# Topsoil Water Repellence Increased Early Wheat Growth and Nutrition

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Soil water repellence, derived from the accumulation of hydrophobic organic compounds, is a constraint to crop and pasture production worldwide predominantly in sandy soils. Inhibited water infiltration, unstable wetting, and preferential flow are key hydrologic issues in water-repellent soil which adversely affect plant germination and establishment. However, despite the general understanding that soil water repellence can reduce soil nutrient bioavailability due to the prevalence of dry topsoil, the implications of water-repellent topsoil for plant growth and nutrition per se are unclear. A controlled glasshouse study was conducted to assess early growth and nutrition responses to severe topsoil water repellence in wheat (*Triticum aestivum* cv. Mace) over 51 days, under uniform plant density (15 plants per container), variable topsoil thickness (20 or 100 mm), and limited water supply (4.2 mm every two days). Wheat grown in severely repellent topsoil treatments with a wettable furrow had significantly greater tiller number per plant, dry matter, and total nutrient uptake compared to plants grown in completely wettable topsoil treatments, regardless of topsoil thickness. Preferential flow in the furrow of repellent topsoil treatments presumably increased soil water availability at depth, but did not cause leaching beyond treatment containers, resulting in conditions conducive to early wheat growth and nutrient uptake. By contrast, increased retention of water at the surface of completely wettable topsoil treatments likely decreased plant-available water due to a reduction in wetting depth and an increased rate of evaporative water loss. Increasing the thickness of wettable topsoil from 20 to 100 mm also significantly reduced wheat growth and nutrient uptake, but topsoil thickness was not important in repellent topsoil treatments. This suggests that preferential flow along a wettable furrow in water-repellent soil can be advantageous for early plant growth and nutrition by improving water capture and plant water uptake under a limited supply.