Title

Scenario of micro - and secondary - nutrients deficiencies and their management in soils and crops of arid and semi - arid regions of Gujarat

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Introduction

The drive for higher agricultural production without balanced use of fertilizers created problems of soil fertility exhaustion and plant nutrient imbalances not only of major, but also of secondary and micronutrients. Considerable research on different aspects of S and micronutrients has been carried out in the state of Gujarat. It is obvious that the deficiencies of secondary and trace elements will arise if they are not replenished timely under intensive agriculture (Singh, 2008, Patel *et. al.*, 1998). Therefore, systematic studies for delineation of micronutrients and amelioration including soil application and seed treatment were carried out in the context of present agricultural scenario for increasing crop production and ensuring food security for the millions living in India.

Soil micronutrient and sulphur status

Soil analysis from different soils in Gujarat revealed that about 28, 10 and 35 per cent of soils are deficient in available Zn, Fe and S, respectively while deficiencies of other micronutrients are quite meager. High magnitude of zinc deficiency is associated to alkaline calcareous soil and low in available phosphorus. In paddy soils, role of moisture was found significant in governing micronutrients availability.

Long term field experiment results indicated that rate of depletion of micronutrients under continuous cropping in *Goradu* soil was in the order of Zn >Fe>Mn>Cu. Depletion trend of micronutrients at medium fertility (150% of recommended NPK) also indicates that the soil status should be monitored every three to four years or after the harvest of eight to ten crops, especially for Zn and Fe to take suitable corrective measures or restoration of soil fertility status above the critical level.

Micronutrients management

Studies in rice (*Gurjari*) - wheat (GW-496) sequence showed that it is better to apply 125 kg N ha^{-1} along with 2.5 kg Zn ha^{-1} in rice and recommended dose of nitrogen (120 kg ha^{-1}) to wheat in soils which had marginal status of Zn and high available P_2O_5 level for getting higher yield of rice as well as of wheat and profit in this cropping sequence. In groundnut-wheat sequence, basal application of 5.0 kg Zn ha^{-1} Zn to groundnut and that of seed treatment for Mn and Mo were found superior over NPK-Zn control treatment for sustaining higher crop productivity. Foliar application of 1% $FeSO_4$ (without neutralization) was found the best treatment for production of the grain to the extent of 1.7 t ha^{-1} and straw 5.0 t ha^{-1} in case of drilled paddy. In another study on wheat, seed treatment of Zn, Mn and Mo proved beneficial

In order to correct multinutrient deficiencies in crops, foliar Grades-II (for Fe deficient soil) and Grades - IV (For Zn and Fe deficient soils) were found more effective in most of the crops viz., cereals (maize, sorghum, *bajri* and wheat), vegetables (potato, cabbage, okra) and pulse like pigeon pea. Soil application of Grade -V was also found useful especially in oilseeds like castor and mustard crops and found equally effective with foliar Grades -II and IV recommended especially for cereals. In oilseed based crop sequences, application of sulphur at 20 kg ha^{-1} to only oilseed crop in the sequence was sufficient to get beneficial results.

Studies showed that cabbage fresh head yield was highest with application of 10 t ha-1 FYM + 10 t ha^{-1} sewage sludge. Higher dose of 3.5 % sea weed liquid fertilizer produced the highest yield of groundnut pod yield while at Anand, it was due to medium dose of 1.5 %. Non - replicated field trials carried out on farmer's fields at different districts of Gujarat with different crops viz. cereals, pulses and oilseeds. Balanced application of zinc and sulphur either alone or in

combination and zinc enrichment with FYM showed additional benefits in terms of higher yields. Boric acid spray increased the oil yield in groundnut and protein content in pigeon pea as non-significant.

Conclusion

The overall scenario of micronutrients research carried out in Gujarat although provides useful information on management of these nutrients either on crop (s) or region basis, the future need is to generate site specific research information. The data presented above clearly showed the need for integrating sulphur in nutrient management practices, keeping in view not only the contents of macronutrients but also those of secondary and micronutrients and their nutrient interactions both in soils and plants.

References

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