Annals of Arid Zone 54(3&4): 133-335, 2015

Short Communication

# Effect of Micronutrient Application on *Mateera* (*Citrullus lanatus)* under Hot Arid Agro-climate

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The deficiencies of micronutrient in soils and crops has increased in the recent years due to the factors like intensive cropping, loss of top soil by erosion, leaching, decreased use of farmyard manure, imbalance use of chemical fertilizers and liming of acid soils. If soils are deficient in micronutrients then food produced from these soils were also deficient or low in micronutrient and leads to deficiency problem in consumer. Increase in quality and yield of vegetables from the application of micronutrients have been reported in many parts of the world (De and Rai, 2005).

The deficiency of micronutrients has become major constraint in productivity, stability and sustainability of soils (Bell and Dell, 2008). Uptake of the micronutrient is affected by the presence of major nutrients due to either negative or positive interactions (Fageria, 2001). Indiscriminate use of macronutrients may affect uptake of micronutrients (Kumar and Babel, 2011). Plants take their nutrients mostly from soil for the optimum plant growth and crop yield depends not only on the total amount of nutrients present in the soil at a particular time but also on their availability which is controlled by soil texture, organic carbon and calcium carbonate, cation exchange capacity, pH and electrical conductivity of soil. Arid region of Rajasthan, having the problem of sand dunes which are characterized by light texture, low organic carbon content, high pH, low CEC and salinity/alkalinity problems (Shyampura *et al*., 2002). These soil conditions are not favourable for adequate availability of micronutrients (Singh, 2006; Singh, 2008; Yadav and Meena, 2009; Yadav, 2011). The low organic matter has been attributed to high temperature, low rainfall, scanty vegetation cover and single grained texture of soil.

The native crops like mateera (Citrullus lanatus) support livelihood in the hostile climatic conditions where vegetable crop diversification is not much feasible. However, limited attention was paid for its nutrient management and other crop production aspects. Mateera requires hot and dry climate and a growing season preferably with warmer days for cultivation both as rainy and summer season crop.

Keeping in view, a field experiments was conducted at ICAR-CIAH, Bikaner research farm with mateera cultivar "Thar Manak" during 2014 in the kharif season to investigate the effect of micronutrients application on mateera crop. The soil was sandy, alkaline in reaction with pH 8.1, organic carbon (0.1%), available N (95.48 kg $ha^{-1}$), available P (11.0 kg $ha^{-1}$), available K (244.5 kg $ha^{-1}$) and Zn, Cu, Fe and Mn (0.41, 0.25, 4.75 and 6.00 ppm). The mateera crop was applied differential doses of different micronutrient as per schedule of treatments. The seven treatments consisting of control (full recommended NPK through fertilizer), NPK + Zinc Sulphate @ 15 kg $ha^{-1}$ at the time of planting, NPK+ Iron Sulphate @ 15 kg $ha^{-1}$, NPK+ Managanese Sulphate @ 15 kg $ha^{-1}$, NPK+ Cupper Sulphate @ 15 kg $ha^{-1}$, NPK+ Zn, Fe, Mn and Cu Sulphate @ 15 kg $ha^{-1}$ each and NPK +Zn+Fe Sulphate @ 15 kg $ha^{-1}$ each at the time of planting as field application and were replicated 3 times in a randomized block design. Crop was raised as per standard packages and practices of mateera. supplementary irrigation was applied in furrow as and when required. Yield response was computed as follows.

$$\text{Yield Response} = \frac{\text{Yield in fertilized plot - Yield in unfertilized plot}}{\text{Yield in unfertilized plot}}$$

Application of micronutrient had significant effect on yield of mateera, TSS and average fruit weight of mateera (Table 1 and Fig. 1). Application of Zn, Fe, Mn and Cu sulphate @ 15 kg $ha^{-1}$ of each one gave maximum fruit yield (336.89 q $ha^{-1}$) which was statistically at par

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*Table 1. Micronutrient application in mateera under arid conditions*

| Treatments | Treatments details | Yield (q ha$^{-1}$) | TSS (%) | Av fruit wt (kg) |
|---|---|---|---|---|
| T1 | Full recommended NPK through chemical fertilizer | 236.66 | 7.83 | 1.73 |
| T2 | T1 +Zinc sulphate fertilizer @ 15 kg ha$^{-1}$ at the of planting | 297.98 | 9.23 | 2.05 |
| T3 | T1+ Iron sulphate fertilizer @ 15 kg ha$^{-1}$ at the of planting | 254.61 | 8.15 | 1.75 |
| T4 | T1+ Manganese sulphate fertilizer @ 15 kg ha$^{-1}$ at the of planting | 242.33 | 8.24 | 1.41 |
| T5 | T1+ Copper sulphate fertilizer @ 15 kg ha$^{-1}$ at the of planting | 281.29 | 8.55 | 1.56 |
| T6 | T1+Zn, Fe, Mn and Cu @ 15 kg ha$^{-1}$ each at the of planting | 336.89 | 8.82 | 1.89 |
| T7 | T1+Zn+Fe @ 15 kg ha$^{-1}$ each at the of planting | 306.21 | 8.92 | 2.01 |
| | CD (0.05%) | 48.20 | 0.96 | 0.30 |

with Zn+Fe sulphate @ 15 kg ha$^{-1}$ each (306.21 q ha$^{-1}$) and application of Zn sulphate @ 15 kg ha$^{-1}$ each at the time of planting (297.98 q ha$^{-1}$) as compared to control which was 236.66 q ha$^{-1}$ yield. Maximum TSS and average fruit weight (9.23% and 2.05 kg fruit-1) were recorded in zinc sulphate fertilizer @ 15 kg ha$^{-1}$ treatment which was statistically at par Zn+Fe sulphate @ 15 kg ha$^{-1}$ each (8.92% and 2.01 kg fruit$^{-1}$) and application with Zn, Mn, Fe and Cu @15 kg ha$^{-1}$ each (8.82% and 1.89 kg fruit$^{-1}$) and copper sulphate @ 15 kg ha$^{-1}$ (8.55%). Same trend was observed for per cent yield response of different treatments. Maximum per cent yield response (42.35%) was observed when Zn, Fe, Mn and Cu sulphate @ 15 kg ha$^{-1}$ each were applied followed by Zn+Fe sulphate @ 15 kg ha$^{-1}$ each (29.39%) and application of Zn sulphate @ 15 kg ha$^{-1}$ each (25.91%) as compared to control, whereas, application of Mn sulphate @ 15 kg ha$^{-1}$ each gave minimum per cent yield response (2.39%) followed by Fe sulphate (7.58%) as compared to control. This may be due to micronutrients deficient soil and more partitioning of carbohydrate to mateera as a result of balance nutrition in the treatment receiving micronutrients application.

Generally, foliar application of zinc and manganese was found to mitigate the adverse effects caused by severe water stress treatment, especially in fruit yield. It could enhance the fruit yield more effectively reported by Yousefi and Zandi, 2012. These results have been further supported by Jiskani (2005), who reported that significant effect on crop yield in chillies was recorded when micronutrients were applied in combination with NPK instead of alone; while Lovatt (2005) indicated that foliar spray of 1% either Polyfeed or Multi 'K' at 45, 60 and 75 days after planting increased the crop yield by about 10% over unsprayed control. Similar result were also reported by Baloch et al., 2008 and Anonymous, 2007.

## Conclusion

The result showed that application of micronutrients Zn, Fe, Mn and Cu @ 15 kg

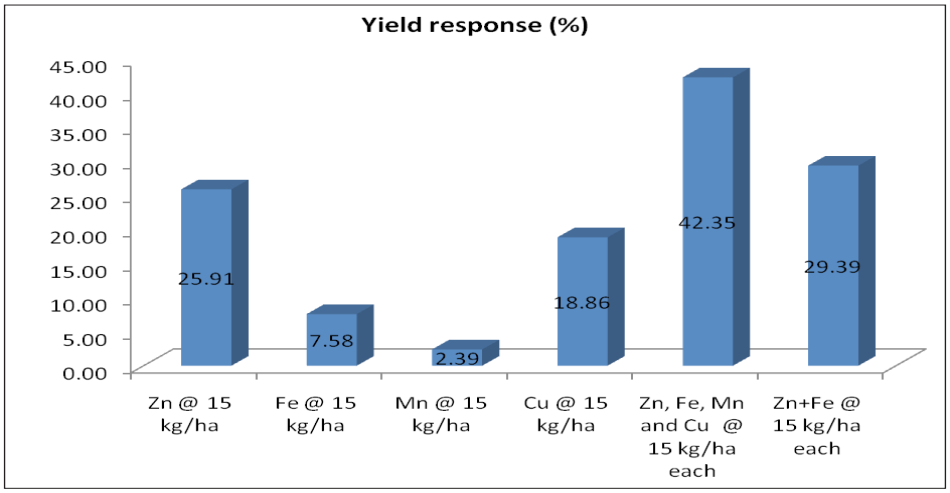


*Fig. 1. Effect of micronutrient application on yield response (%) mateera under arid conditions.*

$ha^{-1}$ each at the of planting followed by Zn+Fe @ 15 kg $ha^{-1}$ each at the of planting alongwith recommended dose of NPK gave higher yield and helpful in the production and quality of mateera in the sandy soils of hot arid region. Therefore, there is a need to apply these nutrients on soil test basis. This becomes important management point of view as it will require selective use of different micronutrients at different location.

## References


Anonymous 2007. *Micronutrient fertilizers: Fetrilon Combi, A Foliar Application for Vegetables*. http://www.agnova.com.au/resources/Fetrilon-Combi-guide.

Baloch, Q.B., Chachar, Q.I. and Tareen, M.N. 2008. Effect of foliar application of macro and micro nutrients on production of green chilies (*Capsicum annuum* L.) . *Journal of Agricultural Technology* 4(2): 177-184.

Bell, R.W. and Dell, B. 2008. *Micronutrients for Sustainable Food, Feed, Fibre and Bioenergy Production*. First edition, IFA, Paris, France (www.fertilizer.org).

De, Nirmal and Rai, Mathura. 2005. Micronutrient disorders and management in vegetable crops: a review. *Vegetable Science* 32(1): 1-10.

Fageria, V.D. 2001. Nutrient interactions in crop plants. *Journal of Plant Nutrition* 24(8): 1269- 1290.

Jiskani, M.M. 2005. *Foliar Fertilizers-fast acting Agents.* Daily DAWN, the Internet Edition, Monday December 5, 2005.

Kumar, M. and Babel, A.L. 2011. Available Micronutrient Status and Their Relationship with Soil Properties of Jhunjhunu Tehsil, District Jhunjhunu, Rajasthan. *India Journal of Agricultural Science* 3(2): June 2011.

Shyampura, R.L., Singh, S.K., Singh, R.S., Jain, B.L. and Gajbhiye, K.S. 2002. *Soil Series of Rajasthan.* Technical Bulletin, NBSS&LUP, Udaipur.

Singh, M.V. 2006. Micro- and secondary nutrients and pollutant elements research in India. Coordinator Report-AICRP Micro and secondary nutrients and pollutant elements in soil and plants, IISS, Bhopal. 30: 1-110.

Singh, M.V. 2008. Micronutrient Deficiencies in crops and soils in India. *Micronutrient Deficiencies in Global Crop Production* 93-125. doi:10.1007/978-1-4020-6860-7_4, http://dx.doi.org/10.1007/978-1-4020-6860-7_4

Yadav, B.K. 2011. Micronutrient status of soils under legume crops in arid region of western Rajasthan, India. *Academic Journal of Plant Sciences* 4(3): 94-97.

Yadav, R.L. and Meena, M.C. 2009. Available micronutrients status and relationship with soil properties of Degana soil series of Rajasthan. *Journal of the Indian Society of Soil Science* 57(1) 90-92.

Yousefi, M. and Zandi, P. 2012. Effect of foliar application of zinc and manganese on yield of pumpkin (cucurbita pepo l.) under two irrigation patterns, ejpau, 15(4), #02. Available online http://www.ejpau.media.pl