



## **Impact of high temperature on water sorptivity of mineral soils**

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### **Impact of high temperature on water sorptivity of mineral soils**

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Wettability is a critical feature of all soils as it directly influences their physical, mechanical, chemical, biological and agriculture properties. All of these are closely related to soil organic matter (SOM) content. Certain fractions of the SOM pool are responsible for the limited wettability or water repellency observed in soils, although exact causes and compounds responsible have yet to be established. The simplest way of quantifying the impact of SOM on wetting properties of soils is the method of measuring soil water parameters or characteristics for natural soil before and after SOM removal.

This method was applied to determine the SOM content – water sorptivity relationship for 5 cultivated soils (*Haplic Cambisols*, *Haplic Arenosols*, *Haplic Luvisols*, *Haplic Phaeozems*, *Haplic Leptosols*) from the Lublin region in southeast Poland. SOM removal has been executed in two different ways: (I) 48 hours burning in 500°C oven, (II) 24 hours extraction with isopropanol:ammonia (70:30) in a Soxhlet device. The

rationale was that method (I) is expected to remove SOM totally, while method (II) removes only a fraction of the SOM, but this fraction is thought to includes those responsible for water repellency. Extracted SOM fractions were analyzed by GC-MS. Thus, for each investigated soil, 3 samples were obtained: (A) untreated, (B) all SOM removed, and (C) SOM reduced leading to repellency elimination. To determine sample wettability, the sorptivity for water ( $S_w$ ) and methanol ( $S_m$ ) were determined from the measured kinetics of imbibition for sample placed in horizontal column as a slope of liquid mass of vs.  $\text{SQRT}(\text{ time})$ . The ratio of both sorptivities ( $S_w/S_m$ ) is related to apparent wetting angle of water in soil.

The main findings are:

- (i) High temperature and associated removal of SOM caused an increase in water sorptivity in all investigated soils ranging from 50% (*Haplic arenosols*) to ca 200% (*Haplic leptosols*). This suggests that all soils exhibited some natural degree of water repellency.
- (ii) The difference of the apparent wetting angle values between a soil in natural state (untreated: A) and after total SOM removal (B) is always positive and lies between 10 and 30 degrees.
- (iii) For the samples investigated, the apparent wetting angle is a nonlinearly increasing function of the total organic carbon content.