

Water management: using soil surfactants

WE POSED THE FOLLOWING QUESTIONS to Mica McMillan, the senior research agronomist for Aquatrols:

SportsTurf: What soil conditions most often lead to the need for using surfactants?

McMillan: The primary soil condition that leads to the need for using soil surfactants is less than ideal wetting of the thatch layer and/or soil. Soil surfactants, also known as soil wetting agents, are typically used to avoid or alleviate soil water repellency and/or reduce the surface tension water—in both cases to make sure that water effectively and uniformly infiltrates and disperses in the rootzone.

Water repellency in thatch or soil reduces infiltration rates and causes non-uniform soil wetting. It is caused by hydrophobic coatings which interfere with the ability for thatch and soil to accept and evenly distribute

water (and spray solutions). Even low levels of water repellency can lead to waste of water and increased need for irrigation.

Soil water repellency occurs in all soil types but is most prevalent in sandy soils due to the small surface area (compared to a clay soil) which more rapidly becomes affected by the coatings. Sandy soils also experience numerous wet to dry cycles, which are a factor in the occurrence and severity of soil water repellency. Numerous other factors also contribute to soil water repellency including fungal pathogens, root exudates, organic matter, organic coatings on soil particles, etc.

Soil water repellency is exhibited all over the world, under most climates and under many different cultural practices such as agriculture, golf courses, bowling greens, parks, forests, sand dunes, etc. So it's no surprise that it is a factor in the maintenance of sports turf as well.

Turf managers are encouraged to check the soil wettability by collecting numerous soil moisture readings with a hand held moisture sensor. If your soil is wetting well, the readings should be similar. If there is a lot of variation, a simple test for water repellency can be used. (Water Drop Penetration Time (WDPT) test information below). Unless it's ideal (instantaneous and very uniform) then including soil surfactants in your turf management program can be a good way to ensure that you are using your water efficiently.

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ST: How should a turf manager choose a product when using surfactants as part of a **soil applied** herbicide program? When might he know he should include surfactants in a program?

McMillan: If a turf manager is having problems with water movement on the turf/soil surface and into the root zone, i.e., slow water infiltration, runoff, percolation, groundwater contamination, minor drainage, poor water distribution, it is an indication that water repellency may be present and a soil surfactant could help address these issues. Soil surfactants lower the surface tension of water (influencing the cohesive forces) and, depending on the formulation, improve the wettability of soils (influencing adhesive forces). This allows water molecules to spread outward and more easily move into and through the soil. Since surfactants increase the uniformity of distribution of water, any material applied with that water and surfactant will also be uniformly distributed optimizing the efficacy of products such as fertilizers, soil applied herbicides and pesticides. Before tank mixing soil surfactants with any product, perform a jar test to confirm products are compatible.

It's important to not confuse soil surfactants with foliar adjuvants or stickers, which are formulated to enhance activity of foliar applied herbicides, fertilizers or pesticides. Many different types of surfactants or wetting agents are available just be sure to use the right one for your purpose.

ST: Any recommendations or general guidelines concerning what type of surfactants to use in specific situations?

Water Drop Penetration Time (WDPT) test

MATERIALS NEEDED: soil corer, tray, eyedropper, watch with 2nd hand/timer, paper and pen/pencil.

1. Following a dry period, pull some cores from the areas with variable soil moisture readings and lay them on a tray. If the weather is wet – pull the cores and let them dry in-tact at room temperature for several days.
2. Mark paper as follows: thatch/mat, 0 (soil surface), 0.5, 1, 1.5, 2, 2.5, etc.
3. With cores on their sides and beginning at the turf end of the core, place drops of water on the core at the thatch/mat area, soil surface and at 0.5 inch intervals along the core. Record how long it takes (from 0 to 60+ seconds) for the drop to fully disappear.

Anything above 0 seconds indicates some level of water repellency.

More information can be found in "Soil Science: Step-by-Step Field Analysis" published by the Soil Science Society of America, pgs 97-112.

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McMillan: There are numerous soil surfactants on the market today. Certain chemistries are better wetters—helping to restore wettability to water repellent thatch and soil; some are better at helping water to infiltrate more effectively. Know what your needs are when purchasing one, and be a wise buyer.

- Do you need a surfactant to alleviate soil water repellency symptoms curatively or preventatively? Then make sure you choose a wetting agent type of soil surfactant which is designed to do what you need.

- Do you need a surfactant primarily to reduce surface runoff? Then a penetrant type soil surfactant is what you need.

- Do you need a surfactant to maximize benefits of fertilizers or pesticides? Select a product where there is evidence of effectiveness for that use.

- Another question is how the surfactant will be applied. Sprayer or injected – or dry? Different kinds of formulations exist to fit your needs – and it is important to use the formulation designed for your use.

- Some surfactants can be phytotoxic, particularly older chemistries. So make sure phytotoxicity testing has been done on your turfgrass type.

Bottom line, know what you need and ask questions to make sure you get it. Work with distributors that have a good knowledge of the surfactant chemistries they are selling and make sure that there is university research to support claims.

The timing of your turf management program can also be a factor.

ST: Is how much to use always related to square feet being covered or is there any other factor?

McMillan: As with all turf management products, label rates should always be used when applying soil surfactant materials. These are the rates that have been found to be effective via extensive testing to perform as marketed. Because the severity of the water management problem you are addressing can vary, the type and rate of soil surfactant can also vary. The timing of your turf management program can also be a factor. So in addition to square feet being covered being a factor, the depth and severity of the water distribution problem and how long you need a treatment to last are also factors in soil surfactant selection and rate recommendation.

ST: Do you recommend any specific type or brand of sprayer equipment that is better to use when employing surfactants?

McMillan: I do not recommend any particular sprayer or brand for surfactant use. However, I do recommend that when purchasing a surfactant, be clear on how it will be applied. Some surfactants can be very viscous so should not be applied via injection into the irrigation system. If the soil surfactant is to be applied through spray application, remember that the target is not only the surface, but also into the soil, so use a nozzle and water volume that is suited to soil applied materials. ■