

across the state although most lawmakers thought weather forecasting was unlikely.

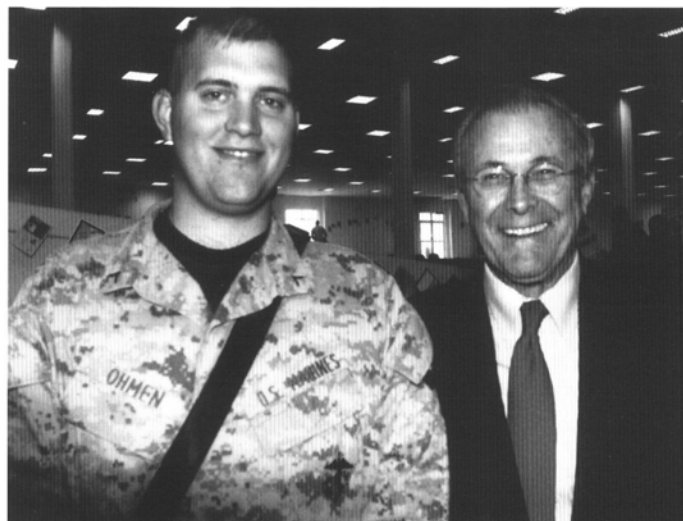
Lapham quickly realized that if enough people telegraphed weather information from enough sites, scientists had a chance to map weather patterns as various fronts moved across the country. He knew only the Federal government could manage a nationwide project like he envisioned.

That conclusion led him to draft legislation that was introduced in the U.S. House of Representatives by Milwaukee Representative Halbert Paine. The resolution was passed and signed into law on February 9, 1870. It established a nationwide system of observatories within the U.S. Army Signal Corps. Military personnel were used to make weather observations and the Corps hired Increase Lapham as the nation's first meteorologist. Their first goal was to predict storms on the Great Lakes.

Of course, you can guess the rest of the story. The small agency in the Army Signal Corps evolved into the National Weather Service we know today.

And it was all because of Wisconsin's Increase Lapham.

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Despite the fact that there is significant opposition to the war in Iraq, the soldiers involved in that conflict are being welcomed home with open arms and high praise. Such wasn't the case for the GI's of my generation who were also involved in an unpopular conflict. So we are thrilled with society's renewed respect for soldiers and veterans.

I am lucky to have a staff member who recently completed a four-year stint in the Marine Corps and is a veteran of duty in Iraq. Lance Corporal Chris Ohmen was stationed with the 2nd Battalion of the 2nd Marine Regiment in the 2nd Marine Division near Fallujah, Iraq. He bumped up against the big boss - Secretary of Defense Donald Rumsfeld — during one of the Secretary's trips to the Middle East to visit with the troops. I'm glad someone was there to snap a picture of Chris and Secretary Rumsfeld — no one would ever believe it otherwise!

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Congratulations to WGCSA's Gene Haas; his formidable contributions to golf were recognized by the Golf Course Owners of Wisconsin at their July meeting in Sheboygan Falls at the Bull at Pinehurst Farms. Gene was presented with their Lifetime Achievement Award. As we know, no one could be more deserving than the author of *Caring for the Green*.

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Cooler days (and cooler nights), football games, pumpkins and gourds and cornstalks, fall festivals and a thousand other seasonal things make autumn in Wisconsin the best time of the year. Soak it all in and give yourself the chance to return some normality to your life. ♻️

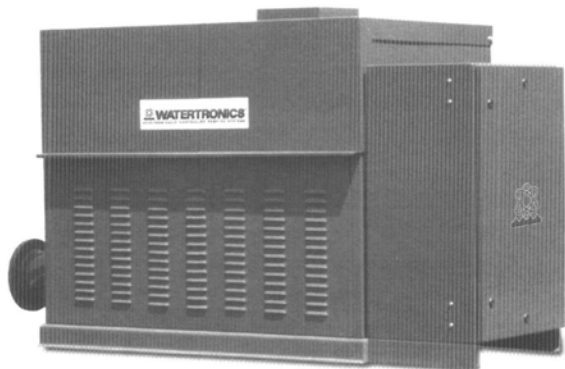
163 Yard Par 3 eighth hole at the Refuge Golf Club in Oak Grove, Minnesota.

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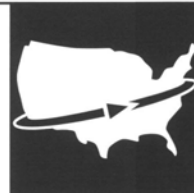
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Horizontal Centrifugal

Ways Golf Courses Deal With Bad News



By Patrick O'Brien and Chris Hartwiger, USGA Green Section, Southeast Region

Editor's Note: Good golf course reading abounds across the country, and some of the best comes from 1.) the USGA Green Section Agronomists, and 2.) the CAROLINAS Green, official publication of the Carolinas Golf Course Superintendents Association. We are offer both in this excellent article from the September/October 2005 issue on a subject that is still a worry one year later. Thanks to my friend Chuck Borman, executive directors of the Carolinas Golf Course Superintendents Association for permission to share this advice with you. And thanks to Bob Vavrek's colleagues for the same kind of sound thinking that we get from him.

The staff of GOLF WEEK reported in an article in the July 23, 2005 issue that according to a new report released by the Sporting Goods Manufacturers Association International, "the number of American golfers declined six percent in 2004 and now is smaller than the U.S. golf population in 1987." Also reported was a statistic from the National Golf Foundation that "the number of care golfers, defined as people 18 and older who play eight or more rounds of golf annually, dropped 4.7 percent to 12.8 million in 2004."

These statistics are sobering for those in the golf business. The supply of golfers is shrinking yet throughout the country the supply of golf courses is flat or increasing slightly. Of course, these statistics only confirm what keen observers have noticed for the last few years. Golf courses, whether they are private, daily fee, or resort, have been placed in a position where they must battle to attract and retain golfers. Their economics lives depend on it.

Generally, golf courses we see in the Southeast are dealing with this difficult economic environment in one of three ways. The first group is the "Cost Cutters." These golf courses focus up the middle, carefully maintain costs, and try to provide an enjoyable golf experience for those who play the course. The clientele of these golf courses commonly is golfers seeking value.

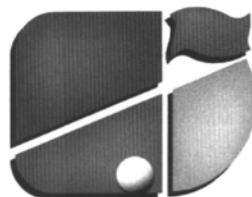
The second group of courses falls into what we call the "Gee Whiz Group." Typically, these are higher end courses that are using emerging trends or technologies to enhance golfer enjoyment. An example might be the use of a new species of turfgrass on the fairways that has a much different look than bermudagrass. Others are using turfgrass varieties on the tees that are used traditionally on putting greens. A few clubs are importing bunker sand from across the country. The goal of these improvements is to create a "Wow" or a

"Gee whiz" effect. Golfer comments such as "Gee whiz, I've never seen tees mowed so short" or "Wow, that is the most beautiful fairway grass I've ever seen" are common when these upgrades are made.

Some may believe that making cosmetic upgrades to a golf course during a recessionary time in the industry is foolish, but there is a method to the madness. These clubs are seeking ways to separate themselves from their competition and market themselves. It has never been more difficult to attract new golfers. Golf courses that want to increase their market share are using the "Gee whiz" effect and based upon results observed, they have been successful in impressing not only new golfers, but existing ones, too.

The final group of courses is the "Procrastinators." Lack of money and lack of consensus on the product to be produced hold these golf courses back. This group is the least likely to gain market share based upon their actions. These courses cling to the hope that the industry will begin to grow again because a rising tide floats all boats.

The message is clear. Now is a fantastic time to be a golfer. It is a buyers' market. Golf courses are entrenched in a battle to gain market share and keep their businesses viable. We cannot predict the future, but be certain that there will be clear winners and losers. Cost cutting may turn into quality cutting, "Gee whiz" may turn into "Uh oh," and procrastination may lead to dissatisfaction. In the meantime, courses are advised to take the competitiveness of this market seriously and develop a plan for attracting and retaining golfers. Work the plan and hope for the best. No one knows which strategy will prevail in the end, but market forces will provide us all with the answer. ♣



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How Phosphonate Fungicides Affect Bentgrass Stress

By Lane Tredway, Lee Butler and Brad Franklin, Department of Plant Pathology, North Carolina State University

Editor's Note: Now that Dr. Geunhwa Jung has moved to the University of Massachusetts/Amherst, we are asking plant pathologists from across the country to pinch hit for him until the UW - Madison fills his position. Frankly, seldom does a day go by that I don't think about Dr. Jung and all the excellent work he did for us.

Phosphonates are still a hot topic of discussion around the country, and this excellent article appeared in the July/August 2006 issue of CAROLINAS Green and appears here with permission of Chuck Borman, executive director of the Carolinas GCSA.

The phosphonate fungicides are a group of products that contain phosphite (PO_3^{2-}) as the active ingredient. These products are very different from phosphate (PO_4^{3-}), which is applied to plants in various forms as a phosphorous fertilizer. In fact, the phosphite ion provides no nutritional benefit to plants whatsoever. Instead, this molecule has fungicidal activities against certain pathogens and also stimulates the plant's natural defense responses against disease.

The phosphonates have been available in the turf market since the early 80's, but first gained widespread attention in the mid-90's when Dr. Leon Lucas and co-workers at North Carolina State University demonstrated their beneficial effects on the summer stress tolerance of creeping bentgrass. In their studies, combinations of Aliette (fosetyl-Al) and Fore (mancozeb) significantly increased the quality of creeping bentgrass, even in the absence of true disease activity. The exact cause of this quality increase remains unknown, but physiological effects on the plant and control of secondary pathogens are likely involved.

NOT ALL PHOSPHONATES ARE CREATED EQUAL

Since the work by Dr. Lucas, several changes have occurred in the phosphonate group. First, the Aliette formulation of fosetyl-Al was modified to include a green pigment similar to that in Fore, giving rise to a new product call Signature. In addition, several new phosphonate fungicides have been released to the turf market. These products, such as Alude, Magellan, Magnum, Resyst, and Vital, contain potassium and/or ammonium salts of phosphate. Even though some of these products are advertised as 'generic' versions of Signature, they are very different in two respects

First, the new phosphonates contain the phosphite ion in a different form. In fosetyl-Al products, the

phosphite ion is bound within a complex molecule. After application, the molecule is broken down in the plant to release the phosphite ion. In contrast, phosphite salts contain the phosphite ion in solution and do not require processing by the plant.

The second difference is that Signature contains a high concentration of a green pigment, which is not present in the other phosphonate products. Independent research has shown that this pigment has beneficial effects on turfgrass health, which persists well after the 'painting' effect wears off. This pigment technology is now being referred to as 'StressGard' by patent-holder Bayer Environmental Science to emphasize its beneficial effects on turfgrass health.

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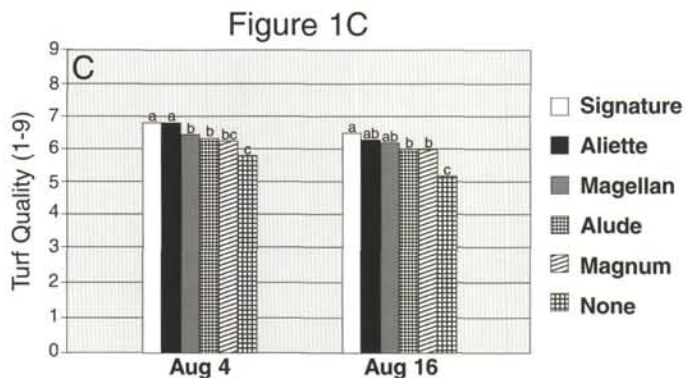
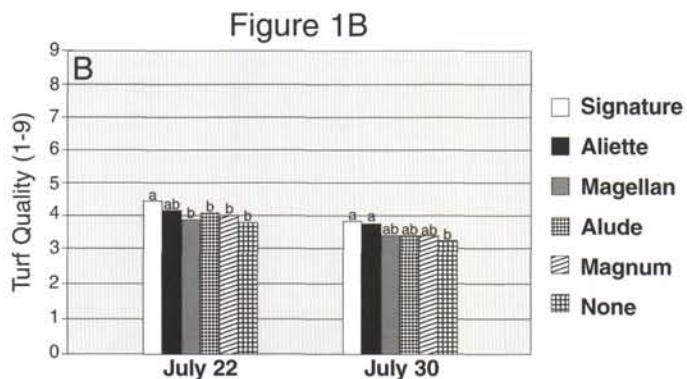
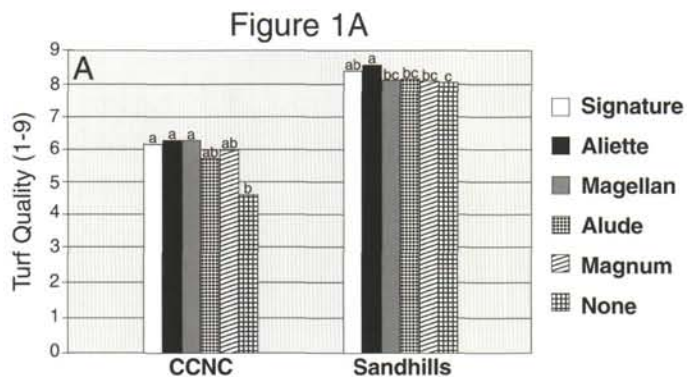


Figure 1. Impact of phosphonate fungicides on creeping bentgrass quality in: A) 2003 at CCNC and Sandhills Research Station; B) 2004 at the Sandhills Research Station; and C) 2005 at Lake Wheeler Turfgrass Field Laboratory. Data are averaged across all mixtures with contact fungicides. Bars containing the same letter are not significantly different according to the Waller Duncan k-ratio t-test.

Several questions arise from these changes in the phosphonate fungicides. Do the new phosphite salts provide the same turf quality benefits as fosetyl-Al? Does the green pigment play a significant role? Which fungicide serves as the best tank-mix partner with the phosphonates for summer management of creeping bentgrass? We initiated a research project at NC State University in 2003 to address these questions.

METHODS AND RESULTS

This research was conducted at the Country Club of North Carolina in Southern Pines, NC, on an A-1/A-4 blend (2003), the Sandhills Research Station in Jackson Springs, NC, on A-1 (2003 and 2004) and the Lake Wheeler Turfgrass Field Laboratory in Raleigh, NC, on Penncross (2005). In each year, treatments were applied on a 14-day interval from early June to late August using a CO₂-powered backpack sprayer. TeeJet 8004 nozzles were used to deliver two gallons of water per 1000 sq. ft. at 40 psi. Each plot was 3.33 x six feet in size and treatments were replicated four times.

Treatments included two fosetyl-Al products, Signature and Aliette, each applied at four oz/1000 sq.ft. and three phosphate salt products, Alude, Magellan, and Nutri-grow Magnum, each applied at six fl oz/1000 sq. ft. The phosphonates were applied along or tank-mixed with the contact fungicides Daconil Ultrex 82.5 WDG (3.2 oz/1000 sq.ft.) or Fore 80WP (four or eight oz/1000 sq.ft.).

The visual quality of each plot was rated 14 days after treatment, based on color, texture density, and uniformity using a scale of zero to nine (nine = best, five = acceptable). Data analysis indicated no statistical interaction among the phosphonates and contacts, meaning that these two types of fungicides behave independently. Therefore, data will represent an average across all tank-mixtures including that product.

RESULTS: PHOSPHONATE FUNGICIDES

At the CCNC location in 2003, the phosphonates did not affect bentgrass quality on June 19, July 1, or July 15. Significant differences were detected on July 29, after four applications of each treatment. On this date, Aliette, Signature, and Magellan significantly increased turfgrass quality as compared to the untreated control (Figure 1A).

At the Sandhills Research Station in 2003, benefits from phosphonate applications became evident more quickly, but no effects were observed later in the season. Aliette significantly increased turf quality ratings on June 19 and July 15, and Signature improved bentgrass quality on July 15 (Figure 1A).

In 2004 at the Sandhills location, the phosphonates again had no apparent effect early in the season, but certain products did increase turf quality in late July

after four applications of each treatment. Signature increased bentgrass quality on July 22, while both Signature and Aliette improved turf quality on July 30 (Figure 1B).

In 2005, this trial was conducted on Penncross at the Lake Wheeler Turfgrass Field Lab in Raleigh, NC. As in past years, the phosphonates impacted turf quality late in the season after several applications on 14-day intervals. On August 4, Aliette, Signature, Magellan, and Alude increased creeping bentgrass quality as compared to the untreated. On August 16, all phosphonates increased turf quality, but Signature was superior to Alude and Magnum (Figure 1C).

**RESULTS:
CONTACT FUNGICIDES**

Over the three years of this study, the contact fungicides chlorothalonil (Daconil Ultrex) and mancozeb (Fore) provided the greatest, most rapid, and most consistent increases in creeping bentgrass quality. Quality increases were typically evident after one or two applications of these materials on a 14-day interval, and the benefits persisted throughout the season. Daconil Ultrex (3.2 oz/1000 sq. ft.) and Fore (eight oz/1000 sq. ft.) produced the highest quality turf in general, while the four oz/1000 sq. ft. rate of Fore also increased quality as compared to the untreated control (Figure 2).

THE PHOSPHONATES AS FUNGICIDES

Is there a difference between fosetyl-Al and the phosphite salts from a disease control perspective? The research conducted to date indicates that there is not. For example, a trial conducted at Blowing Rock Country Club in 2005 showed that Signature (four oz/1000 sq. ft.) and Alude (six fl oz/1000 sq. ft.) provided excellent control of anthracnose foliar blight when applied alone or combined with Daconil Ultrex (3.2 oz/1000 sq. ft.) Other researchers have shown that fosetyl-Al and phosphite salts

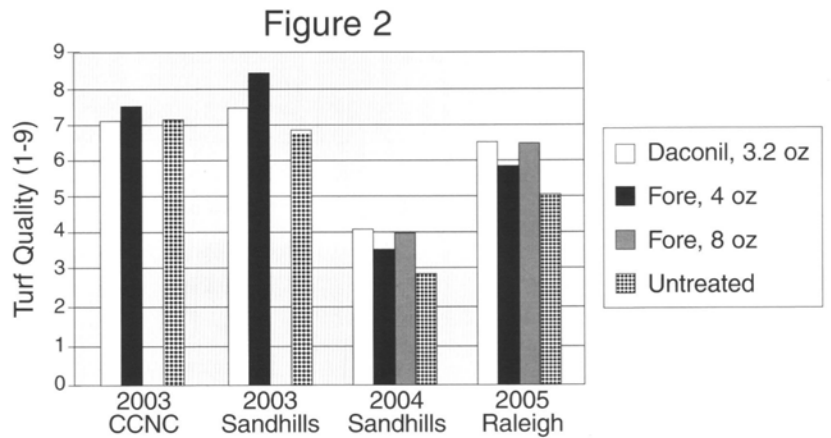


Figure 2. Impact of contact fungicides on creeping bentgrass quality. Data are averaged across all mixtures with phosphonate fungicides. Bars containing the same letter are not significantly different according to the Waller Duncan k-ratio t-test.

provide good control of Pythium foliar blight when applied preventatively. Because they work by enhancing the plant's resistance to disease, the phosphonates must be applied on a preventative basis for best results.

SUMMARY

This research has shown that the phosphonates and contact fungicides work to improve creeping bentgrass quality independently, indicating that they do not need to be tank-mixed to obtain their benefits. The contact fungicides chlorothalonil and mancozeb provide the greatest and most consistent increases in turf quality, likely due to suppression of algae and other secondary pathogens. The phosphonates provided smaller quality increases, typically late in the season during severe stress and after several applications.

Fosetyl-Al formulations increased creeping bentgrass quality in all three years of this study, and on a total of seven rating dates. In contrast, the phosphite salts only improved turf quality in 2003 (CCNC only) and 2005 and on a total of three rating dates. Although fosetyl-Al and phosphite salts provide similar levels of Pythium blight and anthracnose control, fosetyl-Al formulations provide greater and more consistent increases in creeping bentgrass stress tolerance. We did not observe a consistent benefit from the StressGard pigment contained within Signature, as compared to the Aliette formulation of fosetyl-Al. When developing a fungicide that includes the phosphonate fungicides, one should consider the desired effect of each application and select their products accordingly.

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