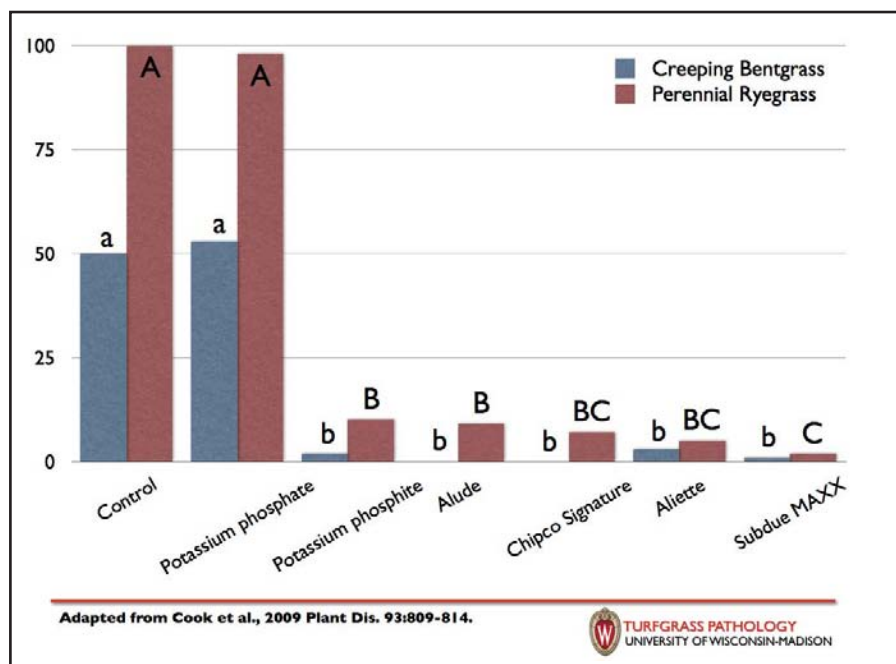


## A Review of Phosphite Products and Their Efficacy

By Dr. Jim Kerns, Department of Pathology, University of Wisconsin - Madison

Phosphite products have undoubtedly become extremely popular with golf course superintendents. It seems like every superintendent is applying a phosphite product of some kind or another. While phosphites do have their place and are effective, it is important to understand these products and their limitations. These products are composed of esters or salts of phosphorus acid and many have fosetyl-Al or potassium phosphite as active ingredients. Phosphite products are thought to have a dual mode of action that involves direct effects on the pathogen and indirect effects by stimulating plant defense responses (4). For an excellent review of phosphite products, I suggest reading 'Landscoot and Cook 2005. Sorting out the phosphonate products' published in *Golf Course Management* 73 (11), pgs 73-77 (3). Many studies have demonstrated the effectiveness of phosphite products, but few have conducted the experiments in a way to compare apples to apples. This article will review two studies that equally compared phosphite products in lab and field experiments.

A relatively recent paper published in *Plant Disease* by Cook et al., (2009) examined the efficacy of phosphonate fungicides (Alude, Chipco Signature, Aliette, and a two reagent grade solutions designed to yield potassium phosphite and potassium phosphate) on *Pythium* blight of perennial ryegrass and creeping bentgrass. The field experiments were conducted in a 'mist chamber' constructed over field plots. In conjunction with this study, the authors investigated the in vitro (in cultures) sensitivity of *Pythium aphanidermatum* (one of common the causal agents of *Pythium* blight in turf) to various concentrations of phosphorous acid and phosphoric acid. The sensitivity of the *Pythium aphanidermatum* isolates used in their field study ranged from 94.6 to 134.3 ppm, which seems quite high (1). Yet when the phospho-



**Figure 1. Suppression of *Pythium* blight on creeping bentgrass and perennial ryegrass in Pennsylvania. All treatments except for Subdue MAXX (applied at 1 fl oz/M) were applied at rates that supplied 8.56 lbs. of phosphoric acid/acre. This was based on the intermediate rate for Alude 7.4 fl oz/M. Bars with the same lower case letter (creeping bentgrass treatments only) are not significantly different. Bars with the same upper case letter (perennial ryegrass treatments only) are not significantly different. Data adapted from Cook et al., 2009. *Plant Dis.* 93:809-814.**

nate fungicides were applied at 8.56 lbs of phosphoric acid per acre (this equates to an intermediate rate of 7.4 fl oz/M), *Pythium* blight suppression was observed with each treatment. Suppression was equal to that observed with applications of Subdue MAXX applied a 1 fl oz/M (Figure 1) (1). The authors demonstrated that phosphoric acid does inhibit mycelial growth of various *Pythium* species including *Pythium aphanidermatum*, but more importantly that when applied at an intermediate rate can suppress *Pythium* blight development.

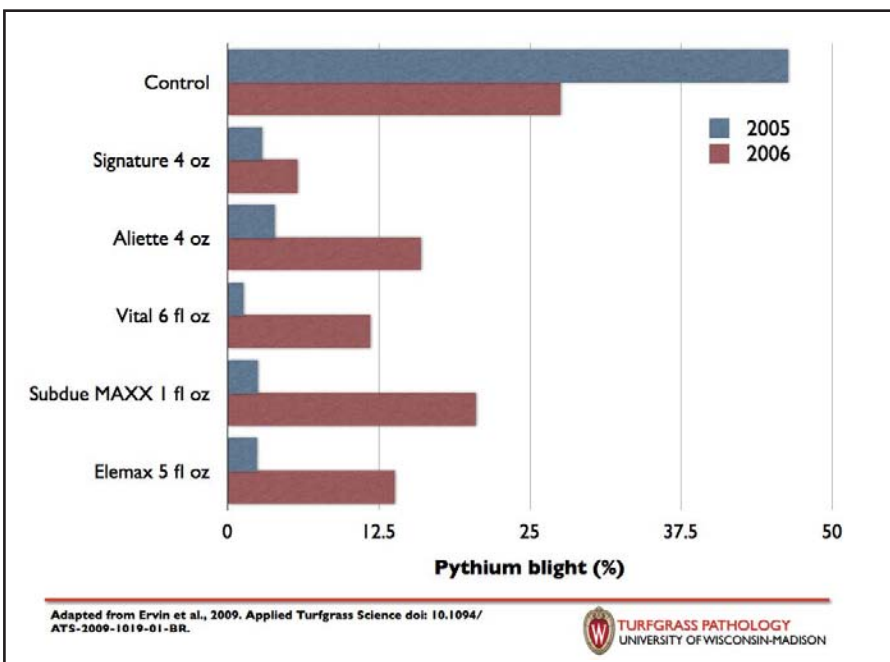
Another experiment conducted by Ervin et al. (2) followed up on the work conducted in Cook et al. (1), except without

the use of a mist chamber and inoculation. In their study, field plots were established on a perennial ryegrass fairway in Virginia and they did not inoculate the experimental area. However, Ervin et al. (2) also reported excellent suppression of *Pythium* blight with many phosphite products. In some cases the suppression was as good or better than a 1 fl oz rate of Subdue MAXX (Figure 2). However the authors observed considerable differences in efficacy across years (Figure 2). In their study, Signature performed the best in both years. In 2006, the other treatments did not perform as well, but still suppressed disease when compared to the non-treated control (2).

# WISCONSIN PATHOLOGY REPORT

What does this all mean for the practitioner? First, phosphite products are effective and can be a nice part of a disease management program. The problem is deciding a rate to apply them. It seems like the rate of 8.5 lbs of phosphoric acid per acre worked exceptionally well in the Cook et al. (1) experiment and would be the rate to consider if you are considering phosphite products for the first time or are looking to adjust your current program.

This is problematic because many of the products registered as fungicides have already determined rates that are effective. If you are using products that are not registered as fungicides through EPA, then you will have to calculate rates that provide the appropriate amount of phosphoric acid. In any case, the important number to know is how much phosphoric acid these products contain. Furthermore, the results from the Ervin et al. (2) demonstrate that results with any product, vary from year to year and one should not expect excellent results each year. In summary, the use of a phosphite product alone in some years may not be enough to prevent Pythium blight. These products are only effective if they are applied prior to disease development and are best used as part of a program. Applications of phosphites once Pythium blight develops typically does not help, once the disease has developed then the use of Subdue MAXX, Banol, Stellar, and Segway could be your best options.



**Figure 2. Pythium blight suppression using various phosphite products on a perennial ryegrass fairway in Virginia. Rates were applied for 1000 ft<sup>2</sup> and were applied 4 times every 14 days June through early August. Data shown is from the August 12 rating date for both 2005 and 2006. The experimental area was not inoculated. Data was adapted from Ervin et al., 2009. Applied Turfgrass Science doi: 10.1094/ATS-2009-1019-01-BR.**

## References:

1. Cook, P.J., Landschoot, P.J., and Schlossberg, M.J. 2009. Inhibition of Pythium spp. and suppression of Pythium blight of turfgrasses with phosphonate fungicides. Plant Dis. 93: 809-814.
2. Ervin, E.H., McCall, D.S., and Horvath, B.J. 2009. Efficacy of phosphite fungicides and fertilizers for control of Pythium blight on a perennial ryegrass fairway in Virginia. Online. Applied Turfgrass Science doi: 10.1094/ATS-2009-1019-01-BR.
3. Landschoot, P., and Cook, J. 2005. Sorting out the phosphonate products. Golf Course Manage. 73(11): 73-77.
4. Smillie, R.H., Grant, B.R., and Guest, D. 1989. The mode of action of phosphite: Evidence for both direct and indirect modes of action on three Phytophthora spp. in plants. Phytopathol. 79: 921-926.

**ARTHUR CLESEN INC.**  
arthurclesen.com

*Our reputation is spreading....*

Anderson, John.....630-669-0519  
Bartosh, Scott.....262-221-5524  
Hamilton, Dennis..608-295-2494