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Transformation of applied Zn under different moisture regimes in rice soils

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Zn is one of the essential micronutrient elements most commonly deficient in flooded rice soils. It is known to occur in soil as in a number of discrete chemical forms; Water soluble plus Exchangeable Zn (WSEX-Zn), Organically Complexed Zn (OC-Zn), Amorphous sesquioxide bound Zn (AMOX-Zn), Crystalline sesquioxide bound Zn (CRYOX-Zn), Manganese oxide bound Zn (MnOX-Zn) and Residual Zn (Res-Zn) differing in their solubility and thus availability to plants. In submerged moisture condition brings about a number of dynamic changes in rice growing soils, which may influence the transformation of Zn and thus affect its availability to rice. Therefore, the present investigation was carried out to study the transformation of applied Zn in rice growing soils under field capacity and submerged moisture regimes.

A laboratory incubation was conducted using surface soil (Calcustert, pH 8.42) collected from rice fields at in Northern Dry Zone of Karnataka, India, after the harvest of paddy. Each container was filled with 1 kg of soil and treated with 3 levels of $ZnSO_4$ (Z_1=0, Z_2=10, Z_3=25 kg ha^{-1}) and 2 moisture regimes (field capacity and submergence). The experiment was laid out in Completely Randomized Design with 3 replicates. Samples were drawn periodically 30, 60 and 90 Days After Incubation (DAI) and analysed for pH, total Zn, Available Zn using standard analytical methods and different fractions of Zn by sequential Zn fractionation procedure.

Results revealed that applied Zn was transformed to WSEX-Zn, OC-Zn, AMOX-Zn, Avail.-Zn and total Zn and showed an increasing trend with increasing levels of Zn at 30, 60 and 90 DAI under both the moisture regimes. The amount of Zn recovered in WSEX-Zn, OC-Zn, CRYOX-Zn and Avail.-Zn recorded significantly ($p<0.05$) decrease and MnOX-Zn, AMOX-Zn, Res –Zn and total -Zn recorded significantly increase with increase of incubation period in both the moisture regimes. The recovery of applied Zn in WSEX-Zn form which represents the most readily available pool was relatively low as compared to other forms.

Financial assistance by ICAR/CARP MOA work plan is acknowledged.

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