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Effect of neem cake and fish amino acid on the growth and yield of blackgram

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Abstract

A field experiment titled “Effect of Neem cake and Fish amino acid on the growth and yield of Blackgram” was conducted during Zaid season of 2023 at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute SHUATS, Prayagraj, Uttar Pradesh. The experiment was laid out in Randomized Block Design with nine treatments which are replicated thrice. The treatments combination are T₁ Neemcake 0.5 t/ha + Fish amino acid 0.5%, T₂ Neemcake 0.5 t/ha + Fish amino acid 1%, T₃ Neemcake 0.5 t/ha + Fish amino acid 1.5%, T₄ Neemcake 1 t/ha + Fish amino acid 0.5%, T₅ Neemcake 1 t/ha + Fish amino acid 1%, T₆ Neemcake 1 t/ha + Fish amino acid 1.5%, T₇ Neemcake 1.5 t/ha + Fish amino acid 0.5%, T₈ Neemcake 1.5 t/ha + Fish amino acid 1% and T₉ Neemcake 1.5 t/ha + Fish amino acid 1.5% are used. Results obtained that combined the application of T₉ recorded significantly maximum Plant height (33.17 cm), Plant dry weight (21.8 g/plant), Number of nodules per plant (39.20), Significantly maximum number of pods per plant (15.52), number of seeds per pod (6.30), Seed yield (1.62 t/ha), stover yield (3.92 t/ha).

Keywords: Neem cake, fish amino acid, growth parameters, yield attributes and economics

Introduction

Black gram (*Vigna mungo* L.), also known as urad dal or black lentil, is a highly nutritious and versatile legume that is widely consumed in many parts of the world. It is a staple in Indian cuisine and is used in a variety of dishes such as dals, curries, and soups. Black gram is rich in protein, fiber, vitamins, and minerals, making it a valuable addition to a healthy diet (Singh and Ahlawat, 2005) [18]. It contains about 26% protein, which is almost three times that of cereals, carbohydrates (60%), fat (1.3%) and rich in phosphoric acid and other minerals and vitamins. The crop is resistant to adverse climatic conditions and improves the soil fertility by fixing atmospheric Nitrogen in the soil. It has been reported that the crop produces equivalent to 22.10 kg of N/ha., which has been estimated to be supplement of 59 thousand tonnes of urea annually. It controls soil erosion and compete with weed effectively due to its deep root system and foliage cover.

Neem cake is a potential source of organic manure. Neem has demonstrated considerable potential as a fertilizer. Neem cake also reduces alkalinity in soil, as it produce organic acid on decomposition, being totally natural, the Neem cake we offer hence ensure fertility of the soil, it also improve the organic matter contain of the soil, helping improvement in soil texture, water holding capacity, soil aeration for better root development.

The fish amino acid is liquid organic manure made from fish waste. It is of great value to both plants and microorganisms in their growth, because it is rich organic matter and plant nutrients like amino acids, protein and carbohydrates, which helps to meet any nutritional deficit in a plant and thus optimize the growth and yield from that plant. Foliar application or a soil drenching of fish amino acid could maximize nutrient uptake and minimize run off or leaching, providing just enough N to the plant for the production of chlorophyll to maintain plant health (Aung and Flick, 1980) [3]. Fish amino acid diluted with water with other natural farming inputs and applied as a foliar spray increases the number of pod formation in black gram thus, increases the yield of the crop.

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Foliar application of FAA also protects the crop from pests and would have improved the metabolic activity and cell division resulting in higher plant height, more number of leaves, more chlorophyll content which consequently increased the photosynthetic activity which in turn yield attributes and higher grain yield of black gram (Priyanka *et al.*, 2019) ^[17].

Materials and Methods

The experiments on the effect of Neem cake and Fish amino acid on the Growth and Yield of Blackgram were conducted during *Zaid* season of 2023 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj which is located at above the mean sea level. This region is located approximately 5 kilometers from Prayagraj city on the right bank of the Yamuna River beside Prayagraj Rewa Road. A composite soil sample was taken between 0 and 30 cm down. It was crushed, let to air dry, and its chemical and physical qualities examined. The soil reaction of the sandy clay loam was 7.2, the organic matter content was 0.69 (0.72%), the available nitrogen was 181.7 kg/ha, the phosphorus was 32.74 kg/ha, the potassium was 120.0 kg/ha, the sulfur content was 7.2 mg/kg, the zinc was 0.81 mg/kg, and the available Boron was 0.66 mg/kg. Blackgram variety Sekhar 2 were selected for sowing. Seeds were sown in line manually on 2023. Seeds were covered with the soil immediately after sowing. The spacing adopted was plant to plant 10 cm and row to row 30 cm according to the treatment details and the seeds were drilled at 5 cm depth. All the treatments were applied by balancing to the initial soil test values and crop requirements to justify the crop response to the supplied nutrients in both years. Plant parameters such as Plant height(cm), Number of nodules per plant(no), Plant dry weight(g), crop growth rate, (g/m²/day), Relative growth rate (g/g/day) were observed on duration of the crop (15, 30, 45 and 60 DAS) as well as Pod per plant (no), Number of seed per pod, Seed yield (t/ha), Stover yield (t/ha), Test weight (g), Harvest index (%) were observed after harvesting of the crop.

Results and Discussion

Yield and Yield Attributes

Significant and higher seed yield (1.62 t/ha) was recorded with [Neem cake 1.5 t/ha + Fish amino acid 1.5%] which was superior over all other treatments as compared to rest of the treatments and there is no significance difference between the treatments. At 60 DAS, Significantly higher plant height (33.17 cm) was recorded in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] as compared to rest of the treatments. However, [Neem cake 1 t/ha + Fish amino acid 0.5%], [Neem cake 1.5 t/ha + Fish amino acid 0.5%] was found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. At 60 DAS, Significantly higher plant dry weight (21.84 g) was recorded in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] as compared to rest of the treatments. However, the [Neem cake 1 t/ha + Fish amino acid 0.5%], [Neem cake 1 t/ha + Fish amino acid 1%], [Neem cake 1.5 t/ha + Fish amino acid 1%] were found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. At 45 DAS, Significantly maximum Number of nodules /plant (39.20) was recorded in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] as compared to rest of the treatments. However, the [Neem cake 1.5 t/ha + Fish amino acid 0.5%], [Neem cake 1 t/ha + Fish

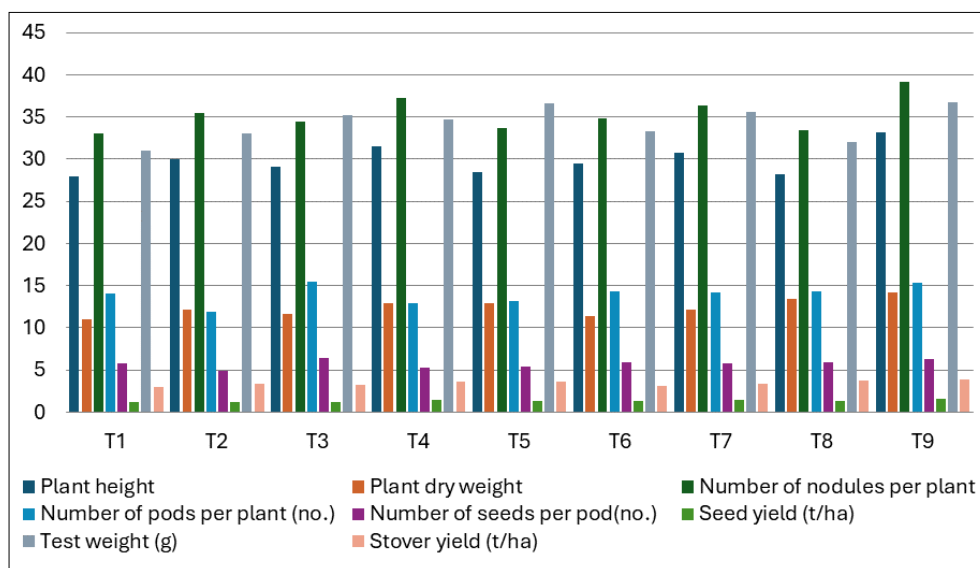
amino acid 0.5%], [Neem cake 0.5 t/ha + Fish amino acid 1%] as found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. Significant and maximum number of pods/plant (15.52) was recorded with [Neem cake 0.5 t/ha + Fish amino acid 1.5%] which was superior over all other treatments. However, [Neem cake 1.5 t/ha + Fish amino acid 1%], [Neem cake 1.5 t/ha + fish amino acid 0.5%], [Neem cake 1 t/ha + fish amino acid 1.5%], [Neem cake 0.5 t/ha + fish amino acid 0.5%] and [Neem cake 1.5 t/ha + fish amino acid 1.5%] was found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. Significant and maximum number of number of seeds/pod (6.30) was recorded with [Neem cake 1.5 t/ha + Fish amino acid 1.5%] which was superior over all other treatments. However, [Neem cake 1.5 t/ha + Fish amino acid 1%], [Neem cake 1.5 t/ha + fish amino acid 0.5%], [Neem cake 1 t/ha + fish amino acid 1.5%], [Neem cake 0.5 t/ha + fish amino acid 0.5%] and [Neem cake 0.5 t/ha + fish amino acid 0.5%] was found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. Significant and higher test weight (36.80 g) was recorded with [Neem cake 1.5 t/ha + Fish amino acid 1.5%] which was superior over all other treatments. However, [Neem cake 1.5 t/ha + fish amino acid 0.5%] and [Neem cake 1 t/ha + Fish amino acid 1%] was found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. Significant and higher straw yield (3.92 t/ha) was recorded with which was superior over all other treatments. However, [Neem cake 1.5 t/ha + Fish amino acid 1%], [Neem cake 1 t/ha + Fish amino acid 1%], [Neem cake 1 t/ha + Fish amino acid 0.5%] was found to be statistically at par with [Neem cake 1.5 t/ha + Fish amino acid 1.5%]. Significant and higher harvest index (28.26%) was recorded with [Neem cake 1.5 t/ha + Fish amino acid 0.5%] which was superior over all other treatments. however, the [Neem cake 0.5 t/ha + Fish amino acid 0.5%], [Neem cake 1 t/ha + Fish amino acid 0.5%], [Neem cake 1 t/ha + fish amino acid at 1%], [Neem cake at 1.5 t/ha + fish amino acid at 1.5%] was found to be statistically at par with [Neem cake (70 kg/ha) + Fish amino acid (20 kg/ha)].

Economical attributes

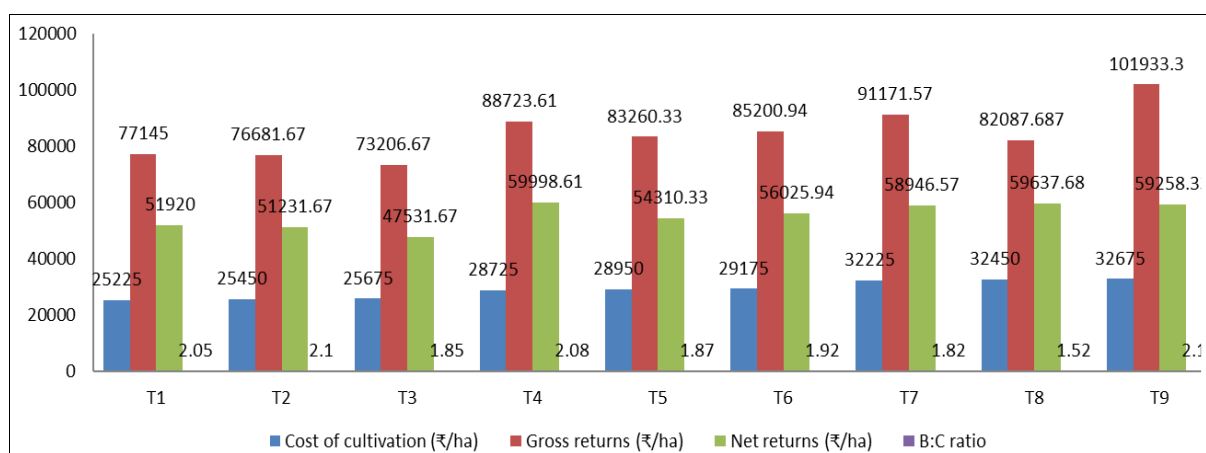
Gross returns (101933.30 INR/ha) were found to be highest in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] and minimum gross returns (73206.67 INR/ha) was found to be in [Neem cake 0.5 t/ha + Fish amino acid 0.5%] as compared to other treatments. Net returns (INR/ha) were found to be highest in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] and minimum net returns (47531.67 INR/ha) was found to be in [Neem cake 0.5 t/ha + Fish amino acid 1.5%] as compared to other treatments. Benefit Cost ratio (2.11) was found to be highest in [Neem cake 1.5 t/ha + Fish amino acid 1.5%] and minimum benefit cost ratio (1.52) was found to be in [Neem cake 1.5 t/ha + Fish amino acid 1%] as compared to other treatments. Highest Benefit cost ratio was recorded with Neem cake (1.5 t/ha) might be due to higher grain and straw yield, which provides nutrient in all growth stages to obtain better farm profitability and productivity. Further, higher gross return, net return was with application of Fish amino acid 1.5% might be due to activation of required enzymes during growth and reproductive stages of crop resulted in higher grain and straw yield, which helps to obtain higher benefit cost ratio.

Table 1: Effect of Neem cake and Fish Amino Acid on growth and yield attributes of Blackgram.

S No	Treatments	Plant height	Plant dry weight	Number of nodules per plant	Number of pods per plant (no.)	Number of seeds per pod (no.)	Seed yield (t/ha)	Test weight (g)	Stover yield (t/ha)	Harvest index (%)
1.	Neem cake 0.5 t/ha + Fish amino acid 0.5%	28.01	10.97	33.10	14.06	5.78	1.22	31.01	3.01	26.99
2.	Neem cake 0.5 t/ha + Fish amino acid 1%	29.98	12.15	35.43	11.93	4.90	1.22	33.03	3.34	24.89
3.	Neem cake 0.5 t/ha + Fish amino acid 1.5%	29.15	11.62	34.46	15.52	6.37	1.16	35.16	3.19	24.81
4.	Neem cake 1 t/ha + Fish amino acid 0.5%	31.50	12.94	37.23	12.93	5.31	1.41	34.67	3.57	26.36
5.	Neem cake 1 t/ha + Fish amino acid 1%	28.46	12.98	33.64	13.23	5.43	1.32	36.59	3.66	24.59
6.	Neem cake 1 t/ha + Fish amino acid 1.5%	29.47	11.40	34.84	14.33	5.89	1.35	33.26	3.13	28.12
7.	Neem cake 1.5 t/ha + Fish amino acid 0.5%	30.77	12.21	36.37	14.19	5.83	1.45	35.63	3.36	28.26
8.	Neem cake 1.5 t/ha + Fish amino acid 1%	28.26	13.37	33.41	14.36	5.90	1.30	32.08	3.80	23.69
9.	Neem cake 1.5 t/ha + Fish amino acid 1.5%	33.17	14.18	39.20	15.33	6.30	1.62	36.80	3.92	27.20
	SE m (\pm)	1.037	0.55	1.26	0.649	0.26	0.028	0.33	0.155	0.994
	CD (p=0.05)	3.109	1.67	3.67	1.92	0.79	0.08	0.99	0.46	2.83

**Fig 1:** Effect of Neem cake and Fish Amino Acid on growth and yield attributes of Blackgram.**Table 2:** Influence of Neem Cake and Fish amino acid on economics of Black gram.

S. No.	Treatments	Cost of cultivation (₹/ha)	Gross returns (₹/ha)	Net returns (₹/ha)	B:C ratio
1.	Neem cake 0.5 t/ha + Fish amino acid 0.5%	25225	77145.00	51920.00	2.05
2.	Neem cake 0.5 t/ha + Fish amino acid 1%	25450	76681.67	51231.67	2.1
3.	Neem cake 0.5 t/ha + Fish amino acid 1.5%	25675	73206.67	47531.67	1.85
4.	Neem cake 1 t/ha + Fish amino acid 0.5%	28725	88723.61	59998.61	2.08
5.	Neem cake 1 t/ha + Fish amino acid 1%	28950	83260.33	54310.33	1.87
6.	Neem cake 1 t/ha + Fish amino acid 1.5%	29175	85200.94	56025.94	1.92
7.	Neem cake 1.5 t/ha + Fish amino acid 0.5%	32225	91171.57	58946.57	1.82
8.	Neem cake 1.5 t/ha + Fish amino acid 1%	32450	82087.687	59637.68	1.52
9.	Neem cake 1.5 t/ha + Fish amino acid 1.5%	32675	101933.30	59258.33	2.11

**Fig 2:** Influence of Neem Cake and Fish amino acid on economics of Black gram.

Conclusion

The experiment concluded that the effect of Neem cake and Fish amino acid was recorded higher growth and yield parameters in T₉ (Neem cake 1.5 t/ha and Fish amino acid 1.5%). T₉ also showed economically most profitable containing most benefit to cost ratio among all the other treatments.

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