

Effect of Different Foliar Application of Nutrients on Yield, Quality and Economics of Chickpea

C. A. Kale, R. M. Gethe , D. D. Khedkar , N. J. Danawale, O. B. Chandapure, M. S. Mane.
Inter - Faculty Department of Irrigation Water Management,
Mahatma Phule Krishi Vidyapeeth, Rahuri - 413 722 (India)
(Received : 10.02.2024 Accepted : 09.03.2024)

Abstract

A field investigation entitled "Effect of different foliar application of nutrients on growth, yield and quality of wheat (*Cicer arietinum* L.)" was conducted in rabi season of 2022- 2023 at the Instructional Farm, Post - Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment was laid out in RBD with nine treatments replicated three times. The highest grain yield (29.21 q ha⁻¹), straw yield (44.46 q ha⁻¹), biological yield (73.67 q ha⁻¹), harvest index (39.64%) and yield increase over control (85.81%) is obtained due to foliar application of nutrients. Among all treatments, numerically higher protein content (20.50%) and significantly higher protein yield (598.80 kg ha⁻¹) was recorded significantly higher to all treatments. The significantly higher gross monetary returns (Rs. 132173 ha⁻¹) net monetary returns (Rs. 77071 ha⁻¹) and B:C ratio (2.39) was obtained with application of treatment T₉ GRDF+ Phule Liquid Micro Grade II @ 1% at 35 DAS.

Key words : Foliar, significant.

The chickpea, or (*Cicer arietinum* L.), is a member of the Fabaceae plant family, which includes legumes. After dry beans and peas, it is the third most important legume crop in the world. Grown and consumed in vast amounts from south-east Asia to India, as well as in the Middle East and Mediterranean regions, chickpeas are a significant grain legume in Asia. Because chickpeas are high in protein, carbohydrates, and minerals, they have a high nutritional value and can help people improve the nutritional content of their diets. A 100 g serving of chickpea seed contains 180 calories, 2.99 g fat, 29.98 g carbohydrates, and 9.54 g protein. Chickpeas contain 0.44 mg of lysine, 0.30 mg of thiamine, 0.15 mg of riboflavin, and 2.9 mg of niacin per gram. (fatsecret.co.in)

Phule Liquid Micro Grade II is a liquid micronutrient solution developed by Micronutrient Research Scheme, Department of Soil Science and Agricultural Chemistry, MPKV, Rahuri, contains Fe (2.5%), Zn (2.0%), Mn (1%), Cu (1%), Mo (0.1%) and B (0.0%), 2013). Foliar

spraying with NPK (19:19:19) at a concentration of 0.5 per cent to improve chickpea grain yield.

The goal of nutrient application is to increase the overall efficiency of cropping systems by providing economically optimal nutrients to plants and minimizing nutrient losses from the field. In such a situation, foliar fertilization makes a lot of sense. Foliar fertilization has become a recognized technology that increases yield and improves the quality of crop production. It also improves nutrient utilization and reduces environmental pollution by reducing the amount of fertilizers added to the soil, especially gram. (Yaseen et al., 2010) The effectiveness of foliar fertilization is higher than that of soil fertilization under drought and salinity conditions.

Material and methods

A field investigation entitled "Effect of foliar application of nutrients on growth, yield and quality of chickpea (*Cicer arietinum* L.)" was conducted in rabi season of 2022- 2023 at the

Instructional Farm, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The experiment consists of 9 treatments viz., T₁ : Absolute control; T₂ : Only water spray; T₃ : GRDF only (25:50:30 kg N:P₂O₅:K₂O ha⁻¹ + 5 ton FYM ha⁻¹); T₄ : GRDF + 1 foliar sprays of Urea @ 2% at 35 DAS; T₅ : 75% GRDF + 1 Foliar spray of 12:61:00 @ 1% at 35 DAS; T₆ : GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS; T₇ : GRDF + 1 Foliar spray of 13:00:45 @ 1% at 60 DAS; T₈ : 50% GRDF + 1 sprays of 00:00:50 @ 1% at 60 DAS; and T₉ : GRDF + 1 Foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS .The experiment was laid out in randomized block design (RBD) with three replications. The soil was clay loam in texture, medium in available nitrogen (190.70 kg ha⁻¹) medium in available phosphorus (17.32 kg ha⁻¹) and high in potassium (435.58 kg ha⁻¹) The Soil was slightly alkaline in reaction (pH 8.17) with medium in organic carbon content (0.57%). Seed drill sowing in chickpea seeds dibbled in flat bed method done on rough seed bed at spacing of 30 cm x 10 cm. The recommended dose of

fertilizer (25:50:30 kg N:P₂O₅:K₂O ha⁻¹) was applied 12.5:25:15 kg N:P₂O₅:K₂O ha⁻¹ as a basal and 12.5 kg N as top dressing through in treatment T₃ to T₉. Foliar application of different fertilizers was done at 35 and 60 days after sowing, respectively. Periodical observations on the growth characters, yield contributing characters, grain yield and straw yield were recorded during investigation. Soil analysis was also done initially and after harvest for calculating amount of available nutrients in soil. Furthermore, the uptake of nitrogen, phosphorous and potassium by grain and straw was also estimated.

Results and Discussion

(i) **Yield parameter** : Among all the treatments given to wheat crop, significantly higher grain yield and straw yield (29.21 and 44.46 q ha⁻¹, respectively) were recorded under the treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS. The biological yield and harvest index of the treatment T₆ i.e. GRDF + 1 foliar spray of

Table 1. Effect of different foliar application on grain yield, straw yield, biological yield, harvest index and yield increase over control of gram

Treatments	Yield (q ha ⁻¹)			Harvest index (%)	Yield increase over control
	Grain yield	Straw yield	Biological yield		
T ₁ - Absolute control	15.72	31.49	47.21	33.29	-
T ₂ - Only water spray	16.56	33.05	49.61	33.38	5.07
T ₃ - GRDF only (25:50:30 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + 5 ton FYM ha ⁻¹)	21.81	37.33	59.14	36.87	38.74
T ₄ - GRDF + 1 foliar spray of Urea @ 2% at 35 DAS	24.41	38.28	62.69	38.93	55.27
T ₅ - 75 % GRDF + 1 foliar spray of 12:61:00 @ 1% at 35 DAS	22.55	38.11	60.66	37.17	43.44
T ₆ - GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS	27.21	40.67	67.88	40.08	73.09
T ₇ - GRDF +1 foliar spray of 13:00:45 @ 1% at 60 DAS	26.24	39.29	60.99	43.02	66.92
T ₈ - 50 % GRDF +1 foliar spray of 00:00:50 @ 1% at 60 DAS	20.13	34.74	54.87	36.68	28.05
T ₉ - GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS	29.21	44.46	73.67	39.64	85.81
S.E.±	1.06	1.33	-	-	-
C.D.at 5%	3.13	3.91	-	-	-
G.M.	22.64	37.49	59.64	37.67	-

Phule Liquid Micronutrient Grade II @ 1% at 35 DAS is 73.67 q ha⁻¹ and 39.64%. The highest grain yield, straw yield, biological yield, harvest index and yield increase over control is obtained due to the availability of both macro and micro nutrients is uniform throughout the vegetative growth stage of crop. Due to foliar application

of nutrients, there was increase in plant height, number of branches plant⁻¹, plant spread and dry matter accumulation which may results into higher yield parameter of gram. The results are in comparison with the results found by Dhakad *et al.* (2018), Jadhav *et al.* (2021) and Kirnapure *et al.* (2020)

Table 2. Effect of different foliar application on protein content and protein yield of gram

Treatments	Quality studies	
	Protein content (%)	Protein yield (kg ha ⁻¹)
T ₁ - Absolute control	19.00	298.68
T ₂ - Only water spray	19.52	323.25
T ₃ - GRDF only (25:50:30 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + 5 ton FYM ha ⁻¹)	19.58	427.03
T ₄ - GRDF + 1 foliar spray of Urea @ 2% at 35 DAS	20.10	490.64
T ₅ - 75 % GRDF + 1 foliar spray of 12:61:00 @ 1% at 35 DAS	20.04	445.89
T ₆ - GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS	20.33	553.17
T ₇ - GRDF +1 foliar spray of 13:00:45 @ 1% at 60 DAS	20.21	549.91
T ₈ - 50 % GRDF +1 foliar spray of 00:00:50 @ 1% at 60 DAS	19.52	392.93
T ₉ - GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS	20.50	598.80
S.E.±	0.32	22.46
C.D.at 5%	NS	67.38
G.M.	19.86	453.36

Table 3. Effect of different foliar application on Gross monetary return, cost of cultivation, net monetary return and B:C ratio of gram

Treatments	Gross monetary returns (Rs. ha ⁻¹)	Cost of cultivation (Rs. ha ⁻¹)	Net monetary return (Rs. ha ⁻¹)	B:C Ratio
T ₁ - Absolute control	72002	38330	33672	1.87
T ₂ - Only water spray	75838	40154	35684	1.88
T ₃ - GRDF only (25:50:30 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + 5 ton FYM ha ⁻¹)	99324	51758	47566	1.91
T ₄ - GRDF + 1 foliar spray of Urea @ 2% at 35 DAS	110849	53690	57159	2.06
T ₅ - 75 % GRDF + 1 foliar spray of 12:61:00 @ 1% at 35 DAS	102650	51606	51044	1.98
T ₆ - GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS	123384	54778	68606	2.25
T ₇ - GRDF +1 foliar spray of 13:00:45 @ 1% at 60 DAS	118860	54534	64326	2.17
T ₈ - 50 % GRDF +1 foliar spray of 00:00:50 @ 1% at 60 DAS	91699	48282	43417	1.89
T ₉ - GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS	132173	55102	77071	2.39
S.E.±	4937	-	4937	-
C.D.at 5%	14480	-	14480	-
G.M.	102975	49804	53171	-

(ii) Protein parameter : The gram treated with treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS produced significantly maximum protein yield (598.80 kg ha⁻¹) as compared to rest of the treatments during investigation. The gram treated with treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS has been produced higher grain yield and as the protein yield is product of protein content and grain yield the present reflection was noticed. These results are fairly similar with Shivay *et al.* (2014) Das *et al.* (2013) and Verma *et al.* (2019).

(iii) Economics parameter : The gram crop treated with treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS found superior and obtained significantly maximum gross monetary returns of Rs. 132173 ha⁻¹. The maximum cost of cultivation recorded in treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS Rs. 55102. The gram crop treated with treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS found superior and obtained significantly maximum net monetary returns of Rs. 77071 ha⁻¹. The benefit cost ratio of gram treated with treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS was found significantly superior (2.39) as compared to other treatments. This results are conformity with jadhav *et al.* (2021), kirnapure *et al.* (2020) and Yadav *et al.* (2022). The gram crop treated with Treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS has been produced higher grain and straw yield due to boosting of luxurious crop growth and yield

attributes. This was reflected in obtaining highest gross monetary returns, Net monetary returns and B:C ratio.

References

- Das, S., Pareek, B. L., Kumawat, A. and Dhikwal, S. R. 2013. Effect of phosphorus and biofertilizers on productivity of chickpea (*Cicer arietinum* L.) in north western Rajasthan, India. Legume Research-An International Journal, 36(6), 511-514.
- Dhakad, A. K. and Kushwaha, H. S. 2018. Effect of phosphorus liquid bio-fertilizer on productivity and economics of chickpea (*Cicer arietinum* L.). Journal of Food Legumes, 31(3), pp.191-193.
- Fatsecret-calorie counter. 2022. Nutrients benefits of chickpea. Mobile.fatsecret.com.
- Jadhav, S. S., Jadhav, A. S., Karpe, P. J. and Chalak, A. M. 2021. Effect of foliar application of fertilizers on yield attributes, yield and economics of chickpea (*Cicer arietinum* L.).
- Kirnapure, V. S., Choudhary, A. A., Gawate, A. N. and Potkile, S. N., 2020. Influence of foliar application of nutrients on yield and economics of chickpea. Journal of Pharmacognosy and Phytochemistry, 9(3), pp. 202-204.
- Shivay, Y. S., Prasad, R. and Pal, M. 2014. Effect of variety and zinc application on yield, profitability, protein content and zinc and nitrogen uptake by chickpea (*Cicer arietinum*). Indian Journal of Agronomy, 59(2), 317-321.
- Verma, Gaurav, Yadav, D. D., Sharma, V. K., Kumar, A., Singh, R. K., Upadhyay, P. K. and Gupta, G. 2019. Effect of fertility levels and biofertilizers on agro-physiological performance, productivity and quality of chickpea (*Cicer arietinum*). Indian Journal of Agricultural Sciences, 89(9), 1482-6.
- Yadav, A., Singh, D., Kumar, R., Pandey, S. B., Pal, S., Sachan, R. and Kumar, M. 2022. Effect of Phosphorus, Zinc and Rhizobium on Productivity and Profitability of Chickpea (*Cicer arietinum* L.) under Central Plain Zone of Uttar Pradesh.
- Yaseen, A., Abou El Nour, E.A.A and Shadid, S. 2010. Response of wheat foliar spray with urea and micronutrients. Journal of America Science. 69(1): 14-22. (Cross ref.)