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Effect of weed management practices on growth and yield of Blackgram (*Phaseolus mungo* L.)

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Abstract

A field experiment was conducted during *Zaid* (summer) season of 2023 at Crop Research Farm Department of Agronomy. The experiment consisted of eight treatments laid out in Randomized Block Design and replicated three. The treatment consisted of pre- emergence application of Pendimethalin at 1.0 kg/ ha, post-emergence application of Imazethapyr at 80 ml/ha, Imazamox at 50 ml/ha and their combinations pendimethalin at (750 ml/ha) +Imazethapyr at (40 ml/ha) and pendimethalin at (750 ml/ha) + Imazamox at (25ml/ha) and along with two hand weeding at 15 and 30 DAS and a control. Minimum weed population (4.69), weed dry weight (g/m²) (9.17) and pod/plant (31.40), seed/plant (8.60), test weight (36.20 g), seed yield (1185 kg/ha) was recorded in treatment 6 with pre- emergence application of pendimethalin was applied at (750ml/ha)+Imazethapyr at (40ml/ha).

Keywords: Black gram, herbicide, growth, yield and economics

Introduction

Pulses are the cheapest source of proteins to the vegetarians" population of India and it contain high amounts of proteins, nutrients (Ca, P, K, Fe and Zn), vitamins, fibers and carbohydrates for balanced nutrition. Pulses have been the mainstay of Indian agriculture for restoring the soil fertility through biological nitrogen fixation as well as conserving and improving the physical properties of soil by the virtue of their nodulated root system and leaf litter fall. Cultivation of pulses builds-up a mechanism to fix atmospheric nitrogen to N- compounds in their root nodules and tend to fix 72 to 350 kg N per ha per year. Indian Council of Medical Research (ICMR) recommends 65 g of pulses for an adult per day, but the actual consumption of pulses in India is 30 g per adult per day due to its low availability. India is the largest producer and consumer of pulses with an annual production of 23.03 m tons from an area of 29.99 m ha having average productivity of 823 kg/ha (Anonymous, 2020) ^[1].

About 70% of the world's black gram production comes from India. India is the world's largest producer as well as consumer of black gram. It produces about 11.99 million tonnes of Urad annually from about 9.85 million hectares of area, Uttar Pradesh black gram production 0.84 million tonnes in an area about 0.61 million hectares. Black gram area accounts for about 19 percent of India's total pulse acreage which contributes 23 percent of total pulse production. Madhya Pradesh, Maharashtra and Rajasthan are major black gram growing states area wise. (GOI, 2021-22) ^[4].

"Removal of weeds at appropriate time using a suitable method is essential to obtain high yields of blackgram. In blackgram, weeds could be controlled by hand weeding". Pendimethalin is basically pre-emergence herbicide. In rainfed condition, if weeds have not yet germinated, this herbicide may be effective when applied after first showing (Singh *et al.* 2016) ^[12]. As a result, many herbicides are already available on the market, and new ones are constantly being developed for the effective weed control of soybean and groundnut crops, such as imazethapyr. Presently, imazethapyr is a very effective post emergence herbicide for controlling broad leaf and some grassy weeds in blackgram. But its efficacy has not been tested in combination with other herbicides for wide spectrum weed control in blackgram (Verma *et al.* 2020) ^[13].

Materials and Methods

This experiment was laid out during the *Zaid* season of 2023 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The crop research farm is situated at 250 39" 42" N latitude, 810 67" 56" E longitude and at an altitude of 98 m above mean sea level. The treatment consisted of pre-emergence application of Pendimethalin at 1.0 kg/ha, post-emergence application of Imazethapyr at 80 ml/ha, Imazamox at 50 ml/ha and their combinations pendimethalin at (50 ml/ha) + Imazethapyr at (40 ml/ha) and pendimethalin at (750 ml/ha) + Imazamox at (25ml/ha) and along with two hand weeding at 15 and 30 DAS and a control. The experiment consisted of eight treatments laid out in Randomized Block Design and replicated thrice. Data recorded on different aspects of crop, viz., growth, yield attributes were subjected to statistically analysis by analysis of variance method. (Gomez and Gomez, 1976) [5] and economic data analysis mathematical method.

Results and Discussion

Growth parameters Weed population/m²

At 45 DAS significant and lower weed population was count total weed (3.68/m²) was observed under treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatment 6 application of pendimethalin (750 ml/ha) + imazethapyr (40 ml/ha) PE, treatment 7 pendimethalin (750 ml/ha) + imazamox (25 ml/ha) PE, treatment 8 imazethapyr (40 ml/ha) + imazamox (25 ml/ha) PoE, treatment 4 imazethapyr (80 ml/ha) PoE were found to be statistically at par with treatment 2 hand weeding at 15 & 30 DAS over weedy check (38.4/m²).

The maximum weed population and dry weight of weeds were observed in weedy check at 25, 50 DAS and harvest stage and increased throughout the growth stages that could be ascribed to the competition for moisture, nutrient, space and light. This increment in population of weeds under weedy check might be ascribed to uninterrupted growth of weeds throughout the crop season. Heavy infestation of weeds under weedy check has been also reported by Mishra *et al.* (2017) [6], Poornima *et al.* (2018) [9], Chavan *et al.* (2019) [3], and Sahu *et al.* (2019) [11] in mungbean crop.

Weed dry weight (g/m²)

At 45 DAS significant and lower total weed dry weight was recorded (6.85 g/m²) was observed under treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatment 6 application of pendimethalin (750 ml/ha) + imazethapyr (40 ml/ha) PE, treatment 7 pendimethalin (750 ml/ha) + imazamox (25 ml/ha) PE, treatment 8 imazethapyr (40 ml/ha) + imazamox (25 ml/ha) PoE, treatment 4 imazethapyr (80 ml/ha) PoE were found to be statistically at par with treatment 2 hand weeding at 15 & 30 DAS over weedy check (92.28 g/m²).

The maximum weed dry weight of weeds were observed in weedy check at 15, 30 DAS and 45 DAS and increased throughout the growth stages that could be ascribed to the competition for moisture, nutrient, space and light. This increment in dry weight of weeds under weedy check might be ascribed to uninterrupted growth of weeds throughout the crop season. Heavy infestation of weeds under weedy check has been also reported by Mishra *et al.* (2017) [6], Poornima *et al.* (2018)

[9], Chavan *et al.* (2019) [3], and Sahu *et al.* (2019) [11] in mungbean crop.

Yield and yield attributes

Pods/plant (No.)

A perusal of data and observed that recorded maximum number of pods/plant (32.12) was in treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatment 6 application of pendimethalin (750 ml/ha) + imazethapyr (40 ml/ha) PE, treatment 7 pendimethalin (750 ml/ha) + imazamox (25 ml/ha) PE, treatment 8 imazethapyr (40 ml/ha) + imazamox (25 ml/ha) PoE, treatment 4 imazethapyr (80 ml/ha) PoE were found to be statistically at par with treatment 2 hand weeding at 15 & 30 DAS over weedy check (21.35). It might be due to the tissue differentiation from somatic to reproductive meristematic activity and development of floral primordial might have increased with increasing in more flowers and pods Morteza *et al.* (2018) [7].

Seeds/pod (No.)

An examination of data and found that recorded highest number of seeds/pod (32.12) was in treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatment 6 application of pendimethalin (750 ml/ha) + imazethapyr (40 ml/ha) PE, treatment 7 pendimethalin (750 ml/ha) + imazamox (25 ml/ha) PE, treatment 8 imazethapyr (40 ml/ha) + imazamox (25 ml/ha) PoE, treatment 4 imazethapyr (80 ml/ha) PoE were found to be statistically at par with treatment 2 hand weeding at 15 & 30 DAS over weedy check (21.35).

It is an established fact that least crop-weed competition during critical phase of crop growth exerts a vital governing role on complex process of yield formation due to better availability of space, water and nutrients to the crop plant. Rathore *et al.*, (2015) [10].

Test weight (g)

A visualization of data and revealed that recorded higher test weight (36.40 g) was in treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatments were found to be statistically non-significant to each other.

Seed yield (kg/ha)

A perusal of data presented in table 1 and found that recorded highest seed yield (1240 kg/ha) was in treatment 2 hand weeding at 15 & 30 DAS. However, among the herbicidal treatment 6 application of pendimethalin (750 ml/ha) + imazethapyr (40 ml/ha) PE, treatment 7 pendimethalin (750 ml/ha) + imazamox (25 ml/ha) PE, treatment 8 imazethapyr (40 ml/ha) + imazamox (25 ml/ha) PoE, treatment 4 imazethapyr (80 ml/ha) PoE were found to be statistically at par with treatment 2 hand weeding at 15 & 30 DAS over weedy check (635 kg/ha).

Thus crop plants might have used available resources effectively throughout the crop growth stages resulting in higher seed yield. These results are in close conformation with the findings of Padmaja *et al.* (2013) [8] who reported that application of imazethapyr recorded higher yield attributes and yield which was due to lower weed density and weed dry weight. Application of herbicides controlled the weeds effectively and made available nutrients to crop and consequently resulted in higher yield (Arunraj *et al.* 2018) [2].

Table 1: Response of weed control treatment on growth, yield attributes and yield of blackgram

S. No.	Treatment Combinations	Weed population m ² (45 DAS)	Weed dry weight (g/m ²) (45 DAS)	pod/plant (No.)	Seed/pod (No.)	Test weight (g)	Seed yield (kg/ha)
1.	Weedy check	6.24** (38.4)*	92.28	21.35	4.60	33.15	635
2.	Hand weeding (15 and 30 DAS)	2.05 (3.68)	6.85	32.12	9.40	36.40	1240
3.	Pendimethalin (1.0 L/ha) Pre-emergence	4.44 (19.2)	52.19	24.79	6.00	33.55	960
4.	Imazethapyr (80 ml/ha) Post-emergence	2.74 (7.02)	13.39	27.45	7.60	34.20	1055
5.	Imazamox (50 ml/ha) Post-emergence	4.17 (16.8)	48.52	26.63	6.40	33.80	1020
6.	Pendimethalin (750 ml/ha) + Imazethapyr (40 ml/ha) pre-emergence	2.28 (4.69)	9.17	31.40	8.60	36.20	1185
7.	Pendimethalin (750 ml/ha) + Imazamox (25 ml/ha) pre-emergence	2.52 (5.86)	11.39	29.30	8.20	35.85	1140
8.	Imazethapyr (40 ml/ha) + Imazamox (25 ml/ha) Post-emergence	2.66 (6.56)	12.63	28.60	7.80	33.35	1090
	S.Em(±)	0.31	2.139	1.608	0.648	1.083	62.26
	CD (p=0.05)	0.95	6.49	4.88	1.97	3.28	188.84

*Data in parenthesis are original values

** $\sqrt{x+0.5}$ Subjected to Square root transformation values

Conclusion

Application of Pendimethalin (750ml/ha) + Imazethapyr (40ml/ha) (treatment 6) in black gram recorded minimum weed population, weed dry weight and maximum yield.

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