



## WETTING AGENT INFLUENCES ON WATER INFILTRATION AND RETENTION IN SAND PUTTING GREENS

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### INTRODUCTION

Wetting agents have long been employed on golf courses. Yet, when a reader inquired in the July 2004 issue of *Golf Course Management* about reports on comparative studies of these products, the answer was amazing. Apparently, there are no comprehensive studies comparing the effectiveness of the most commonly used wetting agents. Fortunately, such a study is now underway and the results will be published in 2005.

We decided that in the meantime, we would conduct a study on simulated greens to get an idea of just how much wetting agents vary in their effectiveness. The primary focus was on water infiltration rates. We also rationalized that if one of the modes of action of wetting agents is to reduce water surface tension, then there should also be a reduction in the force of attraction between water molecules and solid surfaces. The end result might then be a reduction in the amount of water retained in the root zone of sand putting greens. This, then, became the secondary objective of our study.

### METHODS

Fifteen simulated putting greens were constructed in 16-inch lengths of 6-inch diameter plastic sewer pipe. One end of each pipe was enclosed with a grate covered with hardware cloth and a 2-inch layer of pea gravel. A commercial 85/15 (v/v) sand-sphagnum peat was then packed into each pipe such as to provide a 12-inch root zone with a target bulk density of 1.54 g/cm<sup>3</sup>.

The greens were then saturated

with water, followed by four wet-dry cycles that would hopefully bring soluble organic compounds to the surface via capillary action, coat the sand grains, and create hydrophobic conditions. Failing to achieve this result, humic acid was extracted from soil and applied to the greens. After another three wet-dry cycles, the surface sand particles were obviously coated with organic compounds and were slightly hydrophobic.

Initial rates of infiltration of 1-inch of water were measured, the greens allowed to drain for 24 hours, and the volume of drainage water measured. This process was repeated after a single 6 oz/M application of the products identified in Table 1. We then made three more applications of each product, conducted the infiltration measurements, and collected the drainage water. The quantity of water added vs. that collected provided a measure of how much of the added water was retained by the greens.

### RESULTS AND DISCUSSION

With a single application, only Premier significantly increased water infiltration rates as compared to the untreated putting green (Table 1). The single application of Aquaduct actually appeared to reduce infiltration. Thus, the products tested varied greatly in the impacts of their single applications on water infiltration rates.

Even with four applications, only Premier and Raiz-Mor significantly increased water infiltration (Table 1). The fact that Raiz-Mor had such a favorable effect on water infiltration is of considerable interest because this product is

currently being sold only for use on field crops as a surfactant/wetting agent and as a stimulator of soil microbial activity.

Our rationalization that wetting agents have the potential of reducing water retention in putting greens was validated. Single applications of the wetting agents reduced water retention by 3.4 to 6.3% as compared to the untreated putting green (Table 2). This raised concerns about the impact of multiple applications. Fortunately, there was no evidence that four applications reduced water retention much more than single applications. In the case of one wetting agent, Pervade, the opposite effect seemed to occur. Four applications of this product actually slightly increased water retention.

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Table 1. Wetting agent influences on changes in infiltration rates as compared to the untreated control.

Wetting agent	Change in infiltration rate	
	One application	Four applications
	----- inches/hour -----	
Premier	+2.20	+10.04
Pervade	+0.03	+ 1.52
Aquaduct	-2.47	+ 2.25
Raiz-Mor	-1.28	+ 5.88
LSD (p=0.05)	1.42	3.10

Table 2. Wetting agent influences on changes in water retained by putting greens after 24 hours of drainage.

Wetting agent	Change in water retention	
	One application	Four applications
	----- % of water added -----	
Premier	-6.3	-5.4
Pervade	-6.3	+0.4
Aquaduct	-3.4	-4.8
Raiz-Mor	-4.5	-1.3
LSD (p=0.05)	0.2	0.2

**SUMMARY**

The results of this study by no means provide the basis for selection of a wetting agent. We were not successful in creating pronounced hydrophobic conditions prior to application of the wetting agents and the simulated putting greens had no turfgrass growing on them. Hence, there was no organic matter accumulation near the tops of the greens, which is now believed to be a common cause of low infiltration rates.

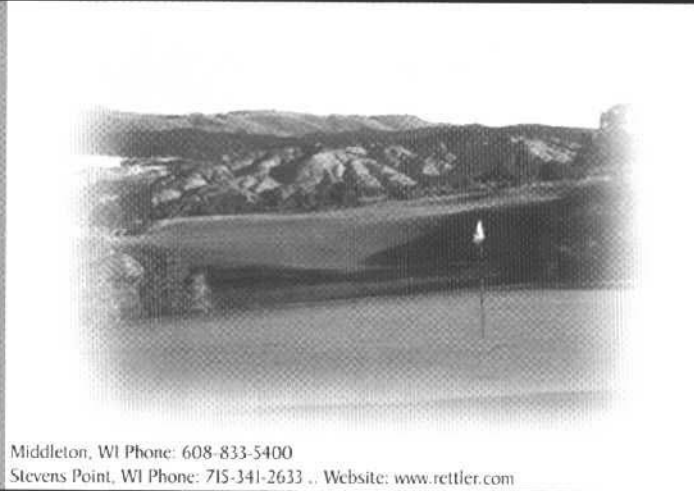
Our study does indicate that there are large differences in the effectiveness of wetting agents and that some reduction in water retention should be expected. In other words, wetting agents simultaneously have the potential of rendering drouthy putting greens even more drouthy, but improving drainage in slow-draining greens.

Despite the care used in construction of the putting greens, we encountered large variability in water infiltration rates. For example, among the three replicates of the control greens that had no wetting agent applied, infiltration rates ranged from 3.8 to 5.9 inches per hour, a variation of 55%. Applications of the wetting agents did not reduce this variability. What this implies is that it is unrealistic to expect that a given wetting agent will be equally effective across a number of putting greens with the same construction or, for that matter, in all areas of a single putting green.

*Editor's Note: Pat Gallagher is an August 2004 graduate of the Turf & Grounds Management Program. He is seeking employment that capitalizes on his background in business, the enjoyment he derives from interacting with people, and the organizational and management skills he developed during his years of employment in the restaurant industry.*

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