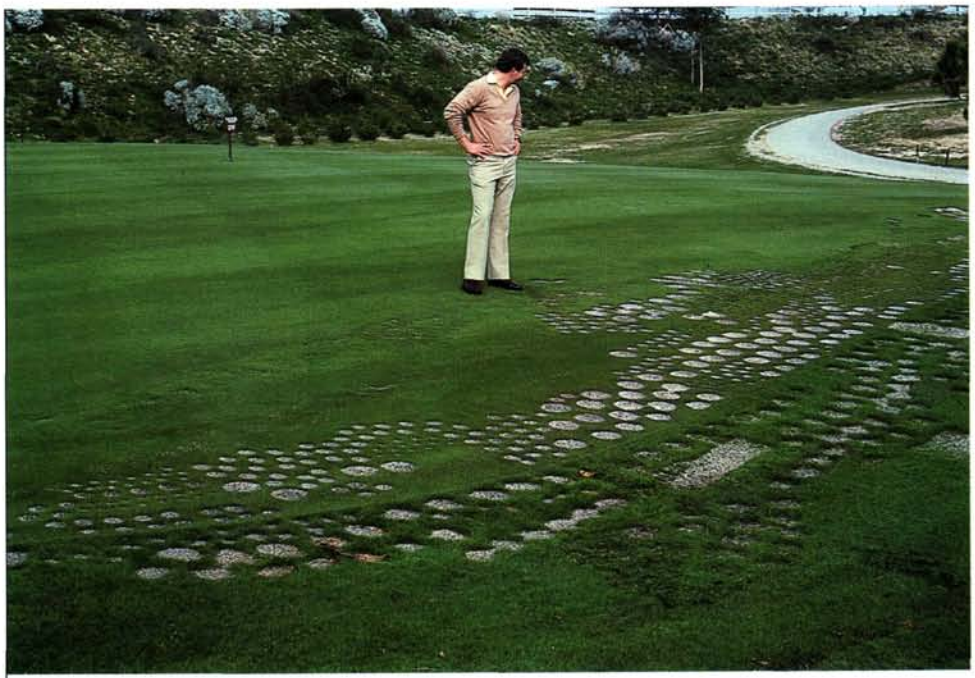
Research *You Can Use*

Oxygenator Solutions for Bentgrass Putting Greens

Maybe soil oxygenator sprays can help your bentgrass putting greens. Or maybe not.

BY BETH GUERTAL



Try products on your nursery area before applying them to the entire golf course.

It's hot, it's humid, and your bentgrass putting greens are in trouble. All the typical management tools have been called into use: fans, syringing, and any other technique you can think of to create air movement and cool the putting green surface. Perhaps you are considering some amendments, a growth-enhancing agent, a bioproduct, or a material designed to increase the oxygen content in the underlying greens mix. Of course, many new growth-promoting additives don't have a long history of use, and it might be difficult to determine if you are really seeing a result from their application. The purpose of this article is to report on the results we saw from a two-year study in which we applied a commercial oxygenator spray to bentgrass putting greens.

The study was conducted in 2000 and 2001 at two locations: the Auburn University Turfgrass Research Unit (TGRU) and Auburn Links (AU Links), a local golf course. Bentgrass at the TGRU was a two-year-old stand of "Crenshaw" growing in a loamy sand push-up putting green, while bentgrass at AU Links was a 10-year-old stand of "Penncross" growing in a USGA-type sand/peat mix. Treatments were:

1) Commercial oxygenator (Comm) spray applied once per week.

2) Comm applied twice a month.

3) Comm applied once a month.

4) hydrogen peroxide (HP) applied once a week.

5) hydrogen peroxide applied twice a month.

6) hydrogen peroxide applied once a month.

7) an untreated control.

The commercial spray, which was ethaneperoxoic acid, was mixed with their recommended stabilizing agent and applied at a rate of 32 oz. product per acre in a 50 GPA spray volume. Because ethaneperoxoic acid is related to hydrogen peroxide, comparable hydrogen peroxide treatments were included in the study. The hydrogen peroxide was purchased at a local drugstore and also applied at 32 oz. per acre. Treatments were applied with a CO_2-powered backpack sprayer and were watered in after application.

Plots at both locations were 5 × 5 feet in size, and there were four replications of each treatment. Collected data included turf color and quality, root length density or dry weight of roots, and soil oxygen diffusion rate. The experiments were conducted from May to September of each year, with the oxygenator treatments applied only during that time.

Soil oxygen diffusion rates were collected by inserting platinum-tipped electrodes into the soil at a 1-inch

depth. There were ten of these electrodes, and when coupled with a silver chloride reference electrode, the resulting equilibrium electrical current was a measure of the capability of the soil to supply oxygen to a plant root. What was measured was the oxygen diffusion rate (ODR), with results reported in ug/cm^2/min.

RESULTS — 2000

Table 1 illustrates differences in oxygen diffusion for the treatments that received weekly spray applications of the commercial product or the drugstore hydrogen peroxide. On August 15th data were collected one hour after spray treatments were applied. The remaining data were collected one day (24 hours) after the treatments were applied. All of this data was collected at the TGRU location.

At this one location in one year of the study, addition of any oxygenator compound did not increase the soil oxygen diffusion rate. Of course, this is only one location and one year of data collection, and these data were collected only at one day (or one hour) after treatments were applied. It could be that results would be observed over a longer period of time, or that this method of oxygen measurement would be missing differences in soil oxygen content.

To determine if the applied products increased bentgrass performance, root length was selected as a variable that could be measured. At the TGRU, samples were collected once a month, washed free of all soil, stained red with Congo red dye, and scanned under a light-scanning table to measure root length density. At AU Links samples were also collected monthly, but they were washed and only dry weight obtained. Table 2 illustrates differences in root length density or weight as affected by treatment. Because there were rarely differences in root length as affected by the number of applications (one, two, or four times a month), the data shown are averaged over the number of applications, and just the means for the different products are shown.

Testing products on your golf course can be as easy as placing a piece of plywood on the back of a green before spraying.

At these two locations, application of any oxygenator treatment did not increase bentgrass root length density or root dry weight. The only significant effect was found on the 26th of September, when plots receiving the hydrogen peroxide treatment had a lower root length density than those that were untreated.

RESULTS — 2001

In the second year of the study there was only one time that application of an oxygenator treatment affected root length density. This was on the 3rd of July at the TGRU, when plots treated with the commercial oxygenator product had a greater root length density than bentgrass roots from plots sprayed with hydrogen peroxide. There was not a significant difference from the untreated control, however.

In 2001 oxygen diffusion rates were recorded one hour after spray treatments were applied (Table 4). Again, because there was no significant effect due to the

Table 1

Oxygen diffusion rates in a native-soil bentgrass putting green (1 inch depth) as affected by weekly oxygenator sprays, TGRU location, 2000.

	Date				
	28 July	15 Aug.	29 Aug.	13 Sept.	20 Sept.
Treatment	ug $O_2/cm^2/min.$				
Commercial	0.33 a*	0.77 a	0.64 a	0.45 a	0.59 a
Hydrogen Peroxide	0.28 a	0.74 a	0.68 a	0.47 a	0.51 a
Untreated	0.39 a	0.73 a	0.69 a	0.64 a	0.53 a

**Within each sampling date, means followed by the same letter are not significantly different from each other at $\alpha = 0.05$.*

Table 2

Effect of oxygenator source on root length density or dry root weight of creeping bentgrass, TGRU and AU Links, 2000.

	TGRU			AU Links	
	25 July	29 Aug.	26 Sept.	15 Aug.	12 Sept.
Treatment	m length			g	
Commercial	14.7 a*	31.0 a	30.5 ab	0.49 a	0.15 a
Hydrogen Peroxide	14.5 a	31.2 a	25.7 b	0.83 a	0.10 a
Untreated	13.5 a	32.0 a	32.3 a	0.36 a	0.11 a

**Within each column, means followed by the same letter are not significantly different from each other at $\alpha = 0.05$.*

Table 3

Effect of oxygenator source on root length density or dry root weight of creeping bentgrass, TGRU and AU Links, 2001.

	TGRU			AU Links		
	3 July	31 July	28 Aug.	3 July	31 July	28 Aug.
Treatment	m length			g		
Commercial	24.6 a*	12.7 a	20.5 a	0.37 a	0.18 a	0.14 a
Hydrogen Peroxide	18.3 b	14.6 a	21.0 a	0.25 a	0.17 a	0.18 a
Untreated	23.5 ab	12.7 a	17.1 a	0.25 a	0.19 a	0.10 a

**Within each column, means followed by the same letter are not significantly different from each other at $\alpha = 0.05$.*

Table 4

Oxygen diffusion rates in a native-soil bentgrass putting green (1 inch depth) as affected by weekly oxygenator sprays, TGRU location, 2001.

	Date	
	3 July	7 Aug.
Treatment	ug $O_2/cm^2/min.$	
Commercial	0.37 a*	0.45 a
Hydrogen Peroxide	0.42 a	0.46 a
Untreated	0.34 a	0.48 a

**Within each sampling date, means followed by the same letter are not significantly different from each other at $\alpha = 0.05$.*

number of spray applications, results were averaged over one, two, or four sprays per month. The two times measurements were recorded in 2001 revealed that there were no significant differences in the soil oxygen diffusion rate due to oxygenator treatments.

CONCLUSIONS

In our limited study (only two years at two locations), we did not see a beneficial effect from applying soil oxygenator sprays to bentgrass putting greens. In this study we tried to measure the impact of the oxygenator sprays by measuring soil oxygen, root growth, and visual quality. Although the data are not presented in this article, we never saw any difference in turf quality or color due to the oxygen sprays.

Does this mean that the products are worthless, or that you may never see a positive effect? No. The long-term, wide-range impact of a product should never be judged on the basis of a somewhat small-scale study such as this one. It may be that the product affects other measures of bentgrass survival, such as shoot density or carbohydrate storage. However, results such as these presented here are a first clue that the product should be evaluated on a test basis or that you might want to ask your sales representative for additional research data.

Should you buy enough product to spray every green on your course? Again, no. Test any new product on a small area such as a practice green or nursery green. Always leave an untreated area as a control. You can't tell if a product is working if you do not have an untreated area as a comparison. The simplest method for making a control plot is the plywood test. Lay a piece of plywood down on the green, spray the material as directed, and remove the plywood. The area under the plywood that was not sprayed is your control.

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