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Modifying soil water status and improving stand establishment in a water repellent soil using surfactant coated seed.

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Surfactant seed coating (SSC) is a technology being developed cooperatively by scientists at the USDA, Agricultural Research Service and Aquatrols to improve stand establishment in water repellent soils, particularly under arid conditions. Early SSC studies have demonstrated that surfactant coatings can dramatically increase soil water content, turfgrass density, cover, and biomass for Kentucky bluegrass, tall fescue and perennial ryegrass sown in water repellent soils under greenhouse conditions. However, in these studies, surfactant loads were excessive ($\geq$ 40 wt% of seed mass).

The objective of the current study was to ascertain if a lower surfactant treatment level (10 wt%) would improve emergence and stand establishment in a severely water repellent sandy soil under field conditions.

Research was conducted on a golf course near Utrecht, NL. At the time of planting water drop penetration time (WDPT) of the soil was approximately 300 s, indicating severe water repellency. Chewings fescue (Festuca rubra subsp. commutata) seed was treated with ASET-4001 surfactant at a loading rate of 10 wt% using two different proprietary coating procedures (US Patent Application 20100267554). The two different ASET-4001 coatings were compared against untreated seed in a randomized complete block design with four replicates. In order to maximize abiotic stresses, the only applied water came from rainfall. Assessments of stand establishment were made every 7-14 days for three months using a subjective visual assessment of percent grass cover and sward quality based on a 1-10 scale (where 10 is best). At six months post-sowing, 20 mm x 300 mm soil cores were randomly removed from each plot and soil wetting front depth measured.

Improved emergence of the surfactant coated seeds over the untreated seeds began to appear 7 days after sowing. However, there were no differences between the two SSC treatments. Establishment was influenced by weather conditions. From mid-June to early July, ratings were similar between all treatments. However, with the onset of warmer more stressful growing conditions in mid-July, stand establishment ratings for the SSC treatments were higher than for the untreated control. From 16 July to 18 August, stand establishment ratings for the SSC treatments were between 9.1 and 9.8. In the untreated control plots, 16 July ratings were at 7.1 and dropped precipitously to 5.3 by 18 August. The visual differences between treatments suggested that rootzone water may be greater in the SSC treatments. Mean wetting front depths in cores collected from the SSC plots were at minimum 2x greater than untreated controls (200 mm vs 100 mm) confirming that SSC resulted in greater rootzone water distribution. SSC improved emergence and stand establishment of Chewings fescue and modified the soil wetting pattern in severely water repellent sand for at least six months. SSC may provide a sustainable strategy to improve turfgrass establishment under water stress conditions or when irrigation is limited.