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THE EFFECTS OF WATER REPELLENCY ON SOIL QUALITY INDEX OF HEATED SOIL

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INTRODUCTION:Soil water repellency is a reduction in the rate of wetting and retention of water in soil caused by the presence of hydrophobic coatings on soil particles. In many forest and shrubland environments, water repellency may be induced or enhanced after heating. Fire and increasing temperature of soil affects the soil characteristics. Fires decrease organic matter content, increase bulk density, change soil texture , induce soil water repellency and change also soil water retention.
Soil water retention is a basic soil property. Some characteristics of soil such as texture, compaction, friability and hydraulic conductivity are related to the soil water retention curve. The index proposed by Dexter (2004) is the slope (S) of the soil water retention curve (SWRC) at its inflection point. It is determined for the SWRC when the gravimetric water content, a function of soil-water suction (h) and expressed using the van Genuchten equation, is plotted with the natural logarithm of h.
Several authors have reported the effect of fire on SWRC, but reports about the effects of heating on S-index value and soil physical characteristics are little. The main objective of this research is studying effect of water repellency on soil quality index.

MATERIALS AND METHODS:To determine the effect of water repellency on the soil quality index, organic soil were heated in a muffle furnace at 100, 200, 300, 400 and 500 °C for 30 minutes so that five treatments (T100, T200, T300, T400, T500) were obtained. Hydrophobicity was measured using water drop penetration time (WDPT) and molarity of ethanol (MED) methods. The parameters of van Genuchten equation were determined using of RETC software and S –index was obtained by Dexter's (2004) equation. Then the s-index parameter compared with some physical characteristics such as organic matter, bulk density and texture. Results were statistically analyzed using the SAS8 software **.**

RESULTS AND DISCUSSION :After heating the soil, samples were exposed to room temperatures, so were allowed to equilibrate to room temperature prior to test. Water repellency tests show that although unheated soil had low water repellency but T100, T200, T400 and T500 were hydrophilic. Heating at 300 °C caused severe water repellency and higher temperature (higher than 300) removed the water repellency completely. Hence samples heated at 400 and 500 were highly wettable (water drop penetration time, WDPT=0 s).The slope, S, of the water retention curve was calculated using the Dexter's (2004) equation. The results show that there was a significant difference among treatments. The soil Quality index in T300 was lower than other treatments. Among soils with approximately equal percent of sand (Ctrl, T100, T200, T300) Ctrl and T300 had low quality index (0.101 and 0.093). S- Index was higher in T400 and T500 than other treatments, this subjects was because of increasing sand percent in these treatments. The physical soil quality index was higher than 0.09, for all soils, which indicates a good physical quality of these soils. The correlation between S- index and other soil characteristics showed that there was significant correlation between S- index and temperature, sand, silt and bulk density in soils. Also S- index increased by increasing sand percent but decreased by increasing silt percent and bulk density. These results are not consistent with the Nourmahnad and Tabatabaei (2012), because of they obtained significant correlation between S- index and organic matter (by means of Data Stoof et al., 2010) but in this paper there is no correlate between them.

Keywords: Heating, Soil quality index and Soil water retention curve