SOIL FORMATION AND CLAY MINERAL TRANSFORMATION ON RED COLORED SUBSTRATE OF THE NORTH TAIGA ZONE OF EUROPEAN RUSSIA

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Red-coloured substrates (Munsell, 10R-5YR) are uncommon for the northern part of European Russia, which is characterized by a cold and humid climate. Red-coloured substrates, which were formed in hot climate millions of years ago, and which serve as parent material for soils, now occur near the surface because of denudation (post-glacial erosion). Soils and redeposited calcite-free Permian red loams were studied by X-ray diffraction and chemical methods. The dominant clay minerals in the clay-size fraction (<0.001mm) of the parent material are dioctahedral hydromica and smectite. Randomly interstratified mica-smectite and small quantities of kaolinite and chlorite could be found, too. The studied soils are Chromi-Albic Luvisols (characterized by podzolization) with strong textural differentiation, and weakly differentiated Chromic Regosols (WRB, 1998). The mineralogical composition of the clay-size fraction of these soils is inherited from the parent material. The main differences in the clay mineral features, especially smectite, can be found in the upper part (eluvial horizons – El and ElB) of the Chromi-Albic Luvisols. It was found that smectite in eluvial horizons has the charge localization in the tetrahedral sheet, as in beidellite. The smectite of deeper horizons of Chromi-Albic Luvisols and in the solum of the Chromic Regosols, has the charge localization in the octahedral sheet, as in montmorillonite. The content of smectite in comparison to hydromica increases in the eluvial part of the soil with strong textural differentiation, probably because of a transformation from hydromica to smectite. This difference in the clay minerals features was not detected in the Chromic Regosols.

Typical soils for this zone are Dystric Albeluvisols, which are strongly leached acid loamy soils on moraine substrates. They show strong differences in the clay mineralogical composition. The distribution and specification of clay minerals of soils formed on red substrate, especially in Chromic Regosols, are uncommon for the bio-climatic conditions in the Northern Taiga. This is due to iron oxyhydroxides, components of the red-coloured substrate, which mitigate the zonal processes of podzolization and leaching of nutrients. The differences between soils with weak and strong textural differentiation are related to the environment (relief, cryogenic conditions).