

IMPACT OF MICRO NUTRIENT APPLICATION ON PRODUCTIVITY OF CHICKPEA [*CICER ARIETINUM* (L.)]

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SUMMARY

The application of micronutrient and their combinations were tried to improve the productivity of chickpea on sandy loam soils of Western Rajasthan during *Rabi* 2022-23. The experiment comprised of eight treatments in four replications and laid out in randomized block design (RBD) using cultivar CSJ 515. The maximum seed yield (1946 kg/ha) was recorded under treatment RDF + 0.5% ZnSO₄ + 0.5% FeSO₄ + 0.2% B spray at flower initiation as compared to RDF (1648 kg/ha). However, the application of micro nutrient alone or in combination increased the growth and yield attributes but they were at par with RDF (10 kg N and 30 Kg P₂O₅/ha) except two sprays of 0.5% ZnSO₄ and 0.5% ZnSO₄ + 0.5% FeSO₄ + 0.2% B spray at flower initiation and pod formation. The maximum net returns (69689 Rs./ha) and a benefit to cost ratio (3.17) was recorded in RDF + 0.5% ZnSO₄ + 0.5% FeSO₄ + 0.2% B spray at flower initiation.

Key words: Chickpea, economics, micro nutrient and RDF

Chickpea (*Cicer arietinum* L.) is important source of protein (20-25%) and a good source of dietary fibre, starch, minerals and vitamins. It is typically low in fat, contains no cholesterol and high in iron, potassium and magnesium. It is the second most crop after soybean and contributes 49 per cent of total pulse production in India. The contribution of pulses in total food grain production of country is (305.44 mt) only 8.4 % during 2020-21 (Anonymous 2021). In Rajasthan it is cultivated on 1.75 mha with a production of 1.92 mt and contribute 14% of total country's chickpea production during 2023 (Anonymous 2023). Zinc plays a key role in a wide range of enzymes and proteins, controlling many important biochemical pathways, iron is an essential micronutrient for almost all living organisms because it plays critical role in metabolic processes such as DNA synthesis, respiration and photosynthesis (Kuldeep *et al.* 2018). B is necessary for cell division and differentiation and considered the most important micronutrient particularly during flowering (Reguri and Singh, 2023). Currently crop yield is falling due to no availability of micronutrients, so it is need of the hour to ensure sufficient supply of these micronutrients throughout crop growth period. Soil application of micronutrients often results in binding with soil

particles making them unavailable for uptake. Foliar application of micronutrients in such conditions is an economically viable option and also beneficial because of their relatively quick absorption by the leaves (Verma *et al.*, 2017). Under such conditions, proper management of micro nutrients in crop through foliar feeding can be effective intervention in enhancing crop productivity. Among all agronomic factors, adequate fertilization stands first and it is considered as one of the most productive inputs in agriculture (Kumar *et al.* 2023). The new varieties with improved agronomic practices, can express full yield potential only when adequate quantities of micronutrients containing fertilizer were applied along with NPK.

MATERIALS AND METHODS

The present study was conducted at Instructional Farm, College of Agriculture Sumerpur, Agriculture University Jodhpur Rajasthan during *Rabi* 2022-23. The soil of the experimental field was sandy loam in texture, slightly alkaline in pH (7.80), low in organic carbon (0.26%), low in available nitrogen (197.3 kg/ha), medium in available phosphorus (27.80 kg/ha) and high in available potassium (283.0 kg/ha). Eight treatments comprising foliar spray of

TABLE 1
Growth, yield attributes and economics of chickpea under micro nutrients application.

Treatment	Plant height (cm)	No. of pods/plant	No. of seeds/pod	Seed index (g)	Seed yield (kg/ha)	Fodder yield (kg/ha)	HI (%)	Net return (Rs/ha)	B:C
T ₁ -Control (RDF)	41.51	42.71	1.44	17.51	1648	3047	35.12	57998	3.06
T ₂ -0.5% ZnSO ₄ spray at FI*	41.58	42.86	1.44	17.87	1742	3225	35.06	60854	3.01
T ₃ -0.5% ZnSO ₄ spray at FI & PF**	42.29	43.03	1.42	17.85	1862	3338	35.82	65100	3.02
T ₄ -0.5% FeSO ₄ spray at FI	42.04	42.71	1.44	17.63	1739	3163	35.48	60513	2.99
T ₅ -0.5% FeSO ₄ spray at FI & PF	41.78	42.73	1.44	17.77	1804	3285	35.45	62423	2.96
T ₆ -0.2% B at FI	41.64	42.78	1.43	17.51	1672	3200	34.33	58033	2.97
T ₇ -0.5% ZnSO ₄ + 0.5% FeSO ₄ +0.2% B spray at FI	42.52	43.37	1.46	18.05	1946	3425	36.21	69689	3.17
T ₈ -0.5% ZnSO ₄ + 0.5% FeSO ₄ spray at FI & PF	41.57	43.30	1.46	17.94	1868	3388	35.54	61670	2.71
S.Em±	1.78	1.88	0.04	0.68	61.0	84.0	0.51		
CD at 5%	NS	NS	NS	NS	180	2.48	NS		

*Flower initiation and **Pod formation.

micronutrients viz., T₁-Control (RDF), T₂-0.5% ZnSO₄ spray at flower initiation (FI), T₃-0.5% ZnSO₄ spray at FI & Pod formation (PF), T₄-0.5% FeSO₄ spray at FI, T₅-0.5% FeSO₄ spray at FI & PF, T₆-0.2% B at FI, T₇-0.5% ZnSO₄ + 0.5% FeSO₄ +0.2% B spray at FI, T₈-0.5% ZnSO₄ + 0.5% FeSO₄ spray at FI & PF were sprayed in RBD with four replications. The chickpea crop variety CSJ 515 was sown manually keeping the row distance of 30 cm and seed rate of 80 kg seed ha⁻¹ on first fortnight of November and harvested in second week of March. The cultivation of crop was followed as per recommended package of practices using fertilizer dose of 20 kg N and 40 kg P₂O₅ ha⁻¹ applied through urea and DAP, respectively at the time of field preparation. The experimental unit was 3.0 m X 3.4 m. Observation was taken as per standard procedure at harvest of the crop.

RESULTS AND DISCUSSION

The data pertaining to plant height, number of pods per plant, number of seeds per pod, seed index and seed yield and economics of chickpea in accordance with treatment of micro nutrients levels were depicted in Table 1. The values related to growth attributes, yield attributes and harvest index were showed non-significant difference among treatments. However, micro nutrient application recorded higher growth and yield attributes as compared to RDF. Factors such as micro nutrients might have increased growth and yield attributes by formation of new plant cells, elevated the level of IAA, development of meristematic tissues, cell elongation and tissue differentiation and sugar

transportation. Similar results were reported by Kala *et al.* 2017 and Iqbal *et al.* 2021. Seed and fodder yield recorded a significant difference among treatment combinations. However, Seed yield (1946 kg/ha) recorded significantly highest in 0.5% ZnSO₄ + 0.5% FeSO₄ +0.2% B spray at FI and two spray of 0.5% ZnSO₄ + 0.5% FeSO₄ +0.2% B spray at FI and PF noticed at par values (1868 kg/ha). Grain yield of chickpea was significantly influenced with increasing levels of micronutrients. This was perhaps due to the combined application of micronutrients overall improved growth and yield attributes (Reddy and Singh, 2021).

The cost of cultivation of gram included the expenditure incurred from field preparation to threshing of the produce using prevailing prices and gross return was calculated on the basis on MSP of gram i. e. 5230 q⁻¹ for the 2022-23. The net return was highest in the 0.5% ZnSO₄ + 0.5% FeSO₄ +0.2% B spray at FI (69689 ha⁻¹) and maximum benefit to cost ratio (3.17) was recorded in this treatment. Zinc, iron and boron are required in small but critical concentration for the functioning of several plants' physiological functions like photosynthesis and sugar formation, fertility and seed production, growth regulation and disease resistance (Mekkei, 2020 and Pareek, 2025). The results showed that the using integrated approach would be economically gainful proposition and micro nutrient application beyond flowering stage was unfruitful. Results suggested economic viability and agronomic feasibility of the technology for gram cultivation. These results are in conformity of the results as reported by Jain *et al.* 2020.

CONCLUSION

From the above study, it can be concluded that the chickpea was found to be more responsive regarding growth and yield by application of micro nutrients foliar spray and which might be further tested for recommended for this region.

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