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Research Article

EFFECT OF IRON AND ZINC APPLICATION ON ECONOMICS OF GROUNDNUT CULTIVATION UNDER NORTH GUJARAT CONDITIONS

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Abstract: The field experiment was carried out during *kharif* season of the three consecutive years from 2020 to 2022 at Agricultural Research Station, S.D. Agricultural University, Aseda, Gujarat to study the effect of micronutrient application on yield and economics of groundnut. Ten treatments of Ferrous sulfate and Zinc sulfate were applied as soil application and foliar application in randomized complete plot design with three replications. Higher value of net return (127600 Rs/ha) and BCR value (4.74) was recorded under the treatment T_7 ($FeSO_4$@ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha) followed by treatment T_3: $ZnSO_4$ @ 8 kg/ha which record net return of Rs 127238 and 4.70 BCR value.

Keywords: *Iron sulphate, Zinc sulphate, Economics, Groundnut*

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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. It is also referred as king of oilseeds is endowed with various names *viz*., peanut, earthnut, goober peas, pindas, jacknut. Micronutrients are essential for healthy growth and reproduction of plants *i.e*., Boron, Chlorine, Copper, Iron, Manganese, Molybdenum, Nickel and Zinc. Micronutrients deficiency is widely in humans, animal and plants, especially in many arid countries, due to high pH, low organic matter, salt stress, continual drought and imponderables application of fertilizers. Much of this malnutrition is the result of insufficient intakes of available trace elements in the diets of the poor peoples. Through linking agricultural systems, human nutrition could be sustainable solutions for malnutrition on the future by changing agricultural systems in ways that will help supply enough essential trace elements to the poor to meet their needs for healthy and productive lives [1]. Micronutrients are essential elements for plant growth and needed it in small quantities, higher yield and quality characters of agricultural products increased with micronutrients application. Whenever, the supply of one or more of these elements is insufficient, yields will be reduced and the quality of crop products impaired, but crop species and cultivars vary considerably in their susceptibility to deficiencies [2].

In addition, Oil ranks fourth in edible oil and attains third position in vegetable protein source for human consumption. It has significant contribution in value added products, confectionery, and culinary preparations. Groundnut has considerable amount of vitamins E, K, B and more niacin as compared to cereals. Productivity is lower in India due to cultivation as rainfed crop in semi-arid and dryland areas with lower fertility status of soil and inappropriate nutrient management leads to zinc deficiency. Soil and foliar application of micronutrient improve the status in soil and they are by increase the yield of groundnut [3].

Materials and Methods

An experiment was conducted at Agricultural Research Station, Sardarkrushinagar Dantiwada Agricultural University, Aseda, Gujarat during kharif season of years 2020,2021 and 2022.

The soil of experimental site was loamy sand in texture with 8.01 pH, low in organic carbon (0.316 %), medium in available phosphorus (57.30 kg ha^{-1}) and higher in available potash (271.66 kg ha^{-1}). Groundnut variety Gujarat Groundnut - 20 was sown at second fort night of June with line sowing method in randomized block design with ten treatments and three replications. The experiment consist of ten treatments *viz*., T_1: Water spray, T_2: $FeSO_4$ @ 15 kg/ha, T_3:$ZnSO_4$ @ 8 kg/ha, T_4:Foliar spray of $FeSO_4$ @1 %, T5:Foliar spray of $ZnSO_4$ @ 0.5 %, T6:Foliar spray of $FeSO_4$ @1 % + Foliar spray of $ZnSO_4$ @ 0.5 %, T_7: $FeSO_4$ @ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha, T_8:$FeSO_4$ @ 15 kg/ha + 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). Pre emergence herbicide (Pendimethalin @ 1 kg a.i / ha) was applied at next day after sowing (DAS) with knapsack sprayer fitted with flat-fan nozzle using 500 liter water/ha. The half dose of N and full dose of P were applied through urea and di ammonium phosphate as basal at the time of sowing and remaining N was top dressed at 30 DAS.

Results and Discussion

Harvest index and shelling percentage, 100 kernel weight (g)

Harvest index, shelling percentage and 100 kernel weight of groundnut remained un affected by the various treatments on individual as well as on pooled results of three years.

Economics

Higher value of net return (127600 Rs/ha) and BCR value (4.74) was recorded under the treatment T7 ($FeSO_4$@ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha) followed by treatment T_3: $ZnSO_4$ @ 8 kg/ha which record net return of Rs 127238 and 4.70 BCR value.

Increase in net return and benefit to input applied is due to higher pod yield and haulm yield recorded in the soil applied micronutrient fertilizers which have lower cost of production. The overall costing of input applied are lower and out puts are more, so its recorded higher net return and benefit. These results are conformity with [4-11].

Table-1 Economics of different treatments in groundnut

Treatments	Yield (kg/ha)		Income (Rs./ha)			Cost (Rs./ha)	Net return (Rs./ha)	BCR
	Pod	Haulm	Pod	Haulm	Total			
T_1 – Water spray	2231	3490	111574	20939	132513	33927	98586	3.91
T_2 – $FeSO_4$ @ 15 kg/ha	2356	3682	117825	22093	139918	33972	105946	4.12
T_3 – $ZnSO_4$ @ 8 kg/ha	2712	4290	135615	25740	161355	34072	127283	4.73
T_4 – Foliar spray of $FeSO_4$ @1 %	2352	3668	117583	22010	139593	34007	105586	4.1
T_5 – Foliar spray of $ZnSO_4$ @ 0.5 %	2307	3639	115374	21836	137210	34027	103183	4.03
T_6 – Foliar spray of $FeSO_4$ @1 % + Foliar Spray of $ZnSO_4$ @ 0.5 %	2388	3777	119381	22661	142043	34107	107936	4.16
T_7 – $FeSO_4$ @ 15 kg/ha + $ZnSO_4$ @ 8 kg/ha	2734	4226	136716	25356	162072	34372	127700	4.71
T_8 – $FeSO_4$ @ 15 kg/ha + Foliar spray of $ZnSO_4$ @ 0.5 %	2449	3676	122471	22058	144529	34327	110202	4.21
T_9 – $ZnSO_4$ @ 8 kg/ha + Foliar spray of $FeSO_4$ @1 %	2674	4108	133722	24646	158368	34407	123961	4.6
T_{10} – Grade IV Multi micronutrient spray @ 1%	2358	3692	117890	22155	140045	34347	105698	4.08

Selling price: Groundnut pods @50 rs/kg. Haulm@ 6 rs/kg Price of different inputs
$FeSO_4$ @20 Rs./kg, $ZnSO_4$@50 Rs./kg, Grade IV multimicronutrient@420, Urea@ 6.14, DAP@27, FYM @0.60, Labour charge @ 355 Rs./day

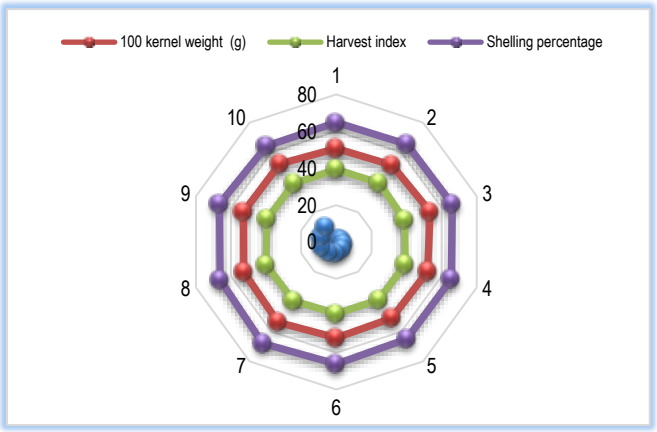

Fig-1 Harvest index, 100 kernel weight and shelligng percentage as affected by micronutrient application in groundnut

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 getting higher yield and net return

Application of research: Study of effect of Iron and Zinc application on economics of groundnut cultivation

Research Category: Agriculture Economics

Abbreviations: DAS-Days after sowing, N-Nitrogen $ZnSO_4$-Zinc Sulfate $FeSO_4$-Ferrous Sulfate

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Study area / Sample Collection: Agricultural Research Station, Aseda, 385535

Cultivar / Variety / Breed name: Gujarat Groundnut 20

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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