

COMPARISON OF THE DEVELOPMENT OF ACID BROWN SOILS UNDER HARDWOOD AND CONIFEROUS FORESTS IN VOSGIAN MOUNTAINS

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The purpose of this work is to evaluate the effects on soil characteristics of Norway Spruce planted on former beech forest. The two contiguous sites are located at 830 m on a rounded hill brow, near the Hantz pass in vosgian mountains.

Using an isoquartz check, a mineralogical reconstitution and a determination of the ponderal variations of total elements in the profiles, as compared to the C horizon, were established. A fractionation of the humic substances by a classical method (extractions by alcohol and alkaline reagents), an analysis of the clay minerals and a study of the chemical and some physical properties (bulk density, expansion...) are also carried out in order to have an entire view of the pedological influence of a 70 years spruce stand.

The nutrient level of the acid brown soil developed on permian sandstone is unchanged at the present time, but the results indicate some significant facts which let suppose a long-dated alteration of the productivity of these coniferous sites. These major facts are :

- a change in the composition of organic matter materialized by a significant increase of « inherited humin » and a relatively low fraction of compounds resulting from insolubilization processes (fig. I) ;
- an « alteration » of the exchange complex characterized by a more pronounced concentration of calcium and manganese in the A1 horizon and by a notable increase of the protonic acidity (see fig. II and the H^+/Al^{3+} ratio) ;
- the presence of larger amounts of easily reducible manganese (≥ 50 % of total manganese in A1B and B horizons) and iron (fig. II) ;
- a faster and more intense hydrolysis of primary minerals in the two upper horizons (fig. III). Particularly the K-feldspars show appreciably larger soustractions — especially in the A1 horizon — under conifers (40 %) than under hardwoods (24 %) ;
- in spite of an identity and a relative stability of the clay fraction in the two profiles, a more developed weathering complex in the coniferous site and probably a more intense translocation of clay down to the B/C horizon (table 3) ;
- an appreciable increase of losses (Si, K, Fe) and, on the contrary, more important gains of manganese (table IV). The exportation-index I_e , which represents the losses of total elements per unity of depth, is significantly higher in the coniferous ecosystem (fig. V) ;
- a soil development leading to physical perturbation (expansion) and horizon differentiation (reduction of the upper horizons and larger development of the subsoil).

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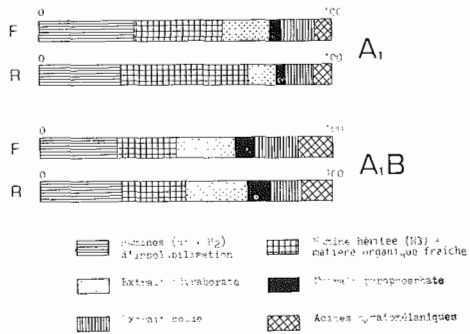


Figure 1 : Chemical fractionation of organic matter in the two ecosystems (A1 and A1B horizons)

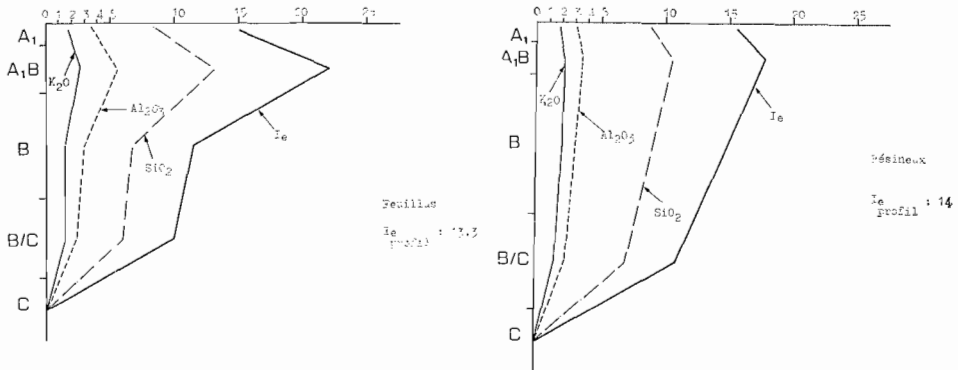


Figure 5 : Indexes of soustraction Ie (losses per unity of depth in t/ha)