

VALIDATION OF MICROPLASTIC EXTRACTION AND QUANTIFICATION TECHNIQUES IN RED-YELLOW PODZOLIC SOIL

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The impact of microplastics (MPs) in terrestrial environments remains poorly understood, and there is still a lack of a standardized method for quantification. The available methods varied widely due to the wide range of morphological and chemical characteristics of MPs. Hence, experimental methods have to be validated precisely before the analysis. This research was designed to validate different methods for MPs extraction, using a complete randomized design including five treatments and control, with three replicates under laboratory conditions for a selected red-yellow podzolic soil (Typic Hapludults). An incubation study was carried out under dark, constant moisture conditions at room temperature for one month to validate the extraction efficiency via visual identification, Raman spectroscopy and staining methods. Each treatment composed of MPs (< 4 mm) according to its natural abundance and 500 g of soil; T₁: HDPE (0.068 g) + soil, T₂: LDPE (0.068 g) + soil, T₃: PP (0.0107 g) + soil, T₄: PVC (0.006 g) + soil, T₅: HDPE (0.068 g) + LDPE (0.068 g) + PP (0.0107 g) + PVC (0.006 g) + soil. Soil pH, electrical conductivity and microbial density changes were monitored within the incubation period. At the end of the incubation period, 5 ± 0.01 g of each replicate was subjected to density separation and organic matter digestion. The recovery efficiency results of each extracting method were investigated by ANOVA using R software. The study revealed no significant effect from MPs on pH, electrical conductivity and microbial density of the soil (p>0.05). The visual identification method outperformed the other analysis methods. It gives higher recovery efficiencies (> 70%) for HDPE, LDPE & PP and (50-60%) for PVC. It can be concluded that there is higher applicability of the visual identification method out of the selected methods for quantifying the targeted MPs.

Keywords: Microplastics, Raman spectroscopy, Staining method, Visual identification