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Influence of Weed Control Methods on Yield, Nutrient Uptake and Economics of Blackgram

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Abstract The study conducted in late *rabi* season of 2013 at field unit of MRS, Hebbal, Bengaluru, revealed that interculture@ 20 DAS and hand weeding @ 40 DAS resulted in higher yield (1,182 and 5,873 kg/ha seed and haulm yield respectively) as well as enhanced nutrient uptake by blackgram (80.7, 16.7 and 35.1 kg/ha N, P and K respectively) and least nutrient uptake by weedy check (31.0, 6.7 and 14.5 kg/ha N, p and k respectively). Interculture @ 20 DAS and hand weeding @ 40 DAS recorded higher gross returns, net returns and B : C (Rs 61,445, Rs 39,121and 2.75 respectively) over weedy check (Rs 21,082, Rs 2,398 and 1.13 respectively). Combination of herbicides performed well over single application of pre-emergent herbicides.

Keywords Nutrient uptake, Herbicide rotation, Crop weed competition, Blackgram.

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Introduction

Food legumes occupy a significant place as they have been valued as food, fodder and feed side by side they play an important role in sustaining soil productivity through their ability to fix atmospheric nitrogen. Blackgramk [*Vigna mungo* (L.) Hepper] is an important pulse crop in India. It is grown in all season. Frequent irrigations during summer season and monsoon rains during *kharif* season results in lot of weed population and weed growth in this crop. In *rabi* season it is grown under residual soil mouisture where weed growth is also significant due to poor management practices taken up by farmers with increasing cost of labor.

Blackgram is especially under fertilized because of its cultivations as *paira* crop in rice fallows and as catch crop for adjusting the season. So generally it is grown as a subsidiary crop because of which less inputs and care is given to the crop and above that weeds pose a serious threat for compet-

ing already limiting resources. In presence of weeds the nutrient uptake by crop is also reduced [1], while weeds deplete valuable nutrients making the crop to starve.

Hand weeding is laborious, time consuming, costly and tedious. Moreover, many times labor is not available at the critical period of weed removal. Furthermore, weather conditions may 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. In agriculture, labor component is becoming scarce, not available at time and prohibitively costly. Chemical control of weeds is an excellent alternative to manual weeding.

Pre-emergence application of herbicide may allow the emergence of weeds, especially grasses after a few days. At present, inclusion of post-emergence herbicides for managing weeds is getting more and more attention. The present investigation was planned and implemented taking into account the pre- as well as post-emergence herbicides so that weeds can be controlled throughout the crop growth period thus, ultimately improving the productivity of the crop. Hence, the present investigation was conducted to study the effect of weed control methods on yield, nutrient removal and economics of weed control in blackgram.

Materials and Methods

The investigation was conducted at the field unit of Main Agricultural Research Station, Hebbal during late *rabi* season of 2013. The region comes under the agro climatic zone southern plateau and hills with an elevation of 914m MSL. The soil textural class of the experimental site is sandy clay loam in with 0.28 Ds/m^{-1} electrical conductivity, slightly acidic to neutral in reaction (6.7 pH), 238 kg/ha nitrogen, 25.4 kg/ha available phosphorus and available potassium of 175.8 kg/ha. The soil contains 0.71% organic carbon T-9 cultivar of blackgram was sown at a spacing of 30cm × 10 cm.

The experiment comprised of 14 treatments which were replicated thrice. The treatments (Table 1) included pre-emergent herbicides alone and in combination with post-emergent herbicides along with interculture in combination with hand weeding and weedy check. During harvesting randomly five plants were taken for oven drying and were subjected to destructive analysis of major nutrients following standard procedure. The yields from the net plots were taken into account for yield estimation and economics. The values obtained were subjected to fisher's method of analysis of variance (ANOVA) as outlined by Gomez and Gomez [2] and data were compared with critical differences at a probability level of 0.05%.

Table 1. Treatment details, dosage and time of application of herbicides. DAS - Days after sowing, fb-Followed by.

Treatments		Dosage (kg/ha)	Time of application (DAS)
T_1	-Pendimethalin 30 EC	0.75	3
T_2	-Alachlor 50 EC	1.0	3
T_3	-Oxyfluorfen 23.5 EC	0.075	3
T_4	-T_1 fb imazethapyr 10 SL	0.75 fb 0.063	3 fb 30
T_5	-T_2 fb imazethapyr 10 SL	1.0 fb 0.063	3 fb 30
T_6	-T_3 fb imazethapyr 10 SL	0.075 fb 0.063	3 fb 30
T_7	-T_1 fb fenoxaprop-p-ethyl 9 EC	0.75 fb 0.054	3 fb 30
T_8	-T_2 fb fenoxaprop-p-ethyl 9 EC	1.0 fb 0.054	3 fb 30
T_9	-T_3 fb fenoxaprop-p-ethyl 9 EC	0.075 fb 0.054	3 fb 30
T_{10}	-T_1 fb quizalofop-p-ethyl 5 EC	0.75 fb 0.03	3 fb 30
T_{11}	-T_2 fb quizalofop-p-ethyl 5 EC	1.0 fb 0.03	3 fb 30
T_{12}	-T_3 fb quizalofop-p-ethyl 5 EC	0.075 fb 0.03	3 fb 30
T_{13}	-Interculture @ 20DAS and hand weeding @ 40 DAS	–	–
T_{14}	-Weedy check	–	–

Results and Discussion

The data on seed as well as haulm yield showed significant difference (Table 2). Significantly higher seed and haulm yield was observed in mechanical weeding 1, 181.6 and 5,873.3 kg/ha respectively and it was statistically at par with pendimethalin followed by quizalofop (T_{10}) with seed and haulm yield of 1,120.6 and 5,194.3 kg/ha respectively. Seed and haulm yield was significantly reduced under control (405.4 kg of seed yield and 2,700 kg/ha). Better crop

Table 2. Seed yield, haulm yield, harvest index and weed index of blackgram as influenced by weed control practices.

Treatments	Seed yield (kg/ha)	Haulm yield (kg/ha)	Harvest index	Weed index (%)
T_1	719.3	4203.0	0.15	39.04
T_2	759.3	4516.4	0.15	35.66
T_3	734.0	4266.7	0.15	37.80
T_4	767.9	4434.0	0.15	34.92
T_5	868.8	4583.6	0.16	26.37
T_6	1053.2	4787.5	0.18	10.75
T_7	1078.2	4856.8	0.18	8.63
T_8	1096.9	4719.3	0.19	7.04
T_9	1078.6	4976.8	0.18	8.59
T_{10}	1120.6	5194.3	0.18	5.03
T_{11}	853.9	4279.2	0.17	27.64
T_{12}	985.9	4948.2	0.17	16.45
T_{13}	1181.6	5873.3	0.17	0.00
T_{14}	405.4	2700.0	0.13	65.64
SEm±	30.4	344.8	0.03	NA
CD ($p \leq 0.05$)	83.2	896.6	NS	NA

Table 3. Influence of weed control practices on nutrient uptake by blackgram.

Treatments	N	P	K
T_1	53.8	11.3	24.0
T_2	57.4	12.1	25.7
T_3	54.7	11.5	24.4
T_4	57.0	12.0	25.4
T_5	61.3	12.8	26.9
T_6	68.6	14.1	29.3
T_7	70.5	14.5	30.0
T_8	68.7	14.1	29.2
T_9	70.8	14.6	30.4
T_{10}	72.8	15.0	31.4
T_{11}	58.6	12.1	25.5
T_{12}	67.7	14.0	29.5
T_{13}	80.7	16.7	35.1
T_{14}	31.0	6.7	14.5
SEm±	4.9	1.1	2.4
CD ($p \leq 0.05$)	14.3	3.1	6.9

growth lead to more pod bearing ranches and ultimately more haulm and seed yield [3,4].

Among the herbicidal treatments the combination of pre and post-emergent herbicides (T_4, T_5,T_6, T_7, T_8, T_9, T_{10}, T_{11} and T_{12}) yielded more than only a single application of pre-emergent herbicides (T_1, T_2, T_3). The reproductive sink depends on the vegetative source available due to which harvest index was moreover not influenced by weed control measures (Table 2). No control of weeds (T_{14}) resulted in yield reduction of nearly 65.55%, similar findings were reported by Gogoi et al. [5] where yield reduction ranged from 60 to 65% in summer blackgram Singh [6] after conducting experiment for four years reported that the yield reduction due to weed interference is 41.2 and 41.6% in summer and *kharif* season respectively.

Table 3 indicated the significant effect of weed control measures on nutrient uptake by blackgram. Significantly higher nutrient uptake of 80.7, 16.7 and 35.1 kg N, P and K respectively was recorded in interculture followed by hand weeding (T_{13}) and it was at par with pendimethalin followed by quizalofop-p-ethyl (T_{10}), alachlor followed by fenoxaprop-p-ethyl (T_8), oxyfluorfen followed by fenoxaprop-p-ethyl (T_9), oxyfluorfen 23.5EC followed by quizalofop-p-ethyl (T_{12}) and pendimethalin followed by fenoxaprop-p-ethyl (T_7). The superior performance of these treatments may be attributed to the fact that because of lower weed population weed competition for resources was less thus crop growth was higher resulting in higher nutrient uptake. Better nutrient uptake by mechanical weed control was reported by Ansar et al. [7]. Least nutrient uptake was observed in weedy check (T_{14}) with values of 31.09 kg N, 6.7 kg P and 14.5 kg K, because of higher weed competition crop growth was hampered ultimately nutrient uptake was also reduced. Least nutrient uptake by control plots were earlier reported by Choudhary et al. [8]. Among the herbicidal treatments singh application of herbicides (T_1, T_2 and T_3) has recorded lower nutrient uptake than than double herbicidal application (T_4 to T_{12}) due to higher weed interference and lower crop growth so the nutrient uptake was also low.

The data on various economic aspects are represented in Table 4. Among the weed control practices highest gross returns and net returns was obtained in (T_{13}) interculture followed by hand weeding (Rs 61, 445 and Rs 39,121 respectively) and it's in concomitant to earlier works done by Chaudhary et al. [9] . It was followed by pendimethalin followed by quizalofop-p-ethyl (T_{10}) with values of Rs 58,263

Table 4. Influence of weed control practices on economics of blackgram.

Treatments	Cost of cultivation Rs/ha	Gross returns Rs/ha	Net returns Rs/ha	B : C
T_1	20,131	37,403	17,273	1.86
T_2	20,065	39,481	19,417	1.97
T_3	19,805	38,166	18,362	1.93
T_4	21,034	39,931	18,897	1.90
T_5	20,968	45,179	24,211	2.15
T_6	20,708	54,765	34,057	2.64
T_7	21,445	56,065	34,620	2.61
T_8	21,379	57,040	35,661	2.67
T_9	21,119	56,089	34,970	2.66
T_{10}	21,517	58,268	36,756	2.71
T_{11}	21,451	44,401	22,950	2.07
T_{12}	21,191	51,266	30,075	2.42
T_{13}	22,325	61,445	39,121	2.75
T_{14}	18,685	21,082	2,398	1.13

and Rs 36,756 gross returns and net returns respectively. This might be due to highest seed yield obtained in these treatments which resulted in higher gross returns as well as net returns. Whereas, (T_{14}) weedy check (Rs 21,082 and Rs 2,398) recorded the least gross and net returns because of lower grain yield obtained due to more crop weed competition. Poor economic performance of weedy check was also reported by Chaudhury et al. [9].

Interculture @ 20 DAS and hand weeding @ 40 DAS (T_{13}) recorded highest return to rupee invested (Table 4) of 2.75, in this treatment though cost of cultivation was more due to higher labor cost but still higher yield has resulted in increased benefit ultimately higher B : C similar results has been reported by Kundu et al. [10]. It was followed by (T_{10}) pendimethalin followed by quizalofop-p-ethyl (2.71). While, weedy check (T_{14}) recorded least value of Rs 1.13 per rupee invested which is solely because of lower yield obtained due to severe weed competition.

It can be inferred that herbicides taken in combination results in enhanced nutrient uptake over single application of herbicides. In labor available areas mechanical weed control is the best method for controlling weeds as well as in obtaining higher profit. Crop raised without any weed control method works nearer to break-even point against nearly 200% profit by simply adopting any weed control measure. Pendimethalin as pre-emergence followed by quizalofop-p-ethyl as post-emergence may be taken as viable option in labor scarce areas.

References

1. Tiwari AN, Tiwari KN, Singh KK, Tiwarni VS, Sharma JK (2011) Effect of weed removal on yield and nutrient uptake in pigeon pea + black gram intercropping. Ind J Agron 35 : 341—345.
2. Gomez KA, Gomez AA (1984) Statistical procedure for agricultural research. John Wiley and Sons, New Delhi, pp 680.
3. Brij N, Kumar A, Sharma BC, Sharma N (2011) Chemical and cultural methods for weed control of mung bean under limited moisture conditions of kandi belt of Jammu. Ind J Weed Sci 43 : 241—242.
4. Chhodavadia SK (2014) Efficacy of pre-and post emergence herbicides for integrated weed management in summer green gram (*Vigna radiata* L.). (Abstract) 2nd Int Conf on Agriculture and Horticulture Science Hyderabad, India.
5. Gogoi AK, Kalita H, Pathak AK, Deka J (2003) Weed manage ment in blackgram . Ind J Agron 36 : 601—602.
6. Singh G (2011) Weed management is summer and *kharif* season blackgram [*Vigna mungo* (L.) Hepper]. Ind J Weed Sci 43 : 77—80.
7. Ansar M, Anwar A, Arif M, Muhammad N, Zahid A (2010) Screening of pre and post emergence herbicides against chickpea (*Cicer arietinum* L.) weeds under semi rainfed conditions of Pothohar, Pakistan. Pak J Weed Sci Res 16 : 421—430.
8. Choudhary VK, Kumar PS, Bhagawati R (2012) Integrated weed management in blackgram (*Vigna mumgo*) under mid hills of Arunachal Pradesh. Ind J Agron 57 : 382—385.
9. Chaudhary SU, Iqbal J, Hussain M, Wajid A (2011) Economical weed control in lentil crop. J Anim Pl Sci 21 : 734—737.
10. Kundu R, Bera PS, Brhmachari K, Mallick R (2011) Integrated weed management in summer green gram (*Vigna radiata* L.) under gangetic alluvial soil of West Bengal. J Bot Soc Bengal 65 : 35—43.