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# Effect of integrated nutrient management on growth, yield and quality of chickpea (*Cicer arietinum* L.) in central zone of UP

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## Abstract
The experiment Effect of Integrated Nutrient management on Growth, yield and quality of Chickpea (*Cicer arietinum* L.) in Central zone of UP was conducted on radish crop at Agriculture Research Farm of Rama University, Mandhana, Kanpur, U.P, India, during Rabi season of 2022. There was 8 treatments *viz.*, $T_1$ (Control), $T_2$ (RDF 100%), $T_3$ (RDF 100% + FYM 10 t/ha), $T_4$ (RDF 100% + FYM 5 t/ha + PSB), $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium), T6 (RDF 50% + FYM 10 t/ha), T7 (RDF 50% + FYM 5 t/ha + PSB) and T8 (RDF 50% + FYM 5 t/ha + PSB +Rhizobium). All the 8 treatments were replicated thrice in Randomized Block Design. The treatment combination consists of FYM, doses of fertilizers (50 and 100%) and Rhizobium. The treatment $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium) found best in parameters viz., plant height(cm), number of branches per plant, number of leaves per plant, dry matter accumulation (g plant-1), days to 50% flowering, number of pods per plant, number of seed per pod, pod length (cm), seed index (g), protein content in seed (%), seed yield (q) and straw yield (q).

**Keywords:** Chickpea, FYM, rhizobium

## Introduction
Pulses provide a consistent supply of food for humans and animals in India, and they also help to maintain the country's economy and ecology. Pulses are crucial elements of climate change-resistant industrial systems. 78% of the global usage output comes from Asia and Africa. India is the world's largest producer and consumer of pulses because it is an affordable choice for developing nations to cultivate pulses. Although chickpea output as a percentage of all pulse production climbed to 35.22 percent in 2021-22, chickpea yield is still very low. The government has sought to bridge the supply-demand imbalance caused by India's constantly increasing pulse consumption by importing goods through 2017. Chickpea production has become more expensive over time. Integrated nutrient management (INM) has been used in conventional agriculture for a very long time because soil plant systems have a low rate of nutrient turnover (Meelu and Singh, 1991) [5]. Due to two major factors, it has recently taken on greater significance. First, given the need for a continuous increase in agricultural output and the limited amount of available land, India's current level of fertilizer production is insufficient to supply all of the plant nutrients needed. About 9–10 million tonnes of fertilizer production and demand were out of balance in 2000. Second, the findings of numerous manure and fertilizer experiments carried out in the nation showed that neither chemical fertilizers nor organic sources alone exclusively can accomplish the output sustainability ability of soil as well as crops under highly intensive cropping systems. (Singh and Yadav, 1992) [7]. Due to the emerging lack of one or more secondary and micronutrients, even the so-called balanced use of chemical fertilizers will not be able to maintain high productivity. The combined use of organic and inorganic sources of nutrients in INM found superior to the use of each component separately. Chickpeas, a legume, use atmospheric nitrogen through symbiotic nitrogen fixation to meet much of their nitrogen needs. Nodulation and nitrogen fixation by Rhizobium begins about 20-25 days after seeding. Therefore, an initial dose of nitrogen may be required to initiate initial growth. Phosphorus was found to be a limiting factor in legume production. It Helps to promote flowering and pods development. It plays an important role in the formation of joints and improves the protein content of legumes.

Fertilizers also have impacts on soil properties, product quality, and human health, but fully organic agriculture cannot sustain farming on a viable scale for long periods of time. A realizable, beneficial and viable alternative to sustain agriculture on commercial scale with quality produce is the integrated management of nutrient involving organic and inorganic fertilizers leads to integrated soil management wherever necessary injudicious combinations. (Kumaraswamy, 2005) [3].

## Materials and Methods

The present investigation Effect of Integrated Nutrient management on Growth, yield and quality of Chickpea (*Cicer arietinum* L.) in Central zone of UP was carried out during the *Rabi* season of 2022 at Agriculture Research Farm of Rama University, Mandhana, Kanpur, which is located in the alluvial belt of Gangetic plains of central Uttar Pradesh. For this an experiment was planned using 8 treatments *viz.*, $T_1$ (Control), $T_2$ (RDF 100%), $T_3$ (RDF 100% + FYM 10 t/ha), $T_4$ (RDF 100% + FYM 5 t/ha + PSB), $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium), T6 (RDF 50% + FYM 10 t/ha), T7 (RDF 50% + FYM 5 t/ha + PSB) and T8 (RDF 50% + FYM 5 t/ha + PSB + Rhizobium) with three replication in Randomized Block Design. The observations were recorded from each treatment of all three replication. Five plants of radish were selected randomly and tagged under each treatment for recording different growth parameters *viz.*, plant height (cm), number of branches per plant, number of leaves per plant, dry matter accumulation (g plant-1), days to 50% flowering, The yield parameters *viz.* number of pods per plant, number of seed per pod, pod length (cm), seed index (g) protein content in seed (%), seed yield (q) and straw yield (q) are recorded.

## Results and Discussion

The data on the Effect of Integrated Nutrient management on Growth, yield and quality of Chickpea (*Cicer arietinum* L.) in Central zone of UP are described:

### Growth parameters

The data of growth parameters *viz.* plant height (27.14 cm, 57.30 cm 67.68 cm and 71.55 cm) were recorded at 30, 60, 90 DAS and harvest stage were found significant in the treatment $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium). The maximum number of branches per plant (12, 17.33 and 19.66), number of leaves per plant (722.24), 778.54 and 1151.44), dry matter accumulation g, 7.55 g and 10.48 g) were recorded at 30, 60, 90 DAS and found significant in the treatment $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium). The minimum number of branches (6.66, 10and 13.0), number of leaves (516.56, 752.42 and 906.55), dry matter accumulation (1.67 g, 5.66 g and 8.46 g) were recorded in the treatment control at 30, 60 and 90 DAS.

**Table 1:** Effect of integrated nutrient management on growth parameters on chickpea

| Treatments | Plant Height(cm) | | | | No of branches per plant | | | No. of leaves per plant | | | Dry matter accumulation | | | Days to 50% flowering |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | 90 DAS | At Harvest | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | |
| $T_1$ | 26.13 | 44.88 | 50.78 | 57.57 | 6.66 | 10.00 | 13.00 | 516.56 | 752.42 | 906.55 | 1.67 | 5.66 | 8.46 | 45.30 |
| $T_2$ | 26.45 | 46.52 | 53.28 | 60.48 | 8.00 | 11.66 | 14.66 | 547.64 | 795.64 | 953.14 | 1.70 | 5.98 | 8.98 | 44.66 |
| $T_3$ | 26.96 | 54.70 | 63.25 | 67.35 | 10.66 | 15.00 | 17.66 | 665.75 | 918.35 | 1,086.78 | 1.84 | 7.03 | 9.87 | 41.33 |
| $T_4$ | 27.01 | 55.60 | 65.57 | 69.58 | 11.33 | 16.33 | 19.00 | 690.55 | 943.42 | 1,118.35 | 1.88 | 7.28 | 10.33 | 39.06 |
| $T_5$ | 27.14 | 57.30 | 67.68 | 71.55 | 12.00 | 17.33 | 19.66 | 722.24 | 978.54 | 1,151.44 | 1.91 | 7.55 | 10.48 | 37.66 |
| $T_6$ | 26.56 | 48.62 | 57.59 | 62.35 | 8.66 | 12.33 | 15.06 | 575.88 | 832.47 | 978.47 | 1.73 | 6.22 | 9.07 | 44.00 |
| $T_7$ | 26.78 | 50.48 | 59.75 | 64.58 | 9.33 | 13.66 | 16.33 | 602.58 | 858.57 | 1,012.35 | 1.78 | 6.48 | 9.63 | 42.66 |
| $T_8$ | 26.89 | 52.34 | 61.46 | 66.24 | 10.00 | 14.33 | 17.06 | 632.12 | 884.68 | 1,050.22 | 1.80 | 6.74 | 9.62 | 40.66 |
| S.Em.± | 0.394 | 0.825 | 0.731 | 1.060 | 0.140 | 0.179 | 0.260 | 8.394 | 11.618 | 11.871 | 0.025 | 0.114 | 0.127 | 0.726 |
| CD (0.05) | N/A | 2.526 | 2.240 | 3.246 | 0.430 | 0.547 | 0.798 | 25.709 | 35.580 | 36.357 | 0.077 | 0.350 | 0.389 | 2.223 |

The integrated nutrient management minimize the Daye to 50% flowering of chickpea plants. The significant days to 50% flowering was recorded in the treatment $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium). The results of present investigation followed the findings of Jat *et al*. (2012) in green gram, Giri and Joshi (2010) [1] in chickpea and Kumar *et al.* (2015b) [8] in chickpea.

### Yield and quality parameters

The yield and yield related traits were significantly influenced by various integrated nutrient management practices. The nutrient through fertilizers easily obtained by plants and *Azotobacter* is a nitrogen fixing bacteria that fixes the atmospheric nitrogen to nitrate form that complete the rest recommended dose of nitrogen of plants. The data of yield and quality parameters have been presented in the Table-2.

The highest number of pods per plant (92.50), number of seeds per pod (1.92), protein content in seed (21.75%), seed yield per hectare (27.35 q.) and straw yield per hectare (40.32 q.) were recorded in the treatment $T_5$ (RDF 100% + FYM 5 t/ha + PSB + Rhizobium) which is significant over all treatment of this investigation. The lowest number of pods per plants (61.85), number of seeds per pod (1.04), pod length (2.20 cm) protein content in seed (14.90%), seed yield (11.22 q) and lowest straw yield (21.47 q) were observed in the treatment absolute control. The results followed the findings of Mukherjee (2015) [6] and Kumar *et al.* (2016) [4].

**Table 2:** Effect of integrated nutrient management on yield and quality parameters on chickpea

| Treatments | No. of pods per plant | No. of seeds per pod | Pod Length (cm) | Seed Index (g) | Protein in Seed (%) | Protein Yield (kh/ha) | Seed yield (q) | Straw yield (q) | Harvest Index |
|---|---|---|---|---|---|---|---|---|---|
| $T_1$ | 61.85 | 1.04 | 2.20 | 14.50 | 14.90 | 16.71 | 11.22 | 21.47 | 34.32 |
| $T_2$ | 66.44 | 1.36 | 2.40 | 15.30 | 16.55 | 23.69 | 14.32 | 25.45 | 36.00 |
| $T_3$ | 82.64 | 1.74 | 3.40 | 19.00 | 20.68 | 50.12 | 24.24 | 35.50 | 40.41 |
| $T_4$ | 88.55 | 1.85 | 3.60 | 20.25 | 21.00 | 53.86 | 25.65 | 37.60 | 40.55 |
| $T_5$ | 92.50 | 1.92 | 3.90 | 21.50 | 21.75 | 59.48 | 27.35 | 40.32 | 40.57 |
| $T_6$ | 70.25 | 1.40 | 2.70 | 16.80 | 17.46 | 28.54 | 16.35 | 28.26 | 36.65 |
| $T_7$ | 74.69 | 1.53 | 2.80 | 17.70 | 18.25 | 33.83 | 18.54 | 29.54 | 38.56 |
| $T_8$ | 78.45 | 1.66 | 3.00 | 18.40 | 19.79 | 41.32 | 20.88 | 32.36 | 39.21 |
| S.Em.± | 0.620 | 0.021 | 0.041 | 0.212 | 0.315 | 0.446 | 0.338 | 0.357 | 0.735 |
| CD (0.05) | 1.899 | 0.064 | 0.126 | 0.649 | 0.964 | 1.365 | 1.035 | 1.095 | 2.251 |

## Conclusion

On the basis of results the application of RDF 100% + FYM 5 t/ha + PSB + Rhizobium recorded highest growth parameters, yield attributes and yield, net returns and B:C ratio as well as soil fertility status as compared to rest of the treatments.

The results of this study make it clear that integrated nutrient management should be a regular practice for giving balanced nutrients in accordance with the needs of the crop. The integrated nutrient management system, which combines balanced and adequate fertilizer with organic manures and suitable microbial culture, would be beneficial to modern agriculture because it would prevent any toxic or negative effects from excessive fertilizer doses and would create a more hospitable ecosystem for the production of sustainable crops.

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