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Soil microbiological composition and its evolution along with forest succession in West Siberia

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Natural forest succession process in West Siberia is mostly initiated by fire disturbance and involves changing tree species composition from pioneer species to late succession trees. Along with forest aging, litter and forest biomass accumulate. Changes of the soil nitrogen cycle between succession stages, important for plant functioning, have been reported in a number of studies. To help understanding the mechanism of the changes in the soil nitrogen cycle we analyzed soil microbiological composition for soil profiles (0-160 cm) taken at sites corresponding to three forest succession stages: (1) young pine, age 18-20 years, (2) mid age, dark coniferous, age 50-70 years, (3) mature, fir-spruce, age 170-180 years. Soil samples were taken from each soil horizon and analyzed in the laboratory for quantity and species composition of algae and other microorganisms. Algae community at all stages of succession is dominated by species typical for forest (pp. Chlorhormidium, Chlamydomonas, Chloroccocum, Pleurochloris, Stichococcus). Algae species composition is summarized by formulas: young forest C14X10Ch9H2P4Cf1B2amph4, mid age X16C15Ch10H4P4Cf1B2amph4, mature X24C22Ch17H10P2amph5Cf1, with designations C – Cyanophyta, X – Xantophyta, Ch – Chlorophyta, B – Bacillariophyta. Diversity is highest in upper two horizons and declines with depth. Microorganism composition on upper 20 cm was analyzed in three types of forests separately for consumers of protein (ammonifiers) and mineral nitrogen, fungi, azotobacter, Clostridium pasteurianum, oligonitrophylic (eg diazotrophs), nitrifiers and denitrifiers. Nitrogen biologic fixation in the mature forest soils is done mostly by oligonitrophyls and microorganisms of the genus Clostridium as well as yanobacteria of sp. Nostoc, but the production rate appears low. Concentrations (count in gram soil) of nitrogen consumers (eg ammonifiers), oligonitrophyls, Clostridium and denitrifiers increase several fold from young forest to mid age, and from mid age to mature forest. On the contrary, azotobacter disappears in mature forest while nitrifiers decline by several times from young to mid age forest. Large variation in microbiological activity was observed between sites reaching different succession stage, however further studies are needed to discriminate between effects of the site productivity and forest age.