4125.0
Imazethapyr 100 g/ha 20 DAS	18.4	98.5	2.6	24.5	25.0	99.5	1330.0	3105.4
Imazethapyr 100 g/ha 20 DAS+HW 40 DAS	11.1	131.4	1.6	31.9	15.3	131.2	1710.6	4000.0
Quizalofop 60 g/ha 20 DAS	51.1	89.7	7.3	21.8	72.7	86.4	1216.6	2638.4
Quizalofop 60 g/ha 20 DAS+HW 40 DAS	14.3	111.6	2.0	27.3	19.6	111.9	1470.3	3450.5
Pendimethalin 1.0 kg/ha PE	18.1	93.4	2.6	23.2	25.4	96.4	1230.0	3009.9
Pendimethalin 1.0 kg/ha PE+HW 40 DAS	15.0	110.5	2.1	27.1	20.9	110.2	1462.3	3400.1
Alachlor 2.0 kg/ha PE	19.3	92.2	2.7	23.1	26.4	95.2	1250.5	2950.4
Alachlor 2.0 kg/ha PE+HW 40 DAS	16.5	109.4	2.3	27.1	22.4	111.3	1455.8	3414.8
LSD (P=0.05)	3.6	13.9	0.7	3.5	8.3	16.9	230.5	484.7

Crop Yield

All weed control treatments significantly increased the seed and haulm yield of clusterbean over unweeded control (Table 2). The weed free check gave maximum seed yield of 1840 kg/ha as against 518 kg/ha under unweeded control, while maximum haulm yield of 4181 kg/ha was recorded under weed free check as against 1478 kg/ha under unweeded control. Seed and haulm yield under weed free check was found significantly superior over all weed control treatments except two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS which were at par with each other. The per cent increase in seed yield due to weed free treatments, two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha+hand weeding 40 DAS was 255.0, 231.8 and 230.0%, respectively, over weedy check, while it was 182.8, 179.0 and 170.5% in haulm yield. The observed relationship i. e. increased seed and haulm yield under

two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS was also reported by Shete *et al.* (2008) and Vyas and Kushwah (2008).

Phytotoxicity

On the basis of visual observation on 0-10 point scale, none of the weed control treatments was found phytotoxic on crop in terms of different phytotoxic effects during the experimentation. The seedlings and plants did not show any abnormalities.

Nutrient Uptake by Crop

All the weed control treatments recorded significant increase in N, P and K uptake by the crop compared to weedy check. Weed free treatment, two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS were found at par

with each other with respect to N, P and K uptake (Table 2). Weed free treatment, two hand weedings (20 and 40 DAS) and imazethapyr 100 g/ha 20 DAS+hand weeding 40 DAS significantly increased N uptake by 249.7, 229.4 and 223.4%, P uptake by 250.7, 231.1 and 225.0% and K uptake by 238.3, 228.5 and 219.0% in crop over weedy check, respectively. These results are in agreement with the findings of Singh *et al.* (2006).

REFERENCES

- Chhokar, R. S., R. S. Balyan and S. S. Pahuja. 1997. Nutrient removal of weeds on soybean under integrated weed management. *Ind. J. Agron.* **42** : 138-141.
- Dhaker, H., S. L. Mundra and N. K. Jain. 2009. Weed management in clusterbean [*Cyamopsis tetragonoloba* (L.) Taub.]. *Ind. J. Weed Sci.* **41** : 224-227.
- Shete, B. T., H. M. Patil and S. S. Ilhe. 2008. Effect of cultural practices and post-emergence herbicides against weed control in soybean. *J. Maharashtra agric. Univ.* **33** : 118-119.
- Singh, P., V. Nepalia and S. S. Tomer. 2006. Effect of weed control and nutrient management on soybean (*Glycine max*) productivity. *Ind. J. Agron.* **51** : 314-317.
- Vyas, M. D. and S. S. Kushwah. 2008. Effect of cultural and chemical methods on growth and yield of soybean in Vindhynagar plateau of Madhya Pradesh. *Ind. J. Weed Sci.* **40** : 92-94.