

# RESEARCH

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## Questions about the wetting agent evaluation

The results of the wetting agent evaluation are in. What do they mean for the average superintendent?

Keith J. Karnok, Ph.D.

During the 2003 and 2004 growing seasons, GCSAA and the USGA Green Section sponsored a wetting agent evaluation. Details of the evaluation can be found in the April 2005 *GCM* (p. 52-91), in this issue and on the Internet at [www.gcsaa.org/gcm/2005/april05/Default.asp](http://www.gcsaa.org/gcm/2005/april05/Default.asp) and [www.eifg.org](http://www.eifg.org). Ten wetting agents were evaluated at nine test sites. Over the past several weeks, numerous questions have been asked about the study and how the data should be interpreted or used. This article will briefly address the questions that have been asked most often.

**QUESTION:** Why was this evaluation carried out?

**ANSWER:** The study was conducted in response to superintendents' desire for side-by-side comparisons of products not normally evaluated by universities. Wetting agents were chosen because they have become a standard

tool for superintendents, and few comparative data are available.

Wetting agents have increased in use over the past several years, as indicated by the number being marketed today as compared to 25 years ago. The Buyers Guide in the December 1979 issue of *Grounds Maintenance* listed four wetting agent companies. In 2005, I identified 27 companies that offer 75 wetting agents labeled for turfgrass use. Over the past few years, I have surveyed superintendents attending my various GCSAA seminars. Of the more than 1,000 superintendents surveyed, 87% have said that they use wetting agents as a part of their regular turf management program, and 98% say that they "do use or have used a wetting agent under certain circumstances."

Without a doubt, wetting agents have become an important tool for golf course superintendents. With so many to choose from, the most common question is, "Which one is best?" The wetting agent evaluation did

not attempt to answer that question, but it did compare 10 commonly used wetting agents on a regional basis to give superintendents a better understanding of the range in performance.

**QUESTION:** Why were the wetting agents only tested for controlling localized dry spot (LDS)? Wetting agents have other uses, too.

**ANSWER:** Wetting agents are used for a variety of reasons on the golf course. For example, many superintendents use them for water management, either helping to move water to deeper soil depths, or in some cases, to retain water in the surface. Others use wetting agents to get a more-uniform wetting of the soil profile. There are a host of other reasons superintendents use wetting agents. However, surveys show that superintendents use wetting agents primarily to control localized dry spots caused by water-repellent soil.

**QUESTION:** Why weren't the results from all the testing locations averaged together to come up with the overall best product?

**ANSWER:** The objective of the study was to determine wetting agent performance in distinctly different regions of the country because certain wetting agents might perform better in certain situations than others. These differences would be lost if the results from different regions were simply averaged together.

There were huge differences among testing locations, and these differences can affect wetting agent performance. Consider that the age of the testing sites ranged from 13 years to less than 4 years. Also, three different species of grass were used (creeping bentgrass, bermudagrass, and annual bluegrass), including six different cultivars of creeping bentgrass. Thatch and/or mat thickness ranged

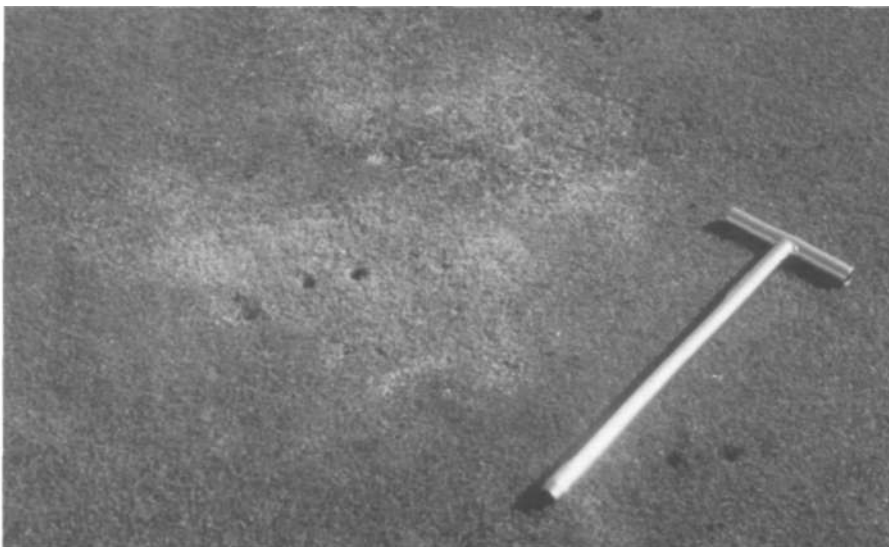


Figure 1. Wetting agents are primarily used to manage localized dry spot caused by water-repellent soil.

from 0.75 to 0.125 inch and soil organic matter ranged from 3.04% to 0.29%. One location had more than 16 inches of rain in one month, while another had no rain during the same month and less than 16 inches of rain during the entire study. Some locations averaged summer temperatures in the 90s, whereas others rarely broke into the 80s. One can only guess at the range in humidity among the locations. Five locations had minimal soil water repellency during the course of the study, and four others had significant levels. This shows how variable soil hydrophobicity can be.

Obviously, anyone can simply average data from all the testing locations together if an overall big picture is desired. The caution here is that important details will be missed. It should be noted that some of the products tested varied in performance among the testing sites. Each superintendent should carefully consider the data from his or her region.

**QUESTION:** Why does the control turf (no wetting agent applied) seem to have the highest quality ratings? Does this suggest that superintendents could have better-quality grass if wetting agents were not used?

**ANSWER:** In the Georgia report, we tried to explain why quality ratings for the control plots were so high. Research shows that water-repellent soils have a critical moisture point. If soil moisture is kept above this point, the soil will not show signs of water repellency and there will be no LDS. When moisture content falls below this point, the soil will begin to repel water, and LDS will become apparent if the turf isn't irrigated soon. This critical moisture point varies among soils.

In this study, most locations did not allow the soil to drop below the critical moisture point for periods long enough for the development of LDS. This may have been due to irrigation scheduling and/or above-normal rainfall. On most golf courses today, keeping a green above the critical moisture point at all times is unlikely. The requirement for firm and fast playing surfaces won't allow it. That's the value of using a wetting agent. Re-wetting a water-repellent soil that has dropped below its critical moisture point (a common occurrence on most golf greens) would be very difficult without the use of a wetting agent.

Is the quality information presented in the article invalid or of little use? Quite the con-



**Figure 2.** In the wetting agent evaluation test plots at Michigan State, L-93 creeping bentgrass showed the effects of the wetting agent treatments and localized dry spot.

trary. The quality data most likely represent the stress the wetting agent put on the turfgrass rather than the effects of water-repellent soil. This is important information to know.

**QUESTION:** What do the water-droplet-penetration times (WDPT) really mean?

**ANSWER:** These numbers are simply a gauge that allows one to determine whether the soil is water-repellent and its relative degree of water repellency. Soil water repellency fluctuates seasonally. It tends to be highest by the end of summer and fall and lowest in late winter and early spring. It also decreases in severity with soil depth. Most water repellency occurs in the top 2 inches of the soil.

A water-repellent soil as indicated by WDPT does not guarantee that LDS will be a problem. Because LDS is a symptom of turfgrass stress, a soil can be quite water-repellent but little LDS will be apparent. Likewise, a soil that is less water-repellent may show extensive LDS. The presence or absence of LDS depends on the other types of stress the turfgrass experiences. Less soil water repellency will cause LDS if the turf is in a high-traffic area or on a south-facing slope, or if it suffers from compaction, excessive thatch,

poor irrigation coverage, a shallow root system, etc. Likewise, turfgrass can withstand considerably more soil water repellency if none or only a few of these stress factors are present. Therefore, WDPT is simply an indicator of a potential problem. The test is an effective way to measure a wetting agent's performance in terms of temporarily reducing the level of soil water repellency.

**QUESTION:** University professors have told me to accept only information that has been statistically analyzed. I noticed that at some locations the control had very low WDPT to begin with. Are the different letters after the WDPT values still important?

**ANSWER:** It's always advisable to ask for statistical verification of all data presented to the superintendent. Does a statistical difference always represent a true biological difference? In this case, some of the locations had very low WDPT for the control, but there were still significant differences among products and how they compared to the control. In this study, a WDPT of 0-5 seconds indicated no water repellency, and 5-60 seconds indicated slight water repellency.

Can soil having "slight" water repellency cause LDS? As indicated in the above Q&A,

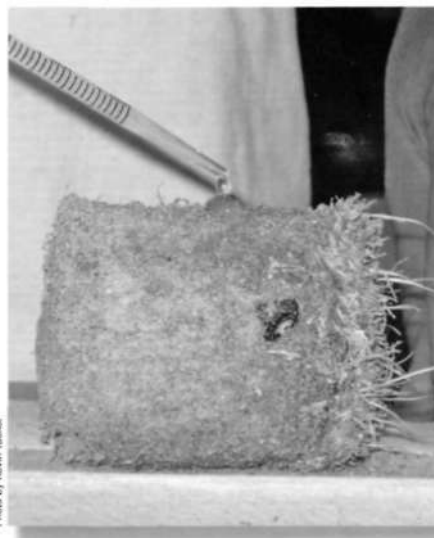
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it depends on the level of other stresses the turf may be experiencing. Under little stress, a soil having a WDPT of less than 60 seconds probably isn't going to induce LDS, and a wetting agent may not even be necessary. However, it is possible that if the turfgrass is experiencing other types of stresses, a 60-second WDPT may push the plant to the point of exhibiting LDS. Statistical differences among the wetting agents were reported at the lower end of the WDPT scale (less than 30 seconds). When differences among wetting agents in this range are significant, the differences are probably not biologically significant in terms of reducing soil water repellency. However, a wetting agent may still be needed, or other characteristics of the wetting agent may be important (formulations, phytotoxicity, cost, etc.).

One important point should be raised here. The reason for using wetting agents is not only for relieving or preventing LDS. Research has shown that where soil is water-repellent, wetting agents will facilitate more-uniform wetting of the soil. More-uniform wetting results in water savings and more-uniform growth of the turfgrass plant, especially the root system.

**QUESTION:** The two testing locations closest to me reported little advantage to using a wetting agent. Turf quality and soil water repellency were both low for the control. Therefore, why should I use a wetting agent? We are a low-budget course.

**ANSWER:** Every golf course and, for that matter, every green or other area prone to soil



**Figure 3.** Water-droplet-penetration times were determined by placing small droplets of water every centimeter along the surface of the soil core.

water repellency is unique. Many variables (environmental and cultural) can affect the occurrence of water-repellent soil and the performance of a wetting agent. Each golf course, green or other area with water-repellent soil should be considered individually. The data from a particular testing site do not guarantee the product will perform in the same manner under all cultural and environmental conditions in that region. The study only indicates what a superintendent might expect in a particular region.

## Summary

The GCSAA-USGA wetting agent evaluation has provided much-needed information

about wetting agents, not only the products evaluated in the study, but wetting agents in general. The study showed that there are similarities and definite differences among the products tested, and it certainly helps explain why a wetting agent might perform one way under one set of conditions and another way under different conditions. The reader is encouraged to study the information closely and examine the uniqueness of his or her own turf situation. Of course, whenever possible, do your own testing. This is the superintendent's safest and surest way of increasing the chances for selecting the right product for the right situation.

## References

1. Carrow, R.N. 1989. Understanding wetting agents. *Golf Course Management* 57(6):18-26.
2. Kamok, K., and M. Beall. 1995. Localized dry spots caused by hydrophobic soil: What have we learned? *Golf Course Management* 63(8):57-59.
3. Kamok, K.J., E.J. Rowland and K.H. Tan. 1993. High pH treatments and the alleviation of soil hydrophobicity on golf greens. *Agronomy Journal* 85:983-986.
4. Kamok, K.J., and K.A. Tucker. 1999. Dry spots return with summer. *Golf Course Management* 67(5):A9-52.
5. Kamok, K.J., and K.A. Tucker. 2000. FAQ about LDS. *Golf Course Management* 68(6):75-78.
6. Kamok, K.J., and K.A. Tucker. 2001. Fight localized dry spots through the roots. *Golf Course Management* 69(7):58-60.
7. Kamok, K.J., and K.A. Tucker. 2001. Effects of flutolanil fungicide and Primer wetting agent on water repellent soil. *HortTechnology* 11 (3):437-440.
8. Kamok, K., and K. Tucker. 2002. Water-repellent soils, Part I. Where are we now? *Golf Course Management* 70(6):59-62.
9. Kamok, K., and K. Tucker. 2002. Water-repellent soils, Part II. More questions and answers. *Golf Course Management* 70(7):A9-52.
10. Kamok, K.J., and K.A. Tucker. 2003. Turfgrass stress, water-repellent soils and LDS. *Golf Course Management/JF71(6):97-98.*
11. Kamok, K. J., and K.A. Tucker. 2004. Wetting agents: What are they, and how do they work? *Golf Course Management* 72(6):M-86.
12. Kamok, K. J., and K.A. Tucker. 2005. GCSAA-USGA wetting agent evaluation: Georgia. *Golf Course Management* 73(4):70-7A.
13. Throssell, C. 2005. GCSAA-USGA wetting agent evaluation: Update. *Golf Course Management* 73(8):7-1-83.
14. Throssell, C, et al. 2005. GCSAA-USGA wetting agent evaluation. *Golf Course Management* 73(4):52-91.
15. Tucker, K.A, K.J. Kamok, D.E. Radcliffe, G. Landry Jr., R.W. Roncadori and K.H. Tan. 1990. Localized dry spots as caused by hydrophobic sand on bentgrass greens. *Agronomy Journal* 82:549-555.
16. Wilkinson, J.F., and R.H. Miller. 1978. Investigation and treatment of localized dry spots on sand golf greens. *Agronomy Journal* 70:299-304.

Keith J. Kamok, Ph.D. ([kkamok@uga.edu](mailto:kkamok@uga.edu)), is a professor of turfgrass science at the University of Georgia, Athens. He will be an instructor at GCSAA's 2006 education conference at GIS in New Orleans.

## THE RESEARCH

says

- > **Wetting agents are** regularly used by 87% of the superintendents surveyed; 98% indicated they have used or do use wetting agents occasionally.
- > **Although wetting agents** are used for a variety of reasons, the primary use is for control of localized dry spots (LDS) caused by water-repellent soil.
- > **Wetting agents allow** a water-repellent soil to readily re-wet even when moisture content falls below the critical moisture point.
- > **Water-droplet-penetration** times (WDPT) are only one indicator of wetting agent performance. Phytotoxicity is another important consideration.
- > **Soils having a low WDPT** (less water repellency) may show LDS before a comparable soil having a higher WDPT (more water repellency).
- > **Statistical differences among** wetting agents at very low WDPT (less than 30 seconds) probably are not biologically significant from each other.
- > **Superintendents should carefully** consider the data from the region nearest them and from surrounding regions.