Andhra Pradesh J Agril. Sci : 1(3): 79-82, 2015

PRODUCTIVE POTENTIAL OF FODDER MAIZE (*Zea mays* L.) AS INFLUENCED BY SOIL AND FOLIAR APPLICATIONS OF ZINC

SHAIK MEHTAZ SULTHANA*, V. CHANDRIKA, Y. REDDI RAMU AND K.V. NAGA MADHURI

Department of Agronomy, S.V. Agricultural College, Tirupati-517502, Andhra Pradesh, India.

ABSTRACT

A field experiment was conducted during *kharif,* 2014 at S.V. Agricultural College Farm, Tirupati to findout the response of fodder maize to different soil and foliar applications of zinc. The twelve nutrient management practices consisted of RDF (120 kg N - 50 kg P_2O_5 - 40 kg K_2O ha^{-1}) without zinc and different combinations of soil and foliar applications of zinc were studied in a randomized block design with three replications. The results of the experiment revealed that among all the treatments, the maximum plant height (362.0 cm), leaf area index (4.972), leaf to stem ratio (0.304), dry matter production (6695 kg ha^{-1}) and green fodder yield (424 q ha^{-1}) were recorded with RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS (T_{12}). All the above growth parameters and yield were statistically comparable with RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 45 DAS (T_{11}). Hence, it can be concluded that application of zinc had significant influence on the growth parameters and green fodder yield of fodder maize.

KEYWORDS: Fodder maize, Zinc Sulphate, Growth Parameters and Green Fodder Yield.

INTRODUCTION

Livestock production is the backbone of Indian agriculture contributing 7 per cent to national gross domestic product and a source of employment and ultimate livelihood for 70 per cent of the population in rural areas. The milk production to a large extent depends upon the availability of good quality fodder. At present, the country faces a net deficit of 61.1 per cent green fodder, 21.9 per cent dry crop residues and 64% concentrate feeds (www.apdoes.org). To meet out the needs of the ever increasing livestock population, the production as well productivity of fodder is to be increased.

Fodder maize is the most nutritious and palatable *kharif* fodder which is considered good for milch animals. It has an excellent growth characters, quick growing nature, excellent fodder quality, free from toxicants and can be safely fed to animals at all the growth stages. Nevertheless, the high fertilizer application and intensive cropping has lead to deficiency of micronutrients including zinc in most of the soils. Zinc deficiency not only adversely affects plant growth but also impairs health of milch animals. Therefore, a field study was undertaken to study the effect of zinc on growth and yield of fodder maize (*Zea mays* L.) variety 'African tall' through soil and foliar applications.

MATERIAL AND METHODS

A field experiment was carried out during *kharif,* 2014 at S.V. Agricultural College Farm, Tirupati. The experimental soil was sandy loam in texture, near neutral in soil reaction (pH 6.4), low in organic carbon (0.48 per cent), available nitrogen (174 kg ha^{-1}) and available zinc (0.49 ppm), high in available phosphorus (44 kg ha^{-1}) and medium in available potassium (165 kg ha^{-1}).

The experiment was laidout in a randomized block design with twelve treatments and replicated thrice. The treatment comprised of soil and foliar applications of zinc *viz.,* Recommended dose of fertilizers (RDF) alone (120 kg N - 50 kg P_2O_5 - 40 kg K_2O ha^{-1}) without zinc application (T_1), RDF + soil application of 25 kg $ZnSO_4$ ha^{-1} (T_2), RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} (T_3), RDF + foliar application of 0.2% $ZnSO_4$ at 30 days after sowing (DAS) (T_4), RDF + foliar application of 0.2% $ZnSO_4$ at 45 DAS (T_5), RDF + foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS (T_6), RDF + soil application of 25 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 DAS (T_7), RDF + soil application of 25 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 45 DAS (T_8), RDF + soil application of 25 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS (T_9), RDF + soil application of 50 kg $ZnSO_4$

*Corresponding author, E-mail: mehtazsulthana106@gmail.com

ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 DAS (T_{10}), RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 45 DAS (T_{11}), RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS (T_{12}).

Fodder maize was sown on 12th July 2014 at a spacing of 45 × 10 cm and harvested on 29th September 2014. The recommended dose of fertilizers was applied to all the treatments. Nitrogen was applied through urea in two equal splits *viz.,* first half at the time of sowing as basal and remaining half as top dressing at 30 DAS. Entire quantity of phosphorous and potassium was applied as basal through single super phosphate and muriate of potash, respectively in furrows at 5 cm away from the seed rows. Zinc sulphate was applied as per the treatments (soil application of $ZnSO_4$ at two days after basal application of N, P and K and foliar application of 0.2 % $ZnSO_4$ at 30 and 45 DAS as per the treatments).

RESULTS AND DISCUSSION

Growth parameters

Growth parameters like plant height (362.0 cm), leaf area index (4.972), leaf to stem ratio (0.304) were recorded highest with RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS (T_{12}), which was however, comparable with RDF + soil application of 50 kg $ZnSO_4$ ha^{-1} along with foliar application of 0.2% $ZnSO_4$ at 45 DAS (T_{11}) and both of them were differed significantly over other nutrient management practices. The highest dry matter production (6695 kg ha^{-1}) at harvest was produced with the former nutrient management practice, which was significantly superior over other treatments (Table-1). The percentage increase in dry matter production of the treatments with zinc over RDF alone (T_1) ranged from 2-33 per cent. The lowest values of all the growth parameters were recorded with the treatment involving application of only RDF without zinc application (T_1), which differed significantly from other treatments.

This might be due to involvement of zinc in biosynthesis of plant hormones by activating tryptophan, which is a precursor of Indole acetic acid (auxin). IAA is a component of various enzymes, such as carbonic anhydrase and alcoholic dehydrogenase, which have a suggestive role in chlorophyll formation, photosynthesis and metabolic reactions in plants. It also involves in protein synthesis, cell division and cell elongation, which inturn promotes the vertical growth of the plant, photosynthates accumulation and thereby improving the plant biomass production. The results are in accordance with those of Meena *et al*. (2010), Mahdi *et al*. (2012), Mohan and Singh (2014).

Green fodder yield (q ha^{-1})

The highest green fodder yield of maize (424 q ha^{-1}) was recorded with soil application of $ZnSO_4$ @ 50 kg ha^{-1} + foliar application of $ZnSO_4$ @ 0.2 % twice at 30 and 45 DAS along with RDF (T_{12}), which was however comparable with soil application of either 25 or 50 kg $ZnSO_4$ ha^{-1} + foliar application of 0.2 % $ZnSO_4$ once or twice at 30 and 45 DAS along with RDF (T_{11}, T_{10}, T_9, T_8 and T_7). The percentage increase in green fodder yield under these treatments over T_1 (no zinc application) ranged from 13.5 to 30 per cent. Application of only RDF without zinc application (T_1) resulted in significantly the lowest green fodder yield (324 q ha^{-1}).

The increase in green fodder yield might be due to the role of zinc in various growth processes like photosynthesis, nitrogen metabolism, protein synthesis, harmone production and regulation of auxin concentration in the plants. These favourable impacts of zinc resulted in taller plants, increase in leaf area, leaf to stem ratio and dry matter production which might have reflected in terms of higher green fodder yields. These results are inline with those of Patel *et al.* (2007), Koushik *et al.* (2010), Kumar *et al*. (2012).

REFERENCES

Koushik, M.K., Pareek, P., Singh, P and Sumeriya, H.K. 2010. Response of fodder sorghum [*Sorghum bicolor* (L.) Moench] to iron and zinc. *Forage Research*. 36 (3): 181-184.

Kumar, A., Yadav, H.P and Vart, D. 2012. Sustaining productivity of high yielding hybrids of pearlmillet through zinc. *Forage Research.* 38 (1):23-26.

Mahdi, S.S., Hasan, B and Singh, L. 2012. Influence of seed rate, nitrogen and zinc on fodder maize (*Zea mays*) in temperate conditions of Western Himalayas. *Indian Journal of Agronomy.* 57 (1): 85-88.

Meena. L.R., Mann. J.S., Chaturvedi. O.H., Gill. S.C. 2010. Response of newly developed forage sorghum genotypes to zinc levels and *Azospirillium* under semi arid conditions of Rajasthan. *Forage Research.* 36 (3): 128-132.

Table 1. Influence of soil and foliar applications of zinc on growth parameters and green fodder yield of fodder maize at harvest

Treatments	Plant height (cm)	Leaf area index (LAI)	Leaf to stem ratio	Drymatter production (kg ha^{-1})	Green fodder yield (q ha^{-1})
T_1 : Recommended dose of fertilizers (120 kg N - 50 kg P_2O_5 - 40 kg K_2O ha^{-1})	253.0	3.841	0.161	5016	324
T_2 : T_1 + Soil application of 25 kg $ZnSO_4$ ha^{-1}	260.9	4.122	0.182	5451	368
T_3 : T_1 + Soil application of 50 kg $ZnSO_4$ ha^{-1}	268.7	4.4514	0.192	5607	380
T_4 : T_1 + Foliar application of 0.2% $ZnSO_4$ at 30 DAS	276.6	3.994	0.169	5150	354
T_5 : T_1 + Foliar application of 0.2% $ZnSO_4$ at 45 DAS	280.8	4.043	0.172	5233	356
T_6 : T_1 + Foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS	289.1	4.062	0.175	5272	360
T_7 : T_2 + Foliar application of 0.2% $ZnSO_4$ at 30 DAS	302.1	4.241	0.199	5749	406
T_8 : T_2 + Foliar application of 0.2% $ZnSO_4$ at 45 DAS	308.9	4.322	0.206	5805	408
T_9 : T_2 + Foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS	317.3	4.434	0.214	5822	411
T_{10} : T_3 + Foliar application of 0.2% $ZnSO_4$ at 30 DAS	330.9	4.511	0.235	6028	417
T_{11} : T_3 + Foliar application of 0.2% $ZnSO_4$ at 45 DAS	355.2	4.923	0.264	6283	421
T_{12} : T_3+ Foliar application of 0.2% $ZnSO_4$ at 30 and 45 DAS	362.0	4.972	0.304	6695	424
SEm±	2.62	0.019	0.002	41.7	8.85
CD (P=0.05)	7.7	0.05	0.007	122	26

Mohan, S and Singh, S. 2014. Effect of nitrogen, phosphorous and zinc on growth, yield and economics of teosinte (*Zea mexicana*) fodder. *Indian Journal of Agronomy.* 59 (3): 47-473.

Patel, A.S., Sadhu, A.C., Patel, M.R and Patel, P.C. 2007.Effect of Zinc, FYM and fertility levels on yield and quality of forage maize (*Zea mays* L.). *Forage Research.* 32 (4): 209-212.

www.apdoes.org