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Synergistic Surfactants to Enhance Hydrophilicity and Infiltration in Water Repellent Soils

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For more than 50 years, surfactants have been used to ameliorate soil water repellency in highly managed turfgrass. This is the first report of synergism between different surfactant chemistries for the enhancement of hydrophilicity in a water repellent soil. The report relates to the discovery that blends of alkyl polyglycoside (APG) surfactants and ethylene oxide-propylene oxide (EO/PO) block copolymer surfactants significantly enhanced aqueous composition infiltration through the matrices of water repellent soil over that obtained with either the APG or the EO/PO block copolymer surfactants alone. The objectives of this study were: 1) to compare selected APG surfactants and EO/PO block copolymer surfactants to blends of APG and EO/PO block copolymer surfactants in order to describe combinations that synergistically enhanced hydrophilicity in water repellent soils, and 2) to compare infiltration performance of a commercial turf formulation of APG–EO/PO block copolymer surfactants to other penetrant surfactant products in this market. When EO/PO block copolymer surfactants were blended in a 1:1 weight ratio with the APG surfactant, enhanced infiltration was observed, particularly at surfactant dilutions below 2000 mg L^{-1}. Enhanced infiltration by APG-EO/PO block copolymer blends was also achieved with APG or the EO/PO block copolymer surfactants that had limited soil wetting characteristics. Synergistic interactions are a unique property associated with APG-EO/PO block copolymer blends, and could be produced by blends where one or both components when used alone had limited effects on hydrophilicity. Comparison of commercially available surfactant formulations used to improve infiltration of irrigation water to an APG–EO/PO copolymer blend demonstrated that the blend was more effective than the commercial products tested. Enhanced infiltration in water repellent soils by dilute aqueous surfactant solutions can be of critical importance in reducing overland flow, increasing infiltration and achieving maximum agronomic and/or hydrological

benefit when used in conjunction with irrigation.