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Effect of Herbicidal Weed Management on Root Nodulation and Economic Yield of Blackgram (*Vignamungo* (L.) Hepper)

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Abstract

An experiment was carried out at research farm of Banda University of Agriculture and Technology, Banda, Uttar Pradesh to find out cost effective herbicides and their time of application to provide weed free environment during early growth period of blackgram. The experiment was laid out during kharif season of 2019in randomized block design with thirteen treatments replicated thrice. Among various herbicidal treatments application of imazethypyr + pendimethalin (RM) 1000g as pre emergence treatment recorded the lowest weed dry matter accumulation (21.3g/m^2) and the highest weed control efficiency (72.2%) at 60 DAS. imazethypyr + imazamox (RM) 70g as PEresulted in significantly higher number of root nodules and maximum nodule dry weight/plant. While bolder seeds obtained when same combination of herbicide used at 3-4 leaf stage. In un-weeded plots seed yield was reduced in the range of 21 - 40 % compared with weed free and other treated plots. Among all weed control treatments application of imazethypyr + imazamox (RM) 70g at 3-4 leaf stage seems to be the feasible option to realize higher seed yield and more net return (Rs/ha) along with higher B:C ratio. Effective weed management also helps root nodulation of blackgram.

Key Words: Blackgram, weed managemental, nodulation. growth, yield

Introduction

Control of the weeds by using herbicides could be an alternative to manage the weeds and thereby increasing the yield of black gram. Kalhapure *et al.* (2011) .The effectiveness of application of pre- and post-emergence herbicides in sequence or tank mix or integrated with manual weeding over the application of single herbicide in pulses was reported earlier[3]. Identification of a selective and cost effective herbicide and their time of application can be a good alternative to provide weed free environment during early growth period in such an important crop. Legumes crops have nitrogen requirements that typically are met through inoculation with effective nitrogen fixing Rhizobia. Besides managing weeds, the herbicides also affect plant growth by reducing microbial activity along with nitrogen fixation, immediately after application. In this view the present investigation to find out most effective combination of herbicides for the management of weeds in Blackgram (*Vignamungo* (L.) Hepper) was carry out.

Materials and Methods

A field experiment was conducted at research farm of Banda University of Agriculture and Technology, Banda, Uttar Pradesh during year 2019. The experiment comprised 13 treatments was laid out in randomized block design and replicated thrice. The blackgram variety Azad 3 was sown on 29th July, 2019 with recommended package of practices and harvested during first week of November

2019. Before seeding the seeds were treated with liquid rhizobium culture at the rate of 10 ml/ kg seed. Recommended dose of fertilizers (20 kg N, 40 kg P_2O_5 and 30 kg K_2O /ha were applied to crop. Total quantity of all the fertilizers was applied at sowing. The spray of herbicide was done as per treatment with the help of knap-sack sprayer fitted with flat-fan nozzle. In hand-weeding treatment, weeding was done with a hand-hoe. Various crop weather parameters were recorded during crop growing period. The crop in its life cycle experienced 646 mm rainfall and 528 mm evaporation. The maximum and minimum temperature of growing period was in the range of 30.5 to 36.1 and 18.1 to 27.7 ^oC, respectively while relative humidity varies from 49.5 to 80.7 %.

Data on number of nodules and nodule dry weight were recorded at 60 DAS. Five plants from each plot were uprooted carefully, their roots were washed and nodules were detached and counted. Dry weight of nodules, shoots and roots was determined after drying to constant weight at 65 ^oC. The data on dry weight of weeds were recorded on whole-plot basis at harvesting. At maturity, observations on growth and yield traits were taken from 5 random plants/plot. Biological yield and grain yield were recorded on a plot basis and harvest index was calculated.

The weed dry matter, crop growth parameter, root nodulation and dry weight of nodules. yield attributes and yield of crop were recorded as per standard protocol. Economic analysis was done by following the methods as suggested by DWR, Jabalpur. The weed weed dry weight was analyzed after transforming the actual data (X) to square root of (X+0.5). All the data were subjected to analysis of variance (ANOVA) as per the standard procedures. The comparison of various treatment means was made by critical difference (CD) at $P \leq 0.05$.

Results and Discussion

Effect on weed dry matter

The experimental blackgram field was infested with several grassy, broad leaved and sedge weeds. The major weeds species were *Cyperusrotundus, Echinochloacolona, Elusineindica, Euphorbia hirta, Amaranthus* spp., *Digeraarvensis, Solanumnigrum, Lucas aspera, Ageratum conyzoids, Physalis minima, Commelinabenghalensis, Caesuliaaxillaris, Cynodondactylon,* etc[5].

Data recorded on weed dry matter production (Table 1) revealed that hand weeding twice at 15 and 30 DAS reduced dry matter production and increases weed control efficiency (WCE). Application of Imazethypyr + Pendimethalin (RM) 1000g as pre emergence and Imazethypyr + Imazamox (RM)70g at 3-4 leaf stage significantly reduced weed dry weight and increased WCE. The highest weed dry weight (8.8g/m2) was recorded under un-weeded control. All weed control treatments exert significant effect on weed dry weight and weed control efficiency (Table 1). The finding are in accordance with those of earlier investigators[7].

Effect on crop growth

Application of imazethapyr with different doses and timing with single and pre mix application along with imezamox had significant influence on number of nodules/plant and nodule dry weight when recorded at 60 DAS (Table 1).The maximum number of nodules (36.3) and nodule dry weight per plant (32.4g) were noticed in Imazethypyr + imazamox (RM) @70 g pre emergence treated plot being statistically at par with imezathapyr 80g PE, imezathapyr 70g at 3-4 leaf stage, imezathapyr 80g at 3-4 leaf stage,

pendimethalin + imezathyper (pre-mix) 1000 g/ha PE,hoeingtwice and weed free treatment but was significantly better than all other weed-control treatments and weedy check. Better growth attributes caused more accumulation and translocation of photosynthates by the crop, which resulted in more number and dry weight of nodules[1,2]. All weed control measures exhibited significant variation on Leaf Area Index, root nodulation and nodule dry weight/plant (Table 1). The results are in close conformity with the findings of many others[6,7].

Table 1 :Effect of weed management practices on weed dry matter, weed control efficiency, LAI and root nodulation.

Treatments	Weed dry matter (g/m^2)	WCE (%)	LAI	No. of nodule /plant	Nodule dry weight
T1- Imezathypyr@70 g PE	5.3(27.5)	63.5	2.7	28.9	26.0
T2-Imezathypyr@80 g PE	5.2(25.7)	66.2	3.7	32.6	29.1
T3- Imezathypyr @70 g (3-4 leaf stage),	4.8(22.7)	70.0	2.9	30.9	27.6
T4- Imezathypyr @80 g (3-4 leaf stage)	4.8(22.3)	70.5	2.7	32.3	28.6
T5- Imezathypyr + imazamox (RM) @70 g PE	6.0(35.7)	52.8	3.4	36.3	32.4
T6- Imezathypyr + imazamox (RM) @80 g PE	6.0(35.8)	53.1	3.2	24.2	21.6
T7- Imezathypyr + imazamox (RM) @70 g(3-4 leaf stage)	4.8(22.0)	71.0	2.0	17.4	15.4
T8- Imezathypyrr + imazamox (RM) @ 80 g(3-4 leaf stage)	4.7(22.0)	70.9	2.0	27.1	24.2
T9- Pendimethalin@ 1000 g PE	6.2(39.0)	50.3	3.4	29.8	26.3
T10- Imezathypyr + pendimethalin (RM) @ 1000 g PE	4.7(21.3)	72.2	2.9	32.1	28.6
T11-Hoeing (twice) at 15 and 30 DAS	4.4(19.3)	74.3	1.8	31.3	28.0
T12-Weedy check	8.8(61.3)	00.0	1.4	26.5	23.6
T13-Weed free	4.3(17.7)	76.9	3.0	32.2	28.7
SEm±	0.4	4.6	0.3	2.2	1.06
C.D. (P=0.05)	1.1	13.5	0.9	6.4	3.1

Effect on Yield attributes and yields

Maximum number of pods/plant (43) were obtained from weed free plot which was statistically at par with hand hoeing (twice), imezathypyr 70g PE, imezathypyr80g PE, imezathypyr 70 g at 3-4 leaf stage, imazethypyr + imazamox (RM) 70g at 3-4 leaf stage,imezethypyr + imezamox (RM) 80g at 3-4 leaf stage, Imazethypyr + Imazamox (RM) 70g PE,imazethypyr + imazamox (RM) 80g PE,and pendimethalin + imezathyper (pre-mix) 1000 g/ha PE. imazethypyr + imazamox (RM) 70g at 3-4 leaf stage also produced bolder seed.While highest seed and biological yields obtained from weed free plot which was very close to imazethypyr + imazamox (RM) 70g applied at 3-4 leaf stage. Remaining other weed control treatments were found significantly superior over weedy check (Table 2). The results are in accordance with Sharma *et al.* (2016) obtained in soybean crop.Conversation rate of photosynthates into economic yield was observed maximum with hoeing twice resulted higher Harvest Index (32.6 %). Minimum value of harvest index (19.1%) was recorded under weedy check plot might be due to low conversion rate of photosynthates into economic product.

Table 2: Effects of weed management practices on yield attributes, yield and economics of blackgram

Treatment	No. of Pods/ plant	100 seed weight (g)	Seed yield (kg/ha)	Biological yield (kg/ha)	HI (%)	B: C Ratio
T1- Imezathypyr@70 g PE	34.0	4.8	9.84	42.20	23.6	1.7
T2- Imezathypyr @80 g PE	36.3	5	11.02	49.74	22.3	1.9
T3- Imezathypyr @70 g (3-4 leaf stage),	34.5	4.8	9.47	41.84	22.7	1.6
T4- Imezathypyr @80 g (3-4 leaf stage)	31.4	5.1	12.04	45.53	27.1	2.0
T5- Imezathypyr + imazamox (RM) @70 g PE	33.4	5.2	11.74	44.71	26.3	2.0
T6- Imezathypyr + imazamox (RM) @80 g PE	33.3	5.1	9.72	42.36	23	1.6
T7- Imezathypyr + imazamox (RM) @70 g(3-4 leaf stage)	33.7	5.4	12.24	44.58	27.4	2.0
T8- Imezathypyr r + imazamox (RM) @ 80 g(3-4 leaf stage)	39.7	5.2	10.43	43.59	24	1.8
T9- Pendimethalin@ 1000 g PE	41.7	4.8	10.99	43.70	25.2	1.8
T10- Imezathypyr + pendimethalin (RM) @ 1000 g PE	41.4	5.2	11.42	44.16	25.9	1.9
T11-Hoeing (twice) at 15 and 30 DAS	41.0	5.1	12.30	37.86	32.6	2.0
T12-Weedy check	29.5	4.5	7.48	39.32	19.1	1.2
T13-Weed free	43.0	5.2	12.36	46.12	26.8	2.0
SEm±	3.4	0.1	0.49	1.49	0.9	
C.D. (P=0.05)	9.9	0.3	1.44	4.37	2.5	

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