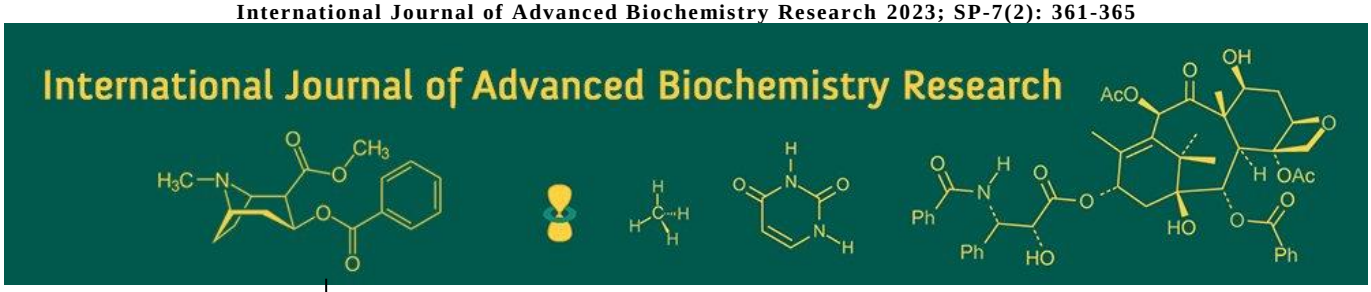

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Influence of weed managing techniques on yield attributes & yield of black gram

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Abstract
The present investigation, titled "Effect of weed management practices on yield and yield attribution of urdbean," was conducted at the Research- Cum-Instructional Farm, Rampur Selaqui, Dehradun (U.K.) during the 2013 Kharif growing season. Three separate replications were employed in the randomized block design of the experiment. Eleven weed management strategies made up the treatment. The current study's findings showed that weed-free treatments produced the smallest levels of total weed density, total dry weight, maximum LAI, CGR, RGR, yield attributes, seed yield, Stover yield and harvest index (%), weed index (%), and WCE. These treatments were followed by hand weeding two times at 20 and 40 DAS and imazethapyr @ 40 g ha^{-1} PoE, and the lowest levels were produced under weedy control. In the experimental field, *Parthenium hysterophorus, Digera arvensis, Celosia argentia, Cynotis axillaris, Alternanthra sessalis* and *Echinochloa colona* were the leading weeds & found during the crop growth period.

Keywords: Yield, yield attributes, weeds and urdbean

Introduction
Among the more vital pulse crops which be able to be grown in tropical and subtropical regions be the urad bean. Urdbean (*Vigna mungo* L. Hepper), one of the pulses, is a significant Kharif pulse crop in India and has about three times the amount of protein of cereals (Kanade, 2006) [3]. According to Islam *et al*. (2012) [7], urdbean is especially high in phosphoric acid, vitamins, & minerals and have 24% protein, 60% carbs & 1.3% fat. The urad bean ranks fourth in important among Indian crops, behind chickpea, pigeon pea, and green gram. In our country, it is cultivated in the rainy season, when weed infestation results in a significant reduction in production. 25 to 35 days after sowing, the weed initially causes the most damage (Randhawa *et al.*, 2002) [9].

Due to their tendency for fighting for resource and their effect on the quality of goods, weeds make up an important obstacle to crop progress. The related weeds in agricultural systems take full advantage of the perfect surroundings that are supplied for maximum crop productivity. All crops experience substantial reductions in yield due to weeds. Apart from to substantially decreasing crop yields, weeds also raise farming costs, decrease input efficiency, disrupt farming operations, degrade product quality, serve as new hosts for a variety of diseases and insects, harm native the environment, and have negative health effects on both people and animals. It is known that weeds are responsible for nearly one third of the loss caused on by different biotic stressors. Early crop growth is the best time to manage weeds since of crop development is essential for pulse yield. Weed growth in pulse crops starts at the same time as the crops, causing severe rivalry between the two (Kandasamy, 2000). 25 to 35 days after sowing, the weed initial causes the most impact (Randhawa *et al.*, 2002) [9]. When weeds infect a crop in its early phases of growth, the yield can be reduced by up to 43.2–64.1% (Rathi *et al.*, 2004) [10]. Herbicides have grown more essential in short duration pulses like black gram where time is quite short for the crop (80-90 days) due to shortages of labor and expenditure involvement. Therefore, studies on the effect of pre-& after-emergent herbicides lying on black gram development & yield are required. The primary disadvantages of hand weeding include inappropriate and frequent, a lack of labor during peak hours, and insufficient rainfall. The usage of pesticides is the sole option that has to be looked into.

Such herbicides' effectiveness against a single-cot or dicotyledonous weeds is revealed by screening them in pulses. Therefore, the present research was conducted to determine the suitable herbicide, their proper rate, and the best timing to apply them to urdbean during the Kharif season.

Material and Methods

The field trial was carried out during rainy season of 2013 at the Research- cum-Instructional Farm, Rampur selaqui, Dehradun (U.K.). The eleven weed control treatments comprising of deferent herbicides at deferent doses and deferent point in time of appliance. *viz*., T_1 weedy check, T_2 manual weeding (20 and 40 DAS), T_3 Pendimethalin, 1000 (20 DAS PE), T_4 Quizalofop – p – ethyl, 37.5 (20 DAS PoE), T_5 Fenoxaprop – p- ethyl, 50 (20 DAS PoE) T_6 Pendimethalin, 30 EC + Imazethapyr, EC (Vallore 32) 750 (20 DAS PE), T_7 Pendimethalin, 30 EC + Imazethapyr, EC (Vallore 32) 20 DAS PE(1000) T_8: 25 DAS PoE Imazethapyr; T_9: 40 DAS PoE Imazethapyr; T_{10}: 55 DAS PoE Imazethapyr; T_{11}: Grass free plot. Dehradun has a sub-humid to semi-arid climates throughout, with 1325 millimetres of average annual precipitation, of which 85% occurs during the months of June and September and the remainder falls in 15% between October and February. During summertime, a week's highest temp. may exceed 46 ^{0}C, while during wintertime, the lowest temperature decreases to 6 ^{0}C. The warmest and coolest month is May & December, accordingly. From mid-June to March, atmospheric humidity is between 70 to 90 percent, and from May to August, with a peak in June, the wind speed is strong.

Results and Discussions

Number of pods plant^{-1}

The records on the number of pods plant^{-1} of urdbean as affected by different treatments are presented in Table 1. It is quite clear from the table that weed free plot (T_{11}) recorded significantly higher number of pods plant^{-1} follow by hand weeding twice at 20 and 40 DAS (T_2). Among the herbicidal treatment's application of imazethapyr @ 40 g ha^{-1} (T_9) found significantly higher number of pods plant^{-1} followed by T_6 Pendimethalin 30 EC + Imazethapyr 2EC (Vallore 32). The lowest numbers of pods plant^{-1} were recorded under weedy check (T_1). The same results have been documented by Ramanathan and Chandrashekharan (1998) [11] and Yadav *et al*. (1997) [13].

Table 1: Yield attributing characters of urdbean as affected by weed management practices

Treatment	Dose (g ha^{-1})	Time of application	No. of pods plant^{-1}	No. of seeds plant^{-1}	No. of seeds pods^{-1}	100-seed weight (g)
T_1 Weedy check	-		13.53	77.26	5.66	3.46
T_2 Hand weeding twice	-	20 & 40 DAS	19.40	144.38	7.50	4.53
T_3 Pendimethaln	1000	2 DAS	15.53	107.32	6.50	3.83
T_4 Quizalofop-p-ethyl	37.5	20 DAS	15.27	98.08	6.36	3.80
T_5 Fenoxaprop-p-ethyl	50	20 DAS	15.00	91.07	6.10	3.70
T_6 Pendimethalin 30EC + Imazethapyr 2 EC (Vallore 32)	750	2 DAS	18.13	129.37	7.13	4.20
T_7 Pendimethalin 30 EC + Imazethapyr 2 EC (Vallore 32)	1000	2 DAS	18.73	136.32	7.27	4.26
T_8 Imazethapyr	25	20 DAS	17.26	117.92	6.86	3.90
T_9 Imazethapyr	40	20 DAS	19.06	140.12	7.36	4.56
T_{10} Imazethapyr	55	20 DAS	18.00	125.74	6.96	3.96
T_{11}Weed free plot			20.66	160.60	7.73	4.57
SEm±			1.07	8.82	0.40	0.22
CD (p=0.05)			3.17	26.02	1.18	0.66

PE =Pre – emergence, PoE = post – emergence, DAS = Days after sowing

Number of seeds plant^{-1}

The information on number of seeds plant^{-1} as Influenced by different treatments are given in Table 1 and results revealed that there were notable variations in the weed control practices. It is quite clear from the table that weed free field (T_{11}) gave considerably maximum number of seeds plant^{-1}, over control but, it was on par with the results obtained from hand weeding twice at 20 and 40 DAS (T_2), pendimethalin 30 EC + imazethapyr 2 EC (Vallore 32) @ 1000 g ha^{-1} (T_7) and imazethapyr @ 40 g ha^{-1} (T_9). The minimum seeds plant^{-1}was recorded in weedy plot.

Number of seeds pod^{-1}

Table 1 gives details regarding the number of seeds pod-^{1} under various treatments. Among Among each of the weed control methods, the free of weeds plot (T_{11}) produced the greatest quantity of seeds per pod, which was comparable to hand weeding two times at 20 and 40 DAS (T_2), pendimethalin, 30 EC + imazethapyr, (Vallore 32) @ 750 g ha^{-1} (T_6), pendimethalin, 30 EC + imazethapyr, (Vallore 32) @ 1000 g ha^{-1} (T_7), imazethapyr, @ 25 g ha^{-1} (T_8), imazethaptr, @ 40 g ha^{-1} (T_9) and imazethapyr, @ 55 g ha^{-1} (T_{10}). The least was found under weedy check. Comparable outcomes have been documented by Chin and Pandey (1991) [2].

Seed Index (g)

Effects of special treatment on seed index are presented in Table 1. Significantly the highest 100-seed weight was recorded under weed free condition (T_{11}) (4.57 g) & it was comparable to hand weeding two times at 20 and 40 DAS (T_2) (4.53 g), pendimethalin, 30 EC + imazethapyr, 2 EC (Vallore 32) @ 750 g ha^{-1} (T_6) (4.20 g), pendimethalin, 30 EC+ imazethapyr 2 EC (Vallore 32) @ 1000 g ha^{-1} (T_7) (4.26 g), imazethapyr @ 40 g ha^{-1} (T_9) (4.56 g) and imazethapyr @ 55 g ha^{-1} (T_{10}) (3.96 g), while considerably least 100 grain-weight experimental under weedy plot (T_1).These outcome confirm by Begum and Rao (2006) who opined that hand weeding twice at 15 & 30 DAS record the highest 100 seed index (5.56 g) follow by application imazethapyr, @ 63 g ha^{-1} (5.55 g).

Table 2: Seed yield, Stover yield, harvest index and weed index of urdbean as affected by weed management practices

Treatment	Dose (g ha^{-1})	Time of application	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index (%)	Weed index (%)
T_1 Weedy check	-		380.50	735.12	34.14	48.75
T_2 Hand weeding twice	-	20 & 40 DAS	718.88	1203.90	37.33	3.18
T_3 Pendimethaln	1000	2 DAS	550.44	1034.73	34.71	25.86
T_4 Quizalofop-p-ethyl	37.5	20 DAS	525.48	1001.23	34.41	29.33
T_5 Fenoxaprop-p-ethyl	50	20 DAS	500.73	957.13	34.35	32.56
T_6 Pendimethalin 30EC +Imazethapyr 2EC (Vallore 32)	750	2 DAS	602.35	1095.38	34.76	18.87
T_7 Pendimethalin 30EC +Imazethapyr 2EC (Vallore 32)	1000	2 DAS	635.70	1147.61	35.84	14.38
T_8 Imazethapyr	25	20 DAS	613.55	1140.07	34.98	17.36
T_9 Imazethapyr	40	20 DAS	662.34	1183.59	35.92	10.79
T_{10} Imazethapyr	55	20 DAS	598.85	1105.90	35.13	19.34
T_{11}Weed free plot			742.54	1275.40	37.40	-
SEm±			32.20	61.79	1.2	-
CD (p=0.05)			97.95	182.28	NS	-

Seed yield (kg ha-¹)

Data concerning black gram seed yields (kg ha-¹) is present in Table 2. Perusal of the results showed in which the seed production of black gram influenced because of different weed managing treatment. Data indicated that significantly maximum seed yield of urdbean was observed under treatment of weed free plot (T_{11}), however, it was found comparable with treatment of hand weeding two times at 20 and 40 DAS (T_2) and Application of imazethapyr @ 40 g ha-¹ (T_9) makes up one of the herbicidal treatment options. The seed yield recorded from weed free plot, hand weeded and imazethapyr @ 40 g ha-¹ is 95.14, 88.93 and 74.07 percent higher over yield harvested from weedy check plot i.e. (380.5 kg ha-¹), whereas much lowest seed yield was experiential under weedy plot (T_1).

Stover production (kg ha^{-1})

Stover was output is a measure for a crop's entire moisture output over the course of its life. Table 2 presents details about how different weed management techniques affect urdbean the stover productivity. The findings indicated that the greatest stover yield of urdbean was measured from weed free (T_{11}) which be found similar with the result of hand weeding twice at 20 and 40 DAS (T_2), pendimethalin, 30 EC + imazethapyr, 2 EC (Vallore 32) @ 750 g ha-¹ (T_6), pendimethalin, 30 EC + imazethapyr, 2 EC (Vallore 32) @ 1000 g ha-¹ (T_7), imazethapyr, @ 40 g ha-¹ (T_8), imazethapyr, @ 40 g ha-¹ (T_9) and imazethapyr, @ 55 g ha-¹ (T_{10}). The basic limited yield of the stover under control of weeds (T_1).

Harvest index (%)

A measure of a crop's productivity efficiency is its harvest index. The data on HI as affected Through different weed methods of management on blackgram have to be had under Table 2. The findings indicate that no significant difference in harvest index was noted due to weed management treatment. However, the most harvest index (37.40%) was practical below weed free plot (T_{11}), whereas lower harvest index (34.14%) was observed under weedy check (T_1). superior harvest index implies that crop produced under weed free or weed control situation had the potential to partition more of photosynthates produced, towards the economic parts.

Weed index

Data with respect to weed index (WI) as have an effect on by a variety of treatments are presented in Table 2. Weed index indicated the fall in grain yield due to crop-weed competition as compared to weed free plot. The maximum weed index be found under weedy check (T_1) (48.75%) and fenoxaprop-p-ethyl @ 50 g ha^{-1} (T_5) (32.56%) attributed to the poor seed results, while the least weed index occurred after manually weeding a couple of times at 20 and 40 DAS (T_2) (3.18%), and using imazethapyr at 40 g ha^{-1} (T_9) (10.79%).

Table 3: Total weed density at different time interval as influenced by weed management practices

Treatment	Dose (g ha^{-1})	Time of application	20 DAS	40 DAS	60 DAS	At harvest
T_1 Weedy check	-		90.00	130.00	156.00	181.00
T_2 Hand weeding twice	-	20 & 40 DAS	88.00	31.00	47.00	72.00
T_3 Pendimethaln	1000	2 DAS	46.00	65.00	80.00	102.00
T_4 Quizalofop-p-ethyl	37.5	20 DAS	87.00	70.00	93.00	120.0
T_5 Fenoxaprop-p-ethyl	50	20 DAS	92.00	73.00	98.00	125.00
T_6 Pendimethalin 30 EC +Imazethapyr 2EC (Vallore 32)	750	2 DAS	42.00	50.67	63.00	95.00
T_7 Pendimethalin 30 EC +Imazethapyr 2EC (Vallore 32)	1000	2 DAS	38.00	45.00	60.00	92.00
T_8 Imazethapyr	25	20 DAS	77.00	58.00	78.00	98.00
T_9 Imazethapyr	40	20 DAS	86.00	40.00	56.00	88.00
T_{10} Imazethapyr	55	20 DAS	94.00	53.00	70.00	94.00
T_{11}Weed free plot			00.00	00.00	00.00	00.00
SEm±			4.21	4.75	4.82	7.61
CD (p=0.05)			12.42	14.03	14.23	22.44

This could be that proficient manage of weeds throughout crucial crop development phases provided conducive surroundings for greater crop plant growth and development, that led to optimum grain yield. The results of Yadav and Shrivastava (1998) [12] and Yadav *et al.* (1997) [13] are in conformity with that. Due to strong competition between crops and weeds in the crucial stage of crop

development, the maximum weed index under weedy plot resulted in the lowest quantity of seeds achievable.

Total weed density

Table 3 illustrates the anticipated total weed density at 20, 40, 60 DAS & harvest stage. In all of the therapies, it appeared that the weed population grew with time. Data showed that a pre-emergence herbicide was used throughout the initial period of observation (20 DAS). among the herbicidal treatment pendimethalin 30 EC + imazethapyr 2 EC (Vallore 32) @ 1000 g ha-¹ (T_7) record considerably least all weed density than supplementary weed control methods and It was situated. similar with results of treatments pendimethalin @ 1000 g ha-¹ (T_3) and pendimethalin 30 EC + imazethapyr 2 EC (Vallore 32) @ 750 g ha^{-1} (T_6). Imazethapyr post-emergence herbicides applied at 40 g ha^{-1} (T_9) and 55 g ha^{-1} (T_{10}) significantly suppressed the growth of whole weeds during the. The outcomes support Begum and Rao's (2006) report that imazethapyr spraying at 63 g ha^{-1} (PoE) was mainly efficient beside sedges and wide leaf weeds. According to Randhawa *et al.* (2002) [9], pre-emergence spraying of pendimethalin @ 1.5 kg ha^{-1} was successful in controlling weeds throughout the near the beginning phases of crop growth. Because of improper weed management methods, the weed abundance was notably higher in weedy check.

Table 4: Total dry mater production (g m^{-2}) of weeds at different time intervals and weed control efficiency at harvest influenced by weed management practices

Treatment	Dose (g ha^{-1})	Time of application	20 DAS	40 DAS	60 DAS	At harvest	Weed control efficiency %
T_1 Weedy check	-		5.41 (28.80)	9.22 (84.47	11.33 (128.0)	13.47 (181.0)	-
T_2 Hand weeding twice	-	20 & 40 DAS	5.35 (28.16)	3.53 (11.99)	5.37 (28.33)	8.51 (72.00)	60.22
T_3 Pendimethaln	1000	2 DAS	3.90 (14.72)	6.18 (40.00)	7.68 (58.49)	10.12 (102.0)	43.64
T_4 Quizalofop-p-ethyl	37.5	20 DAS	5.32 (27.84)	6.36 (40.00)	8.03 (64.00)	10.97 (120.0)	33.70
T_5 Fenoxaprop-p-ethyl	50	20 DAS	5.46 (29.44)	6.61 (43.25)	8.39 (69.97)	11.20 (125.0)	30.93
T_6 Pendimethalin 30EC +Imazethapyr 2EC (Vallore 32)	750	2 DAS	3.73 (13.44)	5.04 (25.00)	6.90 (47.13)	9.77 (95.0)	47.51
T_7 Pendimethalin 30EC +Imazethapyr 2EC (Vallore 32)	1000	2 DAS	3.55 (12.16)	4.70 (21.67)	6.52 (42.00)	9.62 (92.00)	49.17
T_8 Imazethapyr	25	20 DAS	5.01 (24.64)	5.90 (34.33)	7.36 (53.67)	9.92 (98.00)	45.85
T_9 Imazethapyr	40	20 DAS	5.29 (27.52)	3.98 (15.33)	6.20 (38.00)	9.41 (88.00)	51.38
T_{10} Imazethapyr	55	20 DAS	5.53 (30.08)	5.56 (30.44)	7.00 (48.53)	9.72 (94.00)	48.06
T_{11} Weed free plot			0	0	0	0	-
S.Em±			0.34	0.53	0.54	0.52	-
CD (p=0.05)			1.02	1.57	1.60	1.55	-

Total weeds dry accumulation

The sum weed dry material production at dissimilar time interval, weed control efficiency only at harvest are presented in Table 4. several weed techniques for management method showed important effect on whole dry material production of weeds. It has been noticed that throughout all measurement periods, hand weeding two times (20 and 40 DAS) result in the lowly weed dry matter production except 20 DAS interval of observation. However, at 20 DAS, among the herbicidal treatments pendimethalin 30 EC + imazethapyr 2 EC (Vallore 32) @ 1000 g ha^{-1} (T_7) resulted in the lowest weed dry matter production and significantly on par with pendimethalin @ 1000 g ha^{-1} (T_3) and pendimethalin 30 EC + imazethapyr 2 EC (Vallore 32) @ 750 g ha^{-1} (T_6). The minimum dry matter production under chemical methods of weed control might be due to longer persistence of herbicides up to harvest. Poor performance of some of the herbicides might be due to their shorter herbicidal activity, which could not control newly emerged weeds up to longer period of time in urdbean. The weed dried material production was considerably maximum in weedy plot which was therefore nonattendance of appropriate weed management mathod, which leads to growth of more dry material of weeds up to harvest. These outcomes be compliance to the result of Raman *et al.*, (2005) [14].

Weed control efficiency (%)

The facts on top of WCE as subjective by different treatment are accessible in Table 4.The most WCE record in plot wherever manual weed manage (60.22%) was adopted followed by herbicide imazethapyr @ 40 g ha^{-1} (T_9) (51.38%) & pendimethalin 30 EC + imazethapyr 2EC (Vallore 32) @ 1000 g ha^{-1} (49.17%) applied. The minimum was found under fenoxaprop-p-ethyl @ 50 g ha^{-1} (T_5) (30.93%). Gaikwad and Pawar (2002) also reported application of imazaquin @ 150 g ha^{-1} was recorded highest WCE (68.9%). Similar results were also reported by Rathi *et al.* (2004) [10].

Conclusion

Base going on the result from the study, it can be incidental that Imazethapyr 40 g ha 1 was used post-emergence to provide the urdbean its highest yield characteristics and seed yield. The smallest density and dried out material production from weeds, weed index, and highest weed control efficiency (WCE) were also recorded under Imazethapyr 40 g ha^{-1} treatments. These results are similar

to the lowest density and dry have significance production for weeds & highest weed manage efficacy (60.22% and 51.34%, respectively).

References

1. Begum G, Rao AS. Efficacy of herbicide on weed and reply crop of blackgram. Indian Journal of Weed Science. 2006;38(1&2):145-147.
2. Chin DV, Pandey J. Effect of pre- and post emergence herbicides on weeds and yield of blackgram (*Vigna mungo*). Indian Journal of Agronomy. 1991;36:276-277.
3. Kanade. Agricultural marketing report, 2006, 1-6.
4. Kandasamy OS. Cost effective weed management strategies in pulse production. Proc. of CAS on Recent Advances in Pulse Production Technology, TNAU, Coimbatore; c2000. p. 116-119.
5. Kushwah SS, Vyas MD. Herbicidal weed control in soybean (*Glycine max* (L.) Merrill). Indian Journal of Agronomy. 2005;50(3):225-227.
6. Mohanty SK, Pani SK, Kar M, Baisakh N. Effect of herbicides on increasing in productivity of groundnut (*Arachis hypogaea* L.). Indian Journal of Agriculture Sciences. 1997;67(7):296-298.
7. Islam M, Mohanty AK, Kumar S. Correlating growth, yield and adoption of urdbean technologies. Indian Research Journal of Extension Education. 2011;11(2):20-24.
8. Chandravanshi MD, Patel JR, Kasyap S. Effect of integrated nutrient management on growth and yield of Urdbean (*Vigna mungo* L.) in Chhattisgarh plain. Int. J Adv. Chem. Res. 2022;4(2):260-265. DOI: 10.33545/26646781.2022.v4.i2d.109
9. Randhawa JS, Deol JS, Sardana V, Singh J. Crop-weed competition studies in summer blackgram (*Phaseolus mungo*). Indian Journal of Weed Science. 2002;34:299-300.
10. Rathi JPS, Tewari AN, Kumar M. Integrated weed management in blackgram (*Vigna mungo* L.). Indian Journalof Weed Science. 2004;36:218- 220.
11. Ramanatha SP, Chandrashekharan B. Weed management in blackgram (*Phaseolus mungo*). Indian Journal of Agronomy. 1998;43(2):318- 320
12. Yadav RP, Shrivastava UK. Integrated weed management in black gram (*Phaseolus mungo*). Indian Journal of Agronomy. 1998;43(1):106-109.
13. Yadav RP, Yadav KS, Shrivastava UK. Integrated weed management in blackgram (*Vigna mungo*). Indian Journal of Agronomy. 1997;42(1):124-126.
14. Raman R, Kuppuswamy G, Krishnamoorthy R. Response of weed management practices on the growth and yield of Urdbean (*Vigna mungo* Hepper). Legume Research. 2005;28(2):122-124.