



Trace elements in soils and plants of the noun valley, western Cameroon: a contribution to the development of a baseline biogeochemical database

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The Noun valley is located in the western Cameroon. This region is densely populated due to its soils fertility that makes it “the agricultural backbone” of the entire sub-continent of Central Africa. However, the “goitre” disease is also prevalent in the Noun Valley owing to its soils and plants deficiency in iodine. It is therefore important to ascertain the distribution of trace elements in soils and plants of this important ecosystem. The sampling of the soils and selected edible plants such as *Xanthosoma* sp. (cocoyam) and *Zea mays* (corn) were carried out in the rainy season between September and October 2003. The collected samples were sifted, crushed and washed with distilled water prior to digestion. Soils of particle-size lower than 63 μm and plants reduced to a size lower than 0,12 mm were digested using respectively HCl and HNO₃; and calcination at 475°C followed by H₂O₂ and HNO₃. Analytical techniques ICP/AES, GF/AAS and ICP/MS were used for the determination of selected trace elements. Further analyses included soils mineralogy and their contents in biogenic elements carbon, nitrogen and sulphur (CNS) using respectively x-rays diffractometry and electronic microscopy, and the elementary analysis CNS. The concentrations of trace elements in soils reflect those of the pluto-volcanic rocks of the region. They are of basic (basalts, volcanic ash) and acid (granites, gneiss) respective types with most abundant elements Fe, Al, Mg. The observed variations in trace elements between soil samples are probably controlled by the differences in the nature of the bedrocks and by the relief. In addition, notorious toxic such as As and Cd have shown low concentrations. The geochemical base of the soils compared to rocks and soils of the world, the

normal ranges in the soils and the permissible levels do not suggest any anthropogenic influence. Moreover, elementary CNS and mineralogical analysis as well as the values of the physicochemical parameters such as the pH of the soils do not show any indication of anomaly. Some trace elements analyzed in the plants have concentrations that reflect those of the soils (Al, Fe, Ti, and Rb). However, some other trace elements are present in the plants in quantities higher than the concentrations found in the soils: Zn, Cu, Cd, Mo (excluding yam), Ni (groundnut), Ba (groundnut), Sr (groundnut, bean), and B. Trace elements such as As, Cr, V, are not bioavailable for all the analyzed plants. Besides, trace elements such as Co, Cd, Mn, Pb, Sr, Ti and U are found in the normal range of concentrations in the plants while others such as Cu, Zn, Mo, Fe, Al, Ni, B, Ti, Rb, Cs and Ba are in the range of phytotoxicity and even reach or exceed the human food tolerance level (Cu). No plant shows deficiency in the analyzed trace elements. The plants with seeds (groundnuts, corn and bean) show a higher absorption of trace elements compared to plants with tubercles such as *Xanthosoma* sp. (cocoyam), *Dioscorea* sp. (yam) and *Solanum tuberosum* (potato). Overall, geogenic processes control the distribution of trace elements in all types of soil samples. The results of this study lay ground for the development of a bio-geochemical database of the Noun valley towards its maintenance as a healthy and sustainable ecosystem.

Key words: Trace elements, Soils, Plants, Noun Valley, Western Cameroon, Baseline, Biogeochemical