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SEASONAL HYDROCHEMICAL STUDY OF THREE ACID SOILS : COMPARISON OF WATER SOLUTIONS HELD AT LOW AND HIGH TENSIONS

M. BONNE [1], **F. ANDREUX** [1], **J.-C. VEDY** [1] **and B. SOUCHIER** [1]

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Seasonal variations of the chemical composition of gravitational (GS) and displaced (DS) solutions were studied in the A1 horizons of three acidic soils : a « *Sol brun acide* » (Typic Dystrochrept), a « *Podzol Humo-ferrugineux* » (Typic Haplorthod), and a « *Pseudogley Podzolique* » (Typic Glossaqualf) from Eastern France.

GS were collected at the bottom of the A1 horizons with microlysimeters, after each rainfall event ; DS were extracted from the same horizons and after the same rainfall events, by applying a pressure corresponding to pF 4.4.

DS relatively to GS were generally richer in total carbon, nitrogen, potassium, calcium, magnesium and manganese, but iron and aluminium concentrations were not consistently different. Consequently, the pH of GS was always more acid than that of DS (Tables 1 to 4 ; Figures I and II).

The *Sol brun acide* had the lowest amounts of water soluble organic matter (WOM), and soluble cations were balanced by mineral ions, essentially nitrates. The pH of GS was 4.1, and constant with time, whereas the pH of DS was maximal in Autumn (4.7) and minimal in Winter (3.9).

In the *Podzol* and in the *Pseudogley*, WOM predominated and controlled the acidity and the cation complexing capacity of the solutions. Organic carbon and nitrogen concentrations were maximal in Summer and Autumn, then decreased progressively with time. The pH of GS was minimal in Summer (3.4 and 3.8 in the *Podzol* and in the *Pseudogley*, respectively), and increased slightly with decreasing organic carbon concentrations. The pH of DS was significantly higher than in the respective GS, but decreased from Autumn to Spring with decreasing cation : organic carbon ratio.

The amounts of simple compounds, i.e. ammonia, nitrates, amino-acids, polyphenols, and reducing sugars, and of unidentified compounds (mostly humic macromolecules), were measured from Summer to next Spring (Fig. 3). In GS, unidentified forms of carbon and nitrogen predominated in Summer, and decreased with decreasing concentration of total WOM. Conversely, simple compounds, especially ammonia, amino-acids and reducing sugars, increased in proportion from Summer to Spring. Larger amounts of phenolic and sugar compounds were found in DS than in GS, but the proportions of unidentified carbon and nitrogen were higher, and their decrease from Summer to Spring was slower in DS than in GS.

The distribution of organic solutes in GS reflected the increasing contribution of acidic litter leachates, and the decreasing rate of their biodegradation, in the following order : *Sol brun, acide - Podzol - Pseudogley*. The interpretation of the composition of DS wase more complex, as a consequence of the high pressure treatment : preferential solubilization of cellular material from soil microbial biomass occured probably in the *Sol brun acide*, especially in Spring and Summer. Contrarily, solubilization of uncompletely decomposed litter material and of macromolecular organic anions adsorbed on soil mineral surfaces predominated in the *Podzol* and in the *Pseudogley*.

1) Centre de Pédologie biologique - CNRS, B.P. 5, 54501 Vandœuvre-lès-Nancy Cédex (France).

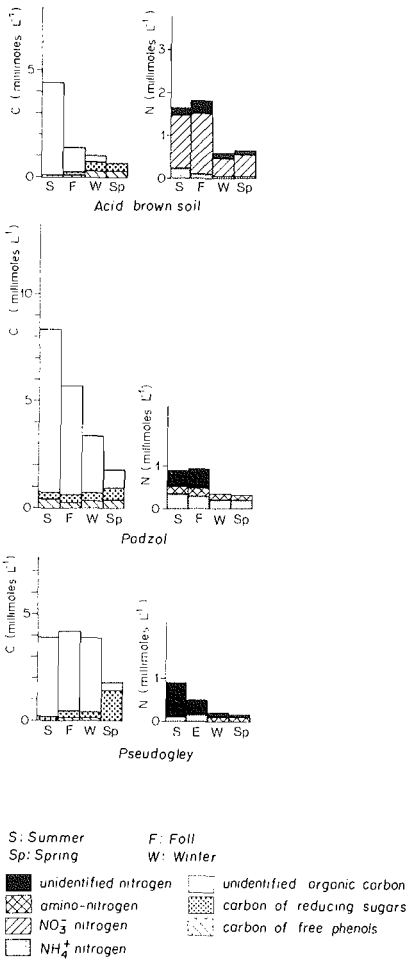

Figure 3 : Distribution of main carbon and nitrogen forms in the gravitational solutions collected from the A1 horizons of the soils.