

PLANT-AVAILABLE NUTRIENTS FROM ORGANIC MATERIALS: N, P, AND K EXTRACTION IN DIFFERENT MEDIA

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Soil degradation is an increasing global problem driven by intensive agriculture, excessive use of mineral fertilizers, and declining organic matter content, which together reduce soil fertility and nutrient availability for plants. Sustainable alternatives are therefore required to restore soil health and ensure long-term agricultural productivity. Organic fertilizers derived from biodegradable waste materials represent a promising solution, as they recycle nutrients and improve soil properties.

This study investigates the availability of plant-essential macronutrients – nitrogen (N), phosphorus (P), and potassium (K) – from selected organic residues, including banana peels, coffee bean husks, pine cones, and dried leaves and stems of violet and pink lupins. These materials were evaluated as potential raw resources for organic fertilizer production. Nutrient extraction was performed using three different approaches: aqueous extraction, alkaline extraction with 0,5 N KOH, and mineralization in concentrated H_2SO_4 , allowing comparison of nutrient release under different chemical conditions.

The results indicate that potassium was most readily released in aqueous extracts, particularly from banana peels, while lupin and coffee bean husks biomass served as an efficient source of phosphorus. Nutrient solubilization was enhanced under alkaline conditions, while mineralization ensured the highest extraction efficiency for nitrogen and phosphorus, emphasizing the influence of chemical treatment on nutrient availability.

These findings confirm that common organic wastes can serve as valuable sources of plant-available N, P, and K. The study highlights the potential of converting organic residues into environmentally friendly fertilizers, contributing to sustainable nutrient management and soil fertility improvement.