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Assessing soil health status of *Sutherlandia frutescens* plants cultivated at ARC-VOPI (Roodeplaat), Pretoria

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Increasing human population, decrease in resources and environmental degradation pose serious threat to natural processes such as critical microorganisms that are responsible for life on earth. Agriculture is challenged to develop strategies for sustainability that conserve non-renewable natural resources such as soil. Good agricultural produce and sustainability depend on the soil health maintenance. Soil health is the capacity of a soil to function as a vital living system, within ecosystem and land use boundaries in order to sustain plant productivity and promote plant health. In this study, we assessed soil microbial diversities of *Sutherlandia frutescens* soils which are responsible for availability of Nitrogen (N), Phosphorus (P) and Carbon (C). The experiment was conducted on the experimental site at the Agricultural Research Council (ARC VOPI) Roodeplaat, Pretoria, South Africa (25°59'S; 28°35'E). The experimental layout was a Latin square with four levels of inoculant per 100 seeds (T_0=Control, T_1=1 gram Inoculant, T_2=2 grams Inoculant and T_4=4 grams Inoculant) replicated four times. Plants and soil samples were collected for analysis. Rhizosphere and Bulk soil samples were sent to ARC's Plant Protection Research Institute (ARC PPRI) for Carbon Substrate Utilisation Profiles (CSUP), functional diversity and soil microbial enzymatic activity. The data obtained were subjected to non-parametric statistical analysis using STATISTICA 12 (StatSoft, Inc. ©) and Principal Component Analysis (PCA) and cluster analyses. There was significant statistical difference existed between the CSUP of soil microbial populations. It was clear that CSUP in T_0 and T_4 differ significantly from T_2 but not from T_1 and the bulk soil. Nutrients composition released over decomposition or the plant root exudates attract microbial populations that are specialized to utilize the specific compounds rapidly, thus contributing to the difference in CSUP of soil microbial populations. Soil microbial populations differed in sampled plots but not statistically significant in their ability to convert C. There was lowest ß glucosidase activity in T_2 and Bulk soil; T_2 and T_4 had the lowest alkaline phosphatase activities whereas T_0, T_1 and T_4 had the lowest acid phosphatase; and T_0 and T_4 had the lowest urease activities. Soil microbial diversity and activities did not differ significantly between the sampled treatments. The samples revealed that the overall lowest soil microbial diversity with the highest overall soil microbial activity in the Bulk soil, compared to the other treatments. Considering the results obtained, the soil samples do not represent the profile of healthy soils, which might make the soils prone to unhealthy plants or lower yields due to low microbial activity, and the occurrence of diseases due to the low microbial diversity.

Biography

Makgato Manaka has completed his BSc Agriculture (Soil Science), honours from the University of Limpopo. He has currently submitted his MSc Agriculture Dissertation to the University (UNISA) and with two papers under review for publication in accredited journals. He is serving as a Student Research Trainee under the Professional Development Programme at the ARC VOP.

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