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Effect of micro and secondary nutrients on growth and yield of blackgram (*Vigna mungo* (L.) Hepper)

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Abstract
A field experiment was conducted during *kharif* 2015 at the experimental farm, Tirhut College of Agriculture, RPCAU, Pusa, Bihar to study the effect of micro and secondary nutrients on growth, yield and quality of blackgram (*Vigna mungo* (L.) Hepper) the experiment was laid-out in a randomized block design (RBD) with eight treatments, each having four replications. The treatments were T_0: RDF (control), T_1: RDF + B, T_2: RDF + Zn, T_3: RDF + S, T_4: RDF + B + Zn, T_5: RDF + B + S, T_6: RDF + Zn + S and T_7: RDF + Zn + B + S. Uniform basal application was made with 20 kg N ha^{-1}, 40 kg P_2O_5 ha^{-1}, 20 kg K_2O ha^{-1} through urea, DAP and MOP, respectively. Sulphur, Zn and B were applied @ 20, 5 and 1.5 kg ha^{-1} from Bentonite-S, Zinc sulphate and Di-sodium tetra-borate pentahydrate, respectively. Plant height at 40 DAS, number of branches $plant^{-1}$, number of nodules $plant^{-1}$ at 40 and 50 DAS, grain yield kg ha^{-1}, straw yield kg ha^{-1}, urdbean significantly affected due to various treatments except plant population, plant height at harvest, number of nodules at 60 DAS and harvest index. The higher grain yield (838 kg ha^{-1}) and straw yield (2472 kg ha^{-1}) were obtained due to application of Zn + B + S.

Keywords: Blackgram, sulphur, zinc, boron

Introduction
The pulses are an integral part of the vegetarian diet in the Indian subcontinent. Besides being a rich source of protein they maintain soil fertility through biological N_2 fixation by *Rhizobium* spp. bacteria prevalent in their root nodules and thus play a vital role in achieving sustainability of crop production as well as soil fertility. India has achieved self-sufficiency in cereal production specially those of wheat and rice with phenomenal jump from 52.5 million tonnes in 1965-66 to 262 million tonnes in 2013-2014. No doubt, we have progressed much from the begging bowl to the bread- basket but this has led to some unhealthy trends in agricultural economy due to the apathy of the farmers towards growing some of the essential food crops like pulses.

Sulphur is being recognized as fourth major essential plant nutrient after nitrogen, phosphorus and potassium. Sulphur plays an important role not only in boost up the productivity but also improve the quality of the blackgram (Saraf *et al*., 1997) [8].

Among micronutrients, zinc influences the synthesis of auxin in plant by inhibiting the synthesis of tryptophan, a precursor of auxin. It is the essential component of various enzyme systems for energy production, photosynthesis, zinc deficient plants also exhibit delayed maturity. Zinc uptake by plant decreases with increase of soil pH. Uptake of zinc is also adversely affected by high levels of available P and Fe in soils.

A primary function of boron in blackgram is formation of cell wall, flower retention, pollen formation and in germination. Seed and grain production is also reduced with low boron supply. Boron deficiency is more pronounced during drought periods when root activity is restricted.

Materials and Methods
A field experiment was carried out at the Research Farm, Tirhut College Agriculture, RPCAU, Pusa, and Bihar during kharif 2015. The soil of experimental field was calcareous sandy-loam alkaline in reaction with pH 8.15. It was moderately fertile being low in organic carbon (0.56%), available nitrogen (251.9 kg N ha^{-1}), phosphorous (15.06 kg P_2O_5 ha^{-1}), and potassium (116.58 kg K_2O ha^{-1}), Sulphur (8.33 mg kg^{-1}), Zinc (0.67 mg kg^{-1}) and Boron (0.51mg kg^{-1}). The experiment was conducted randomized block design (RBD) with eight treatments, each having four replications. The treatments were T0: RDF (control), T_1: RDF +

B, T_2: RDF + Zn, T_3: RDF + S, T_4: RDF + B + Zn, T_5: RDF + B + S, T_6: RDF + Zn + S and T_7: RDF + Zn + B + S. Uniform basal application was made with 20 kg N ha^{-1}, 40 kg P_2O_5 ha^{-1}, 20 kg K_2O ha^{-1} through urea, DAP and MOP, respectively. Sulphur, Zn and B were applied @ 20, 5 and 1.5 kg ha^{-1} from Bentonite-S, Zinc sulphate and Di-sodium tetra-borate pentahydrate, respectively. In all the treatments seeds were first treated with *Rhizobium* + PSB and also treated with captan @ 2.5 g kg^{-1} of seed before sowing against fungal diseases. Sowing was done relatively at higher seed rate to ensure desired plant population within a row. Plant spacing was maintained row to row 30 cm and plant to plant 10 cm by thinning out extra plants at 10 days after sowing when all the plants emerged out and cultivar 'PU-31' was taken as a test crop. The recommended dose of fertilizers N: P_2O_5: K_2O, 20: 40: 20 kg ha^{-1} per hectare was used. Whereas full dose of N, P_2O_5, K_2O, Sulphur, Zinc and boron was applied as basal at the time of blackgram sowing.

Results and discussion

Plant population, plant height and number of branches plant^{-1}

The analysed data relating to the plant population at 10 DAS and harvest of blackgram in Tab.1. It was revealed from the data that there was non-significant difference among various micronutrient treatments. The analysis of variance for the data on plant height shows non-significant difference was found on growth at harvest stages while significant effect of different treatments was recorded at 40 DAS. The maximum growth recorded in treatment T_7 (Zn + B + S) at all stages, while the lowest plant height was recorded in control at all stages. At 40 DAS maximum height (40.03 cm) obtained from T_7 which was statistically at par with T_1 (36.73), T_3 (37.12), T_5 (39.07) and T_6 (38.88). More availability of Zn, B and S might have encourage growth promoting hormones and protein synthesis means more chlorophyll content leading to higher photosynthesis. These resulted into rapid cell elongation and enlargement and ultimately plant height. These results are in conformity with the findings of Kaisher *et al.* (2010) [3], Kannan *et al.* (2014) [4] and Ahmad *et al.* (2013) [1]. Number of branches count plant^{-1} was statistically significant due to various treatments (Table 1). The highest no. of branches plant^{-1} was observed with application of Zn + B + S, which was statistically superior from all the treatments except T_5 (B + S). The lowest number of branches plant^{-1} was observed with control (T_0). Result obtained in this regard is in accordance with the findings of Kaisher *et al.* (2010) [3] who found that application of S and B increased the branches plant^{-1} of mungbean. Similar findings were obtained by Patel *et al.* (2013) [5] and Gowthami and Rama (2014) [2].

Significant differences were observed in formation of root nodules due to various treatments at 40 and 50 DAS while non-significant at 60 DAS (Table 2). At 40 DAS, the highest nodules was counted in treatment T_7 (10.3) which were statistically at par with T_6 (9.8), T_5 (9.4), T_4 (9.8) and T3 (8.9), while the lowest number of nodules were obtained in control (7.0). Almost similar pattern was followed at 50 DAS. The source is ready to transmit the photosynthates and energy into sink (grain yield). The above results obtained in the study are in conformity with the results of Khan and Prakash (2014). Days to maturity was found non-significant due to application of various treatments. Milled reduction was observed when applied balance nutrition like T_7 (Zn + B + S).

The data of grain yield were analyzed and summarized in Table 2. Different treatments exhibited significant variation in grain yield of urdbean. The highest grain yield (838 kg ha-1) was obtained from treatments T_7, which was significantly superior over treatments yield T_0, T_2, T_1, T_3 and T_4 while at par with T_5 and T_6. The maximum straw yield was recorded under treatment T_7, which was significantly superior over T_0 and treatments T_2, T_1, T_3 and T_4, however at par with treatments T_6 and T_5. However, three other treatments with application of B + S, Zn + S and B + Zn were also found effective to enhance yield over control as well as those treatments where applied alone nutrients i.e. B, Zn and S. The lowest grain and straw yield were found in control. The harvest index was unaffected due to different nutrient combinations. The results in respect of grain and straw yields are in agreement with the results advocated by Sahu and Singh (2009) [7] and Ram and Katiyar (2013) [6].

Conclusion

It was conducted that higher plant height, number of branches, number of root nodules, were found when applied Zn (@ 5 kg $ha^{-1,}$ S 20 kg ha^{-1} and B (@ 1.5 kg ha^{-1}. The maximum grain yield and straw yield was also recorded under combined application of T_7 (Zn + B + S) which was significantly superior over T_0 (control), T_1 (B), T_3 (S), T_4 (B + Zn), and T_2 (Zn) and at par with T_5 (B + S) and T_6 (Zn + S). Though all treatments showed positive effect in increasing growth parameter and yield.

Table 1: Effect of micro and secondary nutrients on plant population, plant height and branches of Blackgram

Treatment	Plant population plot-1		Plant height (cm)		Branches plant^{-1}
	At 10 DAS	At harvest	At 40 DAS	At harvest	
T_0 Control	389.0	384.3	34.10	40.85	1.66
T_1 B (1.5kg ha^{-1})	386.5	382.5	36.73	42.68	1.70
T_2 Zn (5 kg ha^{-1})	392.8	386.8	36.45	42.06	1.90
T_3 S (20 kg ha^{-1})	384.0	380.8	37.12	41.95	1.95
T_4 B + Zn	391.5	385.0	36.16	43.44	1.95
T_5 B + S	388.7	381.5	39.07	43.90	2.45
T_6 Zn + S	391.7	379.3	38.88	44.28	2.05
T_7 Zn + B + S	390.0	384.3	40.03	45.79	2.50
SEm±	3.66	4.12	1.21	1.89	0.11
LSD (0.05)	NS	NS	3.56	NS	0.33

Table 2: Effect of micro and secondary nutrients nodules, days of maturity, grain & straw yield and harvest index of Blackgram

Treatment	No. of nodules plant^{-1}			Days of maturity	Grain Yield (kg/ha)	Grain Yield (kg/ha)	Harvest index (%)
	At 40 DAS	At 50 DAS	At 60 DAS				
T_0 Control	7.0	14.9	2.2	66.25	646.50	1854	26.15
T_1 B (1.5 kg ha^{-1})	7.9	17.4	2.4	66.00	710.00	2067	26.45
T_2 Zn (5 kg ha^{-1})	8.1	16.2	3.7	65.50	700.00	1970	26.28
T_3 S (20 kg ha^{-1})	8.9	17.4	2.4	66.00	719.50	2068	26.55
T_4 B + Zn	9.8	17.9	3.0	64.75	781.00	2113	28.06
T_5 B + S	9.4	18.7	2.6	65.00	793.95	2310	27.24
T_6 Zn + S	9.8	17.9	2.9	64.50	787.50	2290	28.37
T_7 Zn + B + S	10.3	19.7	3.4	63.75	838.00	2472	29.01
SEm±	0.69	0.80	0.52	0.64	17.51	87.95	0.88
LSD (0.05)	2.02	2.36	NS	NS	51.51	258.67	NS

References

1. Ahmad I, Akhtar MJ, Asghar HN, Khalid M. Influence of *Rhizobium* applied in combination with micronutrients on mungbean. Pakistan Journal of Life and Social Sciences. 2013; 11(1):53-59.
2. Gowthami P, Rama GR. Influence of foliar application of potassium, boron and zinc on growth and yield of soybean. International Journal of Food, Agriculture and Veterinary Sciences. 2014; 4(3):81-86.
3. Kaisher MS, Rahman MAS, Amin MHA, Amanullah ASM, Ahsanullah ASM. Effect of sulphur and boron on the seed yield and protein content of mungbean. Bangladesh Research publication Journal. 2010; 3(4):1181-1186.
4. Kannan P, Arunachlam P, Prabukumar G, Prabhaharan J. Response of blackgram (*vigna mungo* L.) to multi-micronutrient mixtures under rainfed alfisol. Journal of the Indian Society of Soil Science. 2014; 62(2):154-160.
5. Patel HR, Patel HF, Maheria VD, Dodia IN. Response of *kharif* greengram (*Vigna radiata*. L.) to sulphur and phosphorous fertilization with and without biofertilizer application. The Bioscan. 2013; 8(1):149-152.
6. Ram S, Katiyar TPS. Effect of sulphur and zinc on the seed yield and protein content of summer mungbean under arid climate. International Journal of Science and Nature. 2013; 4(3):563-566.
7. Sahu S, Singh PK. Effect of micronutrients and biofertilizer inoculation on grain yield, protein content, micronutrients content and economics of chickpea crop. Annuls of Agriculture Research New Series. 2009; 30(1-2):32-35.
8. Saraf CS, Shivkumar BG, Patil RR. Effect of phosphorus, sulphur and seed inoculation on performance of chickpea. Indian Journal of Agronomy. 1997; 42(2):323-328.