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Biochemical processes of oligotrophic peat deposits of Vasyugan Mire

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The problem of peat and mire ecosystems functioning and their rational use is the main problem of biosphere study. This problem also refers to forecasting of biosphere changes results which are global and anthropogenic. According to many scientists' research the portion of mires in earth carbon balance is about 15% of world's stock.

The aim of this study is to investigate biochemical processes in oligotrophic deposits in North-eastern part of Vasyugan Mire. The investigations were made on the territory of scientific-research ground (56˚03´ and 56˚57´ NL, 82˚22´ and 82˚42´ EL). It is situated between two rivers Bakchar and Iksa (in outskirts of the village Polynyanka, Bakchar region, Tomsk oblast). Evolution of investigated mire massif began with the domination of eutrophic phytocenosis – Filicinae, then sedge. Later transfer into oligotrophic phase was accompanied by formation of meter high-moor peat deposit. The age of three-meter peat deposit reaches four thousand years.

Biochemical processes of carbon cycle cover the whole peat deposit, but the process activity and its direction in different layers are defined by genesis and duration of peat formation. So, the number of cellulose-fermenting aerobes in researched peat deposits ranges from 16.8 to 75.5 million CFU/g, and anaerobic bacteria from 9.6 to 48.6 million CFU/g. The high number of aerobes is characteristic for high water levels, organizing by raised bog peats. Their number decreases along the profile in 1.7 - 2 times.

The number of microflora in peat deposit is defined by the position in the landscape profile (different geneses), by the depth, by hydrothermic conditions of years and individual months. But microflora activity shows along all depth of peat deposit. We found the same in the process of studying of micromycete complex structure. There was revealed either active component micromycete complex – mycelium, or inert one – spores in a meter layer of peat deposit. If mushrooms spores are observed in all deposit layers, mycelium of mushrooms deepens into the peat deposit (to 2 meters) within the limits of aerobic (meter) zone and only in particular months of dry years. The existence of seasonal dynamics of eukaryotic cells, and also capability of yeast and other groups of micromycetes for growth, testifies about vital activity of a number of eukaryotic cells at a depth of 2 meters.

Researched peat deposits are biochemically active along the whole profile. But they are different in a microflora number of individual physiological groups either in items of the landscape, or in deposit depth. The largest quantity of aerobic cellulose-fermenting microorganisms is marked during dry years. Anaerobic cellulose-fermenting microorganisms dominate during wet years. The quantity of microbe biomass increases in bottom lifts of peat deposits. This fact testifies about viable condition of microbe complex at depth.

The formation process of carbon dioxide in peat deposits of Vasyugan Mire actively occurs during dry years and is defined by hydrothermic conditions of a meter layer of peat deposit. The intensity of CO_2 isolation for certain correlates with the temperature in horizon of 0 – 50 sm. and with bog waters level. The study of gas composition for the three years showed that the largest concentration of carbon dioxide in peat soils is marked along the whole profile during a dryer year (0.08 – 2.65 millimole/l), increasing other years' level in about 1.5 0 2 times. Emission of carbon dioxide in peat deposit reaches maximum during dry years (50 – 170 mg CO_2 / m^2 hour), then wet years (10 – 130 mg CO_2 / m^2 hour) and average years (10 – 108 mg CO_2 / m^2 hour).

Methane in peat deposits of investigated objects reaches the largest concentration in July (from 0.11 to 0.56 millimole/l) and September (from 0.09 to 0.49 millimole/l).

Emission of methane reached maximum during wet 2004 year (3.2 – 11.8 mg CO_2 / m^2 hour), then came average 2005 year (1.2 – 8.6 mg CO_2 / m^2 hour) and the last dry 2006 year (0.7 – 9.3 mg / CO_2 m^2 hour).

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