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Influence of different levels of zinc foliar application on growth, yield of chickpea (*Cicer arietinum* L.) under sub humid southern region of Rajasthan

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Abstract

Chickpea (*Cicer arietinum* L.), a major pulse crop of the Rabi season, belongs to the family Fabaceae and is widely cultivated in India, particularly in the rainfed regions of Rajasthan. This study investigates the influence of different levels of zinc foliar application on the growth, yield, and economic returns of chickpea under the sub-humid agro-climatic conditions of Southern Rajasthan. The experiment involved sixteen treatment combinations comprising four fertility levels (control, 50%, 75%, and 100% recommended dose of fertilizers) and four concentrations of foliar-applied zinc (0%, 0.5%, 1.0%, and 1.5%). The findings revealed significant improvements in growth parameters such as plant height, number of branches, dry matter accumulation, and nodulation with increasing zinc concentrations. Notably, the treatment combining 100% RDF with 1% zinc foliar spray demonstrated maximum plant height (48.27 cm), dry matter accumulation (11.36 g/plant), and number of branches (5.60) improved significantly under this treatment. The enhanced physiological performance is attributed to improved zinc uptake and utilization, leading to better metabolic activity and flower retention. Given chickpea's crucial role in food security, soil enrichment through nitrogen fixation, and as a low-cost protein source, foliar zinc application offers a viable strategy to improve productivity and profitability. This study underscores the importance of integrating micronutrient management into chickpea cultivation to ensure sustainable and economically rewarding pulse production in the region.

Keywords: Chickpea (*Cicer arietinum* L.), zinc foliar application, growth parameters, yield attributes, recommended dose of fertilizer (RDF), micronutrient management, sub-humid region, sustainable agriculture, rainfed farming, economic returns

Introduction

India stands as a global leader in pulse production and consumption, with pulses playing a critical role in food security due to their high protein content and ability to supplement cereal-based diets. Among pulses, chickpea (*Cicer arietinum* L.) is the third most important globally and the most widely cultivated pulse in India, contributing to 65% of the world's production. Rajasthan ranks third in chickpea area within the country, where it is primarily grown under rainfed conditions during the Rabi season. Chickpea offers multiple agronomic and nutritional benefits, including nitrogen fixation, soil enrichment, high protein (about 20-22%), and essential micronutrients like iron, zinc, and phosphorus. It supports both human and livestock nutrition and is highly adaptable to semi-arid and sub-humid climates. Despite its potential, chickpea productivity in India remains below global standards due to poor soil fertility, low input use, and limited awareness about nutrient management. Zinc is a crucial micronutrient that influences crop growth, enzymatic activity, and physiological functions. Foliar application of zinc is recognized for enhancing nutrient efficiency, correcting deficiencies, and improving yield during critical growth stages. However, research on zinc foliar feeding in chickpea, especially in conjunction with varying levels of basal fertilization (RDF), is scarce. Given these factors, the present study was undertaken to evaluate the effect of different levels of zinc foliar application on the growth and yield of chickpea in the sub-humid southern region of Rajasthan. The research also aimed to assess the economic viability of these treatments, contributing to improved chickpea production practices under rainfed conditions.

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Materials and Methods

A field experiment was conducted during the *Rabi* season of winter at the Agronomy Farm, Mewar University, Chittorgarh, Rajasthan.

Experimental material

The experimental material for the present study consisted of

Chickpea (*Cicer arietinum* L.) variety RSG-199, a widely cultivated high-yielding variety suitable for the agro-climatic conditions of Rajasthan. The experiment was conducted during the *Rabi* season of 2024-25 at the Agronomy Farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University, Gangrar, Chittorgarh, Rajasthan.

Table 1: Treatment Combination

Sr. No.	Treatments	Combinations	Symbols
1.	Control + Control	N0F0	T1
2.	Control + 0.5% Zinc	N0F1	T2
3.	Control + 1% Zinc	N0F2	T3
4.	Control + 1.5 Zinc	N0F3	T4
5.	50% RDF + Control	N1F0	T5
6.	50% RDF + 0.5% Zinc	N1F1	T6
7.	50% RDF + 1% Zinc	N1F2	T7
8.	50% RDF + 1.5% Zinc	N1F3	T8
9.	75% RDF + Control	N2F0	T9
10.	75% RDF + 0.5% Zinc	N2 F 1	T10
11.	75% RDF + 1% Zinc	N2F2	T11
12.	75% RDF + 1.5% Zinc	N2F3	T12
13.	100% RDF + Control	N3F0	T13
14.	100% RDF + 0.5% Zinc	N3F1	T14
15.	100% RDF + 1% Zinc	N3F2	T15
16.	100% RDF + 1.5% Zinc	N3F3	T16

Experimental Details

The experiment was laid out in Factorial Randomized Block Design with Sixteen treatments and three replications. The

random allocation of treatments was done using statistical table prepared by Fisher and Yates (1963).

Table 2: Experimental Details

Sr. No.	Particulars	Details
1.	Duration	Rabi 2024-25
2.	Crop	Chickpea (Gram)
3.	Variety	RSG-991
4.	Location	Agronomy Farm, Department of Agronomy, Faculty of Agriculture and Veterinary Sciences, Mewar University
5.	Experimental Design	FRBD (Factorial Randomised Block Design)
6.	Number of Treatments	16
7.	Number of Replications	3
8.	Total Number of Plots	48
9.	Spacing	30 cm x 10 cm
10.	Gross Plot Size	5 m x 2.1 m
11.	Net Plot Size	4.4 m x 1.9 m
12.	Gross Experimental Area	542.08 m ²
13.	Net Experimental Area	401.28 m ²

Results and Discussion

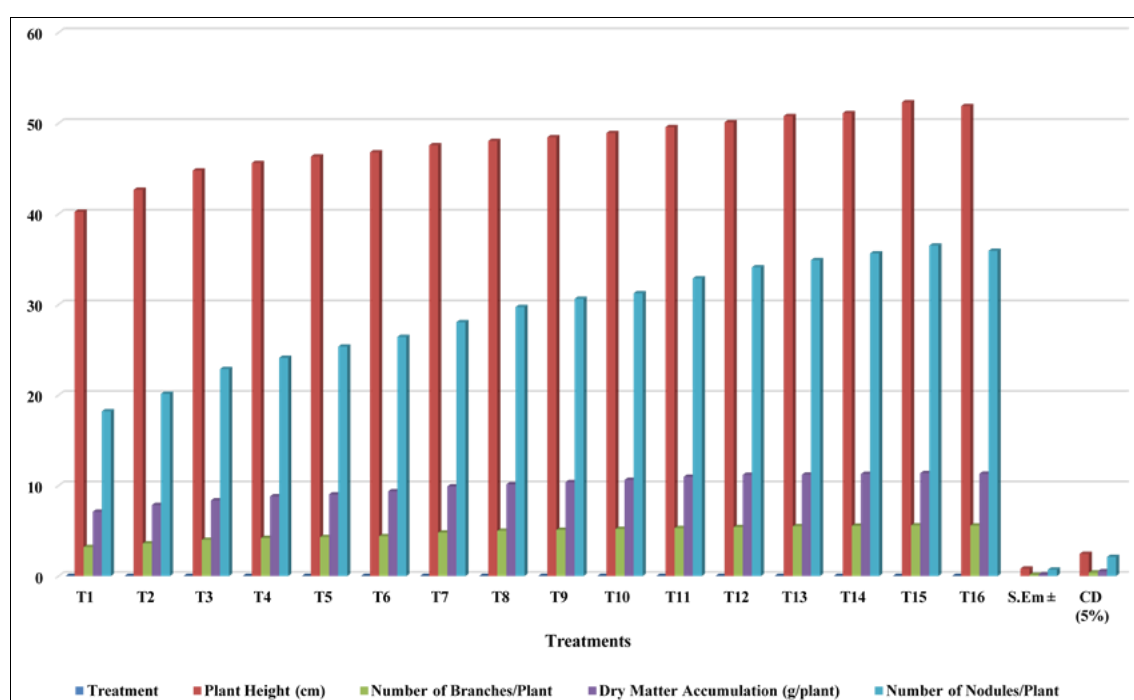
Physical attributes of different genotypes

The data presented in Table No. 3. clearly reveal that the growth attributes of chickpea were significantly influenced by the foliar application of different levels of zinc under the sub-humid

conditions of Southern Rajasthan. The observations recorded at the time of harvest indicated distinct and notable variations among the treatment combinations, thereby reflecting the positive impact of zinc foliar nutrition on the growth performance of chickpea.

Table 3: Growth attributes of Different Levels of Zinc Foliar Application on Chickpea (*Cicer arietinum* L.)” Production Under Sub Humid Southern Region of Rajasthan

Symbol	Treatment	Plant Height (cm)	Number of Branches/Plant	Dry Matter Accumulation (g/plant)	Number of Nodules/Plant
T1	Control + Water spray	40.23	3.20	7.10	18.20
T2	Control + 0.5% Zinc	42.65	3.60	7.84	20.14
T3	Control + 1.0% Zinc	44.78	4.00	8.35	22.87
T4	Control + 1.5% Zinc	45.60	4.20	8.80	24.10
T5	50% RDF + Water spray	46.32	4.30	9.02	25.35
T6	50% RDF + 0.5% Zinc	46.78	4.40	9.36	26.42
T7	50% RDF + 1.0% Zinc	47.56	4.80	9.90	28.05
T8	50% RDF + 1.5% Zinc	48.03	5.00	10.14	29.72
T9	75% RDF + Water spray	48.44	5.10	10.37	30.63
T10	75% RDF + 0.5% Zinc	48.90	5.20	10.62	31.24
T11	75% RDF + 1.0% Zinc	49.56	5.30	10.96	32.88
T12	75% RDF + 1.5% Zinc	50.10	5.40	11.18	34.10
T13	100% RDF + Water spray	50.78	5.50	11.20	34.89
T14	100% RDF + 0.5% Zinc	51.10	5.55	11.28	35.64
T15	100% RDF + 1.0% Zinc	52.30	5.60	11.36	36.50
T16	100% RDF + 1.5% Zinc	51.88	5.58	11.30	35.92
S.Em ±		0.82	0.13	0.17	0.70
CD (5%)		2.45	0.38	0.52	2.10

**Fig 1:** Growth attributes of Different Levels of Zinc Foliar Application on Chickpea (*Cicer arietinum* L.)” Production Under Sub Humid Southern Region of Rajasthan

The data presented in the table clearly indicate that the growth attributes of chickpea were significantly influenced by the foliar application of zinc in combination with various levels of recommended dose of fertilizers (RDF) under the sub-humid conditions of Southern Rajasthan. Among the treatments, the application of 100% RDF along with 1.0% zinc foliar spray (T15) recorded the maximum plant height (52.30 cm), which was significantly superior to other treatments and statistically at par with T16 and T14. This trend was also reflected in other growth parameters. The highest number of branches per plant (5.60) and maximum dry matter accumulation per plant (11.36 g) were also observed under T15, indicating the enhanced vegetative growth due to better nutrient availability and uptake. A significant increase in the number of nodules per plant (36.50) was also recorded under T15, which suggests the positive impact of zinc in promoting root nodulation and biological nitrogen

fixation. In contrast, the lowest values for all growth parameters were recorded under the absolute control treatment (T1), where no RDF or zinc was applied. The critical difference (CD) at 5% level confirmed the statistical significance of differences among the treatments for all growth parameters. The values for plant height, number of branches per plant, dry matter accumulation, and number of nodules per plant exceeded the respective CD values of 2.45 cm, 0.38, 0.52 g, and 2.10 nodules, highlighting the effectiveness of zinc foliar application particularly at 1.0% concentration when combined with full RDF. These results clearly demonstrate that foliar application of zinc at 1.0% concentration along with 100% RDF significantly enhances the growth performance of chickpea. The improvement in plant stature, branching, biomass accumulation, and nodulation under this treatment points to more efficient nutrient utilization and improved physiological functioning of the crop under field

conditions.

Conclusion

The present investigation clearly demonstrated that foliar application of zinc in combination with recommended dose of fertilizers (RDF) had a significant positive influence on the growth, yield, and economic performance of chickpea under the sub-humid agro-climatic conditions of Southern Rajasthan. Among all treatment combinations, the application of 100% RDF along with 1.0% zinc foliar spray (T15) emerged as the most effective, recording the highest plant height, number of branches, dry matter accumulation, nodulation.

References

1. Amarilla R, Khorsandy H, Mustafavi SH. Effect of foliar application of zinc, molybdenum, and boron on soybean. *J Agron Res*. 2019;11(2):123-32.
2. Atiia A, El-Hady A, Saeed M. Effect of zinc application on growth and yield of broad bean. *Agric Res Stn, Giza (Egypt)*. 2016.
3. Awomi TA, Singh AK, Devi KN, Bordoloi LJ. Effect of molybdenum and zinc on yield of mungbean in acidic soil of North India. *J Food Legumes*. 2021;34(1):45-50.
4. Banerjee H, Ghosh RK, Saha S. Effect of zinc, potassium and boron on growth, yield and economics of autumn sown black gram. *J Agric Sci Technol*. 2023;25(1):81-87.
5. Banerjee P, Singh G, Ram H, Sharma P, Kaur J. Effect of zinc, potassium, and boron on growth, yield, quality, and economics of autumn sown black gram. *Indian J Agron*. 2023;68(1):14-21.
6. Basu M, Bhadoria PBS. Performance of groundnut under alluvial soil of eastern India with inoculants and zinc application. *Indian J Agron*. 2022;67(3):253-58.
7. Bhattacharjee S, Biswas PK, Rakshit A, Adhikari. Effect of soil-applied zinc on growth and yield of soybean. *Legume Res*. 2020;43(5):713-17.
8. Deshmukh SS. Effect of specialty fertilizers on chickpea in vertisols [M.Sc. thesis]. Parbhani: Vasant Rao Naik Marathwada Krishi Vidyapeeth; 2020.
9. Dixit AR, Elamathi S. Effect of foliar application of nutrients and growth regulators on yield and economics of green gram. *Int J Curr Microbiol Appl Sci*. 2017;6(5):1719-24.
10. Dwivedi RK, Tiwari D. Effect of foliar spray of nutrients on growth and yield of chickpea. *J Krishi Vigyan*. 2021;9(2):129-32.
11. Gad N. Response of groundnut to nitrogen and zinc fertilization. *Delta Agric Res Rep*. 2012;30:15-20.
12. Gheeth AS, El-Sayed AM, Hassan MA. Effect of various zinc levels on growth and yield of pea. *Giza Agric Sci J*. 2020;33(4):299-305.
13. Hussain S, Wani MA, Qayoom S. Effect of zinc and boron fortification on yield and quality of chickpea variety GNG-1958. *Int J Curr Microbiol Appl Sci*. 2022;11(6):114-20.
14. Jahani MA, Khavari-Nejad RA, Mahmoodzadeh H, Saadatmand S. Zinc oxide nanoparticles influence on *Brassica napus* L. physiology. *Iran J Plant Physiol*. 2020;11(1):44-52.
15. Kaur J, Singh S, Grewal K. Influence of foliar application of ethrel and zinc chloride on groundnut. *Punjab Agric Univ Res J*. 2021;58(2):117-22.
16. Khan M, Khan I. Effect of nickel and zinc concentrations on growth of chickpea. *J Environ Biol*. 2022;43(3):151-58.
17. Mathur R, Sharma PK, Kumar N. Impact of soil compaction, potassium and zinc on growth and yield of moth bean. *Legume Res*. 2022;45(3):297-301.
18. Narayanan S, Suresh G, Kumar V. Effect of seed priming with zinc nitrate on black gram under drought condition. *Madras Agric J*. 2016;103(4-6):170-73.
19. Sharma V, Kaur A, Singh H. Influence of boron and sulphur on growth and yield of mustard. *J Oilseeds Res*. 2023;40(1):57-62.
20. Shinde SN, Bhilare RL. Response of chickpea to soil and foliar application of DAP [M.Sc. thesis]. Rahuri: Mahatma Phule Krishi Vidyapeeth; 2018.
21. Singh D, Kumar P, Rai RK. Response of chickpea to sulphur fertilization. *Indian J Agron*. 2020;65(4):441-46.