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Soil Properties under Baobab Tree (*Adansonia digitata* L.) and their Influence on Fruit Nutrient Content

Jakub Houška[1], Makuei Awuol[2], Jana Jaklová[1], Ondrej Drábek[1], Bohdan Lojka[2], Katja Kehlenbeck[3]

[1] *Czech University of Life Sciences Prague, Faculty of Agrobiology, Food and Natural Resources, Dept. of Soil Science and Soil Protection, Czech Republic*

[2] *Czech University of Life Sciences Prague, Fac. of Tropical AgriSciences, Dept. of Crop Sciences and Agroforestry, Czech Republic*

[3] *The World Agroforestry Centre (ICRAF), Kenya*

Abstract

This study was conducted to determine soil properties under the baobab tree (*Adansonia digitata* L.) in Eastern and Coastal provinces of Kenya and to ascertain their influence on concentrations of baobabs' fruits nutrients. For this purpose 63 ICRAF baobab locations were used for collection of underlying soil. Chemical properties of the ICRAF baobab pulps (water content, ASCL, Total Acidity, Ash, Zn, Fe, Ca, Mg, K) were compared with the soil samples chemical composition to ascertain any relationships. Soil samples (Layer 1: 0–20 cm, Layer 2: 20–40 cm and Layer 3: 40–60 cm) were analysed for pH, cations in $BaCl_2$ solution using ICP measurement (Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, P, Pb, S , Sb, Si, V, Zn) and plant available phosphorus according to Olsen. The statistical analyses PCA, RDA (Redundancy Analysis) and EFA (Exploration Factor Analysis) were performed. The results from PCA (with passively projected fruits parameters and locations) showed that high phosphorus concentrations (both in $BaCl_2$ and Olsen P) and pH in the main root zone are positively correlated with total acids concentrations in fruits whereas Fe and K correlate negatively. Ash is related to higher contents of Ca and S in Layer 3 and higher pH values in Layer 2. ASCL, water content and partly Fe in fruits show strong negative correlation to Sulphur in soils and positive correlation to Mn in both soil layers. Finally, Zn and Mg in baobab pulps are positively correlated to Fe and K (partly Cu) in Layer 3, while being negatively correlated with pH values. Similar results gives RDA (including Monte Carlo permutation test), where the soil properties served as environmental variables explaining the variability among fruits parameters. The statistically significant factors (with $\alpha = 0.05$) within the main baobab root zone were plant-avail. P, P (in $BaCl_2$), Si, K and pH. These findings are in agreement with the EFA. The study shows that fruits quality parameters are affected by soil chemistry, mainly phosphorus content (generally limiting factor in tropical soils) and properties related to bedrock type (silicates versus carbonates).

Keywords: *Adansonia digitata*, baobab, pulp chemistry, soil properties

Contact Address: Bohdan Lojka, Czech University of Life Sciences Prague, Fac. of Tropical AgriSciences, Dept. of Crop Sciences and Agroforestry, Kamýcká 129, 169 21 Prague, Czech Republic, e-mail: lojka@ftz.czu.cz