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Integrated weed management on growth and yield of black gram (*Phaseolus mungo* L.)

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Abstract

An experiment was conducted at Instructional Farm of Department of Agronomy, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.) during *Kharif* season of 2021-22. The experiment consisted of randomized block design having with three replications. In this experiment, 12 treatments The treatments consisted of weedy check, control, weed free plot, Pendimethalin 30 EC @ 850 ml/ha + hand weeding, Diclosulam (strong arm) @ 80 gm + hand weeding, Chlorimuron – ethyl 9% EC @ 67.5 ml/ha, Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha, Chlorimuron-ethyl 25% WP @ 9.37 gm/ha + Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha, Quizofop-p-ethyl 5% EC, Imazethapyr 5% SL @ 50 ml/ha, Chlorimuron 25% WP @ 2 kg/ha, Propaquizafop + Imazethapyr and Alachlor at 1 kg/ha. During the experimentation was observed that the maximum and significantly higher grain yield (10.39 q/ha), gross return (Rs. 91998.00/ ha) as well as highest B: C ratio of 2.73:1. While highest net returns (Rs. 65824.00/ ha) was obtained with Chlorimuron – ethyl 9% EC @ 67.5 ml/ha, due to lower cost of inputs comparison to others. Hence, it can be concluded that weed free treatment with B:C ratio 2.7 can be used as an effective weed management in integrated manner to chemical treatment subjected to unavailability and insufficient of labour.

Keywords: Blackgram, chemical control, integrated weed management and yield components

Introduction

Black gram plays an important role in Indian vegetarian dietary. It is very nutritious as it contains high level of carbohydrate (60 g/100 g), protein (20-25 g/100 g), phosphorus (385 mg/100 g), calcium (145 mg/100 g) and iron (7.8 mg/100 g). It has been shown to be useful in mitigating elevated cholesterol levels (Indira and Kurup, 2013) [2]. It is a good source of phosphoric acid, calcium and vitamins like thiamine (B₁), riboflavin (B₂) and niacin (B₃), grown primarily for its protein rich seeds used as dal and it is being rich in lysine and poor in methionine.

Weedicides now available are capable of controlling many weeds very effectively. Uses of weedicides not only improve the crop yield but saves labours for other productive works. The use of pre- plant, pre- emergence weedicides fluchloralin, pendimethalin and Diclosulam is very limited due to narrow window of their application after sowing of crop and poor efficacy of these weedicides under continuous rains. The only alternative that needs to be explored is the use of post emergence weedicides. Imazethapyr is very effective for controlling weeds in kharif pulses. Imazethapyr, a broad-spectrum weedicide, has soil and foliar activity that allows flexibility in its application timing and has low mammalian toxicity (Tan *et al.*, 2005) [10].

Materials and Methods

The present investigation entitled “Integrated weed management in black gram (*Phaseolus mungo* L.)” was conducted during the *kharif* season of 2021- 22 at the research plot, Department of Agronomy, Faculty of Agriculture, AKS University, Sherganj, Satna (M.P.). Representative soil samples were taken randomly from 0-30 cm soil profile from the experimental site before sowing and were analysed for various physico-chemical properties. Soil of the experimental site was clayey in texture (clay % - 32.24) estimated by using Standard international Pipette method (Piper, 1966) [8], low in available nitrogen (177.4 kg ha⁻¹) estimated by using alkaline potassium per magnate method (Subbiah and Asija, 1956) and low in available phosphorus (12.85 kg ha⁻¹) estimated by using Olsen’s method (Jackson, 1973) [3], very high in available potash (200.00 kg ha⁻¹) estimated by using flame photometer (Jackson, 1973) [3].

Organic carbon content was medium (0.41%) estimated by using Walkey and Black method (Jackson, 1973) [3] and soil reaction was slightly alkaline (PH- 7.4) estimated by using glass electrode pH meter (Jackson, 1973). The experiment was laid out in Randomized Block Design (RBD) with 12 treatments with net plot of 5.0 m x 3.0 m.

Results and Discussion

An examination of data showed positive effect of integrated weed management treatments application on plant height of black gram at 60 DAS stage. The integrated weed management treatments significantly enhance plant height of crop. The highest plant height (49.83 cm) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 20.94 cm), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding (T₃) and Chlorimuron- ethyl 9% EC @ 67.5 ml/ha (T₅) with the respective values of 46.81 cm and 45.98 cm, respectively. The similar results were given by Meena *et al.* (2011) [5], Manjunath and Hosmath (2016) and Patel *et al.* (2018) [7].

An examination of data showed positive effect of integrated weed management treatments application on number of branches per plant of black gram at 60 DAS stage. The integrated weed management treatments significantly enhance number of branches per plant of crop. The highest number of branches per plant (8.40) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 4.33), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding (T₃) and Chlorimuron- ethyl 9% EC @ 67.5 ml/ha (T₅) with the respective values of 8.07 and 7.47, respectively. The similar results were given by Wadafale *et al.* (2011), Prachand *et al.* (2012), Chandel *et al.* (2017) and Patel *et al.* (2018) [7].

An examination of data showed positive effect of integrated weed management treatments application on number of leaves per plant of black gram at 60 DAS stage. The integrated weed management treatments significantly enhance number of leaves per plant of crop. The highest number of leaves per plant (20.13) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 7.40), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was

found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding (T₃) and Chlorimuron- ethyl 9% EC @ 67.5 ml/ha (T₅) with the respective values of 19.20 and 17.73, respectively. Similar results were also reported by Shete *et al.* (2008) [9] and Khedkar *et al.* (2009) [4].

Effect of integrated weed management treatments application on number of root nodules per plant of black gram at 45 DAS stage. The integrated weed management treatments significantly enhance number of root nodules per plant of crop. The highest number of root nodules per plant (19.40) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 5.47), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding (T₃) and Chlorimuron- ethyl 9% EC @ 67.5 ml/ha (T₅) with the respective values of 18.20 and 17.80, respectively. These findings are in accordance with those of Meena *et al.* (2012) [6].

An examination of data showed positive effect of integrated weed management treatments application on number of pods per plant, Length of pod (cm) and Number of grains per pod of black gram. The integrated weed management treatments significantly enhance number of pods per plant of crop. The highest number of pods per plant, Length of pod (cm) and Number of grains per pod (19.33), (11.52 cm) and (8.00) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 4.80, 4.49 cm and 3.07), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding respectively.

An examination of data showed positive effect of integrated weed management treatments application on grain yield per hectare of black gram. The integrated weed management treatments significantly enhance grain yield per hectare and Stover yield per hectare of crop. The highest grain yield and Stover yield per hectare (10.39 and 17.85 q/ha) was recorded under the weed free treatment T₂ which was significantly better than weedy check plot (T₁, 3.42 and 8.81 q/ha), while the plot was not treated any weed control practices. Integrated weed management treatment of T₂ was found statistically at par with Pendimethalin 30 EC @ 850 ml/ha + hand weeding respectively. Similar results were observed by Ahirwar *et al.* (2018), Harphool *et al.* (2018) [11] and Patel *et al.* (2018) [7].

Table 1: Growth parameters of black gram as affected by integrated weed management practices

Tr. No.	Treatment Combination	Plant height (cm) at 60 DAS	Number of branches per plant at 60 DAS	Number of leaves per plant at 60 DAS	Number of root nodules per plant
T ₁	Control (unweed plot)	20.94	4.33	7.40	5.47
T ₂	Weed free (hand weeding)	49.83	8.40	20.13	19.40
T ₃	Pendimethalin 30 EC @ 850 ml/ha + hand weeding	46.81	8.07	19.20	18.20
T ₄	Diclosulam (strong arm) @ 80 gm + hand weeding	41.68	6.00	14.27	8.13
T ₅	Chlorimuron – ethyl 9% EC @ 67.5 ml/ha	45.98	7.47	17.73	17.80
T ₆	Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha	43.33	6.73	15.73	15.27
T ₇	Chlorimuron-ethyl 25% WP @ 9.37 gm/ha + Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha	42.57	6.27	15.20	12.07
T ₈	Quizofop-p-ethyl 5% EC	42.73	6.53	15.47	14.13
T ₉	Imazethapyr 5% SL @ 50 ml/ha	43.82	7.27	17.00	16.80
T ₁₀	Chlorimuron 25% WP @ 2 kg/ha	42.18	6.13	14.73	8.27

T ₁₁	Propaquizafop + Imazethapyr	43.61	7.13	16.67	15.47
T ₁₂	Alachlor at 1 kg/ha	44.31	7.33	17.27	17.20
	S. Em±	0.61	0.30	0.49	0.88
	C.D. (P=0.05)	1.76	0.88	1.41	2.56

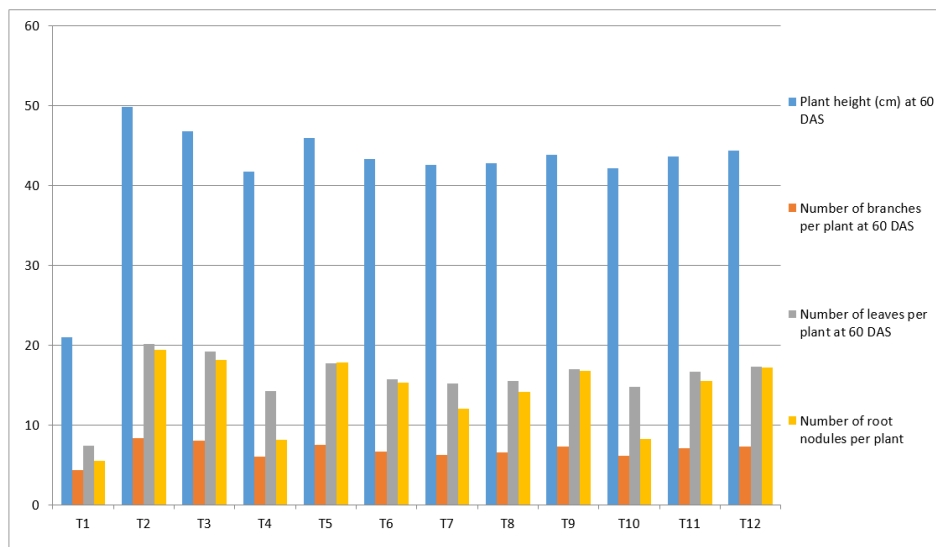


Fig 1: Growth parameters of black gram as affected by integrated weed management practices

Table 2: Yield parameters of black gram as affected by integrated weed management practices

Tr. No.	Treatment Combination	Number of Pods per plant	Length of pod (cm)	Number of grains per pod	Grain yield per hectare (q/ha)	Stover yield per hectare (q/ha)
T ₁	Control (unweed plot)	4.80	4.49	3.07	3.42	8.81
T ₂	Weed free (hand weeding)	19.33	11.52	8.00	10.39	17.85
T ₃	Pendimethalin 30 EC @ 850 ml/ha + hand weeding	18.27	10.81	7.33	9.97	17.28
T ₄	Diclosulam (strong arm) @ 80 gm + hand weeding	12.47	5.00	5.20	4.64	8.99
T ₅	Chlorimuron – ethyl 9% EC @ 67.5 ml/ha	16.60	8.65	6.93	9.22	16.40
T ₆	Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha	14.87	6.80	5.87	6.28	12.21
T ₇	Chlorimuron-ethyl 25% WP @ 9.37 gm/ha + Fenoxaprop-p-ethyl 9% EC @ 67.5 ml/ha	14.60	6.08	5.40	5.89	11.43
T ₈	Quizofop-p-ethyl 5% EC	14.87	6.56	5.60	6.17	12.00
T ₉	Imazethapyr 5% SL @ 50 ml/ha	15.33	7.55	6.13	7.22	14.73
T ₁₀	Chlorimuron 25% WP @ 2 kg/ha	14.07	5.64	5.33	5.25	11.09
T ₁₁	Propaquizafop + Imazethapyr	15.13	7.04	6.00	7.00	13.90
T ₁₂	Alachlor at 1 kg/ha	15.53	8.63	6.20	8.36	15.03
	S. Em±	0.36	0.57	0.43	0.34	0.51
	C.D. (P=0.05)	1.05	1.66	1.25	0.97	1.49

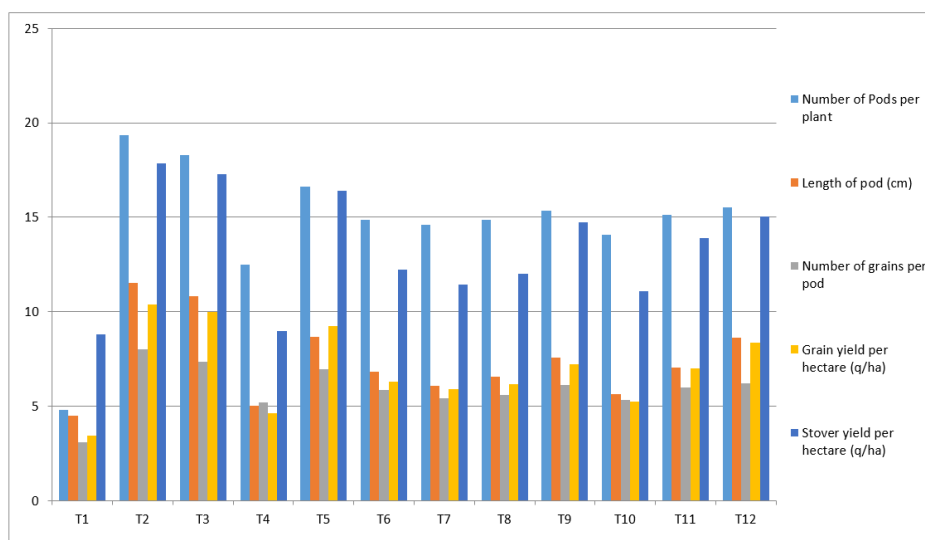


Fig 2: Yield parameters of black gram as affected by integrated weed management practices

Conclusion

Based upon this experiment it is concluded that weed free treatment recorded the maximum and significantly higher grain yield (10.39 q/ha), gross return (Rs. 91998.00/ ha) as well as highest B: C ratio of 2.73:1. While highest net returns (Rs. 65824.00/ ha) was obtained with Chlorimuron – ethyl 9% EC @ 67.5 ml/ha, due to lower cost of inputs comparison to others. Hence, it can be concluded that weed free treatment with B:C ratio >2.7, can be used as an effective weed management in integrated manner to chemical treatment subjected to unavailability and insufficient of labour. Application of Chlorimuron – ethyl 9% EC @ 67.5 ml/ha, can also be adopted as remunerative strategies according to unavailability of labours, resources and circumstances.

However, these results are only indicative and require further experimentation to arrive at more consistent and final conclusion to be passed on to growers.

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