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Short communication

Response of black gram to integrated weed management with varying levels of phosphorus and potassium

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Weed infestation is one of the major constraints greatly affecting the production of blackgram. Frequent irrigations during summer and monsoon rains during *Kharif* season result in high weed population and weed growth in this crop. Unchecked weeds have been reported to cause a considerable reduction in the grain yield of blackgram. Therefore, removal of weeds at appropriate time using suitable method is essential to obtain high yields. Among production inputs, fertilization plays a key role in enhancing productivity levels. Being a leguminous crop, blackgram can fix atmospheric nitrogen. Hence, nitrogen application is not that necessary except on those soils which are poor in organic matter where application of a small quantity of nitrogen as a starter dose is required. However, it responds well to phosphorus and potassium application for proper growth and production. Adequate supply of phosphorus in soil results in rapid growth, maturity and enhances quality of vegetative crop growth while supply of potassium has been proved to increase seed and grain quality by reducing the number of infected and shrivelled seeds. Hence, proper and adequate supply of P and K with good weed management practice can bring up the potential yield of blackgram.

A field experiment was carried out at School of Agricultural Sciences and Rural Development (SASRD), Nagaland University during the *Kharif* season 2015. The experimental site was located at an altitude of $25^0$45'43" N latitude and $95^0$53'04" E longitude at an elevation of 310 m above mean sea level. The climate of the experimental area is broadly classified as subtropical humid. The experiment comprised of four weed management treatments, *viz.* weedy check (control), hand weeding at 25 DAS and 45 DAS. pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS and pendimethalin 0.75 kg/ha *fb* imazethapyr 0.5 kg/ha at 25 DAS with three levels of phosphorus and potassium, *viz.* 30 kg/ha P_2O_5 and 30 kg/ha K_2O, 40 kg/ha P_2O_5 and 40 kg/ha K_2O and 50 kg/ha P_2O_5 and 50 kg/ha K_2O. The experiment was laid out in a factorial randomised block design with three replications. Black gram variety '*KU-301*' was sown at a spacing of 30 x 10 cm. The soil was sandy loam and acidic in reaction (pH 4.6). The soil contained 1.1% oxidizable organic carbon, 263.9 kg/ha available nitrogen, 12.4 kg/ha available phosphorus and 190.2 kg/ha available potassium. The data related to each character were analysed statistically by applying the techniques of analysis of variance as described by Cochran and Cox (1957) and the significant of different source of variations was tested using Fisher Snedecor 'F' test at 5% level of significance.

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Effect on weeds

Weed population differed significantly due to different weed management treatments. The data (**Table 1**) showed that the lowest population of broad-leaf weeds, sedge and grassy weeds at 25 DAS was found in all weed management treatments except weedy check. At 45 DAS, hand weeding at 25 and 45 DAS and pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS showed lowest weed population in all the categories of weeds. At harvest, lowest population of all the categories of weeds was recorded in hand weeding at 25 and 45 DAS. The findings are in conformity with those of Patel *et al.* (2015). Application of varying levels of P and K gave significant effect where application of 50 kg/ha P_2O_5 + 50 kg/ha K_2O recorded maximum weed density at 45 DAS and at harvest while application of 30 kg/ha P_2O_5 + 30 kg/ha K_2O recorded the lowest value which was statistically at par with application of 40 kg/ha P_2O_5 + 40 kg/ha K_2O in all the categories of weeds.

The lowest plant height, leaf area index and crop growth rate were recorded in weedy check (control) while hand weeding at 25 and 45 DAS gave the highest values which was followed by pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS. Weed free

condition maintained with two hand weeding might have eliminated the crop weed competition for space, nutrient, moisture and light and thus the crop in this treatment gave better results (Rao *et al.* 2015). Hand weeded plots improved leaf area index (LAI) in black gram and this could be due to the lack of weed competition which improved the growth of crop. Absence of early weed competition increased the crop growth rate, which also increased the leaf area index (Tamang *et al.* 2015). There was significant difference in plant height, leaf area index and crop growth rate due to application of varying doses of phosphorus and potassium where 30 kg/ha P_2O_5 + 30 kg/ha K_2O gave the lowest plant height, leaf area index and crop growth rate while application of 40 kg/ha P_2O_5 + 40 kg/ha K_2O gave significantly the highest values.

Weedy check gave the least number of nodules/ plant, pods/plant and seed/pod while hand weeding at 25 and 45 DAS gave the highest values, which was statistically at par with pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS. The results are in close agreement with the findings of Jakhar *et al.* (2015). Kumar *et al.* (2015) also reported similar results in case of pods/plant and seed/pod. Application of 30 kg/ha P_2O_5 + 30 kg/ha K_2O gave the least values while 40 kg/ha P_2O_5 + 40 kg/ha K_2O gave the highest values followed by 50 kg/ha P_2O_5 + 50 kg/ha K_2O. Increased number of nodules could be due to the application of phosphorus and potassium in adequate amount, as they have been attributed to increase the activity of rhizobia and in the formation of root nodules and thereby helps in fixing more of atmospheric nitrogen in root nodule (Singh *et al.* 2008). Kokani *et al.*(2014)

Table 1. Effect of treatments on population of weeds (no./m²)

Treatment	Broad-leaved			Sedges			Grasses		
	25 DAS	45 DAS	At harvest	25 DAS	45 DAS	At harvest	25 DAS	45 DAS	At harvest
Weed management									
Pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS	0.71 (0)	0.71 (0.0)	9.90 (97.5)	0.71 (0)	0.71 (0)	3.29 (10.3)	0.71 (0)	0.71 (0)	2.77 (7.1)
Pendimethalin 0.75 kg/ha *fb* Imazethapyr 0.5 kg/ha at 25 DAS	0.71 (0)	5.29 (28.2)	12.81 (164)	0.71 (0)	4.45 (20.3)	4.74 (21.3)	0.71 (0)	4.49 (19.7)	4.73 (21.9)
Hand weeding at 25 DAS and 45 DAS	0.71 (0)	0.71 (0.0)	5.88 (34.1)	0.71 (0)	0.71 (0)	3.16 (9.5)	0.71 (0)	0.71 (0)	2.20 (4.3)
Weedy check (control)	9.41 (88.1)	11.45 (140)	15.71 (246)	6.39 (40.3)	7.66 (58.1)	9.57 (92.6)	8.75 (76.1)	10.52 (111)	11.54 (132)
LSD (p=0.05)	0.27	0.57	0.30	0.53	0.37	0.24	0.13	0.35	0.38
Nutrient management									
30 kg/ha P_2O_5 and 30 kg/ha K_2O	2.85 (7.6)	4.45 (19.3)	10.92 (119)	2.02 (3.6)	3.21 (9.8)	5.02 (24.7)	2.69 (6.7)	3.95 (15.1)	5.11 (25.6)
40 kg/ha P_2O_5 and 40 kg/ha K_2O	2.87 (7.7)	4.48 (19.6)	10.97 (120)	2.02 (3.56)	3.31 (10.5)	5.15 (26.0)	2.72 (6.9)	3.99 (15.4)	5.19 (26.4)
50 kg/ha P_2O_5 and 50 kg/ha K_2O	2.93 (8.11)	5.03 (24.8)	11.25 (126)	2.34 (5.0)	3.62 (12.6)	5.46 (29.3)	2.75 (7.0	4.49 (19.7)	5.63 (32.2)
LSD (p=0.05)	NS	0.50	0.26	NS	0.32	0.21	NS	0.31	0.33

Figures in the parentheses are the original values which are subjected to square root transformation

Table 2. Effect of treatments on growth indices, yield attributes and yield of black gram

Treatment	Plant height	Leaf area index	CGR (g/m²/d)	No. of root nodules/ plant	No. of pods/ plant	No. of seeds/ pod	Seed yield (t/ha)	Stover yield (t/ha)
Weed management								
Pendimethalin 0.75 kg/ha *fb* one hand weeding at 25 DAS	42.45	0.99	1.88	79.81	26.45	5.99	1.39	2.64
Pendimethalin 0.75 kg/ha *fb* imazethapyr 0.5 kg/ha at 25 DAS	36.51	0.75	1.21	71.08	22	5.36	1.29	2.50
Hand weeding at 25 DAS and 45 DAS	46.21	1.13	2.28	79.90	30.15	6.23	1.49	2.68
Weedy check (control)	29.51	0.67	0.74	50.99	14.87	4.80	0.53	2.03
LSD (p=0.05)	1.40	0.09	0.12	4.14	1.20	0.70	0.06	0.06
Nutrient management								
P_2O_5 30 kg/ha and K_2O 30 kg/ha	36.98	0.84	1.39	63.89	22.80	5.05	1.12	2.43
P_2O_5 40 kg/ha and K_2O 40 kg/ha	40.36	0.93	1.70	76.72	24.00	5.99	1.21	2.50
P_2O_5 50 kg/ha and K_2O 50 kg/ha	38.66	0.88	1.50	70.72	23.31	5.75	1.18	2.47
LSD(p=0.05)	1.21	0.08	0.10	3.59	1.04	0.61	0.05	0.05

also observed relatively higher number of seeds in treatment with 40 kg/ha P_2O_5 and 40 kg/ha K_2O.

The highest seed and stover yield was recorded in plots with hand weeding at 25 and 45 DAS followed by pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS. It might be due to lesser crop-weed competition in these treatments as they control weeds more effectively than other treatments (Singh 2011). The lowest seed and stover yield was obtained under weedy check (control). Application of 40 kg/ha P_2O_5 + 40 kg/ha K_2O gave highest seed and stover yields which were statistically at par with 50 kg/ha P + 50 kg/ha K_2O while the lowest values were recorded under 30 kg/ha P_2O_5 + 30 kg/ha K_2O.

The results of the experiment indicated that hand weeding at 25 and 45 DAS can be recommended for high yield of blackgram where there is no scarcity of labour, but in case of labour scarcity pendimethalin 0.75 kg/ha *fb* one hand weeding at 25 DAS can be a better substitute. Application of 40 kg/ha P_2O_5 + 40 kg/ha K_2O in blackgram was found to be the optimum dose for higher yield.

SUMMARY

The dominant broad-leaf weeds in the experiment field were *Ageratum conyzoides*, *Amarantus viridis*,*Chromalaena odorata*,*Commelina bengalensis*, *Phyllanthus niruri* and *Mimosa spinosa*. *Cyperus rotundus* and *Cyperus iria* were dominant among sedges. Among grassy weeds, *Cynadon dactylon*,*Digitaria sanguinalis*, *Eleusine indica*, *Echinochloa colona* were most dominant in blackgram. Hand weeding at 25 and 45 DAS gave maximum decrease in weed density, dry weight of weeds and recorded the highest growth and yield of blackgram; followed by application of pendimethalin 0.75 kg/ha *fb* 1 hand weeding at 25 DAS. Among the fertilizer doses, application of 40 kg/ha P_2O_5 + 40 kg/ha K_2O recorded the highest seed and stover yields.

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