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Sphagnum - methanotrophs symbionts activity at different methane concentration and temperature

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Peatlands cover c.a. 3% (about 4.16 x 10^6 km^2) of the Earth's land surface, while about 80% of the peatland area are situated in Russia, Canada and USA . In Poland peatland area amount to about 13000 km^2 (Okruszko, 1996). Mires play a dual role in atmospheric carbon cycling, by fixing atmospheric carbon dioxide into organic carbon via photosynthesis and decomposition of organic matter under anaerobic condition providing to formation of methane, a greenhouse gas, which is a key driver of global warming.

Up to 90% and even to 100% (Whalen, 2005) of the methane formed in peatland ecosystem does not fetch up the atmosphere, but is oxidized by methanotrophic bacteria situated in plant tissues to CO_2. Emissions of methane from *Sphagnum*–dominated peatlands are lower than from *Carex*-dominated fens (Nykänen et al., 1998). The existence of methantrophic bacteria associated with plants by were found Raghoebarsing and co-wokers, 2005 as an endophytic bacteria which was located in the hyaline *Sphagnum* sp. cells. They reported that methanotrophic symbionts *S. cuspitatum* hosted a 16S rDNA sequence showing 93% identity to methanotrophs *Methylocella palustris* and *Methylocapsa acidophila.*

The researchers with the use of marked $^{14}CH_4$ allowed to count contribution of CH_4-derived carbon in *Sphagnum* agrees on refixation of respired carbon into living plants.

The average amount of contribution carbon into living *Sphagnum* was about 10-30% in peatbogs (Raghoebarsing et al., 2005; Larmola et al., 2010).

The aim of present work was to investigate the influence of methane concentration and temperature on methanotrophic activity of *Sphagnum* – methanotrophs systems. The investigated plants originated from Moszne peatbog, located in the Poleski National Park (Eastern Poland, 51˚ 23' N, 23˚ 63' E).

Methanotrophic activity at different concentration of methane (1% - 20%) and temperature (10^oC - 30^oC) of the samples [μM CH_4*g fresh weight $^{-1}$day $^{-1}$] was calculated from the slope of the linear regression line during methane oxidation. The *Sphagnum sp.* - methanotrophs symbionts in Moszne peatbog showed activity in the range of 0.016 – 0.326 μM CH_4*g fresh weight $^{-1}$*day^{-1}for complete plants. Increase of temperature of from 10^oC to 20^oC was connected with the increasing tendency in methane oxidation was noticed which depends on the quantity of given substrate. However, at temperature of 30^oC and 20% of CH_4 concentration the lose of methanotrophic activity was observed.

The great methanotrophic potential of mire plants (particularly mosses) and symbiotic bacteria inhabiting them, may have a relevant influence on reducing the emission of greenhouse gasses, what show new possibilities of research and new look on mires as the area of high metabolic potential.