

## Lichens as a source of soluble precursors for humification

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### Introduction

Lichens dominate in soil cover in polar and subarctic regions and can serve as a source of enzymes [1] and organic precursors [2] for humification. Here we have studied the content of soluble organic compounds in lichens and have shown how lichen-derived organic compounds can be sequestered in soils.

### Materials and Methods

Water extracts from crushed thalli of 20 lichen species belonging to the genera *Cladonia*, *Cetraria* and *Peltigera* were studied. Total soluble C and N was analyzed on Shimadzu TOC analyzer, phenolics content and composition was studied as described in [2]. Adsorption of lichen-derived organic compounds on soil samples, kaolinite and kaolinite-Al(OH)<sub>3</sub> was studied at pH 5 and 10.01.

### Results and Discussion

Soluble C and N comprise about 23% of total C and N in *Peltigeras* and about 4-10% and 28% of total C and N respectively in *Cladonia* and *Cetraria* spp. The total content of water-soluble phenolics in *Peltigeras* was 12-27  $\mu\text{g g}^{-1}$ , in *Cladonias* and *Cetrarias* - 2-9  $\mu\text{g g}^{-1}$ . The C, N and phenolic contents was 2-3 times higher in growing tips than in senescing parts. Soluble phenolic compounds were represented by conjugates of hydroxybenzoic acid (in all species studied), vanillic and protocatechuic acids (in some species). The study of non-phenolic part of the conjugates revealed the presence of sugars and aminoacids. Preliminary results have shown high adsorption capabilities of lichen-derived organic compounds on soil and clays. These data demonstrate that lichen-derived organic compounds can be stabilized in organic-mineral complexes and participate in the formation of humus profiles in primitive soils.

[1] Beckett *et al* (2013) *Fung Biol* **117**, 431-438 [2] Zagorskina *et al* (2013) *Micobiol.* **82**, 445-452