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Impact of water content and decomposition stage on the soil water repellency of peat soils

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Soil water repellency is widely reported for all kinds of soils and mainly caused by hydrophobic organic compounds. It has a substantial influence on soil hydraulic processes such as water infiltration, preferential flow paths and evaporation and therefore on hydrological processes in general. The severity of soil water repellency strongly depends on the soil water content and the amount of soil organic carbon. Although peat soils are characterized by high soil organic carbon contents, studies about peat soils are rare and mostly available for horticultural substrates. Here, we present soil water repellency measurements for peat soils with varying porosities, bulk densities and stages of decomposition. The peat soils were sampled at two different sites in a bog complex. The sites have been drained for 1 and 100 years. Samples were taken from each soil layer and, additionally, in a vertical resolution of 0.03 m.

To determine the soil water contents at which the peat becomes water repellent, we applied the commonly used water drop penetration time test on progressively dewatered samples. In order to identify the influence of the decomposition stage as determined by the depth within the soil profile and duration of drainage, the potential soil water repellency was measured at air-dried sieved samples by the sessile drop method.

First results show that the soil water repellency of peat soils is strongly dependent on the soil water content. For air-dried peat samples, the influence of different decomposition stages of the bog peat is negligible. All air-dried samples are extremely water repellent with contact angles > 130°. However, comparing the results with the soil organic matter content shows a slightly tendency of increasing soil water repellency with increasing soil organic matter contents.