Sequential Fractionation of Micronutrient Metal Ions in Organic Compost Fertilizer

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Abstract: Sequential fractionation of metal cations in various compost types was carried out to determine the availability of these cations for plant intake. The selected compost types were domestic, market available, municipal waste, industrial sludge, weed mulch, vermicompost, fruit waste compost and cow dung. The metal cations in each compost types were fractionized in to exchangeable, water soluble, organically bound, carbonate precipitate and residual fractions by extracting with 0.5M KNO_3 for 16 hours, then with de-ionized water for 16 hours, then 0.5M NaOH for 16 hours, then 0.05M Na_2EDTA for 16 hours and finally with 4M HNO_3 for 16 hours respectively. Water soluble, exchangeable and organically bound fractions are considered as mobile fractions and cations in these fractions are available for plant intake, carbonate precipitate and residual fractions are considered as residual fractions and are not available for plant intake because they are tightly bound to respective matrices. The selected micronutrient metals are zinc (Zn), manganese (Mn), iron (Fe) and copper (Cu). All the metal ions in each fraction are analyzed by flame atomic absorption spectrometry. This study found that vermicompost contains the highest level of mobile Cu, fruit waste compost contains the highest level of mobile Zn and domestic compost contains the highest level of mobile Mn. All these three types of compost contain fairly high levels of mobile Fe. Based on this study vermicompost, fruit waste compost and domestic compost can be considered as composts with fairly high levels of available (mobile) micronutrients levels. Among analyzed compost fertilizer sources, vermicompost contains the highest total (residual + mobile) copper and manganese levels. Industrial sludge compost contains the highest total zinc level and municipal waste compost contains the highest total iron level. Because of the non homogeneous nature of the compost sources, statistical variation of micronutrient levels in each fractions that are sequenced from various compost sources are fairly high.

Keywords: Compost Fertilizers, Sequential Fractionation, Mobile Micronutrients, Residual Micronutrient