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Water repellency of soils in the lower Himalayan regions of India: impact of land use

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Although soils are generally considered to wet readily, some are actually water-repellent at the surface. This communication presents the recent progress in relating the severity of water repellency to different soil management practices and land uses under the lower Himalayan region of India. All soils under sal forest, chrysopogon and cropland had less water drop penetration time (<5 s) and therefore were classified as wettable. However soils under eucalyptus plantation and panicum stand showed considerable hydrophobicity. This is considered as being caused by differences in organic matter composition rather than amount of organic carbon. If planted indiscriminately and particularly where there is significant competition for land area, nutrients or water, notable problems can occur under the eucalyptus stand.

Keywords: Environmental implications, land use, soil hydrophobicity, soil infiltration rate, water repellency.

ALTHOUGH soils are generally considered to wet readily under rainfall or irrigation, some soils exhibit a reduced, or no affinity to water (water repellency) at the surface and within the root zone. This phenomenon occurs at low to moderate moisture content and has been reported from soils under a range of vegetation types and from many regions around the globe[1]. Water repellency in soils can have serious environmental implications, including reduced seed germination and plant growth as well as irrigation efficiency, accelerated soil erosion and enhanced leaching of agrochemicals through preferential flow[2–5]. Soils containing a large amount of hydrophobic materials (such as plant litter, residue and microbial by-products) may become water-repellent or less wettable[6,7]. These are generally thought to be present as a coating on soil particles or aggregates[8]. The accumulation of hydrophobic waxes on soil particles[9], humic and/or fulvic acid soil coatings[10] and other long-chained organic compounds on or between soil particles[11,12] are all accepted as factors contributing to this negative-impact phenomenon. Soil water repellency often leads to severe run-off and erosion, rapid leaching of surface-applied agrochemicals and loss of water and nutrient availability for crops. The degree of repellency and wettability is traditionally judged using the water-solid contact angle (γ). A solid is classified as being water-repellent if $\gamma > 90°$ and water wettable if

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