Effect of nitrogen and weed management practices of growth and yield of Blackgram (*Vigna mungo* L.)

- **Abstract:** A research trail was conducted in *Kharif* 2022, at Crop research form, SHUATS, Prayagraj.To study the **"**Effect of nitrogen and weed management practices of growth and yield of Blackgram" (*Vigna mungo* L.). The treatments consist of three levels of nitrogen (15, 30 and 45 kg/ha) and weed management practices (Hand weeding twice (20 & 40 DAS), Pendimethalin (0.75ml/ha) Pre-emergence (5 DAS), Imazethapyr (75g/ha) Post-emergence (25 DAS) are included. Experiment were laid out in randomized block design with 10 treatments each replicated thrice. The result showed that *viz*: significantly higher plant height, number of nodules/plant, number of branches/plant, pods/plant, seeds/pod, grain yield, Stover yield, lower weed population/m^2, net returns and B:C ratio recorded in (treatment 9) Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence.

- **Key words:** Blackgram, Nitrogen, Hand weeding, Pendimethalin, Imazethapyr, growth parameters and yield attributes.

1. Introduction:

Black gram (*Vigna mungo* L.) comes in fourth place among the pulses in terms of both production (12.55% of all pulse production) and cultivated area coverage (approximately 70,000 ha) (BBS, 2012). One of Bangladesh's most treasured pulses is black gram. In addition to being an essential part of our nutrition, pulses have made a significant

contribution to Indian agriculture and daily life. Black gramme is the third most significant pulse crop in India. “Weeds are one of the major constraints of low productivity of Urdbean during *kharif* season. It is nutrient legume and contains 48.0% carbohydrates, 22.3% protein, 154 mg calcium, 9.1 mg iron, 1.4 g fat, 0.37 g riboflavin and 0.42 mg thiamine in per 100 gm of blackgram” Asaduzzaman et al., 2010 [1]. “Black gram occupies 3.25 million hectares area of which 70% lies in central and southern part. The total annual production of black gram in the country is about 1.54 million tonnes. In Madhya Pradesh black gram is grown in 4.49 lakh ha and its production is 1.57 lakh tonnes with a productivity of 351.69 kg/ha. In Gwalior district black gram is grown in 6.2 thousand ha with a production of 4.8 m tonnes and productivity is 421 kg/ha. In general, yield loss due to uncontrolled weed growth in black gram ranges from 27 to100%” Singh *et al*., 2010 [2]. “Continuous rainfall during the season makes the manual weeding impracticable. On the other hand, continuous use of herbicides causes environmental pollution and weeds may also develop resistance to the chemicals. Increasing crop density seems to be an alternative to shift crop-weed competition in favour of crop”. [2]

Nitrogen fertilization plays an important role in improving soil fertility and increasing crop productivity. Nitrogen fertilization increases grain yield and biomass in crop. It contributes 18- 34% increase in soil residual N. Sole residue incorporation or in combination with N fertilizer have positive effects on plant growth and production as well as on soil physico-chemical properties. The use of organic materials in combination with inorganic fertilizers to optimize nutrient availability to plants is a difficult task as organic materials have variable and complex chemical nature.

“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” Chand et al. 2004. [3]. Pendimethalin 1000 g/ha is typically advised to manage weeds, but it is ineffective against some perennial sedges and broad-leaved weeds. Pendimethalin usage on a regular basis caused weeds to switch over to having broad leaves. Imazethapyr 75 g/ha is applied post-emergence to control the late-blooming weeds, but because of its longer half-life duration, it also affects subsequent grain harvests. Pendimethalin is basically pre-emergence herbicide. In rainfed condition, if weeds have not yet germinated, this herbicide may be effective when applied after first shower. Singh *et al*., 2016 [4] 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 and quizalofop-ethyl. 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 [5]. Keeping in view the above facts, the present experiment was undertaken to find out Effect of nitrogen and weed management practices of growth and yield of Blackgram (*Vigna mungo* L.).

2. MATERIALS & METHODS:

During the kharif season of 2022, a field experiment was conducted out at the CRF of the wing of Agronomy in SHUATS, Prayagraj, which is located at 25^{o} 24' 42" N latitude, 81^{o} 50' 56" E longitude, and 98 m altitude over the mean sea degree (MSL). to see how nitrogen and weed management practices effect the growth and yield of blackgram (*vigna mungo* L.). The trial was set up in a Randomized Block design with 10 treatments that were reproduced three times. The length of each online plot for each therapy is 3m×3m. When given in combination, the treatment is classified as having a recommended dose of Potash via Muriate of Potash. as well as Nitrogen via Urea and Phosphorus via DAP. T1 Nitrogen (15 kg/ha) + Hand weeding twice (20 & 40 DAS), T2 Nitrogen (15 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence, T3 Nitrogen (15 kg/ha) + Imazethapyr (75 g/ha) Post-emergence, T4 Nitrogen (30 kg/ha) + Hand weeding twice (20 & 40 DAS), T5 Nitrogen (30 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence, T6 Nitrogen (30 kg/ha) + Imazethapyr (75 g/ha) Post-emergence, T7 Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS), T8 Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence, T9 Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence, T10 Control plot (RDF). “At harvesting maturity, the blackgram crop was harvested smartly. Plant height (cm) and dry weight accumulation g/plant were manually recorded on five randomly selected consultant plants from each plot of each replication one at a time, and seeds were isolated from each internet plot and dried under sun for three days after harvesting. Later, the seeds were winnowed, washed, and the seed yield/hectare was calculated and expressed in kg/hectare. After 10 days of thorough drying in the sun, the Stover production from each online plot was measured and expressed in kg/hectare. The statistics were calculated and analysed using. The benefit: cost ratio was reworked after the fee value of seed was replaced with stover and the general value of crop cultivation was protected”. [16]

2.1 Details of treatment combinations:

Sr.No	Treatment Combination
1.	Nitrogen (15 kg/ha) + Hand weeding twice (20 & 40 DAS)
2.	Nitrogen (15 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence
3.	Nitrogen (15 kg/ha) + Imazethapyr (75 g/ha) Post-emergence
4.	Nitrogen (30 kg/ha) + Hand weeding twice (20 & 40 DAS)
5.	Nitrogen (30 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence
6.	Nitrogen (30 kg/ha) + Imazethapyr (75 g/ha) Post-emergence
7.	Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS)
8.	Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence
9.	Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence
10.	Control plot (RDF)

3. RESULTS & DISSCUSIONS:

3.1 Effect on Growth Parameters

3.1.1 Plant height

Height of the plant rise as crop growth progressed, as shown in [Table 1]. The maximum height measured at harvest for treatment (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). While T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (62.96 cm) and T7 (Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS) (86.447 cm) was found to be statistically at par with T9. "It might be due to the field experiment to investigate the effect of nitrogen and carbon on the growth and yield performance of mungbean (*Vigna radiata* L. wilczek). He found that the plant height of mungbean was found to be increased with nitrogen at 40 kg/ha" Hamid 1988. [6].

3.1.2 Nodule of plant

The plant nodule (34.33) [Table 1] was maximum T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). While T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (33.27) and was found to be statistically at par with T9. "It might be because of nitrogen (0, 20, 40 and 60 kg/ha) and P (0, 25, 50 and 75 kg/ha) on the growth and seed yield of mungbean. They observed that the number of nodules per plant was increased with the increasing rates of N up to 40 kg/ha followed by a decrease with further increase in N".Srinivas *et al.*, 2002 [7].

3.1.3 Number of branchs/plant

The number of plant branch (6.40) [Table 1] was maximum T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). While T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (6.20) and T7 (Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS) (5.93) was found to be statistically at par with T9. "It might be due to the conducted an experiment to determine the effect of varying levels of nitrogen (0, 25 and 50 kg ha-1) on the yield and quality of mungbean *cv.* NM-98. Growth (number of branches per plant) and yield components were significantly affected by varying levels of nitrogen and phosphorus. A fertilizer combination of 25 kg Nitrogen + 75 kg Phosphorus resulted with maximum seed yield (1112.96 kg/ha)". Malik *et al.* 2003 [8].

3.1.4 Dry weight of plant

Maximum accumulation of plant dry weight (16.54) [Table 1] was maximum T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). While T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (16.12) and T7 (Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS) (15.79) was found to be statistically at par with T9. The production of more dry matter per plant might be due to nitrogen application and weed control herbicide application which might have helped in very good control of Trianthema monogyna by pendimethalin as this herbicide does not allow the emergence and growth of weed seedlings because of reduced cell division and cell elongation kumar *et al*., 2004. [9].

3.2 Yield and Yield Attributes:

3.2.1 Pods/Plant

The statistical analysis of Maximum (32.13) [Table 2] number of pods/plant was obtained with application of T9 (Nitrogen (4 5kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). Application of Phosphorus along with Molybdenum increased the number of pods per plant might be due the increased yield in these treatments was due to effective control of weeds in early stage, which reduced weed growth and gave higher yield attributes of black gram and finally resulted to higher yield. The results are analogous to those reported by Rao and Murthy (2004) [10].

3.2.2 Seeds/pod

The statistical analysis of the maximum (8.73) [Table 2] number of seeds/pod was obtained with application of T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). "Nitrogen application may mobilize the photosynthates from growing organs to grains, consequently increasing their number and size" Singh *et al.*, 2017 [11].

3.2.3 Weed population/m^2

The statistical analysis of the lower weed population/m^2 was (4.06 m^2) [Table 2] in the application T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). Whereas, T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (8.483) were statistically at par T9. The weed species were effectively controlled by herbicides *i.e.*, imazethapyr and pendimethalin. imazethapyr as compared to alone application of pendimethalin as PE and imazethapyr as PoE. Both doses of pre-mix herbicide imazethapyr and pendimethalin were equally effective as two hand weedings at 20 and 40 days after sowing and they were statistically at par with each other whereas all the weed control treatments were significantly superior to weedy check in respect to reduce the weed population. The reduction weed control treatments except imazethapyr. The findings were in close agreement with previously reported by Bhandari *et al*. 2004 [12].

3.2.4 Seed yield

Different combinations of nitrogen & weed management can have a significant effect on seed production. Highest (1223.33 kg/ha) [Table 2] seed yield (kg/ha) was obtained with application of T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). The increase in seed yield due to phosphorus application is attributed to source and sink relationship. It appears that greater translocation of photosynthates from source to sink might have increased seed yield Patel *et al*. 1984 [13]. weed control treatments had pronounced effect on grain yield but could not be comparable to manual weeding twice. Manual weeding once followed by one hoeing and pendimethalin (0.5 kg/ha) one hoeing through five tined hoe reported similar grain yield. Results of Jain *et al.* (1997). [14].

3.2.5 Stover yield

The stover yield output of the blackgram crop had also been greatly altered by the treatment of nitrogen & weed management. Stover yield (kg/ha) [Table 2] was maximum (2472.67 kg/ha) in the application T9 (Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) (Post-emergence). Whereas, T8 (Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) (Pre-emergence) (1548.33 kg/ha) and T7 (Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS)) (2392.67 kg/ha) were statistically at par T9. Stover yield of Black gram was significantly influenced Higher

grain yield under integrated weed control treatments (herbicide + hand weeding) may be attributed mainly to the better control of weeds during different stages, manual removal of emerging weedsby hand by herbicides and thereby providing better yield attributes. Chhodavadia et al. 2013. [15].

4. CONCLUSION:

It is concluded that the treatment T9 with the combination of Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence was found significantly more productive. It is also recorded that maximum Benefit cost ratio (2.0) as compared to other treatment combinations.

5. ACKNOWLEDGEMENT:

I express my gratitude to my advisor Dr. RAJESH SINGH for constant support, guidance and for his valuable suggestions for improving the quality of this Research work And to all the faculty members of Department of Agronomy, SHUATS, Prayagraj, Uttar Pradesh (U.P), India for providing necessary facilities, for their cooperation, encouragement and support.

6. REFERENCES:

1. Asaduzzaman, M., Sultana, S., Roy, T.S. and Masum, S.M. (2010). Weeding and plant spacing effects on the growth and yield of blackgram. Bangladesh Research Publication Journal, 4: 62–68.
2. Singh, M. and Singh, R.P. 2010. Influence of crop establishment methods and weed management practices on yield and economics of direct seeded rice (Oryza sativa). Indian Journal of Agronomy, 55: 224–29.
3. Chand R, Singh NP and Singh VK. 2004. Effect of weed control treatments on weeds and grain yield of late sown urdbean (Vigna mungo L.) during Kharif season. Indian Journal of Weed Science 36: 127-128.
4. Singh, V. P., Singh, T. P., Singh, S. P., Kumar, A., Satyawali, K., Banga, A., ... & Singh, R. P. (2016). Weed management in blackgram with pre-mix herbicides.
5. Verma, A., & Choudhary, R. (2020). Effect of Weed Management Practices on Weed Growth and Yield of Greengram (Vigna radiata (L.) Wilczek) in Southern Rajasthan. *International Research Journal of Pure and Applied Chemistry*, *21*(20), 12-19.
6. Hamid, A. (1988). Nitrogen and carbon effect on the growth and yield performance of mung bean (*Vigna radiata* L.,). *J. Agron. Crop Sci*. 161(1): 11-16.
7. Srinivas, M., Shahik, M. and Mohammad, S. (2002). Performance of greengram (*Vigna radiata* L. Wilczek) and response functions as influenced by different levels of nitrogen and phosphorus. *Crop Res. Hisar*. 24(3): 458-462.
8. Malik, M. A., Saleem, M. F., Asghar, A. and Ijaz, M. (2003). Effect of nitrogen and phosphorus application on growth, yield and quality of mung bean (*Vigna radiata* L.). *Pakistan J. Agril. Sci*. 40(3-4): 133-136.
9. Kumar, A. and A.N. Tewari. (2004). Efficacy of pre- and post-emergence herbicides in summer blackgram (Vigna mungo L.). Indian Journal of Weed Science. 36: 73-75.
10. Rao, A.S. and Murthy, K.V.R. (2004). Effect of sequential application of herbicides on nutrient uptake by rice fallow blackgram The Andhra Agriculture Journal, 50: 360–62
11. Singh P., Yadav K.K.*, Meena F.S., Singh B. and Singh R. 2017. Effect of phosphorus and sulphur on yield attributes, yield and nutrient uptake of mungbean (*Vigna radiata* L.) in central plain zone of Punjab, India. Plant Archives17 (2):1756-1760.
12. Bhandari V, Singh B, Randhawa JS and Singh J. 2004. Relative efficacy and economics of integrated weed management in blackgram under semi-humid climate of Punjab. Indian Journal of Weed Science 36: 276-277.
13. Patel, R. G., Patel, M. P., Patel, H. C. and Patel, R. B. (1984). Effect of graded levels of nitrogen and phosphorus on growth, yield and economics of summer mung bean. *Ind.J. Agron.* 29(3): 291-294.
14. Jain, V. K., Y. S. Chauhan and Vivek Chitnis, 1997. Effect of cultured and chemical method of weed management on weeds and yield of blackgram (Phaseolus mungo L.). Indian J Agron. 42 : 660-661.
15. Chhodavadiya SK, Mathukiya RK and Dobariya VK. 2013. Pre and post-emergence herbicides for integrated weed management in summer greengram. Indian Journal of Weed Science 45(2): 137-139.

16. Sai Ganesh MV, Singh R, Siva Nagi Reddy V, Banu Manindhar M. Pearl Millet (Pennisetum glaucum L.) Var ABV-04 as Influenced by Nitrogen & Phosphorus Effects on Growth Parameters and Yield. International Journal of Plant & Soil Science. 2022 Apr 15;34(14):7-12.

Treatment No	Treatments	Plant height (cm)	Nodule /plant	Branchs /plant	Dry Weight (g)
1.	Nitrogen (15 kg/ha) + Hand weeding twice (20 & 40 DAS)	47.12	11.07	4.00	11.85
2.	Nitrogen (15 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	49.45	12.33	4.38	13.04
3.	Nitrogen (15 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	52.47	13.60	4.67	13.67
4.	Nitrogen (30 kg/ha) + Hand weeding twice (20 & 40 DAS)	55.17	15.13	5.07	14.27

Table 1. Effect of nitrogen and weed management practices on growth parameters of blackgram.

5.	Nitrogen (30 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	57.33	16.73	5.27	14.67
6.	Nitrogen (30 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	58.45	18.67	5.53	15.25
7.	Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS)	61.67	20.73	5.99	15.79
8.	Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	62.96	22.40	6.20	16.12
9.	Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	64.49	23.80	6.40	16.54
10.	Control plot (RDF)	45.87	10.40	3.53	10.73
	F test	S	S	S	S
	SEd (±)	2.91	0.78	0.58	0.91
	CD (p=0.05)	6.40	5.99	1034.33	2124.33
		1.69	2.15	1.72	2.76

Treatment No	Treatments	Pods/plant	Seeds/ pod	Weed population/ m^2	seed yield (kg/ha)	Stover yield (kg/ha)
1.	Nitrogen (15 kg/ha) + Hand weeding twice (20 & 40 DAS)	22.40	5.00	7.65	729.33	1616.67
2.	Nitrogen (15 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	23.40	5.40	6.36	856.67	1718.67
3.	Nitrogen (15 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	23.87	5.80	7.54	851.67	1846.33
4.	Nitrogen (30 kg/ha) + Hand weeding twice (20 & 40 DAS)	24.67	6.00	8.05	962.67	2003.33
5.	Nitrogen (30 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	26.60	6.40	5.99	1034.33	2124.33

6.	Nitrogen (30 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	27.60	6.80	5.48	1069.67	2217.00
7.	Nitrogen (45 kg/ha) + Hand weeding twice (20 & 40 DAS)	28.93	7.40	8.48	1113.67	2274.33
8.	Nitrogen (45 kg/ha) + Pendimethalin (0.75 ml/ha) Pre-emergence	30.47	7.60	5.08	1163.00	2392.67
9.	Nitrogen (45 kg/ha) + Imazethapyr (75 g/ha) Post-emergence	32.13	8.20	4.06	1223.33	2472.67
10.	Control plot (RDF)	21.27	4.40	9.44	630.67	1548.33
	F-test	S	S	S	S	S
	SEm (±)	0.96	0.36	0.47	30.54	58.63
	CD (p=0.05)	2.87	1.08	1.40	90.74	174.21

Table 2.Effect of Nitrogen and weed management practices influence of yield and Characteristics.