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To study the effect of Rhizobium culture and nitrogen level performance on growth attributes and yield of mung bean crop (*Vigna radiata* L.)

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Abstract

A field experiment was conducted on “To study the effect of Rhizobium culture and nitrogen level performance on growth attributes and yield of mung bean crop (*Vigna radiata* L.)” was conducted during the *kharif* seasons of 2024. The soil of the experimental site was alluvium in nature and slightly alkaline in reaction, which developed mainly by deposition of sediments of the Calcium material through the ages. The trail was laid out in Split plot design with 10 treatments and 3 replications. The treatments consisted of 2 Rhizobium methods control and Rhizobium (350 g per hect.) and 5 Nitrogen level Nitrogen (0 kg per hect.), Nitrogen (6 kg per hect.), Nitrogen (12 kg per hect.), Nitrogen (18 kg per hect.), Nitrogen (24 kg per hect.), according to results plant phenological growth yield attributes and B:C Ratio was recorded highest in Rhizobium (350 gm per hect.) methods, those was statistically significant as compare to Rhizobium (control). While Nitrogen level (24 kg per hect.) was observed highest growth yield attributes and B:C Ratio as compare to Nitrogen (18 kg per hect.) followed by Nitrogen (12 kg per hect.), Nitrogen (6 kg per hect.), Nitrogen (0 kg per hect.). highest plant Height was observed in Rhizobium (350 gm per hect.) 44.54 cm at 40 DAS as compare to control in prospect to Nitrogen application highest plant height was observed in 24 kg N application (44.89 cm) as compare to 0 kg N per hect. 42.51 cm. seed and straw yield highest was observed in Rhizobium (350 gm per hect.) (1,201, 2,477 kg) respectively while in Nitrogen prospect 24 kg N application was recorded maximum (1,207, 2457 kg) as compare to control.

Keywords: Rhizobium culture, nitrogen levels, mung bean

Introduction

Pulses referred to as food legumes, and are secondary to cereals in production and consumption in India. These are drought resistant and prevent soil erosion due to their deep root system and good ground cover hence; pulses are called as “Marvel of Nature”. The World Health Organization (WHO) recommends per capita consumption of pulses @ 80 g day⁻¹ and the Indian Council of Medical Research (ICMR) has recommended a minimum consumption of 47 g per day. The protein hunger is the major problem in the country, were majority of population adopt cereals and millet based dietary habits” (Anonymous, 2020) ^[1]. “Green gram is known as the “Queen of Pulses” because of its superior nutritional value. Green gram is native to East Asia, Southeast Asia and the Indian Subcontinent. Green gram grains contain 22- 28% protein, 60-65% carbohydrates, 1.0-1.5% fat, minerals 3.5%, 3.5-4.5% fibre and 4.5-5.5% ash (Babhulkar *et al.*, 2000) ^[4]. These seeds are more flavorful, nutritious, digestible, and nonflatulent than other pulses growing in the nation. It is a good source of protein with high quality lysine (460 mg g⁻¹ N), tryptophan (60 mg g⁻¹ N) and low anti-nutritional components. It also has a high concentration of ascorbic acid and riboflavin with a value of 0.21 mg 100⁻¹ g” (Azadi *et al.*, 2013) ^[3]. It is India's third most significant pulse crop, accounting for 16 and 10% of total pulse acreage and production, respectively Choudhary *et al.*, 2024 ^[8]. Green gram is grown on 4.5 million hectares in India, with a production of 2.5 million tonnes and a productivity of 548 kg per hectare (Anonymous, 2020) ^[1]. Green gram is mainly cultivated in the states of Rajasthan, Madhya Pradesh, Punjab, Haryana, U.P., Maharashtra, Karnataka Andhra Pradesh and Tamil Nadu.

Improper application of synthetic fertilizers in agricultural field will leads to various health risks

and environmental challenges. Save our environment and our crops we have to follow eco-friendly and sustainable agriculture. Reducing the use of harmful chemicals and fertilizers decrease the ratio of this type of problems. In current era of rapidly growing population is exerting significant pressure on agriculture to meet their nutritional food requirement throughout the world and to achieve the current demand of food requirement, farmers are depending more on chemical fertilizers to achieve maximum productivity per unit area. However, the efficiency of the chemical fertilizers already reached a plateau due to their unsystematically use and resulted in poor soil fertility status of the agriculture fields, In addition to accumulation of toxic substances in the harvested produces and the cost of inorganic fertilizers is increasing enormously to an extent that they are not affordable by the small and marginal farmers (Brady and Weil, 2008) [7]. In this context, there is a need to identify the suitable substitute in place of chemical fertilizers which are economically cheaper and eco-friendly. At present, the use of organic fertilizers either bulky or liquid organic manures plays an important role to sustain the soil health as well as productivity of the crops”.

Bio-fertilizers, a component of integrated nutrient management are considered to be cost effective, eco-friendly and renewable source of non-bulky, low cost of plant nutrient supplementing

chemical fertilizers in sustainable agriculture system in India” (Babhulkar *et al.*, 2000) [4]. Their role assumes a special significance in the present context of high costs of chemical fertilizers. Considering these above facts, the present study was conducted to assess the effect of organic manures and biofertilizer on yield attributes, seed yield and economic of mung bean (*Vigna radiata*) (Balakumbahan *et al.*, 2010) [5].

Materials and Methods

The experiment was carried out in research farm of the Department of Agronomy, College of Agriculture, Guru Kashi University, Talwandi Sabo Bathinda, Punjab, situated in Grid zone at the latitude of 29° 96'N and longitude 75° 12'E with an altitude of 201 meters from mean sea level (MSL). The climate of experimental site is semiarid and sub-tropical dominated with extreme weather conditions having hot and dry summer and cold winter, where maximum temperature goes up to 45 °C during summer and steeply down to a chilling temperature of as low as 1 - 2 °C during winter. The trial was laid out in Split plot design with 10 treatments and 3 replications. The treatments consisted of 2 Rhizobium methods control and Rhizobium (350 g per hect) and 5 Nitrogen level Nitrogen (0 kg per hect.), Nitrogen (6 kg per hect.), Nitrogen (12 kg per hect.), Nitrogen (18 kg per hect.), Nitrogen (24 kg per hect.).

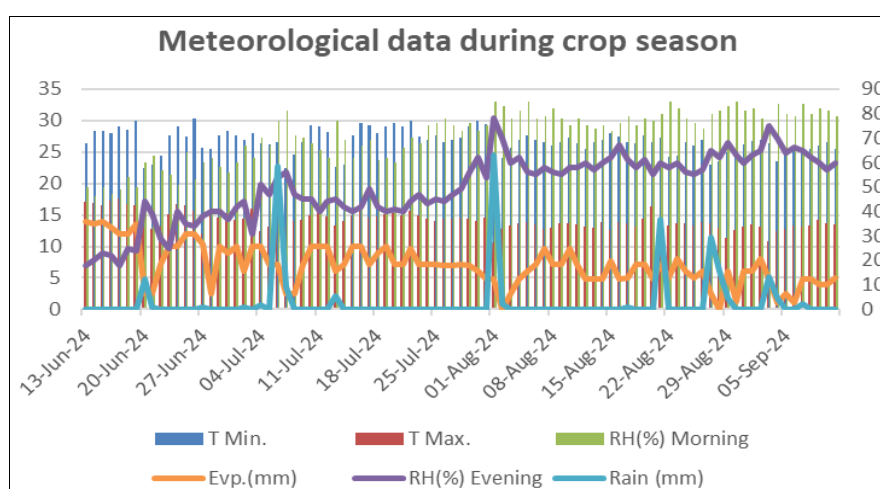


Fig 1: Meteorological data during crop season

Results and Discussion

Growth Attributes

Plant height crucially varies due to variable treatment application of nutrients. The highest plant height at 20 DAS was recorded in 24 kg N ha⁻¹ (23.65 cm) which is significantly higher with 18 kg N ha⁻¹ (23 cm) and which was again significantly higher than 12 kg N ha⁻¹ (22.71 cm). Significantly lowest plant height was observed in the 0 kg N ha⁻¹ (21.28 cm). While at 40 DAS Plant height crucially varies due to variable treatment application of nutrients. The highest plant height at 40 DAS was recorded in 24 kg N ha⁻¹ (44.89 cm) which is significantly higher with 18 kg N ha⁻¹ (44.22 cm) and which was again significantly higher than 12 kg N ha⁻¹ (43.95 cm). Significantly lowest plant height was observed in the 0 kg N ha⁻¹ (42.51 cm) oraiha, 2013 [6].

Dry matter accumulation significantly varies due to different Rhizobium culture. At 20 DAS of sowing the result is non-significant. Highest dry matter accumulation observed in Rhizobium culture (350 gm per hect) 8.56 g/plant, while minimum was observed in 6.30 g/plant. While At 40 DAS and at harvesting stage of the result is significant. Highest dry matter

accumulation observed in Rhizobium culture (350 gm per hect) 19.79, 17.53 g/plant, while minimum was observed in 41.46, 34 g/plant. dry matter accumulation crucially varies due to variable treatment application of nutrients. The highest dry matter accumulation at 20 DAS was recorded in 24 kg N ha⁻¹ (8.17 g/plant) which is significantly higher with 18 kg N ha⁻¹ (7.9 g/plant) and which was again significantly higher than 12 kg N ha⁻¹ (7.6 g/plant). Significantly lowest dry matter accumulation was observed in the 0 kg N ha⁻¹ (6.35 g/plant) Cochran and Cox, (1959) [10].

While at 40 DAS and at harvesting dry matter accumulation crucially varies due to variable treatment application of nutrients. The highest dry matter accumulation at 40 DAS was recorded in 24 kg N ha⁻¹ (19.40, 40.07 g/plant) which is significantly higher with 18 kg N ha⁻¹ (19.13, 37.87 g/plant) and which was again significantly higher than 12 kg N ha⁻¹ (18.87, 37.54 g/plant). Significantly lowest dry matter accumulation was observed in the 0 kg N ha⁻¹ (17.58, 36.25 g/plant) Choudhary *et al.*, 2024 [9].

No. of branches per plant significantly varies due to different Rhizobium culture Highest No. of branches per plant observed

in Rhizobium culture (350 gm per hect) 9.75, while minimum was observed in control plot 7.15. No. of branches per plant crucially varies due to variable treatment application of nutrients. The highest No. of branches per plant was recorded in 24 kg N ha⁻¹ (9.58) which is significantly higher with 18 kg N ha⁻¹ (9.06) and which was again significantly higher than 12 kg N ha⁻¹ (8.72). Significantly lowest No. of branches per plant was observed in the 0 kg N ha⁻¹ (6.75) (Eswaran and Mariselvi, 2016)^[13].

Yield Attributes

Pod length crucially varies due to variable treatment application of nutrients. The highest Pod length was recorded in 24 kg N ha⁻¹ (7.11 cm) which is significantly higher with 18 kg N ha⁻¹ (6.92 cm) and which was again significantly higher than 12 kg N ha⁻¹ (6.55 cm). Significantly lowest Pod length was observed in the 0 kg N ha⁻¹ (5.61 cm). Yadav and Singh (2024) showed similar results where Rhizobium culture enhanced the pod length. It is the most important component of mung bean crop. Pod length is directly related to the number of pod and grains per pod and hence this is an important determinant of grain yield. Pod length may also serve as one of the criteria for assessing the grain yield in legumes crops. Nitrogen dose significantly affects the Pod length. This is due to that more will be the optimum availability of nitrogen doses more will be the length of Pod. Nitrogen significantly extended days to heading and physiological maturity. Pod length significantly increased with increasing nitrogen levels. The increase might be, in pod elongation, brought about by cell division and expansion as the result of nitrogen addition (Aslam *et al.*, 2010)^[2].

It is clearly observed that the Test Weight increased with increasing dose of Rhizobium culture and nitrogen fertilizer amount. Highest Test Weight was observed in treatment Rhizobium culture (350 gm per hect) 38.48, while minimum was observed in control plot 35.45. Test Weight crucially varies due to variable treatment application of nutrients. The highest Test Weight was recorded in treatment those are treated by 24 kg N ha⁻¹ (38.52) which is significantly higher with 18 kg N ha⁻¹ (37.44) and which was again at par than 12 kg N ha⁻¹ (37.05).

Significantly lowest Test Weight was observed in the 6 kg N ha⁻¹ (36.46) and 0 kg N ha⁻¹ (35.34). Grain size of moong bean increase when Rhizobium culture and nitrogen fertilizer amount application was increased; this might be because Rhizobium culture and nitrogen fertilizer amount supplied the essential elements that enhanced the content of the grains, increasing the grain size (Azadi *et al.*, 2013)^[3].

It is clearly observed that the seed yield kg/ha increased with increasing dose of Rhizobium culture and nitrogen fertilizer amount. Highest seed yield kg/ha was observed in treatment Rhizobium culture (350 gm per hect) 1201 kg/ha, while minimum was observed in control plot 944 kg/ha. seed yield kg/ha crucially varies due to variable treatment application of nutrients. The highest seed yield kg/ha was recorded in treatment those are treated by 24 kg N ha⁻¹ (1207 kg/ha) which is significantly higher with 18 kg N ha⁻¹ (1125 kg/ha) and which was again at par than 12 kg N ha⁻¹ (1083 kg/ha). Significantly lowest seed yield kg/ha was observed in the 6 kg N ha⁻¹ (1022 kg/ha) and 0 kg N ha⁻¹ (925 kg/ha). Nitrogen application can improve plant growth and increase grain yield in high-density planting. Grain yield will increase with the increase the growth and yield attributing characters like number of branches, number of leaves, Pod length, number of grains per pod, test weight De Britto and Girija, (2006)^[11].

It is clearly observed that the straw yield kg/ha increased with increasing dose of Rhizobium culture and nitrogen fertilizer amount. Highest straw yield kg/ha was observed in treatment Rhizobium culture (350 gm per hect) 2477 kg/ha, while minimum was observed in control plot 2043 kg/ha. straw yield kg/ha crucially varies due to variable treatment application of nutrients. The highest straw yield kg/ha was recorded in treatment those are treated by 24 kg N ha⁻¹ (2457 kg/ha) which is significantly higher with 18 kg N ha⁻¹ (2365 kg/ha) and which was again at par than 12 kg N ha⁻¹ (2311 kg/ha). Significantly lowest straw yield kg/ha was observed in the 6 kg N ha⁻¹ (2219 kg/ha) and 0 kg N ha⁻¹ (1947 kg/ha). The availability of more nitrogen increased plant height, number of branches, dry matter accumulation which lead to increase in straw yield Devakumar *et al.* (2008)^[12].

Table 1: Effect of Rhizobium culture and nitrogen level performance on plant height, dry matter accumulation and reproductive part of mung bean crop

Plant height		Dry matter accumulation				No. of root nodes per plant	No. of branches per plant
Bacterial spp.	20 DAS	40 DAS	20 DAS	40 DAS	At harvesting		
Rhizobium (control)	21.51	42.73	6.30	17.53	34.00	25.92	7.15
Rhizobium (350 gm per hect)	23.31	44.54	8.56	19.79	41.46	29.96	9.75
C.D. (5%)	1.25	1.93	0.34	0.65	1.08	0.76	0.60
S.Em (±)	1.19	0.29	0.05	0.10	0.42	0.11	0.09
(Nitrogen level kg ha ⁻¹)	20 DAS	40 DAS	20 DAS	40 DAS	At harvesting	No. of root nodes per plant	No. of branches per plant
0	21.28	42.51	6.35	17.58	36.25	25.38	6.75
6	21.40	42.62	7.11	18.33	37.01	27.40	8.13
12	22.71	43.95	7.64	18.87	37.54	27.95	8.72
18	23.00	44.22	7.90	19.13	37.80	28.91	9.06
24	23.65	44.89	8.17	19.40	40.07	30.07	9.58
C.D. (5%)	0.62	1.25	0.20	0.59	1.08	0.67	0.23
S.Em (±)	0.20	0.60	0.06	0.19	0.42	0.22	0.07
Interaction effect	NS	Sig	NS	Sig	Sig	NS	NS

Table 2: Effect of Rhizobium culture and nitrogen level performance on Yield attributes of mung bean crop

Bacterial spp.	Pod length cm	No. of pods per plant	No. of seed per pod	Test weight gm	seed yield kg hac	straw yield kg hac
Rhizobium (control)	5.59	10.43	6.03	35.45	944	2,043
Rhizobium (350 gm per hac)	7.32	12.85	7.36	38.48	1,201	2,477
C.D. (5%)	0.42	0.81	0.45	0.65	45	47.04
S.Em ($\pm$)	0.06	0.12	0.06	0.09	6.91	7.18
(Nitrogen level kg ha ⁻¹)	Pod length cm	No. of pods per plant	No. of seed per pod	Test weight gm	seed yield kg hac	straw yield kg hac
0	5.61	10.49	6.20	35.34	925	1,947
6	6.08	11.26	6.39	36.46	1,022	2,219
12	6.55	11.62	6.60	37.05	1,083	2,311
18	6.92	12.27	6.92	37.44	1,125	2,365
24	7.11	12.58	7.36	38.52	1,207	2,457
C.D. (5%)	0.26	0.27	0.20	1.0	39	91.03
S.Em ($\pm$)	0.08	0.09	0.06	0.33	12.89	30.10
Interaction effect	NS	NS	NS	NS	NS	NS

Conclusion

On the basis of the results from experimentation, it can be concluded that the use of Rhizobium is the best result at all growth, yield and economic parameters as more utilization of solar energy and hence there will be reduced competition among the plants for light, water and nutrients due to wider spacing. As with the Rhizobium (350 gm per hac) the proper germination of the plants over control because the seeds were treated by culture might be due to more harvesting of solar radiation which resulted in more synthesis as well as planting geometry in wheat affects the biomass and other yield components. On the other hand, Nitrogen application with 24 kg N ha⁻¹ showed the best result over the other nitrogen levels at all growth, yield and economic parameters.

References

- Anonymous. Pulses revolution - From food to nutritional security. New Delhi (India): Ministry of Agriculture and Farmers Welfare (DAC & FW), Government of India; 2020.
- Aslam M, Hussain N, Zubair M, Hussain SB, Baloch MS. Integration of organic and inorganic sources of phosphorus for increased productivity of mungbean (*Vigna radiata* L.). Pak J Agric Sci. 2010;47(2):111-4.
- Azadi E, Rafiee M, Hadis N. The effect of different nitrogen levels on seed yield and morphological characteristics of mung bean in the climate condition of Khorramabad. Ann Biol Res. 2013;4(2):51-5.
- Babhulkar PS, Wandile RM, Badole WP, Balpande SS. Residual effect of long-term application of FYM and fertilization on soil properties (Vertisols) and yield of soybean. J Indian Soc Soil Sci. 2000;48:89-92.
- Balakumbahan R, Rajamani K. Effect of bio-stimulants on growth and yield of senna (*Cassia angustifolia*). J Hort Sci Ornamental Plants. 2010;2(1):16-8.
- Boraiah. Effect of organic liquid formulations and manures on growth and yield of capsicum [doctoral dissertation]. Bengaluru (India): University of Agricultural Sciences; 2013.
- Brady NC, Weil RR. The nature and properties of soil. 14th ed. New Jersey: Prentice Hall; 2008.
- Choudhary R, Diwakar AK, Meena AK, Shukla S, Prakash C. Assessment of fertility status of soils under different cropping patterns in rainfed semi-arid eastern plain of Rajasthan, India. Int J Environ Climate Change. 2024;14(5):192-204.
- Choudhary R, Naga IR, Latore AM, Goyal M, Choudhary D. Survey and characterization of ground water quality and its effect on soil properties in Malpura block of Tonk district Rajasthan, India. J Exp Agric Int. 2024;46(6):293-302.
- Cochran WG, Cox GM. Experimental designs. Bombay: Asia Publishing House; 1959.
- De Britto JA, Girija SL. Investigation on the effect of organic and inorganic farming methods on black gram and mung bean. Indian J Agric Res. 2006;40(3):204-7.
- Devakumar N, Rao GGE, Shubha S, Khan I, Nagaraj, Gowda SB. Activities of Organic Farming Research Centre. Navile, Shimoga (India): University of Agricultural Sciences, Bengaluru; 2008.
- Eswaran N, Mariselvi S. Efficacy of vermicompost on growth and yield parameters of tomato (*Lycopersicon esculentum*). Int J Sci Res Publ. 2016;2(6):95-108.