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Original Research Article

Effect of Micronutrients Application on Quality and Economics of Soybean (*Glycine max* L.) Crop

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Keywords

Soybean, Micronutrients, Growth, Quality and Yield

A B S T R A C T

The field investigation entitled "Effect of micronutrient application on quality and economics of soybean (*Glycine max* L.)" was conducted at experimental farm, Department of Agronomy, College of Agriculture, VNMKV, Parbhani during *kharif*2014.The experiment was laid out in a Randomized block design with twelve treatments and 3 replications. Application of RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1} recorded significantly oil yield Kg ha-1, protein yield Kg ha-1 contributing characters and GMR, NMR and effective B:C ratio followed by application of RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax + 1.0% KNO_3 (35&60DAS) (T_5) and T_5 was significantly superior over the rest of the all treatments. The significantly lower quality attributes, GMR, NMR and effective B: C ratio of soybean was observed in 75 % RDF (T_7).

Introduction

Soybean, a wonder legume has high nutritive value and has manifold uses in Agriculture, medicine and industrial sector. Soybean (*Glycine max* L.) belongs to family Leguminoaceae with sub family Papilionaceae. It is originated in China and was introduced in India in 1985. It is economically profitable as compared to cereals and other oilseed crops. It is highly remunerative crop with comparatively less input demand. Due to its short duration (85 to 95 days) fits well as an intercrop and photo insensitiveness of crops made it as suitable crop in double cropping system. Being a leguminous crop, capable of fixing atmospheric nitrogen to an extent of 65 to 100 kg ha^{-1} and help to improve the soil fertility. Nutrient interaction is one of the components of balanced nutrition, apart from nitrogen, phosphorus and some of the secondary and micronutrients are considered necessary for increase in seed yield of soybean.

Among which, imbalanced nutrition especially, the micronutrients play a decisive role in improving the productivity of the crop. There is fairly good adoption and awareness among the farmers for the use of major nutrients, but it is lacking for the use of micronutrients. Farmers are also in confusion about method of application of micronutrients.

In case of Marathwada region more than 35% soils were found deficient in sulphur, 27% in zinc and therefore it has become necessary to address this situation. Generally farmers do not pay attention unless and until they come across some deficiency symptoms in respect of micronutrients deficiency. Also there is no regular habit of soil testing among farmers. Again there are various ways to add nutrients like soil application and foliar application etc. Therefore, it has become the great need of time to suggest the most efficient and economical source of application of micronutrients for the crop like soybean.

Materials and Methods

The experiment was conducted during *kharif*, 2014 at Farm, Department of Agronomy, College of Agriculture, VNMKV, Parbhani. The topography of experimental field was uniform and levelled. The results of the soil revealed that the soil of the experimental plot was clayey in texture, low in available nitrogen (219.75), medium in available phosphorus (18.73), high in available potassium (612.76) and slightly alkaline in reaction. The temperature data revealed that thermal condition of crop environment during crop life were within physiological cardinal limits. In general, maximum temperature ranged between 40.2^0C and 31.3^0C and minimum temperature ranged between 25.7^0C and 13.9^0C. The total precipitation received during crop period was only 414.7 mm with 30 rainy days. The crop was sown at 45cm x 05cm spacing. The net plot size 4.8 x 3.6 m2.The recommended dose (RDF) 30N: 60P: 30K kgha^{-1} was applied as basal dose. The treatment were laid out in RBD in three replications with twelve treatments viz., T_1: RDF(30:60:30kgha^{-1}); T_2: RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1}; T_3: RDF + soil application of $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1}; T_4: RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax (35 and 60 DAS); T_5: RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax + 1.0% KNO_3 (35 and 60 DAS); T_6: RDF + foliar application of 1.0% KNO_3 (35 and 60 DAS); T_7:75% RDF; T_8:75% RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1}; T_9:75% RDF + soil application of $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1}; T_{10}:75% RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax (35 and 60 DAS); T_{11}:75% RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax + 1.0% KNO_3(35 and 60 DAS) and T_{12}:75% RDF + foliar application of 1.0% KNO_3 (35 and 60 DAS).

Results and Discussion

Quality attributes

The mean oil content (%) was not influenced significantly with the application of different treatments. While, mean oil yield (kg ha-1) was found to be statistically significant with the application of different treatments. Application of RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1} (T2) produced the highest value of mean oil content was (20.07 %) whereas, it also recorded significantly higher mean oil yield (273.72 kg ha^{-1}). Application of sulphur, iron, zinc and boron helped in increasing mean oil yield (kg ha^{-1}). Chauhan *et al.*, (2013) and Mujumdar *et al.*, (2001) also recorded similar kind of results.

Table.1 Quality attributing characters () as influenced by micronutrient application treatment

Treatments		Quality attributes			
		Oil content (%)	Oil yield (kg ha^{-1})	Protein content (%)	Protein yield (kg ha^{-1})
T_1	RDF (30:60:30 kg ha^{-1})	19.45	219.90	39.59	446.10
T_2	RDF + soil application of S + $FeSO_4$+ $ZnSO_4$ + Borax	20.07	273.72	40.10	546.50
T_3	RDF + soil application of $FeSO_4$ + $ZnSO_4$ + Borax	19.65	225.67	39.73	458.85
T_4	RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax (35 & 60 DAS)	19.52	224.76	39.61	454.65
T_5	RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax + KNO_3 (35 & 60 DAS)	20.00	270.18	40.00	540.21
T_6	RDF + foliar application of KNO_3 (35 & 60 DAS)	19.47	220.29	39.76	450.00
T_7	75% RDF	19.16	184.24	39.07	375.41
T_8	75% RDF + soil application of S + $FeSO_4$ + $ZnSO_4$ + Borax	19.40	211.88	39.44	429.74
T_9	75% RDF + soil application of $FeSO_4$+ $ZnSO_4$ + Borax	19.26	194.86	39.26	397.18
T_{10}	75% RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax (35 & 60 DAS)	19.23	190.21	39.22	387.58
T_{11}	75% RDF + foliar application of $FeSO_4$ + $ZnSO_4$+ Borax + KNO_3 (35 & 60 DAS)	19.37	206.67	39.37	420.76
T_{12}	75% RDF+ foliar application of KNO_3 (35 & 60 DAS)	19.20	188.58	39.16	384.89
S.Em±		**0.37**	**14.48**	**0.43**	**26.68**
C.D. at 5%		**NS**	**43.44**	**NS**	**80.04**
General mean		**19.48**	**217.58**	**39.53**	**440.99**

Table.2 GMR, NMR and B: C ratio as influenced by micronutrient application treatment

Treatments		Economics			
		Gross monetary returns (₹ ha^{-1})	Cost of cultivation (₹ ha^{-1})	Net monetary returns (₹ ha^{-1})	B:C Ratio
T_1	RDF (30:60:30 kg ha^{-1})	36989	20030	16959	1.84
T_2	RDF + soil application of S + $FeSO_4$+ $ZnSO_4$ + Borax	44687	22415	22272	1.99
T_3	RDF + soil application of $FeSO_4$ + $ZnSO_4$ + Borax	37887	21650	16237	1.74
T_4	RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax (35 & 60 DAS)	37716	21998	15718	1.68
T_5	RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax + KNO_3 (35 & 60 DAS)	44320	23498	20822	1.88
T_6	RDF + foliar application of KNO_3 (35 & 60 DAS)	37176	23030	14146	1.61
T_7	75% RDF	31593	19048	12545	1.65
T_8	75% RDF + soil application of S + $FeSO_4$ + $ZnSO_4$ + Borax	35821	21433	14388	1.67
T_9	75% RDF + soil application of $FeSO_4$+ $ZnSO_4$ + Borax	33230	20668	12562	1.60
T_{10}	75% RDF + foliar application of $FeSO_4$ + $ZnSO_4$ + Borax (35 & 60 DAS)	32479	21016	11463	1.54
T_{11}	75% RDF + foliar application of $FeSO_4$ + $ZnSO_4$+ Borax + KNO_3 (35 & 60 DAS)	35101	22516	12585	1.55
T_{12}	75% RDF+ foliar application of KNO_3 (35 & 60 DAS)	32295	22048	10247	1.46
S.Em±		**2105**	**-**	**1134**	**-**
C.D. at 5%		**6231**	**-**	**3357**	**-**
General mean		**36608**	**21613**	**14995**	**1.69**

The effect of different treatments on mean protein content (%) was found to be non-significant, whereas, mean protein yield (kg ha^{-1}) was found to be statistically significant.

The application of RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1} (T2) recorded higher mean protein content and mean protein yield (40.10 %, 546.50 kg ha^{-1}) respectively (Table 2).

Increased protein content may be to most important role of nitrogen fertilizer in plant is mainly in its presence in the nucleic acid protein structure.

Moreover it might have been added due to sulphur which helped elevate amino acids, proteins, overall photosynthesis Similar results were reported by Wasmatkar *et al.*, (2002) and Khan and Mazid (2011).

Economics of the soybean crop

The data on gross monetary returns revealed that the application of RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1} (T2) produced significantly higher gross monetary returns (44687 ha^{-1}) which was at par with the application of RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax + 1.0% KNO_3 (35&60DAS) (T5) (44320 ha^{-1}) (Table 2).

The data on net monetary returns per hectare revealed that the application RDF + soil application of S @ 17 kg ha^{-1} + $FeSO_4$ @ 20 kg ha^{-1} + $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 05 kg ha^{-1} (T2) produced significantly higher net monetary returns (22272 ha^{-1}) but statistically it was similar to the application of RDF + foliar application of 0.5% $FeSO_4$ + 0.5% $ZnSO_4$ + 0.2% Borax + 1.0% KNO_3 (35and 60DAS) (T5) (20822 ha^{-1}).

References

Adkine, P.M., Mankar, D.D., Khandait, V.M., Bhandare, V.L. and Nawlakhe, S.M. 2011. Effect of boron, molybdenum and potassium nitrate on growth, yield and economics of soyabean. *Journal Soils and crops* 21(1):116-123.

Bhanavase, D. B. and P. L. Patil. 1993. *Journal Maharashtra Agricultural University*. 18: 167-174.

Bhosle, D. Vandana, R. D. Deotale, S. R. Ilmawar, Sneha S. Raut and S. B. Kawde. 2003. Effect of hormones and nutrient on morpho -physilogical characters and yield of soybean. *Journal Soil and Crops*.3 (1): 135-139.

Billore, S.D., A.K. Vyas and O P. Joshi.2005. Effect of integrated nutrient management on productivity, energy use efficiency and economics of soybean (*Glycine max*- wheat (*Triticum aestivum*) cropping system. *The Indian Journal of Sciences.* 75(10): 298-301.

Chauhan, S., A. Titov and D. S. Tomar. 2013. Effect of potassium, sulphur and zinc on growth yield and oil content in soybean (*Glycine max* (L.) in vertisols of central India. *Indian Journal of Applied research.* 3(6): 489-491.

Deosarkar, D.B., S.P. Patinge, A.M. Bhosle and S.B. Deshmukh, 2001. Effect of micronutrients on seed yields of soybean. *Ann. Plant physiology*15 (2):163-166

Khan, H. R., G. K. McDonald and Z. Rengal. 2003. Zn fertilization improves water use efficiency grain yield and seed Zn content in Chickpea. *Plant Soil*.249: 389-400.

Khan, T.A., M. Mazid. 2011. Nutritional significance of sulphur in pulse cropping system. *Biology and*

Medicine, 3 (2): 114-133.

Kobraee, S., K. Shamsi and B. Rasekhi. 2011. Micronutrients fertilizer and soybean nutritional. *Annals of Biological Research*.2 (2):468-475.

Mujumdar, B., M.S. Venktesh B. Lal, Kailashkumar and K. Kumar. 2001. Response of soybean to phosphorus and sulphur in acid alfisol of Meghalaya. *Indian Journal of Agronomy*.46 (3): 500-505.

Nagaraja, A. P. and H. K. Mohankumar. 2010. Effect of micronutrient and bio-inoculants on growth and yield of soybean. *Mysore Journal of Agricultural Science*.44 (2): 260-265.

Price, C. A., H. E. Clark and E. A. Funkhouser. 1972. Function of micro nutrient in plants in nutrient in Agriculture, *Soil Sciences Society of American Journal.* Malison Wisconsin.

Sultana, N., T. Ikeda, M.A. Kashem. 2001. Effect of foliar spray of nutrient solutions on photosynthesis dry matter accumulations and yield in seawater-stressed rice. *Environmental Experimental Botany*.46: 129-140.

Vaiyapuri, K., M. Mohamed Amanullah and K. Rajendran, 2010. Influence of sulphur and boron on yield attributes and yield of soybean. *Madras agric. jouranal*. 97(1-3):65-67

Wasmatkar, R. P., G. L. Ingole and P. D.Raut. 2002. Effect of different level of sulpher and zinc on quality and uptake of nutrient of soybean. *Journal Maharashtra Agriculture Universities.* 27(3): 244-246.