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Original Research Article

Effects of Zinc on the Concentrations of N, P, K, S and Zn in Mungbean (Bari Mug 6) Stover and Seed

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ABSTRACT

A fie experiment was conducted at the Sher-e-Bangla Agricultural University Farm, Dhaka 1207, during the kharif season of 2014 to study the effects of Zinc on the concentrations of N, P, K, S and Zn in Mungbean stover and seed (BARI mug 6). Three levels of zinc (Zn) (0, 1.5 and 3 kg Zn ha-1) were used in the study. The results revealed that The N, P, K and S concentration of mungbean plant increased significantly from control to Zn2 (3 kg Zn ha-1) treatment. Application of zinc increase organic carbon, N, P, K and S status of postharvest soil significantly.

Key Words: Mungbean, zinc, concentration of N P K S & Zn, stover and seed.

INTRODUCTION

Mungbean (*Vigna radiata* L.) is one of the important pulse crops of Bangladesh, as it is an excellent source of easily digestible protein. [1] It belongs to the family Leguminosae. BARI mug 6 is a yield potential, innovated by Bangladesh Agricultural Research Institute (BARI) that fits well in crop rotation between two cereal crops. [2] In Bangladesh, daily consumption of pulses is only 14.30 g per capita per day, [3] while World Health Organization (WHO) suggested 45g per capita per day for a balanced diet. Mungbean is rich source of vegetable protein. It is considered as poor man's meat containing almost triple amount of protein as compared to rice. It contains 1-3% fat, 50.4% carbohydrates, 3.5-4.5% fibers and 4.5-5.5% ash, while calcium and phosphorus are 132 and 367 mg per 100 grams of seed, respectively. [4] Hence, on the nutritional point of view, mungbean is perhaps the best of all other pulses. [5,1] The Zn essentially is being employed in functional and structural component of several enzymes, such as carbonic

anhydrase, alcohol dehydrase, alkaline phosphatase, phospholipase, carboxy-peptidase [6] and RNA polymerase. [7] Further, plants emerging from seeds with lower Zn could be highly sensitive to biotic and abiotic stresses. [8] Zn enriched seeds performs better with respect to seed germination, seedling growth and yield of crops. [9] The farmers of Bangladesh generally grow mungbean with almost no fertilizers. Considering the above facts the present study is aimed at following objectives to determine the effects of Zinc on the concentrations of N, P, K, S and Zn revots dna dees naebgnuM ni.

MATERIALS AND METHODS

The experiment was conducted in the experimental farm of Sher-e-Bangla Agricultural University, Sher-e-Bangla Nagar, Dhaka-1207, Bangladesh during the period from April to July, 2014. The location of the experimental site was at 23.75' N latitude and $90^0$34' E longitude with an elevation of 8.45 meter from sea level. Soil of the study site was silty clay loam in texture belonging to series. The area represents the Agro-Ecological Zone of Madhupur tract (AEZ-28) with P^H 5.8-6.5, ECE-25.28. [10] BARI mug 6, a high yielding variety of mungbean was released by Bangladesh Agricultural Research Institute, Joydebpur, Gazipur in 2003. It is photo insensitive, semi synchronous maturity, short lifespan (60 to 65 days) and bold seeded crop. Its yield potentiality is about 2 t ha^{-1}. This variety is resistant to yellow mosaic virus diseases, insects and pest attack. The plot selected for the experiment was opened by power tiller driven rotovator on the 10^{th} April 2014; afterwards the land was ploughed and cross-ploughed several times followed by laddering to obtain a good tilth. The experiment consisted of one factors: Zinc (Zn), $_0$nZ= No Zn ha^{-1};$_1$nZ =1.5 kg Zn ha^{-1} and $_2$nZ=3 kg Zn ha^{-1}. Levels of these two nutrient elements maed 12 treatment combinations. The experiment was laid out in a Randomized Complete Block Design (RCBD), with three replications. The total number of plots was 36, each measuring 2.5 m x 2 m. Recommended blanket doses of N, K and Sulphur (20 kg N from urea, 30 kg K from MOP and 15 kg S ha^{-1} from Gypsum, respectively) were applied. The whole amounts of MOP, Gypsum and half of Urea fertilizer were applied as basal dose during final land preparation. Rest of the Urea was applied 28 days after sowing. The required amounts of Zn (from Zinc oxide) were applied at a time as per treatment combination after field layout of the experiment and were mixed properly through hand spading. Mungbean seeds were sown on 18^{th} April 2014 in lines following the recommended line to line distance of 30 cm and plant to plant distance of 10 cm. various intercultural operations such as thinning of plants, weeding and spraying of insecticides were accomplished whenever required to keep the plants healthy and the field weed free. The crop was harvested at maturity on 18^{th} June 2014. The harvested crop of each plot was bundled separately. Ten (10) plants from each plot were selected at random and were tagged for the data collection. Data were collected at harvesting stage. The collected data were analyzed with the help of MSTAT-C program and mean values of all the parameters were adjusted by Duncan's Multiple Range Test (DMRT) at 5% level of probability. [11]

RESULTS AND DISCUSSION

Nitrogen and phosphorus concentration in stover: The highest concentrations of nitrogen (0.75%) and phosphorus (0.53%) among the treatments of zinc were observed in Zn_2 (3 kg Zn ha^{-1}). The lowest concentrations of nitrogen (0.61%) and

phosphorus (0.44%) were observed in Zn_0 (control condition) treatment (Table 1).

Potassium and sulphur concentrations in stover: The effect of different doses of Zn showed a statistically significant variation in the potassium and sulphur concentrations in mungbean stover (Table 1). The accumulation of K increased in a higher trend due to Zn application. The highest concentrations of potassium (1.18%) and sulphur (0.150 %) in stover were recorded in Zn_2 treatment. On the other hand, the lowest concentrations of potassium (1.04%) and sulphur (0.094%) in stover were recorded in the Zn_0 where no Zn was applied.

Zinc concentration in stover: The highest zinc concentration (0.008 %) in stover among different doses of Zn fertilizers was recorded with Zn_2. The lowest zinc concentration (0.006 %) was observed in the treatment Zn_0 (Table 1) where no Zn fertilizer was applied. Singh *et al*. (1993) found significant increase of zinc concentration in summer green gram due to the application of 5 kg Zn ha^{-1}.

Table 1 : Effect of Zinc on N, P, K, S and Zn concentrations in mungbean stover

Treatment	Stover				
	N (%)	P (%)	K (%)	S (%)	Zn (%)
Zn_0	0.06 b	0.44 b	1.04 c	0.094 b	0.006
Zn_1	0.70 a	0.52 a	1.13 b	0.119 ab	0.007
Zn_2	0.75 a	0.53 a	1.18 a	0.150 a	0.008
$LSD_{(0.05)}$	0.053	0.053	0.053	0.245	NS
CV(%)	3.17	2.74	0.43	1.93	1.54

In a column figures similar letter(s) do not differ significantly whereas figures with dissimilar letter(s) differ significantly. NS: Non significant

Nitrogen and phosphorus concentration in seed: The highest concentrations of nitrogen (6.90%) and phosphorus (0.66%) among the treatments of zinc were observed in Zn2 (3 kg Zn ha-1). The lowest concentrations of nitrogen (6.32%) and phosphorus (0.48%) were observed in Zn0 (control condition) treatment (Table 2). Prasad and Ram (1986) found that application of Zn (2.5 and 5.0 µg g-1) increased the concentration of phosphorus in mungbean and grain yield.

Potassium and sulphur concentrations in seed: The highest concentration of potassium (1.71%) was found in Zn1 and Zn2 and sulphur (0.518 %) in seed were recorded in Zn2 (3 kg Zn ha-1) treatment. On the other hand, the lowest concentration of potassium (1.53%) and sulphur (0.346%) in seed were recorded in the Zn0 treatment (Table 2) where no Zn was applied. Singh et al. (1993) found significant increase of potassium concentration in mungbean due to the application of Zn (5, 10 and 15 ppm).

Zinc concentration in seed: Zinc did not show significant increase in Zn concentration in mungbean seeds (Table 2). The highest zinc concentration in seed (0.008 %) was recorded with Zn2 (3 kg Zn ha-1) and the lowest (0.006 %) was observed in Zn0 treatment where no Zn was applied.

Table 2 : Effect of Zinc on N, P, K, S and Zn concentrations in mungbean seed

Treatment	Seed				
	N(%)	P(%)	K(%)	S(%)	Zn(%)
Zn_0	6.32 c	0.48 c	1.53 b	0.346 c	0.006
Zn_1	6.62 b	0.56 b	1.71 a	0.456 b	0.007
Zn_2	6.90 a	0.66 a	1.71 a	0.518 a	0.008
$LSD_{(0.05)}$	0.092	0.053	0.053	0.053	NS
CV(%)	1.53	1.74	2.84	0.23	3.01

In a column figures similar letter(s) do not differ significantly whereas figures with dissimilar letter(s) differ significantly. NS: Non significant

CONCLUSION

Nutrient connoitartnec (N, P, K, S and Zn) in stover and seed were positively affected due to Zn fertilization. The interaction effect of Zn was also found remarkable. The N, P, K, S and Zn connoitartnec in stover and seeds also increased with increasing level of Zn up to certain level. Based on the results of the present study, the following recommendation may be drawn - Application of Zinc fertilizers @ 3 kg Zn ha^{-1} (Zn_2) may be the best combination for higher nutrient concentration of mungbean stover and seed and also to maintain soil fertility and productivity than their individual application in Tejgaon series under AEZ No.28 in Bangladesh. Recommendation may vary from soil to soil.

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