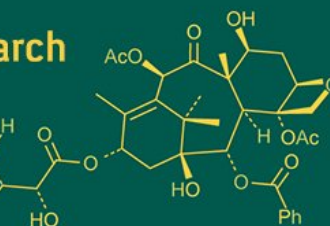
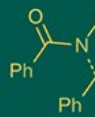


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(5): 717-721
www.biochemjournal.com
Received: 06-02-2026
Accepted: 08-03-2026

Vikas Pal

M.Sc. Scholar, Department of
Agronomy, Naini Agricultural
Institute, SHUATS,
Prayagraj, Uttar Pradesh,
India

Joy Dawson

Professor, Department of
Agronomy, Naini Agricultural
Institute, SHUATS,
Prayagraj, Uttar Pradesh,
India

Shikhar Raj Gupta

M.Sc. Scholar, Department of
Agronomy, Naini Agricultural
Institute, SHUATS,
Prayagraj, Uttar Pradesh,
India

Effect of spacing, organic and inorganic nutrient sources on growth and yield of greengram (*Vigna radiata* L.)

Vikas Pal, Joy Dawson and Shikhar Raj Gupta

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i5Si.8452>

Abstract

A field experiment was conducted during the *Kharif* season of 2025-26 at the Central Research Farm, Department of Agronomy, SHUATS, Prayagraj (U.P.), to study the effect of spacing and organic and inorganic nutrient sources on the growth and yield of green gram (*Vigna radiata* L.). The experiment was laid out in a Randomized Block Design with ten treatment combinations replicated thrice. The treatments consisted of three levels of spacing (25 cm × 20 cm, 30 cm × 15 cm, and 30 cm × 10 cm) along with different organic and inorganic nutrient sources, namely 100% N through urea, 50% N through urea + 50% N through FYM, and 100% N through FYM. The results revealed that significantly higher plant height (54.82 cm), number of nodules per plant (37.8), dry weight (13.39 g), number of pods per plant (25.93), number of seeds per pod (12.4), test weight (35.93 g), seed yield (1.57 t/ha), stover yield (2.78 t/ha), and harvest index (38.1%) were recorded in treatment [30cm × 10cm + 50% N through urea + 50% N through FYM]. Higher gross return (INR 1,51,557.6), net return (INR 1,10,816.5), and B:C ratio (2.72) were also recorded under the same treatment.

Keywords: Urea, FYM, greengram, spacing, nutrient source

Introduction

Greengram (*Vigna radiata* L.), commonly known as mung bean, is one of the most important pulse crops in India. It belongs to the family Fabaceae and is a short-duration, self-pollinated legume crop. The plant is generally erect or semi-erect, with trifoliate leaves, yellow flowers and slender pods containing small green seeds. It has a well-developed tap root system with lateral roots bearing nodules formed by *Rhizobium* bacteria. These nodules help in biological nitrogen fixation, improving soil fertility and reducing the need for nitrogen fertilizers. India is the major producer of green gram in the world and grown in almost all the states. In India during 2022-2023, Greengram is grown in about 31.5 lakh/ ha with the total production of 2.64 million tones with a productivity of 783 kg/ha and contributing 11% to the total pulse production. and Uttar Pradesh (0.30 lakh/ ha) are the major producers of green gram in India (GOI, 2023) ^[4]. Greengram are recognized for their high nutritive value. Greengram contain about 55-65% carbohydrate and are rich in protein, fat, vitamins, and minerals. Green gram contains about 24% protein and is a good source of thiamine and riboflavin. This crop is used as green manure and erosion resisting cover crop. Greengram has ability to fix the nitrogen from atmosphere with the process of symbiosis of microorganisms to maintain the soil fertility. Average rate of atmospheric nitrogen fixed by Greengram is 34 kg/ha annually (Khan *et al.*, 2020) ^[8]. Green gram seed yield decreases when it is intercropped with sugarcane, sunflower and cereals but it increases the productivity of land (Awaad and El-Naggar, 2018) ^[24].

Row spacing affects plant growth and yield due to increased competition with increased plant population. Moreover, the optimum plant population differs with the availability of soil moisture, relative humidity and nutrients. Higher plant population reduced plant growth and yield components but increased yield per unit area. Spacing plays an important role in contributing to the high yield because thick plant population will not get proper light for photosynthesis and high infestation of diseases. On the other hand, very low plant population will also reduce the yield. Spacing by maintaining plant population to an optimum level, play

Corresponding Author:**Vikas Pal**

M.Sc. Scholar, Department of
Agronomy, Naini Agricultural
Institute, SHUATS,
Prayagraj, Uttar Pradesh,
India

an important role in growth and development by affecting plant density and intern's moisture, nutrients and space availability.

Application of Farm Yard Manure (FYM) as an organic source of nutrients improves soil structure, enhances water holding capacity, and increases microbial activity. These improvements create favorable conditions for better root development and nodulation in green gram. Meena *et al.* (2020) ^[25] reported that integrated application of FYM along with

recommended fertilizers significantly increased plant height, dry matter accumulation, and number of pods per plant in mungbean compared to control. Similarly, Kumar *et al.* (2017) ^[7] observed that application of FYM improved nodulation and yield attributes of green gram due to improved soil physical and biological properties. The slow and steady release of nutrients from FYM ensures sustained crop growth throughout the growing period.

Urea, an important inorganic nitrogen fertilizer containing 46% nitrogen, provides readily available nitrogen to the crop during early growth stages. Nitrogen plays a vital role in chlorophyll formation, protein synthesis, and vegetative growth. Adequate nitrogen supply increases plant height, leaf area, and dry weight, which ultimately enhances yield. According to Singh *et al.* (2018) ^[27], application of recommended nitrogen through urea significantly improved growth parameters and grain yield of green gram. However, excessive nitrogen application may reduce nodulation as plants depend more on soil nitrogen rather than biological nitrogen fixation.

Material and Methods

During the *Kharif* season of 2025, a field experiment was conducted to study the effect of spacing and organic and inorganic nutrient sources on the growth and yield of green gram (*Vigna radiata* L.) in alluvial soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, U.P. The sandy loam soil used in the experimental plot had a pH of 7.8, a nearly neutral soil response, an electrical conductivity of 0.56 (ds/m), limited amounts of accessible phosphorous (32.2 kg/ha), and medium amounts of available potassium (182.0 kg/ha) and nitrogen (240.7 kg/ha). Greengram seeds PDM-139 (Samrat) were planted on July 24, 2025, 30 x 10 cm. Ten treatment combinations and three replications were used in the Randomized Block Design trial. The treatments consisted of three levels of spacing (25 cm x 20 cm, 30 cm x 15 cm, and 30 cm x 10 cm) along with different organic and inorganic nutrient sources, namely 100% N through urea, 50% N through urea + 50% N through FYM, and 100% N through FYM. Using a manual hoe, 4-5 cm deep furrows were formed along the seed rows in order to apply fertilizers as band placement. In accordance with the suggested dosage of 20-40-20 kg NPK/ha, urea, single super phosphate (SSP), and Mureta of Potash (MOP) were used as the fertilizer sources. The seeds were sown in 24th July 2025 at a depth of 2-3 cm. The spacing of crop between row to row and plant to plant was 25cm x 20cm, 30cm x 15cm and 30cm x 10cm. After ten days of sowing, the gaps were closed by transplanting following germination. Seed were thinned out wherever required to maintain spacing. At 15 and 30 days

following sowing, Khurpi was used to assist in manual weeding in order to reduce crop weed competition. At

regular intervals from germination to harvest, plant growth parameters such as plant height (cm), dry weight (g/plant), number of nodules/plant were measured. At harvest, yield metrics such as pods/plant, seeds/pod, test weight (g), seed yield (t/ha), stover yield (t/ha), and harvest index (%) were measured. Analysis of variance (ANOVA) was used to statistically examine the observed data in accordance with randomized block design (Gomez and Gomez, 1984).

Results and Discussions

Growth parameter

Plant Height (cm)

The data of growth parameter are presented in Table 1. At harvest, significantly and higher plant height (54.82cm) was recorded significantly in the treatment -8 (30cm x 10cm + 50% N through urea + 50% N through FYM) However, treatment 6(30cm x 15cm + 100% N through FYM) was found to be statistically at par with treatment - 8 with application of 30cm x 10cm + 50% N through urea + 50% N through FYM. The maximum plant height was observed with nitrogen management which was similar to Kumar *et al.* (2018) ^[9] reported that spacing of 30cm x 10cm produced significantly taller plants compared to wider spacings due to better light interception and efficient utilization of available resources. Similarly, Singh and Yadav (2017) ^[26] observed that closer row spacing enhanced plant height because of mild inter-plant competition which promoted vertical growth. Patel *et al.* (2019) ^[12] also reported that Greengram planted at 30cm x 10cm spacing recorded higher plant height compared to 25cm x 20cm and wider spacings, owing to better plant population per unit area and improved canopy structure.

Number of Nodules/plant

According to data at 60 DAS, maximum nodules/plant (28.53) was recorded significantly in the treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 5(30cm x 15cm + 50% N through urea + 50% N through FYM) was found to be statistically at par with treatment 8. Sharma *et al.* (2016) ^[28] observed that integrated application of 50% nitrogen through urea + 50% nitrogen through FYM significantly improved nodulation in green gram versus sole application of either inorganic or organic source. The authors attributed this to improved soil organic matter, which enhances microbial activity including nitrogen-fixing rhizobia

Plant dry weight (g)

Based on the data of Greengram at 60 DAS, maximum dry weight/plant (13.29g) was recorded significantly in the treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 9(30cm x 10cm + 100% N through urea + 100% N through FYM) was found to be statistically at par with treatment - 8. An appropriate FYM supply indirectly helps in providing nitrogen supply and its availability helped the plants to attain more vigour in term of plant height and improve the soil conditions. (Yadav *et al.*, 2017) ^[29]. Ganeshamurthy and Reddy (2000) ^[30] reported that integrated use of organic and inorganic fertilizers significantly increased dry matter production due to continuous nutrient availability and improved soil physical properties.

Yield attributes

Numbers of Pods per plant

Table. 2 displays the information related to yield-attributing characters. The application of Spacing, Organic and Inorganic Nutrient Sources on yield of Greengram.

At harvest, the data recorded maximum pods/plant (25.93) in treatment -8 (30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 5(30cm x 15cm + 50% N through urea + 50% N through FYM) was Statistically at par with treatment 8. Optimum spacing promotes healthier root systems with less competition for soil nutrients, allowing plants to channel more assimilates to reproductive organs. According to Singh and Yadav (2017) ^[26], closer yet optimum spacing improved the number of pods per plant due to efficient resource use by individual plants.

Numbers of seed per pod

At harvest, the data recorded maximum seeds/pod (12.4) in treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 5(30cm x 15cm + 50% N through urea + 50% N through FYM) was statistically at par with treatment - 8. Verma *et al.* (2018) ^[31] reported that integrated nutrient management improved nutrient uptake and photosynthate accumulation, leading to better seed setting and increased seeds per pod in legumes.

Test Weight (g)

At harvest, the data recorded higher test weight (35.93g) in treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 5(30cm x 15cm + 50% N through urea + 50% N through FYM) was statistically at par with treatment 8. Higher test weight of green gram was recorded with spacing 30cm x 10cm.

This might due to better growth of crop, efficient dry matter partitioning and better translocation to the sink, leading to the formation of large sized grains. Similar findings were reported by Rao *et al.* (2013) ^[14].

Seed Yield (t/ha)

At harvest, the data recorded higher seed yield (1.57t/ha) in treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 2(25cm x 20cm + 50% N through urea + 50% N through FYM) and treatment 5(30cm x 10cm + 50% N through urea + 50% N through FYM) was statistically at par with treatment 8. The probable reason for these results attributed to seeds injected with

inorganic nutrients are well-nourished and able to transport necessary nutrients and metabolites to the growing seedling. FYM is a major plant nutrient that influences cell division, germination of seeds, flowering, fruiting, synthesis of fat and starch. Besides, the nutrient take part in various biochemical activities is involved in the regulation of metabolic pathways inclusive of enzyme reactions (Singh *et al.*, 2019) ^[22].

Stover Yield (t/ha)

At harvest, the data recorded higher stover yield (2.78t/ha) in treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM). However, treatment 5(30cm x 15cm + 50% N through urea + 50% N through FYM) was statistically at par with treatment 8. Combined treatments with FYM, vermicompost and chemical fertilizers have been shown to increase yield attributes including stover yield in recent experiments (Ayekpam *et al.*, 2026) ^[32].

Harvest Index (%)

At harvest, the data recorded maximum harvest index (38.1%) in treatment 1(25cm x 20cm + 100% N through urea + 100% N through FYM). However, treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM) was statistically at par with treatment 1. According to Balai *et al.* (2017) ^[33], application of 100% recommended dose of nitrogen increased harvest index compared to lower doses because of improved reproductive growth and seed development. FYM improved seed germination and a bigger root system for nutrient uptake. One important nutrient for plants is phosphorus, which affects cell division, seed germination, flowering, fruiting, and the synthesis of fat and carbohydrates. Additionally, the nutrient participates in a number of metabolic processes that are involved in the control biochemical activities is involved in the regulation of metabolic pathways inclusive of enzyme reactions (Sharma *et al.*, 2021) ^[21].

Economics

The data on the economics of different treatments presented in Table 3 showed that the Maximum Gross return (INR 1,51,554.6/ha), net return (INR 1,10,816.3/ha) and B:C ratio (2.72) was also recorded in the same treatment - 8 (30cm x 10cm + 50% N through urea + 50% N through FYM). These results might be attributable to an increase in grain and stover yields in the same treatment as a result of greater availability of nutrients by the organic and inorganic source.

Table 1: Effect of spacing, Organic and Inorganic nutrient sources on growth attributes of Greengram

S. No.	Treatments	Plant height (cm)	Dry weight (g)	No of Nodules
		60 DAS	60 DAS	60 DAS
1	25cm × 20cm + 100% N through Urea	49.8	11.19	19.26
2	25cm × 20cm + 50% N through Urea + 50% N through FYM	50.08	11.55	23.8
3	25cm × 20cm + 100% N through FYM	46.22	10.20	22.46
4	30cm × 15 cm + 100% N through Urea	49.98	12.03	22.66
5	30cm × 15cm + 50% N through Urea + 50% N through FYM	48.21	11.87	26.46
6	30cm × 15cm + 100% N through FYM	52.33	11.88	24.93
7	30cm × 10cm + 100% N through Urea	50.62	11.71	18.6
8	30cm × 10cm + 50% N through Urea + 50% N through FYM	54.82	13.39	28.53
9	30cm × 10cm + 100% N through FYM	50.79	12.54	22.13
10.	N-P-K 25-50-25 Kg/ha (Control)	49.32	12.32	17
F test		S	S	S
SEm(+)		0.90	0.31	1.17
CD (P= 0.05)		2.66	0.91	3.46

Table 2: Effect of spacing, Organic and Inorganic nutrient sources on yield attributes of Greengram

S. No.	Treatments	No. of Pods/plant	No. of Seeds/pod	Test weight (g)	Grain yield (t/ha)	Stover yield (t/ha)	Harvest index (%)
1	25cm × 20cm + 100% N through Urea	20.4	9.2	30.9	1.11	1.81	38.1
2	25cm × 20cm + 50% N through Urea + 50% N through FYM	23.16	10.76	33.83	1.48	2.63	35.7
3	25cm × 20cm + 100% N through FYM	22.33	8.5	28.5	1.11	2.27	32.8
4	30cm × 15 cm + 100% N through Urea	18.73	9.93	31.36	1.06	2.34	31.0
5	30cm × 15cm + 50% N through Urea + 50% N through FYM	24.76	11.83	35.56	1.53	2.73	35.9
6	30cm × 15cm + 100% N through FYM	22.9	8.9	29.16	1.19	2.35	33.6
7	30cm × 10cm + 100% N through Urea	19.3	10.5	32.86	1.06	2.35	31.2
8	30cm × 10cm + 50% N through Urea + 50% N through FYM	25.93	12.4	35.93	1.57	2.78	36.1
9	30cm × 10cm + 100% N through FYM	21.43	9.53	30.1	1.23	2.34	35.3
10.	N-P-K 25-50-25 Kg/ha (Control)	19.3	8.36	29.3	1.04	1.91	35.3
	S	S	S	S	S	S	S
	SEm(+)	0.69	0.23	0.53	0.35	0.49	0.68
	CD (P= 0.05)	2.04	0.70	1.57	1.05	1.44	2.02

Table 3: Effect of spacing, Organic and Inorganic nutrient sources on economics of Greengram

S. No.	Treatments	Cost of cultivation (₹/ha)	Gross returns (₹/ha)	Net returns (₹/ha)	Benefit-cost ratio (B:C)
1	25cm × 20cm + 100% N through Urea	31,356.6	1,06,988.56	75,631.96	2.41
2	25cm × 20cm + 50% N through Urea + 50% N through FYM	40,741.1	1,43,116.4	1,02,375.3	2.51
3	25cm × 20cm + 100% N through FYM	50,125.6	1,08,674.8	58,549.2	1.17
4	30cm × 15 cm + 100% N through Urea	31,356.6	1,03,764	72,407.4	2.31
5	30cm × 15cm + 50% N through Urea + 50% N through FYM	40,741.1	1,47,800.4	1,07,059.3	2.63
6	30cm × 15cm + 100% N through FYM	50,125.6	1,16,089.2	65,963.6	1.32
7	30cm × 10cm + 100% N through Urea	31,356.6	1,02,940.8	71,584.5	2.28
8	30cm × 10cm + 50% N through Urea + 50% N through FYM	40,741.1	1,51,557.6	1,10,816.5	2.72
9	30cm × 10cm + 100% N through FYM	50,125.6	1,23,930.4	73,804.8	1.47
10	N-P-K 25-50-25 Kg/ha (Control)	31,356.6	1,00,737.2	69,380.6	2.21

Conclusion

Application of treatment 8(30cm x 10cm + 50% N through urea + 50% N through FYM) recorded higher grain yield and benefit cost ratio in Greengram.

Acknowledgement

I am grateful to my advisor as well as all of the faculty members of Department of Agronomy for their unwavering support and advice throughout the entire experimental research study.

Competing Interests

Authors have declared that no competing interests exists.

References

- Abraham YL, Umesha C, Sanodiya LK. Effect of levels of phosphorus and potassium on growth, yield and economics of black gram. *Pharma Innov J*. 2021;10(9):109-112.
- Choudhary P, Gautam Ghosh N, Kumari S. Effect on yield and benefit cost ratio of green gram at different phosphorus levels and frequency of boron levels. *Int J Curr Microbiol Appl Sci*. 2015;12(6):1095-1103.
- Das SK. Effect of phosphorus and sulphur on yield attributes, yield, nodulation and nutrient uptake of green gram (*Vigna radiata* L. reengr). *Legume Res*. 2016;40(1):138-143.
- GOI. Agricultural Statistics at a Glance. Agricultural Statistics Division, Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India; 2023. Available from: <https://eands.dacnet.nic.in>
- Gangaraddi V, Brahmprakash GP. Evaluation of selected microbial consortium formulations on growth of green gram (*Vigna radiata* L.). *Int J Chem Stud*. 2018;6(6):1909-1913.
- Jat SR, Patel BJ, Shivran AC, Kuri BR, Jat G. Effect of phosphorus and sulphur levels on growth and yield of cowpea under rainfed conditions. *Ann Plant Soil Res*. 2013;15(2):114-117.
- Khan MMS, Singh VP, Kumar A. Studies on effect of phosphorous levels on growth and yield of kharif mungbean (*Vigna radiata* L. reengr). *J Pure Appl Biosci*. 2017;5(4):800-808.
- Khan MA, Singh V, Kumar R, Kumar P. Biological nitrogen fixation and productivity of greengram under different nutrient management practices. *J Food Legumes*. 2020;33:120-125.
- Kumar RL, Subramanian N. Production and yield attributes of biofertilizers on pulse crops. *Int J Agric Technol*. 2018;14(7):1777-1786.
- Kumar MN, Patil NB, Bhanage S. Effect of certain fungicides and *Trichoderma* spp. on growth parameter, yield attributes and yield affected by powdery mildew of green gram (*Vigna radiata* L.). *Indian J Agric Res*. 2021;55(5):624-628.
- Olsen SR, Cole CV, Watanabe FS, Dean LA. Estimation of available phosphorus in soils by

- extraction with sodium bicarbonate. USDA Circular. 1954;939:1-19.
12. Patel HR, Patel BM, Patel RB. Effect of spacing on growth and yield attributes of greengram (*Vigna radiata* L.). Int J Chem Stud. 2019;7(3):2451-2454.
 13. Piper CS. Soil and Plant Analysis. Bombay: Hans Publishers; 1966.
 14. Rao SS, Regar PL, Sharma SK. Effect of spacing and nutrient management on yield attributes and yield of mungbean (*Vigna radiata* L.). Legume Res. 2013;36(3):243-247.
 15. Rao T, Singh U, Balan R. Multi-locational assessment of spacing on growth and resource use efficiency of *Vigna radiata*. J Agric Res Technol. 2023;20(1):33-42.
 16. Prajapati JP, Kumar S, Singh RP, Kushwaha IK, Yadav PK. Effect of phosphorus and sulfur on growth, yield attributes and yield of green gram (*Vigna radiata* L.). Environ Ecol. 2013;31(4A):1977-1979.
 17. Parashar A, Tripathi L. Effect of phosphorus and sulphur on the growth and yield of black gram (*Vigna mungo* L.). J Pharmacogn Phytochem. 2020;9(5):2585-2588.
 18. Patel BK, Patel HK, Makawana SN, Shiyal VN, Chotaliya RL. Effect of various sources of nitrogen and phosphorus on growth, yield and economics of summer green gram (*Vigna radiata* L. Wilczek). Int J Curr Microbiol Appl Sci. 2020;11:745-752.
 19. Rakhonde PN, Koche MD, Harne AD. Management of powdery mildew of green gram (*Vigna radiata* L.). J Food Legumes. 2011;24(2):220-222.
 20. Raj SR, Muthukumar C, Renganathan S, Sudhagar Rao GB, Ann Suji H. Management of root rot of black gram caused by *Macrophomina phaseolina* (Tassi) Goid using *Trichoderma viride*. J Biopest. 2020;13(2):50-58.
 21. Sharma P, Borah P. Influence of seed inoculation treatments on yield and quality of green gram (*Vigna radiata* L.). Legume Res. 2021;44(6):730-735.
 22. Singh SN, Singh V. Effect of liquid biofertilizer, plant geometry and phosphorous levels on growth and yield of greengram (*Vigna radiata* L.). J Pharmacogn Phytochem. 2019;9(1):1826-1830.
 23. Sindhu SS, Suneja S, Goel AK, Parmar N, Dadarwal KR. Plant growth promoting effects of *Pseudomonas* sp. on inoculation with *Mesorhizobium* sp. Cicer strain under sterile and "wilt sick" soil conditions. Appl Soil Ecol. 2002;19:57-64.
 24. Awaad H, El-Naggar N. Role of intercropping in increasing sustainable crop production and reducing the food gap in Egypt. In Sustainability of Agricultural Environment in Egypt: Part I: Soil-Water-Food Nexus 2018 May 24 (pp. 101-118). Cham: Springer International Publishing.
 25. Meena RS, Kumar S, Datta R, Lal R, Vijayakumar V, Brtnicky M, Sharma MP, Yadav GS, Jhariya MK, Jangir CK, Pathan SI. Impact of agrochemicals on soil microbiota and management: A review. Land. 2020 Jan 23;9(2):34.
 26. Yadav SS, Singh MK, Singh PK, Kumar V. Traditional knowledge to clinical trials: A review on therapeutic actions of *Emblica officinalis*. Biomedicine & Pharmacotherapy. 2017 Sep 1;93:1292-302.
 27. Singh A, Singh NÁ, Afzal S, Singh T, Hussain I. Zinc oxide nanoparticles: a review of their biological synthesis, antimicrobial activity, uptake, translocation and biotransformation in plants. Journal of materials science. 2018 Jan;53(1):185-201.
 28. Sharma SK, Al-Badi AH, Govindaluri SM, Al-Kharusi MH. Predicting motivators of cloud computing adoption: A developing country perspective. Computers in human behavior. 2016 Sep 1;62:61-9.
 29. Yadav M, Rahman Z. Measuring consumer perception of social media marketing activities in e-commerce industry: Scale development & validation. Telematics and informatics. 2017 Nov 1;34(7):1294-307.
 30. Ganeshamurthy AN, Sammi Reddy K. Effect of integrated use of farmyard manure and sulphur in a soybean and wheat cropping system on nodulation, dry matter production and chlorophyll content of soybean on swell-shrink soils in Central India. Journal of Agronomy and crop science. 2000 Sep;185(2):91-7.
 31. Verma VK, Arora G, Mishra A, Rai P. Generalized zero-shot learning via synthesized examples. In Proceedings of the IEEE conference on computer vision and pattern recognition 2018 (pp. 4281-4289).
 32. Ayekpam S, Singh MS, Chongtham N, Athokpam H, Irungbam P. Integrated Use of Organic Manure and Inorganic Fertilizers for Improving Growth, Yield and Economics of Mung Bean (*Vigna radiata* L.). Journal of Experimental Agriculture International. 2026 Jan 19;48(1):447-52.
 33. Balai RC, Meena LR, Sharma SC. Effect of different levels of nitrogen and phosphorus on cowpea [*Vigna unguiculata* (L.) Walp] under rainfed conditions of Rajasthan. Journal of Agriculture and Ecology. 2017 Jun 25;3:19-24.