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"Zinc, Iron and Managanese Availability in Paddy Soils of South Gujarat"

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Responses to micronutrients largely on upland crops, are being reported from different parts of the country, while their use in paddy fields has not received adequate attention. The nutritional problems of sub-merged paddy involving micronutrients are mainly concerned either with Zn, Fe and Mn deficiencies or sometimes with Fe toxicity, 'Khaira' disease of paddy was attributed to Zn deficiency in *Tarai* region of Uttar Pradesh.

In South Gujarat sub-merged Paddy is grown extremely in some parts of Surat and Valsad districts. With a view to study Fe-Zn relationship (i) laboratory, (ii) pot-culture and (iii) field studies were undertaken.

Laboratory Study: One hundred and three representative surface (0–22 cms) soil samples were collected from the region between Mindhola and Kaveri rivers.

Available Zn (dithizone + nN NH_4 OAc) and Fe (N NH_4 OAc; pH 4-8) as well as exchangeable Mn (nN NH_4 OAc) and easily reducible Mn (nN NH_4 OAc + 0.2% hydroquinone) were determined. Moreover, different forms of Fe viz. exchangeable (nN NH_4 OAc), reducible (nN NH_4 OAc, pH-3.0), complexed (0.05 MEDTA; pH 9.0), dilute acid (0.1 NHCl) extractable and free Fe oxides (5% $Na_2S_2O_4$) were determined.

The results revealed that 7 to 8 per cent of these paddy soils were deficient in available Zn or/and Fe but adequate in Mn. The various forms of Fe present in soils were in the order of free Fe oxide > dilute acid extractable > complexed > reducible > available > exchangeable. All these forms except dilute acid extractable form were interrelated significantly. About 70.5% of available Fe was accountable to the exchangeable form, whereas exchangeable and free Fe oxides jointly contributed to the extent of 83%. The prediction equations were:

Available Fe = 3.710 + 1.244 exch. Fe. ..(1)

Available Fe = 2.863 + 0.739 exch. Fe. + 5.113 Fe_2O_3 ..... (2)

Pot-culture study: In order to study the Fe and/or Zn response by paddy a pot-culture experiment was carried out using 16 soils belonging to seven different groups viz. (i) deficient in Zn and moderate in Fe (– zn, fe) (ii) Deffcient in Zn and adequate in Fe (-Zn, + Fe) (iii) moderate in Zn and deficient in Fe (Zn – fe) (iv) moderate in Zn and adequate in Fe (Zn +Fe) (v) moderate both in Zn and Fe (Zn, Fe) (vi) adequate in Zn and moderate in Fe (+ Zn, Fe) and (vii) adequate in both, in Zn and Fe (+Zn, + Fe). Four levels of Zn (0, 2.5, 5.0 and 10 ppm,) and two levels

of Fe (0, and 50 ppm) were tried. Dry matter produce at panicle initiation stage (70 days) improved to the extent of 17, 14 and 11% in low, medium and high Zn group respectively. Application of Zn has showed beneficial effect on soils having medium to high amount of Zn due higher Fe availableility i.e. well above the critical levels in those soils. For obtaining responsce the critical Zn level elevated and fixed to 0.90 ppm., keeping in view the excessive Fe availability of such soils.

Field study: Feeler trials were conducted at following five locations to study the effect of applying Zn alone/or with Fe.

Location	*Zn-Fe status*	*Treatments*
1. Puni	(–Zn, + Fe)	0, 5, 10 ppm Zn.
2. Ambheta	(–Zn, Fe)	0, 5 ppm Zn.
3. Navsari	(Zn, + Fe)	0, 10 ppm Zn.
4. Uwa	(Zn, –Fe)	0, 10 ppm Zn + 50, 100 ppm Fe
5. Musa	(Zn, Fe)	0, 5 ppm Zn + 50 ppm Fe.

Mean percentage improvement in yield of paddy grains due to Zn application under varying Zn– Fe status ranged from 4.2 to 16.2.

On the whole 5 ppm application proved beneficial to paddy. However, in view the basic status for these elements the balanced application of Zn and Fe is always desirable to overcome the antagonistic interaction effect.