International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
IJABR 2024; 8(4): 200-202
www.biochemjournal.com
Received: 03-02-2024
Accepted: 06-03-2024

KV Rabari
Agricultural Research Station, S. D. Agricultural University, Aseda, Gujarat, India

JM Patel
Bio-Science Research Centre, S. D. Agricultural University, Sardarkrushinagar, Gujarat, India)

DL Sundesha
Agricultural Research Station, S. D. Agricultural University, Aseda, Gujarat, India

Corresponding Author:
KV Rabari
Agricultural Research Station, S. D. Agricultural University, Aseda, Gujarat, India

Soil fertility status: As affected by micronutrient application in groundnut

KV Rabari, JM Patel and DL Sundesha

DOI: https://doi.org/10.33545/26174693.2024.v8.i4c.922

Abstract
Groundnut (*Arachis hypogaea* L.) is important oilseed crop of Gujarat. It has good nutritional value in terms of 25 to 30% protein and 45 to 50% oil. Groundnut also known as king of oilseeds and various names *viz.*, goober peas, pindas, jacknut, peanut and earthnut. The micronutrient have greater role growth stages and reproduction of plants i.e. iron, manganese, molybdenum, nicke, boron, chlorine, copper and zinc. An experiment was carried out during *kharif* season of years from 2020 to 2022 at Agricultural Research Station, S.D. Agricultural University, Aseda, Gujarat to find out the response of ferros sulphate and zinc sulphate on pod yield and soil fertility. Soil application and foliar spray of ferros sulphate and zinc sulphate were tested by for identifying their effect on soil fertility status after harvest of crop. Organic carbon, Available phosphorus and potash were non significantly influenced by the micronutrient application but higher value of both iron (5.044 mg/kg of soil) and zinc (0.489 mg kg^{-1} of soil) were found under the treatment T_7 ($FeSO_4$@ 15 kg ha^{-1} + $ZnSO_4$ @ 8 kg ha^{-1}) on pooled data basis of three years.

Keywords: Iron sulphate, zinc sulphate, soil application, soil fertility status

Introduction
Groundnut (*Arachis hypogaea* L.) is important oilseed crop of Gujarat and have good nutritional value in terms of 25 to 30% protein and 45 to 50% oil. As king of oilseeds, groundnut is also known with different names viz, pindas, jacknut, peanut, goober peas and earthnut. Micronutrients plays essential role in growth and development of plant. Due to high pH, salt stress, low organic matter, drought and judicious application of fertilizers leads micronutrients deficiency in animal plants and humans, especially in many arid countries. In the developing world, malnutrition accounts for more than 30 million deaths a year in mostly resource-poor families. Lacking of intakes of available trace elements in the food diets of the poor peoples leads much of this malnutrition. By linking agricultural systems and human nutrition could be meet the solutions for malnutrition on the future by changing agricultural systems in such a ways that it will help supply enough essential trace elements to the poor people to meet their needs for good healthy and productive lives (Welch, 2002) [1]. Micronutrients are very essential elements for plant growth, development and reproduction and needed it in very small quantities, higher yield as well as quality characters of agricultural products will increased with micronutrients application. Whenever, the one or more of these micronutrient element lacking, quality will be reduced and the yield of crop products impaired, but it varies with crop species and cultivars in their susceptibility to deficiencies (Alloway, 2008) [2]. It has significant contribution in confectionery and culinary preparations and value added products. Groundnut has higher amount of vitamins B, K, E and higher value of niacin as compared to cereals. The productivity of crop lowers in India due to cultivating it under rainfed condition and dryland areas with lower fertility status of soil and lack of nutrient management leads to zinc and iron deficiency. Soil and foliar application of micronutrient improve the status in soil and their by increase the yield of groundnut (Naveen BT. 2012) [3]

Materials and Methods
The experiment was conducted at Agricultural Research Station, SDAU, Aseda, Gujarat during the years 2020, 2021 and 2022 in *kharif* season. The experimental sites soil was

loamy sand in texture with 8.01 pH, low in organic carbon (0.316%), medium in available phosphorus (57.30 kg P_2O_5 ha^{-1}) and higher in available potash (271.66 kg K_2O ha^{-1}). Groundnut var. GG 20 (Gujarat Groundnut 20) was sown during second fort night of June with 45 cm distance line sowing method in randomized block design with total ten treatments replicated thrice. The experiment consist of ten treatments viz., T_1: Water spray, T_2: $FeSO_4$ @ 15 kg ha^{-1}, T_3: $ZnSO_4$ @ 8 kg ha^{-1}, T_4: Foliar spray of $FeSO_4$ @1%, T_5: Foliar spray of $ZnSO_4$ @ 0.5%, T_6: Foliar spray of $FeSO_4$ @ 1% + Foliar spray of $ZnSO_4$ @ 0.5%, T_7: $FeSO_4$ @ 15 kg ha^{-1} + $ZnSO_4$ @ 8 kg ha^{-1}, T_8: $FeSO_4$ @ 15 kg ha^{-1} + Foliar spray of $ZnSO_4$ @ 0.5%, T_9 – $ZnSO_4$ @ 8 kg/ha + Foliar spray of $FeSO_4$ @1%, T_{10}: Foliar spray of multi-micronutrient (grade-IV). Application of micronutrient were made at time of field preparation and soil was matured with 5 t FYM ha^{-1}. Herbicide (Pendimethalin @ 1 kg a.i / ha) was applied one day after sowing, while application of foliar spray was done at 30 and 45 days after sowing (DAS). Nitrogen applied in half dose and full dose of phosphorus were applied as basal through urea and di ammonium phosphate respectively at the time of sowing and remaining half dose of nitrogen was top dressed after 30 days after sowing.

Results and Discussion

OC (%), available P_2O_5 and K_2O in soil

Effect of different treatments on organic carbon, available phosphorus and available potash content remained non significant.

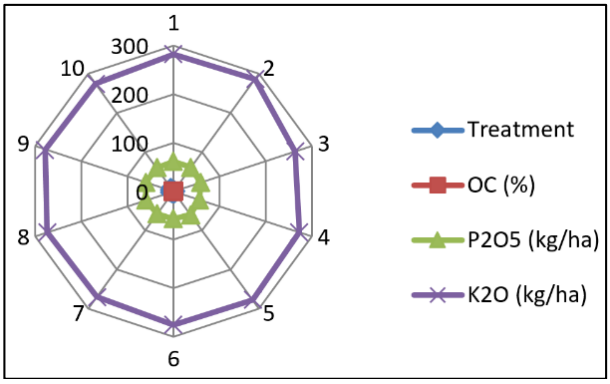

Fig 1: Effect of micronutrient application on soil fertility status after harvest

Effect on DTPA extractable Fe and Zn in soil

The effect of micronutrient application on Fe status in soil after harvest of *kharif* groundnut was affected significantly in all season as well as in pooled. Higher build up of Fe was found in the treatment T_7 ($FeSO_4$ @15 kg ha^{-1} + $ZnSO_4$ @ 8 kg ha^{-1}) in 2020 and 2021 and remained at par with the treatment T_7 and T_8 during the season 2022, treatment T_8 recorded higher value in soil and remained at par with T_2 and T_7. Pooled data revealed that T_7 recorded higher status of Fe after crop harvest and remained at par with all treatment except T_2 and T_8. The Zn status was significantly affected with micronutrient application in all season. Higher value of Zn status after crop harvest was recorded under the treatment receiving soil application of T_7 ($FeSO_4$@ 15 kg ha^{-1} + $ZnSO_4$ @ 8 kg ha^{-1}) in all season as well as in pooled data and remained at par with treatment T_3 and T_9. These findings were supported by Aboyeji *et al.* (2020) [4], Ali and Mowafy (2003) [5], Arunachalam *et al.* (2013) [6], Elayaraja (2014) [7], Habbasha (2014) [8], Majumdar (2001) [9], Manasa (2013) [10], Meena *et al.* (2015) [11], Polara *et al.* (2009) [12], Rekhi *et al.* (2000) [13] Saha *et al.* (2015) [14], Veeramani *et al.* (2015) [15].

Table 1: Effect of different treatment on Organic carbon, available P_2O_5 and K_2O in soil after harvest of groundnut

Treatment	OC (%)				P_2O_5 (kg/ha)				K_2O (kg/ha)			
	2020	2021	2022	Pooled	2020	2021	2022	Pooled	2020	2021	2022	Pooled
T_1 – Water spray	0.333	0.480	0.181	0.331	42.68	64.56	74.96	60.73	247.3	312.3	287.0	282.2
T_2 – $FeSO_4$ @ 15 kg/ha	0.347	0.459	0.176	0.327	39.40	62.38	82.62	61.46	242.8	323.9	288.2	285.0
T_3 – $ZnSO_4$ @ 8 kg/ha	0.361	0.485	0.167	0.338	39.94	57.45	76.05	57.82	225.3	293.4	271.4	263.4
T_4 – Foliar spray of $FeSO_4$ @1%	0.361	0.489	0.176	0.342	37.75	58.55	74.96	57.09	239.2	300.6	278.4	272.8
T_5 – Foliar spray of $ZnSO_4$ @ 0.5%	0.319	0.502	0.153	0.325	38.30	59.64	80.98	59.64	248.6	301.1	282.6	277.4
T_6 – Foliar spray of $FeSO_4$ @1% + Foliar Spray of $ZnSO_4$ @ 0.5%	0.357	0.489	0.171	0.339	39.94	58.00	74.96	57.63	236.5	312.3	279.8	276.2
T_7 – $FeSO_4$ @ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha	0.324	0.485	0.167	0.325	37.21	61.28	74.96	57.82	240.4	296.6	272.2	269.7
T_8 – $FeSO_4$ @ 15 kg/ha + Foliar spray of $ZnSO_4$ @ 0.5%	0.375	0.476	0.181	0.344	41.04	63.47	78.24	60.92	235.1	306.4	280.9	274.1
T_9 – $ZnSO_4$ @ 8 kg/ha + Foliar spray of $FeSO_4$ @1%	0.329	0.507	0.190	0.342	41.58	57.45	81.53	60.19	238.3	304.6	291.3	278.1
T_{10} – Grade IV Multi micronutrient spray @ 1%	0.343	0.485	0.181	0.336	42.13	54.72	80.43	59.09	224.4	306.4	289.9	273.6
S.Em. ±	0.02	0.02	0.01	0.01	2.12	2.92	2.55	1.50	10.08	14.56	6.21	5.71
CD @ 0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V.%	8.47	7.20	8.29	8.25	9.18	8.46	5.66	7.46	7.34	8.25	3.81	6.82
Y x T	-	-	-	NS	-	-	-	NS	-	-	-	NS

Table 2: Effect of different treatment on DTPA- extractable Fe and Zn in soil after harvest of groundnut

Treatment	Fe in soil (mg/kg)				Zn in soil (mg/kg)			
	2020	2021	2022	Pooled	2020	2021	2022	Pooled
T_1 – Water spray	4.953	4.097	3.853	4.301	0.347	0.340	0.463	0.384
T_2 – $FeSO_4$ @ 15 kg/ha	5.450	4.810	4.427	4.896	0.323	0.357	0.477	0.386
T_3 – $ZnSO_4$ @ 8 kg/ha	5.067	4.180	3.733	4.327	0.404	0.407	0.573	0.461
T_4 – Foliar spray of $FeSO_4$ @1%	5.173	4.033	3.627	4.278	0.362	0.374	0.495	0.410
T_5 – Foliar spray of $ZnSO_4$ @ 0.5%	5.173	3.927	3.967	4.356	0.322	0.384	0.430	0.379
T_6 – Foliar spray of $FeSO_4$ @1% + Foliar spray of $ZnSO_4$ @ 0.5%	5.153	4.410	4.053	4.539	0.368	0.363	0.473	0.402
T_7 – $FeSO_4$ @ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha	5.610	5.133	4.390	5.044	0.440	0.441	0.586	0.489
T_8 – $FeSO_4$ @ 15 kg/ha + Foliar spray of $ZnSO_4$ @ 0.5%	5.557	5.000	4.513	5.023	0.360	0.380	0.447	0.396
T_9 – $ZnSO_4$ @ 8 kg/ha + Foliar spray of $FeSO_4$ @1%	5.070	4.253	3.977	4.433	0.422	0.423	0.550	0.465
T_{10} – Grade IV Multi micronutrient spray @ 1%	4.843	4.127	3.963	4.311	0.346	0.373	0.470	0.396
S.Em. $\pm$	0.13	0.19	0.15	0.09	0.02	0.01	0.02	0.01
CD @ 0.05	0.40	0.57	0.45	0.26	0.05	0.04	0.07	0.03
C.V.%	4.46	7.57	6.51	6.14	7.78	6.65	8.09	7.70
Y x T	-	-	-	NS	-	-	-	NS
Initial	4.72	4.05	3.98		0.332	0.326	0.472	

Conclusion

The farmers of North Gujarat Agro-climatic Zone IV growing *kharif* groundnut on Zn deficient light textured soil are recommended to apply 15 kg $FeSO_4$ and 8 kg $ZnSO_4.7H_2O$/ha as basal in addition to recommended dose of fertilizers (12.5-25 kg N-P_2O_5 /ha) for obtaining higher yield and improve the status of iron and zinc in the soil.

Acknowledgement

The author is very much thank full to the Agricultural Research Station, SDAU, Aseda for carried out such research activities that are very much helpful for the farmers that are carried out micronutrient management experiment.

Reference

1. Welch RM. The impact of mineral nutrients in food crops on global human health. Plant and soil. 2002;247:83-90.
2. Alloway BJ. Micronutrients and Crop Production: An Introduction. Springer, New York; c2008. p. 1-39.
3. Naveen BT. Productivity of groundnut as influenced by different nutrient ratios of nitrogen and phosphorus. M.Sc. (Agri.) Thesis (Unpublished). University of Agricultural Sciences. Dharwad, Karnataka (India), 2012.
4. Aboyeji CM, Dunsin O, Adekiya AO, Suleiman KO, Chinedum C, Okunlola FO. Synergistic and antagonistic effects of soil applied P and Zn fertilizers on the performance, minerals and heavy metal composition of groundnut. Open Agriculture. 2020;5:1-9.
5. Ali AAG, Mowafy SAE. Effect of different levels of potassium and phosphorus Fertilizers with the foliar application of zinc and boron on peanut in sandy soils. Zagazig Journal Agricultural Research. 2003;30:335-358.
6. Arunachalam P, Kannan P, Prabhaharan J, Prabukumar G, Kavitha Z. Response of groundnut (*Arachis hypogaea* L.) genotypes to soil fertilization of micronutrients in alfisol conditions. Electronic Journal of Plant Breeding. 2013;4(1):1043-1049.
7. Elayaraja D. Response of groundnut to zinc, boron and organics on the yield and nutrient availability in coastal sandy soil. International research journal of chemistry. 2014;5:16-23.
8. Habbasha El, Magda SF, Mohamed H, Kramany MF, Ahmed AG. Effect of combination between potassium fertilizer levels and zinc foliar application on growth, yield and some chemical constituents of groundnut. Global Journal of Advanced Research. 2014;1(3):86-92.
9. Majumdar B, Venkatesh MS. Response of groundnut to phosphorus and zinc in relation to yield, quality and residual availability of P and Zn in acid soil of Meghalaya. Indian Journal of Hill Farm. 2001;14(1):29-32.
10. Manasa S. Effect of water soluble fertilizers on growth, yield and oil quality of groundnut in a Vertisol of Northern Transition Zone of Karnataka. M.Sc. (Agri.) Thesis (Unpublished). University of Agricultural Sciences. Dharwad, India; c2013.
11. Meena RS, Yadav RS. Yield and profitability of groundnut (*Arachis hypogaea* L.) as influenced by sowing dates and nutrient levels with different varieties. Legume Research. 2015;38(6):791-797.
12. Polara KB, Sakarvadia HL, Parmar KB, Babariya NB, Kunjadia BB. Residual effect of potassium and zinc on growth, yield and nutrient uptake by groundnut in medium black calcareous soils. An Asian journal of Soil Science. 2009;4(2):245-247.
13. Rekhi RS, Benbi DK, Singh B. Effect of fertilizers an organic manure on crop yields and soil properties in rice wheat cropping system. Abrol, I.P, 2000, 56.
14. Saha B, Saha S, Saha R, Hazra GC, Mandal B. Influence of Zn, B and S on the yield and quality of groundnut (*Arachis Hypogea* L.). Legume Research. 2015;38(6):832-836.
15. Veeramani P, Subrahmaniyan K, Ganesaraja V. Nutrient management for sustainable groundnut productivity in India - A Review. International Journal of Engineering Science. 2015;11(3):8138-8153.