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Identification and characterization of mica minerals in mine spoils and their potential in plant nutrition

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Abstract: *Mica deposits are rich in India, with nearly two thirds discarded as waste during the cleaning and processing stages. In this study waste mica from mica mines in Andhra Pradesh was collected and characterized for its structural, chemical and morphological properties. The elemental composition analysis confirmed the presence of 49.23% SiO_2, 18.26% Al_2O_3, 15.45% MgO, 11.28% Fe_2O_3, and 3.81% K_2O, with the high iron content confirming the waste mica as biotite. The Mg/Fe, Fe/(Fe+Mg) ratio and XRD results further confirms this identification. FTIR, and SEM analyses highlighted the characteristic peaks and morphology of biotite in these mine spoils. Plant growth experiments demonstrated the waste mica/boitie's suitability as a nutrient source, with treated plants exhibiting superior growth compared to control and alternative treatments. This study establishes waste mica/biotite as a promising source for enhancing plant nutrient availability. Field experiments are essential to optimize the combination of waste mica and nutrients, presenting a potentially cost-effective approach for potassium management in hitherto deficient soils.*

Keywords: Bioavailability; Biotite; FTIR; SEM; Waste mica; XRD