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# Using electric resistivity tomography in a small scale catchment to evaluate the effectiveness of surfactans in water repellent soils of Western Australia

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Water repellent soils (WRS) are a major limitation on crop production in the southwest of Western Australia, with losses estimated at $250 million per annum. The amelioration of WRS through surfactant application shows variable success in field trials. This study aims to determine the effectiveness of surfactants on surface runoff and infiltration on WRS in a new laboratory based approach.

The experiment used a physical, bench-scale catchment model (0.7 m x 0.7 m), where soils were arranged with a ridge and furrow shape similar to agricultural practices. It quantified irrigation, surface runoff, interflow and basal flow volumes. Electrical Resistivity Tomography (ERT) was used to measure the sub-surface electrical resistivity which is influenced by the amount of water in the soil. Three WRS from Western Australia were tested: very severely repellent (MED score 4.2 from South Stirling), moderate–severely repellent (MED score 2.4 from Badgingarra), and low repellence (MED score 1 from Dandaragan). Two different surfactants were compared to an untreated control, with application in furrow according to common agricultural practice at two replications and multiple wetting and drying cycles.

Using ERT data, 2D-volumetric water contents for each WRS and test run were calculated. Surfactant application increased water infiltration in moderate–severely repellent soils by up to 73%, concentrated within the furrows. Water content also increased below 20 mm depth, where seeds would be located, suggesting a successful amelioration strategy for water repellency in agriculture. Very severely WRS revealed a more concentrated flow where surfactant was applied and only a 33% increase in infiltration.

This physical catchment model in conjunction with hydrological and geophysical methods provides a useful tool to assess the effectiveness of surfactants to increase water infiltration into non-wetting soils. It is an inexpensive tool and could be used in future research before the most promising products are tested in expensive and extensive field trials.

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