

# Resistance to Phosphite Fungicide

...But Not Yet in Turf

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There are a number of turf fungicides the activity of which is based on the phosphite (=phosphonate) ion (PO<sub>3</sub><sup>-</sup>). Chipco Signature fungicide (active ingredient fosetyl-Al) is the most common, and has become a "keystone" product for disease control programs on many golf courses across the country. This is in part because of the general enhancement in quality on stressed turfgrass that has been reported in some studies, including selected tests at the University of Kentucky. The product is also known to provide control of *Pythium* cottony blight in many circumstances, particularly when sequential applications are made. Other phosphite fungicides marketed for turf include Magellan, Resyst, Alude, Prodigy Signature and Vital.

These fungicides are unusual in that they control diseases in two very different ways. They do have some direct toxicity to the fungus, much like all conventional fungicides which somehow poison the target fungus. However, phosphite fungicides also enhance the plant's natural defense mechanisms, which is not true for conventional fungicides. Because these fungicides attack fungi on "multiple fronts," the general belief among plant pathologists has been that they are less subject to fungicide resistance than most other systemic fungicides, and in fact field experience has been consistent with this. Cases of failure of disease control by phosphite fungicides due to fungicide resistance have been rare.

## Recent Research

However, fungicide resistance is not an impossibility with this group of fungicides. This point was made clear in a recent paper on lettuce downy mildew (*Plant Disease*, Volume 88, pages 502-508). (Although lettuce downy mildew in California may seem to have no relevance to *Pythium* cottony blight of turf in Kentucky, there are significant biological similarities.)

In the paper, the authors reported about recent failures of fosetyl-Al to con-

trol lettuce downy mildew in commercial fields in the Salinas and Santa Maria Valleys. They conducted a series of experiments that show evidence of resistance to normal field rates of the fungicide. The "resistant" isolates obtained showed varying degrees of resistance, ranging from some that were still partially sensitive to normal field rates of the fungicide, to other isolates that were essentially insensitive at normal field rates. Their data, as well as another research report I have seen, suggest that isolates resistant to phosphite fungicides may be ecologically "fit." This means that, once resistance occurs, the fungal populations possibly will remain resistant even if fosetyl-Al and similar materials are not used for a period of time.

In the study, the authors noted two factors that may have been involved in the selection of resistance to phosphite fungicides:

- 1) Repeated use of fosetyl-Al (or similar fungicides) over the past decade.
- 2) Regular applications of fertilizers which provided phosphorous in the form of phosphite rather than the more common phosphate. This may have speeded selection towards resistance by exposing the pathogen population to frequent, low doses of phosphite.

## Significance to Turf

This report, and a few others in the scientific literature, indicate that field resist-

ance to phosphite fungicides is a definite possibility. Such resistance may take a period of years to develop at any particular site. How many years? There is no way to accurately predict this, because there are so many complex and interacting factors that influence this. However, I see this report as a reminder to remain aware of the possibility when using these fungicides.

This report of resistance does complicate disease management on golf courses somewhat. It is a common practice during the summer on many courses to spray putting greens every two weeks with Chipco Signature, tank-mixed with one of a number of other fungicides (usually iprodione or chlorothalonil). Such a program generally provides very good control of a number of important diseases, such as brown patch, dollar spot and *Pythium*. It also sometimes provides improved turf quality unrelated to these diseases when stressful conditions hit.

This research report serves as a yellow flag with respect to these spray programs. It would be wise for golf course superintendents to continue to find ways to rotate among fungicide products, and to not rely exclusively during summer on phosphite-based spray programs. Also, it may be wise to avoid frequent use of both phosphite-based fertilizers and phosphite-based fungicides on the same site.

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