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Surface Water Entry and Water Retention of Soil in Relation to Water Repellency in Ohiya *Eucalyptus* Forest

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Abstract

Vegetation can act as a regulatory factor in the movement of water in soil and the production of surface and subsurface runoff. Eucalyptus (*Eucalyptus grandis*) is an exotic species planted in Sri Lanka with the main objective of conserving and reorienting of the degraded lands. These forests are known to cause water repellent conditions in soils around the world. Water repellency limits spontaneous water entry into soil surfaces and affects the hydrologic balance of soils, consequently altering the soil hydraulic properties including surface. Still, the changes in soil hydraulic properties in relation to the effects of water repellency caused by these Eucalyptus forests are less explored, especially under Sri Lankan context. The objective of this study was to determine the surface water entry and water retention of soils in Ohiya Eucalyptus forests in relation to the soil water repellency. Soil samples were collected from 0-5 cm, 5-10 cm and 10-15 cm depths. Persistence of hydrophobicity was determined using Water Drop Penetration Time test (WDPT) both in the field and in the laboratory. The degree of water repellency was determined by the soil-water contact angles obtained from the sessile drop method with air-dried soils. The tested soil showed extreme hydrophobicity on the 0-5 cm, 5-10 cm and 10-15 cm depths showing WDPT higher than 3600 seconds for field estimation and air dried conditions. Soil water contact angle of the 0-5 cm depth soil was 120°. It was greater than 90° for both 5-10 cm and 10-15 cm soil depths. Water entry value for surface soil was 4 cm. This value was high compared with that of normal soils. Volumetric water content of the surface layer at 150 cm suction was <0.4 cm^3/cm^3. According to the results of this study, soil of Ohiya Euc alyptus forest was identified as extremely water repellent for field estimation and air dried soils. Considering the sloping nature of the terrain and the high value of water entry (4 cm) at air dried condition, severe surface runoff can be expected especially during dry season.

Keywords: *Contact angle, Eucalyptus, Water repellency, Water drop penetration time*

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