General Impact Factor (GIF): 0.875
Scientific Journal Impact Factor: 1.205

e- ISSN: 2394-5532
p- ISSN: 2394-823X

International Journal of Applied And Pure Science and Agriculture

www.ijapsa.com

Refining the weed management practices to increase the yield of urd bean (*Vigna mungo* L.) in north-western India

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Abstract

The field experiment was conducted during the Kharif season of 2009-2010 at Crop Research Center farm at SardarVallabhbhai Patel University of Agriculture & Technology, Modipuram, Meerut (U.P.) to, Refining the weed management practices to increase the yield of urd bean (Vigna mungo L.) in north-western India. Tenth treatments (weedy check, one hand weeding at 20 DAS, two hand weeding at 20 and 40 DAS; quizalofop ethyl @ 50 g ai/ha as post- emergence, pendimethaline @ 1 kg a.i/ha as pre-emergence, oxyflourfen @ 100 g a.i/ha as pre-emergence, pendimethaline @ 1 kg a.i/ha as pre-emergence + quizalafop ethyl @ 50 g a.i/ha as post-emergence, oxyflourfen @ 100 g ai/ha as pre-emergence + quizalofop ethyl @ 50 g ai/ha post-emergence, pendimethaline @ 1 kg ai/ha as pre-emergence + one hand weeding at 40 DAS, oxyflourfen @ 100 g ai/ha as pre-emergence + one hand weeding at 40 DAS were tested in Randomized Block Design with four replications. Growth and yield attributes were affected significantly due to different weed management practices. However, weed density and weed dry weight were decreased significantly with increasing number of hand weeding (20 and 40 DAS). Hand weeding at 20 and 40 DAS proved its superiority over other methods of weed control in respect of all the growth characters and yield attributes as well as grain and straw yield of urd bean crop followed by oxyfloufen @ 100 g ai/ha as pre-emergence + one hand weeding at 40 DAS.

Key word: Herbicides, growth, yield and Urd bean

I. INTRODUCTION

Pulses form an integral part of vegetarian diet in the Indian subcontinent. Besides being a rich source of protein, they enrich soil through symbiotic nitrogen fixation and play a vital role in low input sustainable agriculture. Pulses are energy rich crops but are cultivated largely under starved conditions. India is the largest producer, importer and consumer of pulses in the world accounting for 25 percent of the global production, 15 percent trade and 27 percent consumption as sizeable population in country still depends on vegetarian diets to meet their protein requirement. Domestic production of pulses after its peak of 14.94 million tones in 2003-04 had declined to 13.38 million tones in 2008-09 or 2009-10 and to 13.11 million tones in 2005-06 due to adverse climatic conditions prevalent in the major production zones.

The production is estimated to increase marginally to 14.1 million tones in coming year. This still falls short of the domestic requirement of 17 million tones which is increasing consistently with growing population, rising income, value addition and market opportunities (Ali and Kumar 2007). During 2010-11 the area in Uttar Pradesh, production and productivity of urd bean were 5.57 lakh hectare, 3.72 lakh tone and 6.68 q ha^{-1}, respectively. (Source- Agric.statistic cell, Directorate of Agriculture, Lucknow, (U.P). Weeds are plants which grow where they are not desired. They grow in the fields where they compete with crops for water, soil nutrients, light and space and thus reduce crop yields. Various research workers have tried oxyflourfen 23.5 EC and pendimethaline 30 EC.

Weeds ideas in different pulse crops and reported positive results on grassy and non-grassy weeds. Turga super (quizalofop ethyl 5 EC) applied as post emergence (25 DAS) was also found effective to control *cyperusrotundus* and other sedge species of weeds. The chemical method of weed control is easier, less time consuming and less costly than weeding by hired labourers. A great advantage of this method lies in killing weeds in the crop rows and weeds in the immediate vicinity of crop plants. The integrated use of herbicides and manual weeding has been reported more effective, safer and less effective, thus plays an important role for controlling weeds in field crops.

II. MATERIALS AND METHOD

The field experiment was conducted at Crop Research Centre of Sardar Vallabh Bhai Patel University of Agriculture & Technology, Modipuram, Meerut (Uttar Pradesh) during *kharif*, 2010. Geographically, it is situated at 29^0 04' N latitude, 77^0 42' E longitudes and at an altitude of 237 meters above mean sea level. The climate of Meerut is subtropical and semi-arid. It is characterized with hot summers and extremely cold winters. The maximum temperature of 44^0C is not uncommon during summers while very low temperature of 3^0C may be experienced during December-January, frost generally occurs towards the end of December and may continue till the end of January. Average annual rainfall in the area is 760 mm and distributed over a period of about 100 days with peak rainfall in July-August and a few sheltered showers during winter months from South-West monsoon.

However, occasional drought years are also observed. The field study was planned and layout in randomized block design with 4 replications. The soil of experimental field was of sandy loam. Blackgram was sown in *kharif* of 8 August 2010 and was harvested in the 5 November. The soil of the experimental field was poor in available nitrogen and medium in phosphorus and potassium with alkaline in reaction. The organic carbon content in the soil was 0.42 per cent. During crop season, the maximum temperature varied from 29.5^0C to 36.0 ^{0}C. The maximum rainfall of 17.4 mm was recorded in the month of September and total rainfall received during the crop period was 69.6 mm. Relative humidity was the maximum 92% in the month of September respectively. Urd bean variety shakhar-2 was used for sowing with an uniform seed rate of 20 kg ha^{-1}. Seed sowing was done in furrows opened 30 cm apart behind plough at the depth of 5 cm. Soil of the experimental site has been classified as sandy loam and field was drained and leveled. Soil samples were collected at random from different parts of experimental field (16 places) with the help of a soil auger to a depth of 0-22.5 cm prior to the fertilizer application. The collected soil samples were mixed together and a composite sample was drawn and analyzed. A basal dose of 100 kg DAP (Di-ammonium phosphate) was applied uniformly to all plots.

The observations pertaining to yield and yield contributes were recorded at harvest. Weed population was studied with the help of a quadrate (50cm x 50cm) placed in second row in the different corners of the plot in different observations. The populations counts were taken at different stages of crop growth i.e. 20, 40, 60 DAS and at harvest sampled plants were dried in sun and subsequently into oven at 72^0C till constant weight were obtained. In the plots of hand weeding treatments, weeding was done by manual labour with the help of *khurpi* as per the treatment. In case of herbicides application, all herbicides were applied through spraying of aqueous solution at the rate of 800 litres of water per hectare. Solution for each herbicidal treatment was prepared on gross plot area basis combined for all the four replications and spraying was done according by with the help of sprayer, flat – fan nozzle. Pre-emergence application of pendimethalin @ 1 kg a.i. per ha and oxyfluorfen @ 100 g a.i. per ha was done one day after seed sowing. Quizalofop ethyl was applied as post-emergence herbicide @ 50 g a.i. per ha at 25 days after sowing.

III. RESULT AND DISCUSSION

A. Growth attribute

In general, plant height increased up to (82.00cm) with advancement of crop age till harvest. At initial stage of 20 DAS, plant height was significantly higher in all three treatments where in pendimethalin and oxyfluorfen were applied as pre- emergence when compared to rest of the treatments. At 40 days stage, highest plant height was recorded in the treatment of pendimethalin + quizalofop (T_7), and it was significantly higher only over the treatments (T_2, T_3) of 1 or 2 hand weeding and weedy check (T_1). At this stage significantly lowest plant height was recorded in weed check treatment (T_1). At later stages of 60 DAS and harvest, weedy check treatment (T_1) recorded significantly lowest plant height (55.30cm). Among other treatments, one hand weeding (T_2) treatment produced significantly shorter plants than others which remained statistically at same bar of significance at the stage of 60 DAS. Almost similar trend was observed at final stage of harvest. Numerically, the treatment (T_7) of pendimethalin + quizalofop produced tallest plants (39.11cm, 67.42cm and 82.0 cm) at all later stages of 40, 60 DAS and harvest (Table 1).

In general, number of branches/plant increased with crop age and thus maximized at harvest stage under all treatments. At all stages of observation, the treatment of weedy check (T_1) produced significantly minimum number of branches per plant (Table 1). At 40 days stage, all weed control treatments except 1 or 2 hand weeding (T_2) and quizalofop, being *at par* with each other produced significantly more number of branches/plant (6.32) than remaining treatments. However, numerically the treatments (T_5) of pendimethalin produced more branches than the treatments (T_6) of oxyfluorfen. At both later stages of 60 DAS and harvest, maximum number of branches/plant were recorded under the treatment (T_3) of 2 hand weeding, which being *at par* with the treatments (T_9) of pendimethalin + HW at 40 DAS and oxyfluorfen + HW at 40 DAS, produced significantly more number of branches than all other treatments.

The percent increase in branches/plant due to weed control treatments was also worked out for final stage of harvest (Table 4.16). It showed that maximum increase in branches (76.6%) was observed under the treatment (T_3) of 2 hand weeding over weedy check (T_1). It was followed by the treatment (T_9) of pendimethalin + HW at 40 DAS (69.5%) and (T_9) oxyflourfen + hand weeding at 40 DAS (65.0%). The minimum increase of 26.0% in number of branches/plant was recorded in the treatment (T_2) of 1 hand weeding over weedy check treatment (T_1). The growth characters viz. plant height and number of branches per plant recorded were highest under 2 hand weeding treatment followed by pendimethalin + HW and oxyfluorfen + HW treatments. This might be attributed to lesser crop weed competition in these treatments because of effective weed control (Table 2 & 3). Almost similar findings in urd bean have also been reported by Singh *et al.* (1992), Mishra and Misra (1995), Jain *et al*. (1997) and Yadav and Shrivastawa (1998).

Table 1: Plant height (cm) and number of branches per plant of urd bean as affected by different weed management practices

Treatments	Plant height (cm)				Number of branches (No.)			
	20 DAS	40 DAS	60 DAS	Harvest	20 DAS	40 DAS	Harvest	Increase (%) over weedy check at harvest
T_1. Weedy check	16.18	30.33	55.30	67.46	2.43	4.08	6.03	26.0
T_2. One HW at @20 DAS	15.60	35.68	62.56	76.17	3.10	5.33	7.60	76.6
T_3. Two HW @ 20 and 40 DAS	16.00	36.00	67.34	81.90	3.15	7.38	10.65	42.0
T_4. Quizalofop ethyl @ 50 g/ha post-em	15.57	36.75	63.65	77.49	3.00	5.94	8.56	49.3
T_5. Pendimethalin @ 1 kg/ha pre-em	17.85	37.34	64.87	78.95	3.51	6.32	9.00	44.9
T_6. Oxyfluorfen @ 100 g/ha pre-em	18.27	37.50	65.15	79.26	3.32	5.98	8.74	59.4
T_7 Pendimethalin @ 1 kg/ha pre-em followed by Quizalofop ethyl @ 50 g/ha post-em	18.00	39.11	67.42	82.00	3.48	6.68	9.61	55.1
T_8. Oxyfluorfen @ 100 g/ha pre-em followed by Quizalofop ethyl @ 50 g/ha post-em	17.93	38.85	67.28	81.84	3.42	6.58	9.35	69.5
T_9. Pendimethalin @ 1 kg/ha pre-em followed by HW @ 40 DAS	18.33	37.43	66.23	80.58	3.53	7.13	10.22	65.0
T_{10} Oxyfluorfen @ 100 g/ha pre-em followed by HW at 40 DAS	18.11	37.55	66.30	80.63	3.47	7.00	9.95	26.0
SEm ±	0.65	1.23	1.99	1.73	0.08	0.18	0.24	-
C. D. (P= 0.05)	1.34	2.53	4.09	3.54	0.25	0.53	0.72	-

B. Yield attributes

All treatments of weed control produced significantly more number of pods/plant over weedy check treatment (T_1). The maximum number of pods/plants were recorded under the treatment (T_3) of 2 hand weeding which were *at par* with the treatments (T_9) of pendimethalin + HW at 40 DAS and (T_{10}) oxyfluorfen + HW at 40 DAS. These three treatments produced significantly more number of pods/plant (35.40, 34.70 and 33.80) than remaining treatments. Among remaining treatments, pendimethalin + quizalofop (T_7), oxyfluorfen + quizalofop (T_8) and pendimethaline alone (T_4), being *at par* with oxyfluorfen alone (T_6) produced significantly more number of pods/plant than quizalofop alone (T_4) and 1 hand weeding treatments (T_2). The treatment (T_2) of one hand weeding produced significantly minimum number of pods/plant among all weed control treatments. Seeds/pod recorded maximum (7.03) under treatment (T_3) of 2 hand weeding, were found significantly more than the seeds/pod in the treatments (T_2) of 1 hand weeding and (T_4) quizalofop alone application. Weedy

check treatment (T_1) produced significantly minimum number of seeds/pod. All treatments of weed control with exception of T_2 reported significantly higher 1000-grain weight over weedy check treatment (T_1). The highest thousand grain weight (44.35) was recorded in 2 hand weeding treatment (T_3) which remained *at par* with pendimethalin + HW at 40 DAS(T_9) and oxyfluorfen + HW at 40 DAS (T_{10}), and significantly higher than other treatments. All other treatments of weed control found on same bar in this respect (Table 2).

Table 2: Yield and yield attributes of urd bean as affected by different weed management practices

Treatments	Yield attributes of urd bean						
	No. of pods/plant	No. of seeds/pod	1000-grain wt. (g)	Grain wt./plant (g)	Grain yield	Straw yield	Harvest Index (%)
T_1. Weedy check	18.40	4.85	38.65	3.05	6.40	26.88	19.23
T_2. One HW at @20 DAS	25.90	6.12	40.31	3.86	7.80	31.59	19.80
T_3. Two HW @ 20 and 40 DAS	35.40	7.03	44.35	5.59	11.50	35.65	24.39
T_4. Quizalofop ethyl @ 50 g/ha post-em	28.90	6.15	0.80	4.20	8.68	32.98	20.84
T_5. Pendimethalin @ 1 kg/ha pre-em	30.80	6.33	41.33	4.65	9.20	34.05	21.27
T_6. Oxyfluorfen @ 100 g/ha pre-em	29.90	6.35	41.25	4.52	8.91	33.40	21.06
T_7 Pendimethalin @ 1 kg/ha pre-em followed by Quizalofop ethyl @ 50 g/ha post-em	31.60	6.41	42.18	4.85	9.82	34.37	22.22
T_8. Oxyfluorfen @ 100 g/ha pre-em followed by Quizalofop ethyl @ 50 g/ha post-em	31.00	6.40	42.31	4.58	9.54	34.24	21.79
T_9. Pendimethalin @ 1 kg/ha pre-em followed by HW @ 40 DAS	34.70	6.95	43.90	5.38	10.80	34.58	23.80
T_{10} Oxyfluorfen @ 100 g/ha pre-em followed by HW at 40 DAS	33.80	6.88	43.56	5.28	10.47	34.51	23.28
SEm ±	0.66	0.24	0.67	0.11	0.18	0.96	0.31
C. D. (P= 0.05)	1.92	0.72	1.96	0.32	0.53	2.78	0.93

It is the ultimate result of all yield attributes. Weedy check (T_1) treatment recorded significantly lowest grain weight per plant among all the treatments. Among remaining treatments, pendimethalin + quizalofop (T_7) being *at par* with pendimetahlin alone (T_5) and oxyfluorfen + quizalofop (T_8), recorded significantly higher grain weight/plant than oxyfluorfen alone (T_6), quizalofop alone (T_4) and 1 hand weeding treatments (T_2) (Table 1). Among all weed control treatments, 1 hand weeding (T_1) recorded significantly lowest grain weight/plant. It may also be seen in that the (T_3) treatment of 2 hand weeding increased grain weight/plant (5.59g) over weedy check (T_1) by maximum margin of 83.3 percent, it was followed by pendimethalin + HW at 40 (T_9) DAS with 76.4% increase and oxyfluorfen + HW at 40 DAS (T_{10}) with 73.1% increase. Minimum increase of only 26.6% was recorded under 1 hand weeding treatment (T_2) closely followed by quizalofop ethyl alone (T_4) with 37.7% increase in grain weight. Such increase in grain weight/plant under other treatments varied from 48.2 to 59.0 percent. The yield attributes of urd bean viz. pods/plant, seeds/plant, 1000-grain weight and grain weight/plant recorded were highest under the treatment of 2 hand weeding followed closely by pendimethalin + HW at 40 DAS and oxyfluorfen + HW at 40 DAS. These yield attributes were favoured due to better crop growth which is evidenced by the observations recorded on crop dry matter production per plant, number of branches/plant, leaf area index and root nodules/plant. It may be ascribed because of lesser crop – weed competition in these treatments as they control weeds more effectively than other treatments. These results are in conformity to the findings of Chin and Pandey (1991), Mishra and Misra (1995), Jain et al. (1997), Ramanathan and Chandrashekharan (1998), Ramesh chand et al. (2003) and Singh et al. (2006).

All weed control treatments gave significantly higher grain yield over weedy check (T_1). Significantly highest grain yield (11.50 q/ha) was recorded under the treatment (T_3) of 2 hand weeding which was found 5.10 q/ha or 79.7 per cent higher over weedy check treatment (T_1). It was followed by the yields under treatments of pendimethalin + HW 40 DAS (T_9) and oxyfluorfen + HW 40 DAS (T_{10}) which remained *at par* with each other but significantly higher than other treatments and produced 4.40 and 4.07 q/ha or 68.8 and 63.6 percent higher grain yield, respectively over weedy check. Among rest of the weed control treatments, (T_2) 1 hand weeding produced significantly lower grain yield which was found 1.40 q/ha or 21.9 per cent higher over weedy check treatment (T_1). Out of remaining treatments, pendimethalin + quizalofop (T_7) and oxyfluorfen + quizalofop (T_8) being *at par*, produced 3.42 and 3.14 q/ha or 53.4 and 49.1 percent higher grain yield, respectively over weedy check treatment (T_1). It is thus proved from these results that treatment (T_3) of 2 hand weeding at 20 and 40 DAS was best from grain yield point of view. All weed control treatments produced significantly highest straw yield over (T_1) weedy check. Among weed control treatments, highest straw yield was produced under treatment (T_3) of 2 hand weeding although it was significantly higher only over treatment (T_1) of 1 hand weeding. The treatment of one hand weeding (T_2) increased straw yield over weedy check (T_1) by 17.5 percent while such increase in other treatments varied from 22.7 to 32.6 percent in straw yield over weedy check.

The treatments (T_3) of 2 hand weeding, pendimethalin + HW 40 DAS (T_9) and oxyfluorfen + HW 40 DAS (T_{10}) being *at par* with each other gave significantly higher harvest index than remaining all treatments. Weedy check treatment (T_1) being *at par* with one hand weeding (T_2) recorded significantly lowest harvest index. Among other treatments, pendimethalin + quizalofop (T_7) recorded highest harvest index, but it was significantly higher only over the treatments of alone application of quizalofop (T_4), (T_6) pendimethalin or oxyfluorfen. It is thus proved from these results that 2 hand weeding at 20 and 40 DAS produced highest grain yield which might be attributed to desired plant stand per unit area and grain weight/plant. It was followed by the integrated weed control through pendimethalin + HW and oxyfluorfen + HW. These treatments had lower density and dry weight of weeds right from 40 DAS till harvest stage which facilitated good growth of crop plants particularly in reproductive phase and weeds were not allowed These results are in accordance

with those of Jain and Jain (1987), Mishra and Singh (1993), Tewari*et al.* (1993), Modak*et al* (1995), Jain *et al.* (1997), Ramanathan and Chandrashekharan (1998), Choubey*et al*. (1999), Ramesh chand*et al.* (2004), Bhowmick and Gupta (2005) and Shweta and Singh (2005).

BIBLIOGRAPHY

[1] Agric.statistic cell, *Directorate of Agriculture, Lucknow, (U.P).*
[2] Bhowmick, M.K. and Gupta, S. 2005. Herbicidal-cum-integrated approach to weed management in urdbean. *Journal of crop and weed* 1 (2): 75-77.
[3] Chaubey, N.K., Tripathi, R.S. and Ghosh, B.C. 1999. Effect of fertilizer application and weed management practices on nutrient uptake by summer blackgram (*Phaseolusmungo*)and associated weeds under rainfed condition. *Indian Journal of Agronomy* 44 (3): 576-580.
[4] Chin, D.V. and Pandey, J. 1991. Effect of pre and post-emergence herbicides on weeds and yield of blackgram (*Phaseolusmungo*). *Indian Journal of Agronomy* 36 (Suppl.): 276-277.
[5] Jain, N.K. and Jain, S.C. 1987. Impact of different weed free media on growth and yield parameters of blackgram (*Vignamungo* L.) in semi arid tropical conditions. *IndianJournal of weed science* 20 (4): 81-82.
[6] Jain, V.K., Chauhan, Y.S. and VivekChitnis. 1997. Effect of cultural and chemical methods of weed management on weeds and yield of blackgram (*Phaseolusmungo*). *Indian Journal of Agronomy* 42 (4): 661-664.
[7] Mishra, M. and Mishra, A. (1995). Effect of fertilizer, weed control and row spacing on summer blackgram (*Phaseolusmungo*). *Indian Journal of Agronomy*,**40** (3): 434-438.
[8] Modak, R., Chakraborty, T. and De, G.C. (1995). Method of weed management on weed biomass, yield of blackgram (*Phaseolusmungo*) and nitrogen uptake. *Indian Journal of Agronomy*, **40** (1): 115-117.
[9] Ramanathan, S.P. and Chandrashekharan, B. 1998. Weed management in blackgram (*Phaseolusmungo*). *Indian Journal of Agronomy* 43 (2): 318-320.
[10] Ramesh chand, Singh, N.P. and Singh, U.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.
[11] Ramesh chand, Singh, N.P. and Singh, V.K. 2004. Effect of weed control treatments on weeds and grain yield of late sown urdbean (*Vignamungo* L.) during *kharif* season. *Indian Journal of weed science* 36 (1-2): 127-128.
[12] Shwata and Singh, V.K. 2005. Integrated weed management in urdbean during *kharif* season. *Indian Journal of weed science* 37 (1-2): 121-122.
[13] Singh, R.V., Parmar, M.L. and Singh, P.P. 1992. Response of blackgram (*Phaseolusmungo*L) to weed control and fertilizer. *Indian Journal of Agronomy* 37 (1): 192-193.
[14] Singh, V., Gautam, R.C. and Sanjay Kumar. 2006. Performance of *kharif*urd bean as influenced by row spacing and weed management practices. *Indian Journal of Pulses Research* 19 (1): 119-120
[15] Tewari, A.N., Singh, V., Singh, B. and Jain, R.K. (1993). Weed control through herbicides in blackgram intercropped with sesame under rainfed condition (s). proceedings of an international symposium on integrated weed management for sustainable agriculture, organized by *Indian society of weed science*, held at Hissar, Haryana on November 18-20. Vol. III, pp. 173-175.
[16] Yadav, R. P. and Shrivastava, U.K. 1998. Integrated weed management in blackgram (*Phaseolusmungo*). *Indian Journal of Agronomy* 43 (1): 106-105.

