

Determination of the water retention of peat soils in the range of the permanent wilting point.

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Global coverage of peatlands decreases due to the use of peat for horticulture and to the drainage of peatlands for agriculture and forestry. While alternatives for peat in horticulture exist, profitable agriculture on peatlands and climate protection are far more difficult to combine. A controlled water management that is optimized to stabilize yields while reducing peat degradation provides a promising path in this direction. For this goal, profound knowledge of hydraulic properties of organic soil is essential, for which, however, literature is scarce.

This study aimed to compare different methods to determine the water retention of organic soils in the dry range (pF 3 to 4.5). Three common methods were compared: two pressure based apparatus (ceramic plate vs. membrane, Eijkelkamp) and a dew point potentiometer (WP4C, Decagon Devices), which is based on the equilibrium of soil water potential and air humidity. Two different types of organic soil samples were analyzed: i) samples wet from the field and ii) samples that were rewetted after oven-drying. Additional WP4C measurements were performed at samples from standard evaporation experiments directly after they have been finished.

Results were: 1) no systematic differences between pressure apparatus and WP4C measurements, 2) however, high moisture variability of the samples from the pressure apparatus as well as high variability of the WP4C measurements at these samples when they were removed from these devices which indicated that applied pressure did not establish well in all samples, 3) rewetted oven-dried samples resulted in up to three times lower soil moistures even after long equilibrium times, i.e. there was a strong and long-lasting hysteresis effect that was highest for less degraded peat samples, 4) and highly consistent WP4C measurements at samples from the end of the evaporation experiment. Results provide useful information for deriving reliable water retention characteristics for organic soils.