

MOLECULAR CHARACTERIZATION OF *SPHAGNUM*-DERIVED PHENOLICS AND THEIR ROLE IN PEATLAND CARBON CYCLING

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Northern peatlands are powerful agents of carbon sequestration and storage, having the ability to accumulate vast amounts of carbon (C) over millennial timescales with low risks of leakage to the atmosphere (Lal, 2004; Yu *et al*, 2010). *Sphagnum* moss is the dominant peat-forming species across northern, boreal regions and is responsible for the high carbon storage densities observed in ombrotrophic peats (Clymo and Hayward, 1982). Phenolic compounds play an essential role in carbon accumulation and stabilization in peatland ecosystems by acting as anti-microbial agents, effectively inhibiting the decay of organic matter in surficial oxic peat layers (Appel, 1993; Freeman *et al*, 2001). However, the molecular nature, mobility and persistence of the phenolic content of both northern peats and *Sphagnum* moss remains unclear.

This presentation aims to disentangle the fate of phenolics leached from peat and moss, and characterize their associated transformation/degradation products. Previous research in our laboratory has suggested that ‘bound’ phenolics are degraded under aerobic conditions and lost to the environment (Abbott *et al*, 2013; Schellekens *et al*, 2015a, b; Swain and Abbott, 2013). Yet, the stability and ultimate fate of ‘free’ phenolics is yet to be investigated. Here, we use a combination of geomolecular techniques to track individually targeted phenolic acids derived from one of the largest, most valuable *Sphagnum*-dominated wetlands in the UK, namely Butterburn Flow (see below for details). By developing an HPLC-ESI-MS/MS method for the novel identification of water-soluble phenolics, we are tracking associated derivatives/degradation products in natural waters and aqueous peat/moss extracts. Phenolic acids are identified based on their mass spectra and retention times compared to that of authentic standards.

We have established the presence of a dissolved phenolic acid ($m/z = 221$ [M-H]⁻) via LC-ESI-MS/MS (negative ion mode) and a series of phenolic derivatives in natural waters and aqueous moss extracts sampled directly from Butterburn flow, a 450 hectare wetland which lies on the border between Cumbria and Northumbria National Park (from 55°, 05' 19" N, to 02°, 30' 31" E). The presentation will describe changes in the; water-soluble, weakly bound (solvent-extractable), and primarily bound (macromolecular) phenolic fractions from a group of 1-2 metre peat cores sampled along a narrow ombrotrophic bog- minerotrophic fen gradient.

Monitoring variations in the nature and abundance of phenolics present down peat profiles in a transitional mire will help us elucidate the different mechanisms of how carbon is lost and sequestered in both ombrotrophic and minerotrophic peatland ecosystems.

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