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Total phenolic constituents (TPC) in Sphagnum-dominated peat and corresponding humic acids along a bog profile

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Peatlands are waterlogged areas where the rate of biomass production is greater than the rate of decomposition, thus resulting in effective sinks of atmospheric carbon (these ecosystems are estimated to store about one-third of global soil C pool). The reduced litter decomposition in these environments mainly depends on the harsh environmental conditions, such as acidic pH, low temperature, and frequent lack of oxygen. Ombrotrophic bogs are domed peatlands supplied only by atmospheric deposition, and generally dominated by Sphagnum mosses that represent the bulk of living and dead biomass. Such peat deposits, often used as a record of the impact of historical human activity, constitute also a useful tool in palaeoclimatic and paleovegetation reconstructions. In fact, it is possible to deduce environmental and vegetational changes in bog deposits by analysing the constituents derived from plants contributing to peat formation, such as lipids and lignin. The latter, in particular, is an abundant and relatively recalcitrant phenolic macromolecule found in vascular plants, and it is also implicated as major source material for terrestrial humic substances. In the present, the total content of polyphenolic constituents (TPC) in peat and corresponding humic acids (HAs), along a bog profile, were estimated using alkaline CuO oxidation in order to investigate their fate during peat humification processes. In peat, the TPC represent the 4.2% (average value) of the organic carbon (OC). The variation in the yield of

TPC along the profile evidences an initial reduction from a mean yield of 44.8 mg g-1 OC in the first 9 cm to 20.0 mg g-1 OC at a depth of 27 cm, followed by a generally increasing yield with depth (71.0 mg g-1 OC at 60 cm). This moderate fluctuation in the yield of TPC is possibly due to source variation and/or other factors that are super-imposed over post-depositional degradation. In HAs, the TPC represent 5.1% of the organic carbon. The trend of the C-normalised yields of phenolic constituents in HAs (51.0 mg g-1 OC, average value) is similar to the one in peat ($r = 0.71^{***}$), thus showing similar main peaks. In particular, with the exception of the clear peak (81.0 mg g-1 OC) at 60 cm of depth, it is possible to appreciate highest TPC yields (mg g-1 OC) in the first 20 cm, corresponding with the section showing highest C/N atomic ratio values. Taking into account the HA extraction yield values, it was possible to determine the TPC in HAs as percentage of the TPC in peat. Data show that TPC in HAs can account for 10-40% of TLP in corresponding peat samples, and that, despite TLP show highest values in the upper section, a general accumulation of lignin phenols occurs in HA molecules with depth.