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# Effect of Integrated Nutrient Management on Growth and Yield attributes of Chickpea (*Cicer arietinum* L.)

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## ABSTRACT

The objective of the study was to observe the effect of Integrated Nutrient Management on growth and yield attributes of chickpea by adding varied amounts of fertiliser and nutrients from both organic and inorganic sources. The experiment, which was set up at three levels of vermicompost and neemcake with a combination of the recommended dosage of NPK fertiliser, carried out on all treatments. Significant effects have been observed on plant height, No. of branches, No. of pods plant<sup>-1</sup>, No. of seeds pods<sup>-1</sup>, Test weight and Yield of chickpea in the study. The Growth and Yield of Chickpea in the T<sub>9</sub> combination significantly improved attributable to the effective application of vermicompost (2 t ha<sup>-1</sup>) + neem cake (0.5 t ha<sup>-1</sup>) that performed better than T<sub>1</sub>. The results demonstrated that when employed in this configuration, treatment T<sub>9</sub> Growth and Yield of Chickpea—RDF + VC @ 2 t ha<sup>-1</sup> + NC @ 0.5 t ha<sup>-1</sup>—was strongly recommended for cultivation.

**Key words:** Chickpea, Growth, Neemcake, RDF, RSG-974, Vermicompost, Yield.

## Introduction

Pulses are mostly produced, consumed, and imported in India. It is thought to consume 26 MT of pulses annually Sahu *et al.* (2019). Pulse production ranged from 25.75 MT in 2020–21 to 23.02 MT in 2019–20 to about 23.40 MT in 2018–19. Chickpea and pigeon pea are the primary producers of pulses in India. Chickpea make up over 46% (10.56 million tonnes) of the entire crop, whereas pigeon peas make up 18% (4.15 million tonnes) Singh *et al.* (2021). A legume crop in the Fabaceae family, the chickpea (*Cicer arietinum* L.) is also referred to as the garbanzo bean. It is one of the oldest crops still grown today and has been for thousands of years across the Middle East, the Mediterranean, and South Asia. A significant source of protein, carbs,

dietary fibre and minerals like iron, zinc and folate (folic acid), chickpeas are also a good source of protein. For vegans and vegetarians, it is also an excellent source of plant-based protein (Singh *et al.*, 2020). The primary usage of chickpeas is as a food crop, either in their entirety or as flour, which is used to prepare a number of meals, including hummus, falafel, and chana masala. Aside from being utilised as human food, chickpeas are also produced as cover crops or green manures in some areas. In especially in South Asia and the Mediterranean region, chickpea is a significant cash crop for small-holder farmers. It helps sustain rural livelihoods and is a significant source of income for farmers (Gummadov *et al.*, 2016). Nitrogen is important for vegetative growth, phosphorus is important for root development and fruiting, and potassium is impor-

tant for overall plant health and disease resistance Tahir *et al.* (2016). Vermicompost is a rich source of nutrients and organic matter, which can help to improve soil structure, water retention, and nutrient availability. Vermicompost can also help to suppress soil-borne diseases and improve plant growth and yield (Singh *et al.*, 2019). Neemcake is a rich source of organic matter and nutrients, including nitrogen, phosphorus, and potassium. Neem cake also contains compounds that have insecticidal and antifungal properties, which can help to control pests and diseases in the soil. When added to soil, neem cake can help to improve soil fertility, plant growth and disease resistance Choudhary *et al.* (2019).

## Methodology

The experiment entitled "Effect of Integrated Nutrient Management on Soil Properties of Chickpea (*Cicer arietinum* L.) var. RSG-974" was carried out at the crop research farm of Department of the Soil Science and Agricultural Chemistry, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.) during the Rabi season 2022-2023. The details about the experiment site, soil and climate are described in this chapter together with the experimental design, particulars of treatments, planting material and techniques employed for the parameters. It is located at 25°58' North latitude and 81°52' East longitude with an altitude of 98 meter above mean sea level. The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46–48 °C and seldom falls as low as 4–5 °C. The relative humidity ranged between 20 to 94 percent. The average rainfall in this area is around 1100 mm annually. The experiment was laid out in Randomized block design with three replications and Nine treatments with applied three levels of Vermicompost and Neemcake respectively Vermicompost (0 t ha<sup>-1</sup>, 1 t ha<sup>-1</sup>, 2 t ha<sup>-1</sup>) and Neemcake (0 t ha<sup>-1</sup>, 0.25 t ha<sup>-1</sup>, 0.5 t ha<sup>-1</sup>). All plots were fertilized with the basal dose of 20 kg N ha<sup>-1</sup>, 40 kg P<sub>2</sub>O<sub>5</sub> and 20 kg K<sub>2</sub>O ha<sup>-1</sup>) in the form of Urea, SSP and MOP respectively. Seeds were treated with *Rhizobium sp.* Inoculants by following the standard procedure with seed rate of 80 kg ha<sup>-1</sup> at spacing 30 x 10 cm experiment is lead to observe growth and yield of chickpea.

## Results and Discussion

### Plant Height

The effect of Vermicompost and Neem cake with NPK on plant height at 30, 60, 90 and 120 days after sowing was found significant. The maximum plant height 14.04, 27.96, 37.12 and 53.62 cm was recorded in T<sub>9</sub> (RDF + VC@ 100% + NC@ 100%) and minimum plant height 10.73, 23.92, 32.35 and 45.11 cm was recorded in T<sub>1</sub> (RDF + VC@ 00% + NC@ 00%) at 30, 60, 90 and 120 DAS. With an adequate supply of nutrients from sources such as N P K along with organic supplements like Neemcake and Vermicompost may assist with vigorous vegetative growth leading to an increase in plant height via key processes including cell elongation. The study conducted by Singh *et al.* (2019) also found similar results.

### Number of Branches

The effect of Vermicompost and Neem cake with NPK on Number of branches at 30, 60, 90 and 120 days after sowing was found significant. The maximum number of branches 10.04, 14.12, 17.6 and 19.6 cm was recorded in T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) and minimum number of branches 8.3, 12.3, 15.0 and 16.08 cm was recorded in T<sub>1</sub> (RDF + VC@ 0 t ha<sup>-1</sup> + NC@ 0 t ha<sup>-1</sup>) at 30, 60, 90 and 120 DAS. When given a combination of NPK as well as Vermicompost and Neemcake the plants show improved development by having more branches. The growth of lateral branches is aided by neem cake's nitrogen content and vermicomposting's organic material presence as per Singh *et al.* (2017).

### Number of Pods Plant<sup>-1</sup>

The effect of Vermicompost and Neem cake with NPK on number of pods plant<sup>-1</sup> was found signifi-

**Table 1.** Treatment detailed combination of INM

Treatment	Treatment Combination
T <sub>1</sub>	Control
T <sub>2</sub>	VC@ 0 t ha <sup>-1</sup> + NC@ 0.25 t ha <sup>-1</sup>
T <sub>3</sub>	VC@ 0 t ha <sup>-1</sup> + NC@ 0.5 t ha <sup>-1</sup>
T <sub>4</sub>	VC@ 1 t ha <sup>-1</sup> + NC@ 0 t ha <sup>-1</sup>
T <sub>5</sub>	VC@ 1 t ha <sup>-1</sup> + NC@ 0.25 t ha <sup>-1</sup>
T <sub>6</sub>	VC@ 1 t ha <sup>-1</sup> + NC@ 0.5 t ha <sup>-1</sup>
T <sub>7</sub>	VC@ 2 t ha <sup>-1</sup> + NC@ 0 t ha <sup>-1</sup>
T <sub>8</sub>	VC@ 2 t ha <sup>-1</sup> + NC@ 0.25 t ha <sup>-1</sup>
T <sub>9</sub>	VC@ 2 t ha <sup>-1</sup> + NC@ 0.5 t ha <sup>-1</sup>

cant. The maximum number of pods plant<sup>-1</sup> 57.13 was recorded in T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) and minimum number of pods plant<sup>-1</sup> 46.00 was recorded in T<sub>1</sub> (RDF + VC@ 0 t ha<sup>-1</sup> + NC@ 0 t ha<sup>-1</sup>) at harvest. When given a combination of NPK as well as Vermicompost and Neemcake supply vital plant nutrients that promote the better growth of reproductive organs including flowers and pods. Similar result was obtained by Singh *et al.* (2019).

### Number of Seed Pod<sup>-1</sup>

The effect of Vermicompost and Neem cake with NPK on number of seed pod<sup>-1</sup> was found significant. The maximum number of seed pod<sup>-1</sup> 2.53 was recorded in T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) and minimum number of seed pod<sup>-1</sup> 1.53 was recorded in T<sub>1</sub> (RDF + VC@ 0 t ha<sup>-1</sup> + NC@ 0 t ha<sup>-1</sup>) at harvest. Better uptake and utilization of nutrients in plants is made possible through the presence of essential nutrients from NPK coupled with organic material available from vermicomposting that supports soil health. Besides that, the inclusion of nitrogen as a component of neemcake has a positive effect on seed development leading to bigger and healthier ones.

### Test Weight of Chickpea

The effect of Vermicompost and Neem cake with NPK on Test weight of chickpea was found significant. The maximum Test weight of chickpea 170g was recorded in T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) and minimum Test weight of chickpea 145g was recorded in T<sub>1</sub> (RDF + VC@ 0 t ha<sup>-1</sup> + NC@ 0 t

ha<sup>-1</sup>). The use of NPK, Vermicompost and Neemcake may have improved the chickpea plant's ability to absorb and use nutrients, which in turn improved test weight. The organic matter improves water and nutrient availability, which can encourage grain filling and boost test weight. A significant aspect in judging the quality of the harvested crop is the higher test weight, which denotes a higher proportion of full and heavier seeds.

### Seed yield of Chickpea

The effect of Vermicompost and Neem cake with NPK on Seed yield of chickpea was found significant. The maximum Seed yield of chickpea 15.48 q ha<sup>-1</sup> was recorded in T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) and minimum Seed yield of chickpea 09.38 q ha<sup>-1</sup> was recorded in T<sub>1</sub> (RDF + VC@ 0 t ha<sup>-1</sup> + NC@ 0 t ha<sup>-1</sup>). The application of NPK, Vermicompost and Neemcake resulted higher seed yield of chickpea. This can be attributed to the availability of essential nutrients which led to better growth and development of the plants and ultimately, higher yield. The combined application of these nutrients resulted in synergistic effects, leading to an overall improvement in the yield of chickpea. The higher seed yield indicates the importance of integrated nutrient management practices in improving crop productivity (Singh *et al.*, 2018).

### Conclusion

The results of experiment concluded as the effect of Vermicompost and Neem cake with NPK, was

**Table 2.** Effect of Integrated Nutrient Management on Growth and Yield attributes of Chickpea

Treatment Combination	Plant height				No. of branches				Number of pods plant <sup>-1</sup>	Number of seed pod <sup>-1</sup>	Test weight of chickpea (g)	Seed yield of chickpea (q ha <sup>-1</sup> )
	30 DAS	60 DAS	90 DAS	120 DAS	30 DAS	60 DAS	90 DAS	120 DAS				
T1	10.73	23.92	32.35	45.11	8.3	12.3	15	16.8	46.00	1.53	145	09.38
T2	11.38	24.18	33.12	46.38	9.5	12.4	15.4	17.6	49.33	1.6	148	10.36
T3	12.15	25.42	34.16	48.55	8.8	12.8	15.9	18	51.27	1.73	156	11.92
T4	11.68	24.48	33.46	46.85	9.2	12.6	15.6	17.8	50.49	1.67	152	11.22
T5	12.86	25.92	34.88	48.96	9.5	13.3	16	18.4	51.67	1.87	158	12.66
T6	13.56	26.92	36.12	50.63	9.9	13.4	16.7	19	55.07	2.07	165	13.76
T7	13.11	26.08	35.62	49.51	9.6	13	16.2	18.8	52.4	1.73	162	13.20
T8	13.95	27.44	36.68	52.41	10	13.6	17.2	19.4	55.73	2.4	166	14.51
T9	14.04	27.96	37.12	53.62	10.4	14.2	17.6	19.6	57.13	2.53	170	15.52
F-test	S	S	S	S	S	S	S	S	S	S	S	S
S.Em. (+)	0.15	0.30	0.41	0.63	0.09	0.11	0.16	0.19	1.32	0.13	1.44	0.16
C.D. at 5%	0.44	0.89	1.21	1.83	0.27	0.32	0.47	0.55	3.86	0.38	4.20	0.48

found positively significant on Treatment T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>) the maximum plant height, number of branches, number of pods plant<sup>-1</sup>, number of seed pod<sup>-1</sup>, test weight and seed yield were found in treatment T<sub>9</sub> (RDF + VC@ 2 t ha<sup>-1</sup> + NC@ 0.5 t ha<sup>-1</sup>).

## References

- Choudhary, R., Kumar, A. and Kumar, R. 2019. Effect of neem cake on soil fertility and chickpea yield in a sandy loam soil of arid Western Rajasthan, India. *International Journal of Recycling of Organic Waste in Agriculture*. 8(2): 167-175.
- Gummadov, N. and Abasov, M. 2016. Chickpea (*Cicer arietinum* L.): Importance, cultivation, utilization and role in human health-a review. *Journal of Food and Nutrition Research*. 4(6): 355-359.
- Sahu, S. and Dash, A.K. 2019. Production, Consumption, Import and Export of Pulses in India: Trends and Prospects. *International Journal of Agriculture, Environment and Biotechnology*. 12(4): 531-536.
- Singh, M.K., Jha, A. and Jha, S.K. 2020. Chickpea (*Cicer arietinum* L.)- An Important Grain Legume Crop. *Legume Science*. 2(2): e14.
- Singh, N. and Sharma, R.K. 2021. Pulses in India: Production, productivity and nutrient content. *Journal of Pharmacognosy and Phytochemistry*. 10(3): 324-327.
- Singh, Y., Singh, R., Kumar, A. and Gupta, R. 2019. Vermicompost as a soil supplement to improve the growth, yield and quality of chickpea. *Journal of Soil Science and Plant Nutrition*. 19(1): 182-192.
- Tahir, M.A., Adam, H.M. and Tofu, D.M. 2019. Effect of NPK Fertilizer on the Growth and Yield of Chickpea (*Cicer arietinum* L.) in Ethiopia. *International Journal of Agronomy*. 1-7.