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Effect of Organic Amendments and Subsequent Potential Water Repellent Conditions on Major Nutrient Dynamics in Soil

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Abstract

Sri Lankan soils are reported to be characterized by low fertility due to extreme organic matter decomposition. As a result, farmers use extensive amounts of organic manure which subsequently result in water repellent conditions. Water repellency/hydrophobicity reduces spontaneous water penetration affecting soil hydrological processes and organic matter dynamics. Little is known about its effects on major soil nutrients dynamics. The objective of this study was to explore any detrimental impacts of water repellent conditions induced by organic amendments on major nutrient dynamics in soil using a field experiment with Bush bean. *Cattle manure* (CM), *Goat manure* (GM), *Gliricidia sepium* (GL) and, *Casuarina equisetifolia* (CE) leaves were used as organic amendments. The soil was amended with 5% (common field application level) CM, GM, and GL, and 2% of CE mixed with 5% of each manure to induce hydrophobicity, which has been proved to improve the aggregate stability. The soil was analyzed for nitrogen (N), phosphorous (P) and potassium (K) at major plant growth stages. The potential water repellency of the samples were tested under laboratory conditions. Data were statistically analyzed with ANOVA. For all samples, the highest N contents were at the initial stage (43-96 mg/kg), and the lowest ones were at the vegetative stage (8-18 mg/kg). The differences of the N contents between samples with and without intermixed 2% CE were not statistically significant. The P contents were highest at the initial and vegetative stages (highest value>50 mg/kg) compared with later growth stages (highest value<6 mg/kg). The P and K contents of samples with intermixed 2% CE were statistically similar to or higher than those without, in most treatments. The highest K contents were found at the flowering stage (highest value>590 mg/kg), and the lowest ones at the harvesting and vegetative stages (<125 mg/kg). The high nutrient contents in samples with extra 2% CE might be due to additional nutrients supply from CE. Potential water repellency of the manures increased as GL<GM<CM<CE. However, the nutrient dynamics were not in relation with the potential water repellency of the samples. Results revealed that the addition of 2% CE along with 5% organic manures is not detrimental on N, P, and K dynamics. It might remove early season limitations in P availability, and increase p lant available K. Further experiments are required to identify the impacts of continuous additions of organic amendments on soil.

Keywords: *Nitrogen, Organic amendments, Phosphorous, Potassium, Water repellency*

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