

Water Management with Soil Surfactants

By Michael Johnson • Precision Laboratories, Inc.

In the past, turf managers used wetting agents primarily to address turf wilt from localized dry spots (LDS) and/or hydrophobic soils. As technologies have improved, however, the use of soil surfactants has provided broader benefits. Surfactants are now evolving with new chemistries for specific uses. The question is no longer whether or not to use a surfactant but rather which surfactant to choose for a particular use.

Selecting a surfactant for your golf course depends greatly upon the specific conditions and outcomes you require. What may work wonderfully at one course may provide little benefit at another. When considering surfactants, ask yourself the following: What are the desired objectives of

your water management program? Are you applying those objectives to greens, tees and fairways or the entire area? Do you desire firm/fast playing conditions that maximize agronomic benefit, conserving one of our most precious resources?

SOIL SURFACTANT BASICS

Soil surfactants differ in many ways. For example, their molecular weight, chain length and solubility can vary widely. The specific construction of the hydrophobic (water-hating) and hydrophilic (water-loving) ends of the soil-surfactant molecule have a direct determination on what happens to the molecule in water and in the soil. They also affect the volume of water that is retained and/or released in the soil.

A research trial at Clemson University was initiated to determine any differences in soil water content when the surfactant was the only variable. In this study Dr. Jim Camberato took soil columns from a five-year-old TifEagle green, separated them into 1 inch increments and repacked them to eliminate any differences in water channeling from column to column. Each column (treated and untreated) was irrigated on top of a gravel layer, simulating USGA construction drainage, then weighed. After both air and oven drying, the columns were reweighed. The differences in pre and post drying weights were assumed to be water. Moreover, additional samples

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were obtained to show the differences in volumetric/gravimetric soil water content at different depths within the same columns.

In this study clear differences were seen in soil water content both in volume and depth. Surfactants act in different ways in varying growing conditions, making proper selection important in achieving optimum results. A turf manager's choice of surfactant would vary significantly in this study based on where he wanted to maximize agronomic and playability benefits. A key issue to consider in proper soil-surfactant selection is what happens to soil solution.

Another study was conducted at Clemson University with multiple soil surfactants on TifEagle in the summer of 2006 to demonstrate visual differences in LDS and turf quality under consistent irrigation regimes. Four treatments were present in this experiment: Magnus (4 oz./1,000 ft), Revolution (6 oz./1,000 ft), Duplex (20 oz./acre) and Cascade Plus (8 oz./1,000 ft). The Magnus and Revolution plots were clearly a higher turf quality at the end of the summer with stressed roots, where Cascade Plus and Duplex were drier. These results could be changed simply by modifying the irrigation practices (timing, volume). These plots were allowed to dry down with equal irrigation simply to see differences between surfactants which visually were significant.

SURFACTANT USE

Maximizing uniform infiltration and distribution of water into and throughout the turfgrass-soil environment are of highest priority to any turfgrass manager. This also includes retention of water in the root zone long enough to be used. Changes in pore space significantly affect water management, especially with today's newer turfgrass varieties and management practices. While cultural practices such as core aeration are outstanding for removing and/or diluting thatch

restrictions, they often create channeling soil solution (also known as "preferential flow patterns"). Soil surfactants can help prevent this preference of water into only aeration holes. These products won't change or modify soil structure in any way. Practically speaking, they reduce surface tension, making water beads small enough to penetrate micro pores and thus enhancing water and gas exchange. Superintendents in the Carolinas have referred to these products as "liquid aeration."

Nothing goes anywhere without water. By using a product solely to decrease LDS or to increase visual quality and reduce wilt, the soil will imbibe water very quickly where it was once dry, brown and water repellent. However, this improvement may only be a shallow phenomenon. A turf manager may inadvertently inhibit the penetration of water (soil solution) into lower depths of the soil profile, which may ultimately reduce efficacy of certain products or practices.

Several factors must be considered in determining which soil surfactant you should use in your turf management program: the turfgrass species and its rooting depth, your soil profile's infiltration rate, the quality/quantity of your irrigation and discharge water, microclimates, thatch and black layer, disease pressure, pesticide/fertilizer efficacy and playability. Consider what you are using and where you want it to be in the soil profile for maximum efficacy. You may need to change the soil surfactants you use during the year to compensate for changes in these factors. Adaptive management is an important part of any water management program. Consistency in playing conditions and agronomic maximums can be achieved only by changing your water management to contend with variations in turfgrass and climatic conditions.

In the surfactant world, just as in the agrochemical world, there are no silver bullets. A single product cannot do everything, which is why the concepts of synergism and antagonism exist in this field. Maximize your time,

money and investment by taking the time to assess your application objectives, conditions and obstacles. Then do your homework to select the proper soil surfactant. This may involve selecting a few different products to conduct your own trial. In the end, you will benefit by having better turf at a lower cost, with more reliability and predictability. ●

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CORRECTION

In the January-February 2007 issue of *Through the Green* we neglected to recognize Tim Cunningham, CGCS (Coosa Country Club) as GGCSA's Golf Committee Chairman. We apologize for the oversight.

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