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Modification of soil hydrological properties and crop productivity by surfactants

Stanley J. Kostka, Bryan G. Hopkins, Diane L. Rowland, and Birl Lowery

Abstract Text:

Hydrophobic soil organic matter reduces soil affinity to water and consequently affects an array of hydrological and geomorphological processes including infiltration, overland flow, accelerated soil erosion, uneven wetting, the development of preferential flow, and accelerated leaching of agrichemicals. These processes determine retention and movement of water and solutes in soil, therefore, are of great importance to irrigation efficiency, water conservation, and agricultural productivity. The impact of low levels of hydrophobicity on yield is only now being understood in high value agronomic crops. With global declines in water quality and quantity, the projected impacts of climate change, and the concurrent shift towards renewable energy development, the sustainability of future crop and biomass production requires the development of novel technologies to optimize the delivery and efficient use of water in the rootzone. Recently discovered synergistic co-formulations of alkyl polyglycoside and ethylene oxide-proplyene oxide (EO/PO) block copolymer surfactants have accelerated research in a diversity of soils, crops and climates on effects of surfactants on soil hydrological processes. Studies were conducted in a range of soils in the United States and Australia to determine if this surfactant technology could modify soil hydrological properties. Depending on the crop, treatments were applied as either spray applications or in irrigation water. Total seasonal surfactant applications did not exceed 10 L ha-1. Surfactant treatments resulted in increased infiltration, improved rootzone water reserves, reduced heterogeneity of rootzone water distribution, altered crop physiology, and significantly increased yield and quality in high value crops produced under deficit irrigation.

Impact Statement:

Soil treatment with co-formulations of alkyl polyglycoside and ethylene oxide-proplyene oxide (EO/PO) block copolymer surfactants has resulted in stattistically significant improvements to soil hydrological status and crop performance under deficit irrigation.