



Response of weed management practices on the Productivity of urdbean (*Vigna mungo* L. Hepper)

Prahlad Jakhar¹, S.S. Yadav² and Rakesh Choudhary³

¹Swami Keshwanand Rajasthan Agricultural University, Bikaner-334006 (Rajasthan), INDIA

²Department of Agronomy, S.K.N. COA, Jobner, Jaipur (Rajasthan), INDIA

³Department of Agronomy, CCS Haryana Agricultural University, Hisar-125004 (Haryana), INDIA

*Corresponding author. E-mail: rakeshnitharwal9@gmail.com

Received: January 14, 2015; Revised received: March 25, 2015; Accepted: May 3, 2015

Abstract: A field investigation was carried out to evaluate the effect of hand weedings and herbicides on the weed flora, growth and yield of urdbean (*Vigna mungo*). The experiment was conducted during *kharif* season 2011 in loamy sand soil, to study the effect of different Ten weed management treatments comprising weedy check, weed free, one hand weeding (HW) at 20 days after sowing (DAS), two HW at 20 and 40 DAS, trifluralin at 0.75 kg/ha, alachlor at 1.5 kg/ha, imazethapyr at 0.10 kg/ha, trifluralin at 0.75 kg/ha + HW at 30 DAS, alachlor at 1.5 kg/ha + HW at 30 DAS and imazethapyr at 0.10 kg/ha + HW at 30 DAS on urdbean. Results showed that the maximum plant height was recorded under weed free treatment at all the growth stages and the maximum dry matter accumulation of 108.88 and 159.31 g per metre row length at 50 DAS and harvest stages was obtained under imazethapyr at 0.10 kg/ha + HW at 30 DAS treatment that was significantly higher by 17.8, 21.8, 24.6, 31.8 and 56.0 per cent at 50 DAS and 20.4, 17.6, 25.4, 29.0 and 50.1 per cent at harvest stage over imazethapyr at 0.10 kg/ha, one HW at 20 DAS, alachlor at 1.5 kg/ha, trifluralin at 0.75 kg/ha and weedy check treatments, respectively. Application pre emergence application of imazethapyr at 0.10 kg/ha + HW at 30 DAS was found the most effective treatment with regard of grain yield (1403 kg/ha) and net returns (Rs 34815/ha). Two hand weedings done at 20 and 40 DAS also produced grain yield of 1392 kg/ha with net returns of Rs 33469 /ha.

Keywords: Economic viability, Growth parameters, Urdbean, Yield

INTRODUCTION

Pulses occupy a unique position in every system of Indian farming as a main, catch, cover, green manure and intercrop. These are the main source of protein particularly for vegetarians and contribute about 14 per cent of total protein of an average Indian diet. This crop was cultivated on an area of about 31 lakh hectares with a production of 14 lakh tonnes and productivity of 457 kg/ha in our country during 2010-11 (Anonymous, 2011). In Rajasthan, urdbean was grown on 1.37 lakh hectares with production of 4.06 lakh tones. The average productivity is 296 kg/ha (Anonymous, 2010). The weeds compete to a great extent with crop for nutrients, moisture, light and space and results in 30 to 50 per cent reduction in yield (Bhan and Singh, 1991). Malliswari *et al.* (2008) from Tirupati in Andhra Pradesh reported that grain yield of blackgram was reduced upto 42 per cent when weeds remained throughout the growing period of crop. On the other hand, as high as 51 per cent reduction in grain yield of urdbean due to uncontrolled growth of weeds was noted by Begum and Rao (2006) at Bapatla in Karnataka. Therefore, removal of weeds at appropriate time using a suitable method is essential to obtain high yields of blackgram. In blackgram, weeds could be controlled by

hand weedings (Chand *et al.*, 2004). However, hand weeding is laborious, time consuming, costly and tedious. Moreover, many times labour is not available at the critical period of weed removal. Furthermore, weather conditions (rains) do not permit timely hand weeding due to wet field conditions. Delayed removal of weeds is not as effective in controlling weeds and obtaining higher yields as the timely removal of weeds. Under these conditions, use of herbicides offers an alternative for possible effective control of weeds (*Amaranthus viridis*, *Amaranthus spinosus* and *Trianthema portulacastrum* immediately with the crop emergence. *Euphorbia hirta*, *Verbesina encelioides*, *Digera arvensis*, *Corchorus acutangulus*, *Phyllanthus niruri* and *Physalis minima*). Therefore, in the present study effect of various herbicides was compared with hand weedings and untreated check for evaluating weed control efficacy obtaining high yields of urdbean (*Vigna mungo*) grown during summer and *kharif* seasons.

MATERIALS AND METHODS

A field experiment was conducted during the rainy *kharif* season of 2011 at Agronomy farm of SKN College of Agriculture, Jobner (Rajasthan) in western

Table 1. Effect of different weed management treatments on growth parameters of *V. mungo*.

Treatments	Plant stand per metre row length At harvest	Plant height (cm)			Branches per plant		Dry matter accumulation (g)		
		25 DAS	50 DAS	At harvest	50 DAS	At harvest	25 DAS	50 DAS	At harvest
Weedy check	8.29	16.47	38.89	42.56	5.14	6.04	18.89	69.81	106.12
Weed free	9.90	22.07	52.27	57.26	8.60	9.88	28.63	110.37	162.53
One HW at 20 DAS	9.15	20.79	46.15	50.85	6.72	7.77	27.67	89.40	135.44
Two HW at 20 & 40 DAS*	9.72	21.24	51.05	56.39	8.36	9.69	27.08	106.96	155.11
Trifluralin @ 0.75 kg/ha	8.99	20.93	43.89	46.65	6.24	6.89	22.35	82.62	123.50
Alachlor @ 1.5 kg/ha	8.97	21.71	44.69	47.40	6.39	7.50	26.30	87.36	127.04
Imazethapyr @ 0.10 kg/ha	8.85	21.98	45.11	48.22	6.93	8.01	27.20	92.45	132.31
Trifluralin @ 0.75 kg/ha + HW at 30 DAS*	8.95	19.64	47.96	52.87	7.91	8.79	24.14	98.90	142.72
Alachlor @ 1.5 kg/ha + HW at 30 DAS*	9.50	20.15	48.58	53.69	7.96	9.04	27.51	102.25	148.75
Imazethapyr @ 0.10 kg/ha + HW at 30 DAS *	9.85	21.15	51.77	56.78	8.14	9.28	26.46	108.88	159.31
SEM+	0.35	0.91	1.72	2.09	0.30	0.39	0.95	3.86	5.10
CD (P =0.05)	NS	2.63	4.99	6.06	0.86	1.12	2.76	11.19	14.80
CV (%)	7.57	8.78	7.32	8.15	8.16	9.31	7.42	8.13	7.32

side at 26°05' North latitude, 75°28' East longitude and at an altitude of 427 metres above mean sea level. In Rajasthan, this region falls under Agroclimatic zone III a (Semi-Arid Eastern Plain Zone) to study the effect of various weed control treatments on weeds, grain yield of blackgram and the economics involved. Ten weed management treatments comprising weedy check, weed free, one HW at 20 DAS, two HW at 20 and 40 DAS, trifluralin at 0.75 kg/ha, alachlor at 1.5 kg/ha, imazethapyr at 0.10 kg/ha, trifluralin at 0.75 kg/ha + HW at 30 DAS, alachlor at 1.5 kg/ha + HW at 30 DAS and imazethapyr at 0.10 kg/ha + HW at 30 DAS were replicated four times in randomized block design. In summer season, Urdbean variety IPU-94-1 (Uttara) was used as a test crop in rows 30 cm apart using a seed rate of 15 kg/ha.

Trifluralin was pre plant incorporated into the soil using Treflan 48 EC it's a selective and systemic herbicides which acts as a classic mitotic distrupter and arrests cell division at prometaphase. Alachlor was applied through Lasso 50 EC and imazethapyr through Fervent 10 SL. These two herbicides were applied as pre emergence treatment to the respective plots after sowing of crop. A knap-sack sprayer was used for spraying the herbiicides using a spray volume of 800 liter/ha. In the plots ear marked for hand weeding, the operation was done at 20, 30 and 40 days after sowing as per the treatments. In case of hand weeding, weeding was done using a khurpa. Data on dry matter

of weeds were recorded at harvest. Weed control efficiency (WCE) was calculated. Economics of different weed control treatments was also worked out by taking the selling price of blackgram as Rs.3300 /q. The experimental soil was loamy sand in texture, slightly alkaline in reaction (PH 8.4), poor in organic carbon (0.31%) available nitrogen (124.4 kg/ha), available potassium (152.31 kg K₂O/ha) and medium in phosphorus (15.70 kg P₂O₅/ha).

The climate of this region is a typically semi-arid, characterized by extremes of temperatures during both summers and winters. During summers The mean weekly weather parameters for the crop season recorded at college meteorological observatory have

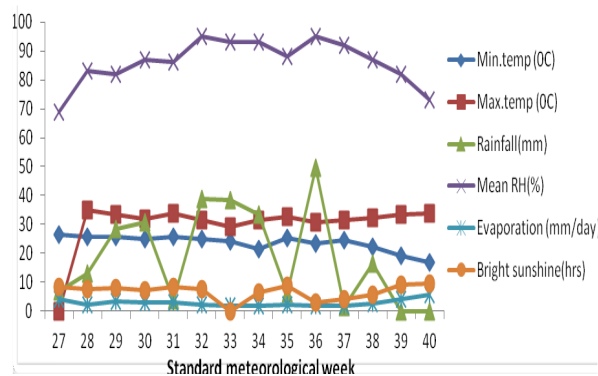
**Fig.1.** Mean weekly meteorological data for crop season

Table 2. Effect of different weed management treatments on number, dry wt. of nodules and yield parameters of *V. mungo*.

Treatments	Number of nodules per plant	Dry weight of nodules per plant (mg)	Pods per plant	Grains per pod	Test weight (g)
Weedy check	23.87	63.40	16.19	6.55	27.84
Weed free	34.96	96.46	28.03	9.17	34.46
One HW at 20 DAS	30.52	80.49	22.02	7.77	31.98
Two HW at 20 & 40 DAS*	34.43	94.42	27.49	9.05	34.28
Trifluralin @ 0.75 kg/ha	27.53	74.56	19.13	7.43	28.36
Alachlor @ 1.5 kg/ha	29.68	76.82	20.01	7.53	30.83
Imazethapyr @ 0.10 kg/ha	30.32	79.51	22.26	7.67	31.83
Trifluralin @ 0.75 kg/ha + HW at 30 DAS*	31.96	85.63	24.77	8.23	32.73
Alachlor @ 1.5 kg/ha + HW at 30 DAS*	33.23	87.93	25.47	8.73	33.26
Imazethapyr @ 0.10 kg/ha + HW at 30 DAS *	34.13	92.06	27.73	8.91	33.78
SEm+	1.17	3.76	0.92	0.37	1.06
CD (P =0.05)	3.40	10.91	2.67	1.07	3.07
CV (%)	7.55	9.05	7.89	9.09	6.63

been depicted graphically in Fig. 1.

RESULTS AND DISCUSSION

The major weed flora founded through Survey of the experimental field revealed that weedy check plots were heavily invaded by annual dicot weeds chiefly *Amaranthus viridis*, *A. spinosus* and *Trianthema portulacastrum* immediately with the crop emergence. *Euphorbia hirta*, *Verbesina encelioides*, *Digera arvensis*, *Corchorus acutangulus*, *Phyllanthus niruri* and *Physalis minima* were the another dicot weeds found to infest the experimental field. *Cyperus rotundus*, *Dactyloctenium aegyptium*, *Cynodon dactylon*, *Digitaria sanguinalis* and *Cenchrus biflorus* were found to be the prominent monocot weed species though; the population of these weeds was comparatively lower.

Effect on growth parameters: It is clear from results that different weed management treatments evaluated for their efficacy in present study differed significantly in their effect on plant height, branches per plant, crop dry matter and number and dry weight of nodules per plant in urdbean (Table 1). The variation among treatments in their effect on growth attributes has been found to be directly associated with almost similar variation in weed control. All the treatments significantly enhanced the growth parameters of crop at most of the stages over weedy check plots. The maximum plant height was recorded under weed free treatment at all the growth stages. After weed free, pre emergent imazethapyr at 0.10 kg/ha + HW at 30 DAS recorded the maximum plant height (46.15 and 50.85 cm) at 50 DAS and at harvest stages. However, it remained statistically at par with rest of the treatments except application of herbicides alone and one hand weeding treatments.

Weed free, two hand weeding done at 20 and 40 DAS, imazethapyr at 0.10 kg/ha + HW at 30 DAS,

alachlor at 1.5 kg/ha+ HW at 30 DAS and trifluralin at 0.75 kg/ha+ HW at 30 DAS were found among the most promising and equally effective treatments in improving this growth attribute of urdbean (Table 1). These treatments registered 67.3, 62.6, 58.4, 54.9 and 53.9 per cent higher branches per plant at 50 DAS and 63.6, 60.4, 53.6, 49.7 and 45.5 per cent at harvest stage than weedy check, respectively. After weed free, the maximum dry matter accumulation of 108.88 and 159.31 g per metre row length at 50 DAS and harvest stages was obtained under imazethapyr at 0.10 kg/ha + HW at 30 DAS treatment that was significantly higher by 17.8, 21.8, 24.6, 31.8 and 56.0 per cent at 50 DAS and 20.4, 17.6, 25.4, 29.0 and 50.1 per cent at harvest stage over imazethapyr at 0.10 kg/ha, one HW at 20 DAS, alachlor at 1.5 kg/ha, trifluralin at 0.75 kg/ha and weedy check treatments, respectively. Weed free treatment attained the highest number of 34.96 nodules per plant among all the treatments. However, it was found statistically at par with two HW at 20 and 40 DAS, imazethapyr at 0.10 kg/ha + HW at 30 DAS, alachlor at 1.5 kg/ha + HW at 30 DAS and trifluralin at 0.75 kg/ha + HW at 30 DAS treatments, wherein 34.43, 34.13, 33.23 and 31.96 nodules per plant, respectively were recorded. These treatments were accompanied by one hand weeding at 20 DAS, imazethapyr at 0.10 kg/ha, alachlor at 1.5 kg/ha and trifluralin at 0.75 kg/ha treatments that were also noted to have 27.9, 27.0, 24.3 and 15.3 per cent more nodules per plant, respectively than weedy check (Table 2). Although, weed control using herbicides alone or with one HW treatments also augmented these growth characters over weedy check, yet the extent of increase was much below than above mentioned treatments. Significant improvement in growth determining character using imazethapyr + HW has also been reported by Kushwah and Vyas (2006) in soybean and Dhaka and Yadav (2011) in sesame

Table 3. Effect of different weed management treatments on yield, harvest index, net return and B:C ratio of *V. mungo*.

Treatments	Yield (kg/ha)			Harvest index (%)	Net returns (Rs/ha)	B:C ratio
	Grain	Straw	Biological			
Weedy check	530	1412	1942	27.43	6932	0.52
Weed free	1416	2622	4038	35.09	33206	1.77
One HW at 20 DAS	894	2085	2978	30.08	18256	1.19
Two HW at 20 & 40 DAS*	1392	2483	3874	35.97	33469	1.92
Trifluralin @ 0.75 kg/ha	698	1722	2420	28.94	11934	0.82
Alachlor @ 1.5 kg/ha	758	1796	2553	29.62	12358	0.76
Imazethapyr @ 0.10 kg/ha	872	1878	2750	31.56	17915	1.23
Trifluralin @ 0.75 kg/ha + HW at 30 DAS*	1153	2263	3417	33.73	26023	1.57
Alachlor @ 1.5 kg/ha + HW at 30 DAS*	1259	2387	3645	34.52	28040	1.54
Imazethapyr @ 0.10 kg/ha + HW at 30 DAS *	1403	2575	3978	35.41	3481	2.09
SEm+	45	82	119	1.53	1458	0.09
CD (P = 0.05)	131	238	344	4.44	4231	0.27
CV (%)	8.72	7.73	7.51	9.49	13.08	13.76

(*Sesamum indicum*).

Effect on yield attributes and yield: The application evaluated for their efficacy registered significantly higher number of pods per plant than unweeded control. After weed free, the highest pods per plant (27.73) were recorded under pre emergent imazethapyr at 0.10 kg/ha + HW at 30 DAS treatment (Table 2). It was found significantly superior over rest of the treatments except HW twice at 20 and 40 DAS and alachlor at 1.5 kg/ha + HW at 30 DAS. These three treatments increased the pods per plant by magnitude of 38.6, 39.4 and 27.3 per cent over alachlor at 1.5 kg/ha, 45.0, 43.7 and 33.1 per cent over trifluralin at 0.75 kg/ha and 71.3, 69.8 and 57.3 per cent over weedy check treatments, respectively. It also showed that all the weed management treatments except alachlor at 1.5 kg/ha and trifluralin at 0.75 kg/ha significantly enhanced the number of grains per pod as compared to weedy check treatment. The highest number of grains per pod (9.05) was achieved under two hand weeding treatment that was statistically at par with weed free treatment. It registered 20.2, 21.8 and 38.2 per cent increase in grains per pod over alachlor at 1.5 kg/ha, trifluralin at 0.75 kg/ha and weedy check treatments, respectively. Weed free and HW twice at 20 and 40 DAS were found to be the most superior treatments in this regard. These treatments resulted a significant increase of 11.8 and 11.2 per cent over alachlor at 1.5 kg/ha; 21.5 and 20.9 per cent over trifluralin at 0.75 kg/ha and 23.8 and 23.1 per cent over weedy check treatments, respectively.

After weed free, application of imazethapyr at 0.10 kg/ha + HW at 30 DAS witnessed the highest number grain (1403 kg/ha), straw (2575 kg/ha) and biological yield (3978 kg/ha) of urdbean (Table 3). These two treatments resulted 164.7 and 162.6 per cent higher

grain and 82.4 and 75.4 per cent higher straw yield of urdbean, respectively than control. Alachlor at 1.5 kg/ha + HW at 30 DAS and trifluralin at 0.75 kg/ha + HW at 30 DAS were found to be the next superior treatments in improving yield and harvest index. One HW at 20 DAS, imazethapyr at 0.10 kg/ha, alachlor at 1.5 kg/ha and trifluralin at 0.75 kg/ha alone, also significantly enhanced the yield of urdbean than control, though, the extent of increase was not as high as in case of above mentioned treatments. These treatments increased the grain yield by 68.7, 64.5, 43.0 and 31.7 per cent, respectively over weedy check and thus observed as the next superior treatments.

The increase yield obtained due to either of these treatments can be better explained with their effectiveness in weed control in comparison to weedy check treatment. HW treatments than application of herbicides alone and single hand weeding because it improved the tilth by making soil more vulnerable for the plants to utilize water and air. The increase in grain yield of urdbean was also largely due to higher harvest indices reflecting greater partitioning of assimilates towards sink under weed free environment. In the presence of weeds, although the vegetative growth of the crop attained a level but sink was not sufficient enough to accumulate the meaningful food assimilates translocating towards grain formation. Chand *et al.* (2003) and Chand *et al.* (2004) also reported improvement in yield attributes of urdbean (*Vigna mungo*) with two hand weedings, alachlor + HW and imazethapyr at 0.10 kg/ha treatment.

All the measures adopted for weed management in urdbean fetched significantly higher net returns and B:C ratio than weedy check treatment that is obviously due to higher grain yield obtained with these treatments. Pre emergence application of imazethapyr at

0.10 kg/ha + HW at 30 DAS provided the maximum net returns of Rs. 34815/ha with B:C ratio of 2.09 thereby, increasing the net returns by margin of Rs. 27883/ha over weedy check (Table 3). Two HW at 20 and 40 DAS and weed free were observed to be the next superior treatments that enhanced the net returns by magnitude of Rs. 26537 and 26274/ha, respectively, with corresponding with B:C ratio of 1.92 and 1.77. Rest of the treatments although fetched significantly higher net returns than control, The lowest grain and straw yields achieved under weedy check treatment was eventually reflected in the lowest net returns (Rs 6932/ha) and B:C ratio (0.52). Results of the present investigation corroborate the findings of Ali *et al.* (2011) in urdbean who conducted an experiment during rainy season in greengram at S.K.Nagar on sandy loam soil. They obtained the highest grain yield and net returns in weed free treatments that showed statistical equivalence with imazethapyr at 100 g/ha and quizalofop-p-ethyl at 100 g/ha both applied at 20 DAS.

Conclusion

Based on this experimentation, it may be concluded that pre emergence application of imazethapyr at 0.10 kg/ha + HW at 30 DAS was found the most effective treatment with regard of grain yield (1403 kg/ha), net returns (Rs. 34815/ha) and B:C ratio (2.09). Two hand weeding done at 20 and 40 DAS also produced grain yield of 1392 kg/ha with net returns of Rs. 33469 /ha and thus proved equally effective and remunerative weed management treatment in urdbean. These two treatments also resulted substantial reduction in nutrient depletion by weeds.

REFERENCES

- Ali, S., Patel, J.C., Desai, L.J. and Singh, J. (2011). Effect of herbicides on weeds and yield of rainy season green gram (*Vigna radiata* L. Wilczek). *Legume Research*, 34 (4) : 300-303.
- Anonymous (2011). Forth Estimation of The Hindu Survey of Indian Agriculture.
- Anonymous (2009-10). Fertilizer and Agriculture Statistics, Northern region. *The fertilizers Association of India*, Northern Region, New Delhi.
- Begum, G. and Rao, A.S. (2006). Efficacy of herbicides on weeds and relay crop of blackgram. *Indian Journal of Weed Science*, 38 (1 & 2) : 145-147.
- Bhan, V.M. and Singh, A.N. (1991). Weed management - A tool for increasing production of oilseed and pulses. *Agricultural Situation in India* : 409.
- Chand, R., Singh, N.P. and Singh, V.K. (2004). Effect of weed control treatments on weeds and grain yield of late sown urdbean (*Vigna mungo* L.) during *kharif* season. *Indian Journal of Weed Science*, 36 (1&2) : 127-128.
- Chand, R., Singh, N.P. and Singh, V.K. (2003). Effect of weed management practices on productivity of late planted urdbean during *kharif* season. *Indian Journal of Pulses Research*, 16 (2) : 163-164.
- Dhaka, M.S. and Yadav, S.S. (2011). Weed management in sesame (*Sesamum indicum* L.) at varying levels of nitro-trogen. *M.Sc. (Ag.) Thesis Swami Keshwanand Rajasthan Agricultural University, Bikaner.*
- Kushwah, S. S. and Vyas, M. D. (2006). Efficacy of herbicides against weeds in rainfed soybean (*Glycine max*) under Vindhyan plateau of M.P. *Indian Journal Weed Science*, 38(1 & 2) : 62-64
- Malliswari, E.T., Reddy, M.T., Sagar, K.G. and Chandrika, V. (2008). Effect of irrigation and weed management practices on weed control and yield of blackgram. *Indian Journal of Weed Science*, 40 (1&2) : 85-86.