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Metal release and soil nutrient levels of serpentine soils under two different soil water status and different soil amendment levels

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Serpentine soils which originated through pedogenesis of ultramafic rocks have the potential to release high concentrations of heavy metals, including Ni, Mn, Cr, and Co, into the surrounding environment. Different soil water statuses, different soil amendments, and amendment ratios can affect the amount of release of these heavy metals from serpentine soil particles. Two sets of serpentine soil samples, each consisting of the control (serpentine soil only), soil + 2.5% dendro-biochar (DB), soil + 2.5% DB + 1% municipal solid waste compost (COM), soil + 2.5% DB + 2.5% COM, and soil + 2.5% DB + 5% COM, were incubated under two different soil water statuses: Saturated point (SP) and Field capacity (FC). After 10 days of incubation, sub samples from each treatment were tested for bioavailability of heavy metals: Ni, Mn, Co, and Cr using DTPA extraction procedure followed by AAS. Using standard colorimetric procedures, available P, available N and total organic carbon (TOC) concentrations of each treatment were also determined. Significantly, the highest concentrations ($P < 0.05$) of three heavy metals (*i.e.*, Ni, Mn, and Co; 129.20, 71.40 and 5.88 mg/kg respectively) were present in the treatment of 'no amendment added,' which was incubated at saturated point. However the soil incubated under field capacity with the highest amendment ratio (2.5% DB + 5% COM) showed highest reduction of Ni, Mn, and Cr (65.4, 68.3 and 100.0% respectively) compared to the highest concentration reported. Also this highest amendment ratio involved the highest concentrations of available N, available P and TOC. Moreover the saturated soil water status is much more favorable for the availability of P and TOC, whilst field capacity is favorable for the availability of N.

Key words: Heavy metal, Soil amendment, Soil water level, Plant nutrients, Ussangoda.

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