



P 3-41. EFFECT OF ZINC CONTENT AND ANTIOXIDANT ENZYME SUPEROXIDE DISMUTASE LEVEL IN MUNGBEAN UNDER INDUCED SALINITY CONDITIONS

S.K. Pandey¹, A. Hemant¹, Ranjan², J.P. Srivastava², Sujata Upadhyay³

¹Department of Plant Breeding and Genetics, INKVV, Jabalpur -482 004, M.P.; ²Institute of Agricultural Sciences, Banaras Hindu University, Varanasi -221 005, U.P.; ³Sikkim University, Gangtok-737 102, Sikkim. E-mail: spjnkvvjab@gmail.com

INTRODUCTION

A total of 800 m ha of land throughout the world is salt affected, either by salinity (397 mha) or the associated condition of sodicity (434 mha) (FAO, 2005). Pulse crops are essentially required in human food for supplementing with good quality protein. Mungbean (*Vigna radiata* L.) is an excellent source of high quality proteins. In sprouted mungbean, high level of ascorbic acid, riboflavin and thiamine is found. But the production of mungbean is threatened by salinity. Therefore, the present experiment was conducted at Dept. of Plant Physiology, B.H.U., Varanasi (U.P.) with an objective to study the effect of Zn content and antioxidant enzyme Superoxide dismutase level in mungbean under induced salinity conditions.

METHODS

Certified seeds of mungbean (*Vigna radiata* L. var. HUM-1) were procured from Dept. of Genetics and Plant Breeding, B.H.U., Varanasi (India). The seeds were preconditioned by soaking wetted sand with seeds in different concentrations of ZnSO₄ i.e. 2×10⁻⁵ M, 3×10⁻⁵ M and 4×10⁻⁵ M respectively for 6 hours. They were then dried under shade after sowing. Hardened and non hardened seeds were sown directly in pots (size: 20 x 20 cm) filled with soil (3 kg). After germination, only five seedlings were maintained in each pot. Plants were grown in a lysimeter with a 16/8h photoperiod at 25°C/21°C and 55/75 % RH (day/ night). Salt stress was applied after sowing when the seedlings were five days old. SOD activity was estimated by the method as proposed by Dhindsa *et al.* (1981). Ten different treatments comprising of various levels of NaCl and Zn separately and in combinations i.e. 40mM NaCl, 80mM NaCl, 120mM NaCl, 40mM NaCl+2×10⁻⁵M Zn, 80mM NaCl+3×10⁻⁵M, 120mM NaCl+ 4×10⁻⁵M, 2×10⁻⁵M Zn, 3×10⁻⁵M Zn and 4×10⁻⁵M Zn were applied to salt stressed mungbean along with control. The observations were made for two consecutive years regarding reduction in SOD activity and uptake of Zn by salt stressed mungbean. The treatments were replicated thrice and the statistical analysis was done using CRD.

RESULTS AND DISCUSSION

Effect of various salinity levels on SOD activity U g⁻¹ (FW) min⁻¹ and uptake of Zn (µg) of salt stressed mung bean (*Vigna radiata* L.) pre-treated with zinc at twenty days interval was studied. The treatment combination 120mM NaCl+ 4×10⁻⁵M Zn gave the best results with least reduction in SOD activity and uptake of Zn as compared to control (Fig.1 and Fig.2). The presence of zinc reduces the production of NADP oxidase activity and enhances the formation of SOD activity; therefore it develops tolerance in plants facing abiotic stresses like salinity. Ali and Mahmoud (2013) reported that significant increases in traits of mungbean i.e. plant height, no. of branches plant⁻¹, no. of pods plant⁻¹, no. of seeds pod⁻¹, 1000 seeds weight, seed weight plant⁻¹ and seed yield ha⁻¹ occurred with foliar application of Zn as compared with untreated plants. The above findings support the results obtained in the present study.

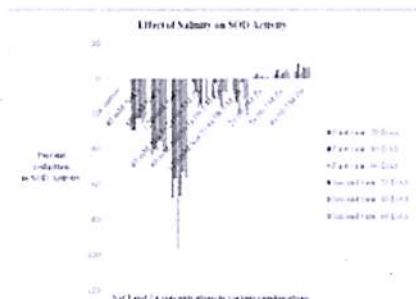


Fig. 1. Effect of salinity on SOD activity $U\ g^{-1}\ (FW)\ min^{-1}$ of Zn (μg) of salt stressed mungbean pre-treated with Zn at 20 days interval

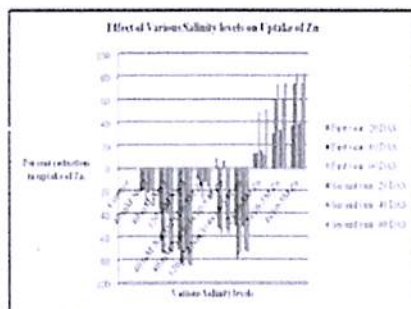


Fig. 2. Effect of various salinity levels on uptake of salt stressed mungbean pre-treated with Zn at 20 days interval

CONCLUSIONS

Zn especially contributes to yield potentiality of mungbean under salt stress. In the present study the treatment combination $120\text{mM NaCl} + 4 \times 10^{-5}\text{ M Zn}$ gave the best results with least reduction in yield under conditions of salinity stress in mungbean crop. The recommendation from the present study is that the seed hardening with Zn @ $4 \times 10^{-5}\text{ M}$ for mungbean cultivation in the salt affected areas is recommended to positively improve growth and yield potentiality of mungbean crop.

REFERENCES

- Ali EA, Mahmoud AM (2013) Effect of foliar spray by different salicylic acid and zinc concentrations on seed yield and yield components of mungbean in sandy soil. *Asian J Crop Sci* 5: 33-40.
- Dhindsa RS, Dhindsa PP, Thrope TS (1981) Leaf senescence: correlated with increased levels of membrane permeability and lipid peroxidation and decreased levels of superoxide dismutase and catalase. *J Exp Bot* 32: 93-101.
- FAO (2005) Global network on integrated soil management for sustainable use of salt-affected soils. Rome Italy: FAO Land and Plant Nutrition Management Service. <http://www.fao.org/ag/agl/agll/spush>