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# Effect of Bolax gummifera rhizosphere on the mobility of soil nutrients in a subantarctic environment (Mont Martial, Ushuaia-Argentina)

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The study area, Mount Martial, is located in the South of Argentina, in the Tierra de Fuego province (54ºS, 68ºW). The climate in Tierra del Fuego is temperate-cold and humid, with a strong and markedly seasonal oceanic influence. The mean air temperature that we recorded in the study zone, at 1050 m above sea level, between February 2005 and January 2010 was -1.9º C, with an absolute maximum of 12.5º C and an absolute minimum of -12.8º C. Although we have no rainfall data, in Ushuaia, which is close to sea level, the mean annual rainfall for 1961-1970 was 550 mm; however, it would be inaccurate to extrapolate this value given the marked variability in precipitation favoured by the relief.
Biogeographically, the area is included in the so-called “Andean Desert”, which is almost barren of large plants and with poor vegetable cover. At 800 a.s.l., the vegetation consists of shrubs of specialised taxons such as Bolax gummifera, Moschopsis rosulata and Saxifraga magellanica.

In the present study, samples of Bolax gummifera rhizosphere (Umbelliferae), bulk soil and subsurface soils (>5 cm to rock layer) were collected from a small homogeneous area (≈500m2). The soils were characterized by analysis of pH ($H_2O$ and KCl), electrical conductivity, total organic carbon, total nitrogen, organic carbon, iron extracted with sodium pyrophosphate, and particle size. Sequential extraction of Fe in the samples was also carried out to determine the following fractions: F1: exchangeable fraction (extracted with 1M MgCl2), F2: amorphous Fe oxyhydroxides (extracted with sodium ascorbate-citrate buffering to pH 8 with sodium bicarbonate), F3: crystalline Fe oxyhydroxides (extracted with 0.11 sodium citrate+ sodium bicarbonate +3 g of sodium dithionite), and F4: organic Fe (extracted with 0.02M $HNO_3$+30%$H_2O_2$ at 85ºC) and bioavailability nutrients (soluble in Mehlich 3 extratant).
The results obtained for the basic physicochemical characteristics of the soils revealed some differences between samples. Thus, Although these are poorly developed soils, significant differences were foundAlthough being incipient soils, significant differences were found in relation to the effect of the rhizosphere on soil properties. For example, the total organic C was 8 times higher and the total nitrogen and C pyrophosphate were 4 times higher in the rhizosphere than in the bulk soil. The results of the sequential extraction of Fe and bioavailability nutrients, such Ca, Mg, K and Fe, also revealed significant differences between rhizosphere and bulk soil, whereas the deeper samples (> 5 cm) displayed intermediate characteristics. These results are consistent with the hypothesis that plants affect the biogeochemical processes in soils by accelerating weathering processes. This aspect may be of particular importance within the context of global climate change, as higher temperatures will favour expansion of vegetation and at the same time the flow of nutrients towards oceans and lakes, which may have a direct effect on primary productivity.