

I. Now You See it, and Now You Don't - or - Options for Summer Disease Management

II. Summary of Turfgrass Entomology Conference, March 25-28, 1997, Columbus, OH

by Larry Stowell, Ph.D. and Wendy Gelernter, Ph.D.

Over the past year, you have been hearing that new products will be available for control of summer patch, anthracnose and fairy ring in 1997. So where are these magic cures? They are currently on the verge of registration, but are all held up in the California Department of Pesticide Regulation (DPR) system. Does this mean they will not be available this year? We hope not. Here is a short update:

Banner (propiconazole): Produced by Novartis, Banner is one of the best sterol synthesis inhibitor fungicides for early preventative control of summer patch and many other fungi during the cooler seasons. This product was "posted" for public comment some time ago but the DPR had a few questions which Novartis has responded to by providing additional data and information from experts around the country. When will it be available? Soon, we hope, but who can tell?

Prostar (flutolanil): AgrEvo has worked with PTRI over the past four years on developing fairy ring control strategies for bentgrass greens using Prostar. This product is due to be out of posting on

April 9th. Unfortunately, the Banner experience indicates that once a product enters posting, it does not necessarily come out of posting for full product sales in the prescribed 30 days. There have been no clear problems with this product but the label is a temporary one that will require submission of results from additional studies before a full label is granted. If all goes well Prostar should be available for sales in the next two weeks.

Heritage (azoxystrobin): This Zeneca product has broad spectrum activity, including very good control of summer patch on poa greens during the peak heat of the summer. Unfortunately, this product has not received a posting notice from DPR yet meaning that it is at least 30 days from registration (the posting requires 30 days). If the Heritage label posts this week, it will be too late for the first preventative application in a summer patch program which will probably go out in Southern California during the next 2 -3 weeks. Heritage is a safe and effective product that should have no problems becoming registered in California. We'll keep our fingers crossed.

Figure 1. Best case scenario: Banner and Heritage are both registered for summer patch and anthracnose control by April 15, 1997.

Product	oz/1000	April	May	June	July	August	September
Banner Maxx	2.0	■	■				
Heritage	0.4	■					

Figure 2. Summer patch and anthracnose control program if Banner is not registered in 1997, but Heritage is labeled by May 15. Rubigan at 1.5 oz/1000 sq ft can be substituted for Eagle.

Product	oz/1000	April	May	June	July	August	September
Eagle	0.6	■	■				
Heritage	0.4			■	■	■	■

Figure 3. Worst case scenario: Banner and Heritage both are not registered in time for the season for summer patch and anthracnose control.

Product	oz/1000	April	May	June	July	August	September
Eagle	0.6	■	■	■	■		
Cleary's 3336 or Fungo 50	8.0				■	■	■

The summer patch and anthracnose programs illustrated above are a starting point for developing your own program. The use of sterol inhibitor fungicides (Eagle, Banner, Bayleton, Rubigan) may have a negative impact upon turfgrass quality if the turf is not healthy - salt or heat stressed. This is especially true for the summer months. Always make sure the best cultural programs are followed. If your course does not have a summer patch disease problem, alternative programs for anthracnose control might include the use of contact fungicides, for example, Daconil 2787 F at low rates (3.0 oz/1000 sq ft) on a weekly interval starting two weeks prior to disease onset based on historical records. Alternatively, two weeks prior to an anticipated stress, such as a tournament, consider application of a preventative fungicide such as Heritage (if labeled) or two weekly applications of a contact fungicide such as Daconil 2787 F. Other contact fungicides also are labeled for control of anthracnose. Use products that you have had good experience with in the past. If you do not have records of which products are most effective at your site, BEGIN KEEPING DETAILED RECORDS OF THE PRODUCTS APPLIED, THE DISEASE OR OTHER PEST TARGETED AND THE RESPONSE. These records of product performance will provide the best decision making tool available - your course specific response to product applications.

News from the Heritage meeting in Baltimore

A Zeneca sponsored meeting in Baltimore from March 26 - 27 was well attended. Couch, Martin, Sanders, Stienstra, Vincelli, Vargas, Dernoeden, and of course Stowell (who's that?) all presented research results. Little surprising information was presented regarding the performance of Heritage with the exception of the report by Dernoeden that Heritage appears to work as well as or better than Prostar for control of brown patch (*Rhizoctonia*). Brown patch is the most costly disease of colonial bentgrass and perennial ryegrass fairways in the East. Heritage provided excellent control of brown patch for four weeks when applied at the 0.1 oz/1000 sq ft rate. When used at 0.2 and 0.4 oz/1000 sq ft, control extends beyond four weeks. These results challenge the use of Prostar as the best control product for brown patch in kikuyugrass fairways. Heritage and Prostar provide two effective options for control of brown patch in kikuyugrass fairways and poa and bentgrass greens.

The rumors that you may have heard that Heritage can, in some cases, increase dollar spot are true. Pete Dernoeden reported significant increase in

dollar spot in Heritage treated plots when compared to the non-treated and Cleary's 3336 treated plots. This is a minor problem for Southwestern golf courses but it can be a serious problem for the Eastern courses where brown patch and dollar spot occur at the same time on fairways.

Systemic action of Heritage is that of a localized penetrant with some systemic activity. The research on radioactively labeled Heritage that was presented at the meeting indicates that application of Heritage at the crown and thatch/root area will result in transport of the fungicide into the growing point and up the plant. Protection from root infecting fungi depends upon preventative application so that new roots will contain the fungicide. Most movement is upward. Application in high volumes (3-4 gal/1000 sq ft) is optimal to move the product to the crown-thatch area. From that point the product is distributed to all of the new roots and leaves that develop.

Microbial diversity of the soil was evaluated by Jim Frank, Zeneca. His research suggested that the number and diversity of microbes changes slightly following application of Heritage. After application there is a drop in the total fungal count and a spike in bacterial numbers that lasts for several days. The fungi were not eliminated and returned to normal levels following several days. Only total bacteria and fungi were evaluated. The fungi that survived are probably tolerant to the product at the rate applied. The increase in bacteria numbers probably represents the opening of ecological sites vacated by Heritage-sensitive fungi. There are some shifts in microbial populations as would be expected but other microbes quickly fill the voids left by fungi that are killed by the fungicide.

Azoxystrobin mode of action was described by researchers from Zeneca. Heritage works by blocking mitochondrial electron transport at cytochrome b. This site of attack by the fungicide is important for several reasons. First, it is a new site of attack for fungicides and second, there is some reason - although limited - to believe that development of resistance may be slow. because of this mode of action.

Cytochrome b is an enzyme that is common to all aerobic organisms. That includes the lowly fungus all the way up (or down depending upon your perspective of humanity) to us humans. This well studied enzyme helps move electrons from molecules called electron donors down an energy gradient to their final resting spot as a component of a molecule of water. In the process of moving

the electron from a high energy state to a lower energy state, several energy storing molecules are formed. These energy storing molecules, called ATP, are used throughout the cell to provide the power to drive chemical reactions. When the cytochrome b enzyme is blocked by azoxystrobin, the energy flow plugs up and cellular functions begin to stop due to lack of ATPs for driving reactions.

Interestingly, the structure of the cytochrome b molecule is what biologists call "conserved" across many species. Conservation of the structure suggests that even small changes in the enzyme result in a great expense to the organism. This is important when resistance occurs as a result of mutation and selection of resistant strains. Zeneca scientists speculate that fungi will be nearly unable to change the cytochrome b gene and still survive. Somehow, though, nature has a way of getting around scientific theories. Our guess is that the mode of action of Heritage will help reduce the speed of resistance development to this new compound but it will not prevent resistance from developing. Careful resistance management programs should be followed so that this product lasts for many years. If resistance shows up rapidly it will be our fault.

The resistance management strategy recommended by Zeneca requires that a fungicide with an alternative mode of action be applied after four sequential applications of Heritage for most diseases. **This means that the 0.2 oz Heritage/1000 sq ft rate applied every two weeks suggested by some researchers will not be feasible in California, because we will use up our 4 Heritage applications in the space of 6 weeks! Because our summer patch season lasts for so many months here, we want to be able to rely on Heritage for several months during the summer. For this reason, Heritage should be applied at 0.4 oz/1000 sq ft during the summer on a monthly (not shorter) interval to insure that the entire summer season (four applications in some areas) can be treated with Heritage without need for rotation until the fall.** By making your first two summer patch applications (April and May) with sterol inhibitors, as illustrated in the figures above, you are accomplishing two goals. First, you are "saving" Heritage for use in the hot part of the year when sterol inhibitors may cause damage to turf. In addition, you are following the Zeneca resistance management program by keeping to four applications of Heritage for summer patch control.

If you are applying Heritage for pythium control, the story is a bit different. In this case, you will have to rotate to either Subdue or Aliette after only two applications of Heritage to comply with the Zeneca resistance strategy that is printed on the Heritage label .

Summary of Turfgrass Entomology Conference, March 25 - 28, 1997, Columbus, OH. At this annual meeting of university, industry and private researchers, new research information on the biology and control of cutworms and grubs was reviewed including:

Host plant resistance to the black cutworm: Chris Williamson (University of Kentucky) and Jim Reinert (Texas A & M) reported that several varieties of turfgrass are highly susceptible to feeding by black cutworms including Pennlinks, Penneagle and Penncross bentgrasses, tall fescue and perennial rye. The presence of endophytic fungi (which have been shown in the past to cause resistance to fall armyworm larvae) in fescue or rye had no effect on cutworm control. Varieties that were resistant to feeding by black cutworms included bentgrasses G2 and G6, and Kentucky bluegrass. Kentucky bluegrass, in particular, was highly resistant to cutworms, with 100% of all larvae killed. These resistant varieties appear to produce chemicals that inhibit the molting process in cutworms, causing reduced feeding and ultimately death.

Other cutworm control options: Chlorpyrifos (Dursban), the most commonly used insecticide for control of cutworms, is coming under increasing scrutiny from the EPA. While there is no immediate threat that this product will be canceled, it behooves all of us to continue to gain experience with alternatives. Researchers report that effective products include beneficial nematodes (Savior) the newly registered pyrethroid insecticide, cyfluthrin (Tempo), acephate (Orthene) and trichlorfon (Dylox or Proxol). While sales of Proxol will probably be discontinued by the manufacturer, AgrEvo, sales of Dylox will continue in the turf market, according to Bayer. Finally, a completely new class of insecticide based on the active ingredient spinosad (Conserve) will be registered by DowElanco in late 1997. This new material, like the fungicide Heritage, is the by-product of a microbial fermentation, and has an extremely low toxicity profile. It is apparently quite active against cutworms, armyworms and sod webworms, killing them upon ingestion by attacking the insect nervous system.

Black turfgrass ataenius: We have been interested for some time in being able to predict where black

turfgrass *ataenius* (BTA) are most likely to occur, since this information would make it easier for us to develop appropriate management strategies BEFORE serious problems occur. Researchers Nikki Rothwell and Dave Smitley at Michigan State University have attacked this question by studying the impact of various turf conditions on the incidence of BTA grubs. They have so far determined that the depth of thatch, the presence of *poa annua*, the presence of Kentucky bluegrass or the presence of excessive moisture had no effect on the numbers of BTA grubs present. Rothwell and Smitley will continue their work this year, and we'll keep you updated on their progress.

Noises in the soil: Our efforts to detect several different grub sounds (moving, feeding and distress) with a high sensitivity acoustic device (i.e., microphone) this summer and reported to you in 1996, were recently written up in the March, 1997 issue of *Golf Course Management*. Researcher Mike Klein (USDA, Ohio) reported at the conference that he has recorded similar "clicking" sounds to those we detected for masked chafer grubs that were under stress (you see, we weren't delusional after all!) Several researchers will be testing the same microphone in their trials this season in hopes of gaining more information on the utility of this tool.

**PACE Consulting
1267 Diamond Street
San Diego, CA 92109**