

Effect of Different Foliar Application of Nutrients on Growth Characters, Yield Contributing Characters and Yield of Gram

C. A. Kale, R. M. Gethe, N. J. Danawale, M. S. Mane, D. D. Khedkar.

Inter - Faculty Department of Irrigation Water Management,
Mahatma Phule Krishi Vidyapeeth, Rahuri - 413 722 (India)

(Received : 25.01.2024 Accepted : 28.02.2024)

Abstract

A field investigation entitled "Effect of different 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 was laid out in RBD with nine treatments replicated three times. All the growth contributing data viz., plant height (53.46 cm), total number of branches plant⁻¹ (19.72 cm), dry matter (18.16 g) and plant spread (40.13) were recorded significantly maximum under T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS foliar application of nutrients. All the yield contributing characters number of pods plant⁻¹ (42.37), number of seeds pod⁻¹ (1.18), weight of pods plant⁻¹ (12.70 g), grain yield⁻¹ (9.14 g) and Test weight (179.87 g) were recorded significantly maximum under T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS foliar application of nutrients. Then 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%) were recorded in treatment T₉ i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient 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 per cent), 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.

In such a situation, foliar fertilization makes a lot of sense. Foliar application of nutrients 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 Chickpea. (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%). Chickpea seed was dibbled in flat bed method 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 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) Growth Parameters : The growth performance of chickpea crop at 30 DAS was almost uniform and not influenced significantly due to foliar application of nutrients at 35 DAS and 60 DAS respectively. Afterwards, the results of plant height, total number of tillers, number of functional leaves plant⁻¹, leaf area plant⁻¹ and dry matter plant⁻¹ accumulation with application

Table 1. Effect of different foliar application on growth contributing characters at harvest

Treatment	Growth contributing characters at harvest			
	Plant height (cm)	No. of branches plant ⁻¹	Dry matter plant ⁻¹ (g)	Plant spread (cm)
T ₁ - Absolute control	40.35	14.98	14.01	30.49
T ₂ - Only water spray	41.87	15.54	14.37	32.05
T ₃ - GRDF only (25:50:30 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + 5 ton FYM ha ⁻¹)	44.10	16.38	15.36	33.33
T ₄ - GRDF + 1 foliar spray of Urea @ 2% at 35 DAS	45.51	16.89	15.78	34.37
T ₅ - 75% GRDF + 1 foliar spray of 12:61:00 @ 1% at 35 DAS	45.53	16.76	15.37	34.11
T ₆ - GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS	50.93	19.04	17.39	38.34
T ₇ - GRDF +1 foliar spray of 13:00:45 @ 1% at 60 DAS	47.06	18.76	16.01	35.29
T ₈ - 50% GRDF +1 foliar spray of 00:00:50 @ 1% at 60 DAS	42.80	15.89	14.83	32.74
T ₉ - GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS	53.46	19.72	18.16	40.13
S.E.±	2.44	0.91	0.84	1.87
C.D. at 5%	7.17	2.69	2.47	5.49
G.M.	45.73	17.10	15.69	34.54

of treatment T9 i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS at harvest significantly higher plant height (53.46 cm), number of branches plant⁻¹ (19.72), dry matter plant⁻¹ (18.16 g) and plant spread (40.13cm) accumulation. The highest, plant height, number of branches plant⁻¹, dry matter and plant spread found in gram crop might be due to addition of GRDF in conjunction with foliar spray of all necessary macro and micro nutrients and their uptake by gram crop. It results in increased availability of all nutrients to plants and enhanced meristematic activity, cell division, enlargement and elongation of cells resulting in higher growth contributing characters. The results are in conformity with Rawat *et al.* (2021), Rathod *et al.* (2017), Das *et al.* (2017), Kumar *et al.* (2023) and Muhammad (2023)

(II) Yield contributing characters : The practical way of judging the superiority of any technology lies in the evaluation of yields. In the present study, significant differences were observed in grain and straw yield of chickpea

because of foliar spray of different nutrients. Among yield contributing characters, significantly higher number of pods plant⁻¹ (42.37), number of seed pod⁻¹ (1.18), weight of pod plant⁻¹ (12.70 g) grains yield plant⁻¹ (9.14 g) and Test weight (179.87) g were obtained with application of treatment T9 i.e. GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS. The effective absorption of nitrogen helped in formation of amino acids and boosts the production of carbohydrate. Phosphorus is vital for seed formation. Potassium plays important role in translocation of starch and protein synthesis. This was reflected in production of higher number of length of panicle, number of spikelets panicle⁻¹, number of grains panicle⁻¹, weight of grain panicle⁻¹ and number of grains panicle⁻¹ gram. Similar results were found by Singh *et al.* (2023), Rathod *et al.* (2017), Das *et al.* (2017) and Kachave *et al.* (2018)

(III) Yield parameter : Among all the treatments given to wheat crop, significantly higher grain yield and straw yield (29.21 and

Table 2. Effect of different foliar application on length of panicle, mean number of spikelets panicle⁻¹, mean number of grains panicle⁻¹, mean weight of grains per panicle and 100 seed weight

Treatment	Yield contributing characters				
	No. of pods plant ⁻¹	No. of seeds pod ⁻¹	Wt. of pods plant ⁻¹ (g)	Grain yield plant ⁻¹ (g)	Test wt. (g)
T ₁ - Absolute control	31.98	1.09	9.59	6.90	165.33
T ₂ - Only water spray	33.18	1.10	9.95	7.16	166.69
T ₃ - GRDF only (25:50:30 kg N:P ₂ O ₅ :K ₂ O ha ⁻¹ + 5 ton FYM ha ⁻¹)	34.95	1.13	10.48	7.54	171.25
T ₄ - GRDF + 1 foliar spray of Urea @ 2% at 35 DAS	36.06	1.16	10.81	7.78	175.81
T ₅ - 75 % GRDF + 1 foliar spray of 12:61:00 @ 1% at 35 DAS	35.78	1.13	10.73	7.72	171.76
T ₆ - GRDF + 1 foliar spray of 00:52:34 @ 1% at 60 DAS	40.64	1.17	12.18	8.77	178.35
T ₇ - GRDF +1 foliar spray of 13:00:45 @ 1% at 60 DAS	38.04	1.16	11.41	8.21	176.32
T ₈ - 50% GRDF +1 foliar spray of 00:00:50 @ 1% at 60 DAS	33.92	1.13	10.17	7.32	171.25
T ₉ - GRDF + 1 foliar spray of Phule Liquid Micronutrient Grade II @ 1% at 35 DAS	42.37	1.18	12.70	9.14	179.87
S.E.±	1.89	0.01	0.56	0.40	2.81
C.D.at 5%	5.56	NS	1.67	1.20	NS
G.M.	36.32	1.14	10.89	7.83	174.29

Table 3. 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	-

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 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)

References

- Das, S., Pareek, N., Raverkar, K. P., Chandra, R. and Kaustav, A. 2012. Effectiveness of micronutrient application and Rhizobium inoculation on growth and yield of chickpea. International Journal of Agriculture, Environment and Biotechnology, 5(4), 445-452.
- 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.).
- Kachave, T., Kausadikar, H. and Deshmukh, M. G. 2018. Effect of specialty fertilizer on growth, yield and quality of chickpea. IJCS, 6(3), 1660-1662.
- 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.
- Kumar, S., Verma, C. B., Kumar, A., Singh, M. and Singh, M. 2022. Effect of sowing dates and micronutrient on growth and yield of chickpea varieties (*Cicer arietinum* L.) under changing climatic conditions. Pharma Innov. J, 11, 1071-1077.
- Muhammad, B. I. 2023. Effect of Seed Priming With Manganese And Boron on Growth, Yield And Seed Quality of Chickpea (*Cicer arietinum* L.). Mesopotamia

Journal of Agriculture, 51(2), 64-78.

- Rathod, S., Channakeshava, S., Basavaraja, B. and Shashidhara, K. S. 2020. Effect of soil and foliar application of zinc and Boron on growth, yield and micro nutrient uptake of Chickpea. *Journal of Pharmacognosy and Phytochemistry*, 9(4), 3356-3360.
- Rawat, D. K., Verma, C., Singh, A. K., Kumar, A. and Prasad, J. 2021. Effect of varieties and micronutrient applications on growth and qualitative characters of chickpea (*Cicer arietinum* L.). *The Pharma Innovation Journal*, 10(12), 3048-3052.
- Singh, S., Srivastava, A. K., Singh, A. and Agnihotri, P. 2023. Effect of Rhizobium and PSB inoculation and foliar spray of micronutrient on growth and yield of Kabuli chickpea (*Cicer kabulium* L.).
- 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.)
-