MOLECULAR FEATURES OF ORGANIC MATTER IN DIAGNOSTIC HORIZONS FROM ANDOSOLS. A COMPARATIVE STUDY OF WHOLE AND DEMINERALIZED SOILS

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Soils in the Midlands slopes of the Tenerife Island (Canary Islands) are mainly allophanic andosols that sustain Canary pine forest-type vegetation. Andosols are usually formed from volcanic substrates, having a typical A horizon (melanic epipedon) that accumulates high quantities of organic carbon (80-300 g C/kg) mainly due to the stabilisation by mineral interactions[1]. The peculiar properties of these variable-charge soils are due to the occurrence of materials such as allophanes, imogolite and other Fe and Al oxyhydroxides prone to form intense organo-mineral interactions and structures with a high degree of stability that contribute to an efficient protection of organic C[1].

This work complements previous results using analytical desorption/pyrolysis to elucidate soil organic matter structure in andosols[2]. In order to further enlighten soil organic matter (SOM) molecular composition and its relation with the soil mineral matrix, the results from a comparative study is described here where whole soil and hydrofluoric acid (HF) demineralised[3] soil samples were analysed by complementary techniques; solid state NMR spectroscopy (CP-MAS ^{13}C-NMR) and analytical pyrolysis (Py-GC/MS). The samples studied were from the organic A horizons of three soils with andic properties and one non-andic soil (Sodic Cambisol) from the island of Tenerife (Canary Islands, Spain). New entrapped organic structures were amenable to analytical pyrolysis and ^{13}C-NMR spectra were considerably ameliorated when minerals, including paramagnetic components, were removed. Our findings support previous ones suggesting the occurrence of high-performace organo-mineral sequestration mechanisms of aliphatic moieties in andosols[2].

References

1. Nanzyo M., Dahlgren R.A., Shoji S. (1993). In: S. Shoji, M. Nanzyo, R.A. Dahlgren (Eds). Volcanic Ash Soils: Genesis, Properties and Utilization, Elsevier Sci. Publ., Amsterdam, Netherlands. pp. 145–187.
2. González-Pérez J.A., Arbelo C.D., González-Vila F.J., Rodríguez-Rodríguez A., Almendros G., Armas C.M., Polvillo O. (2007). Molecular features of organic matter in diagnostic horizons from andosols as seen by analytical pyrolysis. J. Anal. Appl. Pyr. 80, 369–382.
3. Knicker H., González-Vila F.J., Polvillo O., González-Pérez J.A., Almendros G. (2005). Fire-induced transformation of C- and N- forms in different organic soil fractions from a Dystric Cambisol under a Mediterranean pine forest (*Pinus pinaster*). Soil Biol. Biochem. 37, 701–718.