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Formation of a cultivated spodosol in east-central Finland

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Abstract

The processes involved in Spodosol (Podzol) formation are still being debated. The pedogenic processes in a Spodosol, 10,700 years-old, at Sotkamo that has been cultivated for about 50 years were studied by characterizing the morphology and analyzing the major chemical properties, texture and mineralogy. Before cultivation, organic acids produced by decomposition of organic matter from pine litter in O and A horizons had weathered primary minerals in A and E horizons releasing Al and Fe. Percolating waters moved the organo-metallic complexes from A and E horizons to Bhsm and Bs horizons where the complexes coated and bridged sand grains eventually forming cemented ortstein. Because of the high biotite content of the parent material, the index of accumulation of Fe and Al in the Bhsm horizon ($Al + 0.5 Fe = 4.1\%$) was the highest reported in Spodosols of Finland. The data support the theory of downward movement of Al and Fe as organo-metallic complexes with formation of some ferrihydrite but little or no formation of imogolite type materials. Little, if any, podzolization has likely occurred since the initiation of cultivation because, after agricultural liming and consequent increase of pH in the Ap horizon, organic compounds are likely to chelate Ca and Mg rather than Al and Fe.

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