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Short communication

Effect of post-emergence herbicides on weeds, yield and economics of *kharif* blackgram (*Vigna mungo* L.)

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ABSTRACT

An experiment was conducted to evaluate post emergenece herbicides in urdbean crop during *Kharif* season of 2021-22. Two-hand weeding practices at 20 and 40 DAS, had significantly lower values of dry matter (DM) of different weeds. Application of Imazethapyr 35% + Imazamox 35%WG 70g (T_1) recorded significantly lower weed dry matter (g/plant), and higher weed control effieincy (WCE), and remained statistically at par with Sodium Acifluorfen 16.5% 80g +Clodinafop-propargyl 8% EC 165g (T_4). Significantly higher grain (1088.91 kg/ha) and stover yields (1442.46 kg/ha) were recorded in T_1, compared to others. Imazethapyr 35% SL +Imazamox 35% WG 70g ha^{-1} POE is recommended on behalf of higher WCE and superior grain yield and economics i.e., Net return and BCR in blackgram.

Key words: Blackgram, Grain yield, Post-emergence, Weed control efficiency

Blackgram (*Vigna mungo L.*) is one of India's most important pulse crops. It is also known as urdbean, mash, black maple, etc. It is a self-pollinated annual crop belonging to the Leguminaceae family that meets a substantial portion of protein needs, especially for the vegetarian population in the country. Blackgram is a highly nutritious pulse as it contains a high level of carbohydrate (60g/100g), phosphorus (385 mg/100g), protein (20-25 g/100g), iron and calcium (7.8 mg, and 145 mg/100g respectively) (Singh *et al.,* 2016). It has been proven to help reduce high cholesterol levels (Indira and Kurup 2013). In Madhya Pradesh blackgram is grown in 4.49 lakh ha and its production is 1.57 lakh tonnes with productivity of 351.69 kg ha^{-1}, and productivity of 604 kg ha^{-1} in India (Anonymous, 2015). It is a short-duration crop that suits well in different cropping systems. It is grown in (*Kharif*) rainy and summer seasons in India where weed infestation causes considerable loss in yield. Blackgram is susceptible to weed competition (Balyan *et al.* 2016) with a yield reduction of 42-51% (Malliswari *et al.* 2008). The major weeds affecting blackgram in *Kharif* season include *Trianthema monogyna, Commelina benghalensis, Phyllanthus niruri, Digera arvensis, Echinochloa colonum, parthenium spp, Cyperus rotundus*, *Eleusine aegytiacum, and Cynodon dactylon* (Bhowmick *et al.*, 2015). Controlling these weeds is very essential for urdbean cultivating farmers for getting higher economic yield levels. The different weed control practices gave higher economic yields by reducing the weed flora infestation. Chemical control is less expensive and effective control of different types of weeds. There are many herbicides available for controlling weeds in the urdbean. However, nowadays the major herbicides are using in the blackgram field are imazethapyr, imazamox, clodinafop propargyl, fenoxaprop-p-ethyl, cyhalofop - Butyl, quizalofop ethyl, and acifluorfen sodium, etc. are commonly used as post-emergence at 2-3 leaf stage of weeds. These herbicides act on a broad spectrum of weeds, are cost effective and easily available, hence, are being adapted by farmers. The herbicides help to reduce weed flora and improve crop growth, and development without being harmful to the environment. Considering these facts in view, the present study was conducted to compare different herbicides in different combinations in blackgram.

The field experiment was conducted during the *Kharif* season of 2021 at Research Farm, School of Agriculture, ITM University, Gwalior located at latitude 26014' N; longitude 78014' E; 196 m above mean sea level. The Research Farm falls under the grid region of Madya Pradesh. The experimental treatments were Imazethapyr 35% + Imazamox 35%WG 70g (T_1); Propaquizafop 10% 50g +Imazethapyr 10%SL 75g (T_2); Imazethapyer

10%SL 75g (T_3); Sodium Acifluorfen 16.5% 80g +Clodinafop-propargyl 8%EC 165g (T_4); Metribuzin 70%WP 500g (T_5); Metribuzin 70%WP 400g +Quizalofopethyl 5%SC 45g (T_6) and Imazethapyr 35% 60g +Quizalofopethyl 5%SC 60g (T_7) per hectare and two hand weeding exercises at 20 and 40 DAS (T_8) and weed free (T_9) and weedy check (T_{10}). The field experiment was laid out in Randomized block design (RBD) with a total of 10 treatments. All the herbicides were applied as post-emergence at 20 DAS (2-3 leaf stage of weeds) with the help of a knapsack sprayer, using 500 liters of water ha^{-1}. The blackgram variety 'PU-31 (Krishna)' was sown at a seed rate of 15 kg ha^{-1}, with 30cm X 10cm spacing. All the recommended cultural operations were applied to all the experimental plots. Observation recorded the following characteristics viz., weed dry matter (g/m^2), total weed density (no/m^2), weed control efficiency (%) at harvest stage of the crop (85 DAS), grain yield, straw yield (kg/ha), net return (Rs/ha) and B-C ratio. The effect of the treatment was evaluated using the ANOVA test indicating their significance and critical difference at a 5% level of probability was used to compare the levels of significance of treatments (Snedecor and Cochran, 1994).

The experimental field was mainly infested with different types of weed flora which consisted of grassy weeds viz., *Cynodon dactylon, Echinocola spp, Dactyloctenium aegyptium,* etc., broadleaf weeds viz., *Commelina benghalensis*, *Acalypha indica*, *Amaranthus viridis, Parthenium hysterophorus,* and *Trianthema portulacastrum,* etc., and sedges viz., *Cyperus rotundus* and *Cyperus esculantus* were recorded. The data recorded in Table 1 clearly showed that different weed control treatments recorded significantly lower weed density, dry matter of weeds, and maximum weed control efficiency at the harvest stage of the crop (85 DAS). However, Imazethapyr 35% SL +Imazamox 35% WG 70g ha^{-1} POE, recorded lower values of weed density, minimum weed dry matter, and higher values of weed control efficiency (WCE) (32.2 no/m^2, 20.4 g/m^2 and 89.73 % respectively) as compared to other treatments, however, it was significantly at par with T_4, followed by T_2, and T_7 and these treatments were recorded nearer values of weed control efficiency to T_1, as compared to other herbicide treatments. In the case of T_3, followed by T_6, being at par with T_5, were recorded significantly higher values of weed density, and weed dry matter accumulation and found as inferior to T_1, and also, recorded lower values of weed control efficiency as compared to all herbicide treatments. If the density of weeds decreases then the dry weight of weeds reduces. The treatments which recorded higher WCE resulted in higher values of yield and yield attributes of blackgram because the lower weed dry matter resulted in higher weed control efficiency

Table 1. Effect of different weed control measures on weed parameters at harvest of crop (85DAS)

Treatments	Weed density ($no./m^2$)	Weed dry matter (g/m^2)	WCE (%)
T_1 Imazethapyr 35% + Imazamox 35%WG 70g per hectare	5.71 (32.2)	4.50 (20.4)	89.73
T_2 Propaquizafop 10% 50g +Imazethapyr 10%SL 75g per hectare	6.20 (38.79)	5.20 (26.7)	86.56
T_3 Imazethapyer 10%SL 75g per hectare	6.90 (47.65)	6.30 (39.7)	80.03
T_4 Sodium Acifluorfen 16.5% 80g +Clodinafop-propargyl 8%EC 165g per hectare	5.90 (34.8)	4.72 (21.8)	89.03
T_5 Metribuzin 70%WP 500g per hectare	7.19 (51.28)	6.80 (46.8)	76.45
T_6 Metribuzin 70%WP 400g +Quizalofopethyl 5%SC 45g per hectare	7.09 (49.87)	6.70 (44.7)	77.51
T_7 Imazethapyr 35% 60g +Quizalofopethyl 5%SC 60g per hectare	6.20 (38.92)	5.55 (30.4)	84.70
T_8 Two hand weeding exercises at 20 and 40 DAS	6.02 (35.8)	5.01 (24.7)	87.57
T_9 Weed free	0.00	0.00	100
T_{10} Weedy check	13.89 (192.65)	14.11 (198.8)	0
SEm±	0.23	0.23	-
LSD (P=0.05)	0.68	0.67	-

Note: Data analyzed by $X=\sqrt{x+0.5}$ transformed values and in parenthesis are the original values.

Table 2. Yield and economics of blackgram as affected by different weed control treatments

Treatments	Seed yield (kg/ha)	Stover yield (kg/ha)	Net Return (Rs/ha)	Benefit-Cost ratio
T_1-Imazethapyr 35% + Imazamox 35%WG 70g per hectare	1088.91	1442.46	75196	2.16
T_2-Propaquizafop 10% 50g +Imazethapyr 10%SL 75g per hectare	1002.42	1381.35	66845	1.91
T_3-Imazethapyer 10%SL 75g per hectare	876.11	1162.14	54578	1.61
T_4-Sodium Acifluorfen 16.5% 80g +Clodinafop-propargyl 8%EC 165g per hectare	1041.23	1407.23	70591	2.02
T_5-Metribuzin 70%WP 500g per hectare	598.71	976.18	29104	0.86
T_6-Metribuzin 70%WP 400g +Quizalofopethyl 5%SC 45g per hectare	658.34	1001.05	32571	0.92
T_7-Imazethapyr 35% 60g +Quizalofopethyl 5%SC 60g per hectare	997.55	1338.04	64178	1.75
T_8-Two hand weeding exercises at 20 and 40 DAS	1176.46	1473.34	78879	2.03
T_9-Weed free	1248.45	1533.34	82718	1.97
T_{10}-Weedy check	398.27	807.59	10744	0.32
SEm±	31.35	45.92	-	-
CD (P=0.05)	93.15	136.43	-	-

and improve crop growth and development. The results confirmed the findings of Singh *et al.,* (2016) and Kumar *et al.,* (2015).

As concerned with yield and economics of blackgram weed free plot being at par with two-hand weedings at 20, 40 DAS were recorded significantly greater value of grain, straw yield (Table 2). Among different herbicide treatments, T_1 recorded a higher level of grain and straw yield and was found superior among all herbicide treatments. But at par with T_4, followed by T_2, and T_7 as compared to other herbicide treatments. In the case of T_3, followed by T_6, being at par with T_5 were recorded higher values of grain, and straw yield over the weedy check and found significantly inferior compared to T1. Due to the absence of weed control practices in blackgram the weedy check plot recorded significantly lower values of grain and straw yield among all different weed control treatments. However, the economics of blackgram was influenced by different weed control treatments. Among herbicide treatments, the higher values of net return and B-C ratio were recorded with T_1. But T_4 recorded nearer values of net return and benefit-cost ratio as compared to other herbicide treatments. Similar findings were recorded by (Yadav *et al.* 2014) and (Yadav *et al.* 2015).

Based on the results obtained during the experimental study it may be concluded that the application of Imazethapyr 35% +Imazamox 35% WG 70 g/ha POE, was most effective in controlling the weeds in kharif urd bean. This heribicide is also easily available and cheaper compared to other available chemical formulations. Futher, use of Imazethapyr 35% +Imazamox 35% WG 70 g/ ha as post emergence also resulted in higher net return and B-C ratio and enhanced seed yield. So, based on the present study it may be recommended that Imazethapyr 35% +Imazamox 35% WG 70 g/ ha POE is a potential option to effectively control the weed in *kharif* urd bean and minimize the yield losses substantially.

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