I've Never Seen THAT Before!

Sclerotium rolfsii Blight On Golf Greens

by **TOM UNRUH**, Golf Course Superintendent,
Del Paso Country Club, Sacramento, California

and **DR. ZAMIR K. PUNJA**,
University of California, Davis, California

Figure 1

MOST GOLF course superintendents have at some time seen unusual spotting or discolorations on their greens, problems which may not always be easy to diagnose, even with the help of color photographs available in our literature. With luck and a little time, these unusual markings may develop into something recognizable; better yet, they could go away. But what if they get worse, much worse? At the Del Paso Country Club, in Sacramento, California, that is exactly what happened on the greens, starting in the summer of 1977.

A few small, irregular, yellowish rings appeared in June of that year (Figure 1). The rings neither expanded nor healed. Turf samples were taken to the plant pathology section of the State Department of Agriculture, where the disease was identified as being caused by the fungus *Sclerotium*. The description of this fungus indicated that it was not normally found on turf! Fortunately, like all happy turf disease stories, the problem faded away in 1977.

But the disease returned in 1978 with a vengeance not to be forgotten. By July 1, about 30 percent of the area of the 18th green, where the disease was first seen, was brown, and the problem was identified as being due to the fungus *Sclerotium rolfsii*, causing southern blight disease (Figure 2). There were no fungicides registered on turf for control of the disease at the time.

Because our plight was not seen on national television, we did not receive instant offers of assistance from across the nation. We thus began to seek help from knowledgeable persons in our area. As word of our problem spread, we received an offer of assistance from Zamir K. Punja, at the University of California at Davis, who was working at the time on *S. rolfsii* affecting vegetable crops. It also became apparent that this disease was occurring on golf courses in Southern California, and through cooperation, the trading of information began. Today, after three years of work and research, we feel we can control this disease on turf. All preliminary work was done at the Plant Pathology Department at U.C. Davis, while the field work was carried out on the practice putting green at Del Paso Country Club.

Because this disease has had little exposure or fame, it will benefit many to be familiar with it, the symptoms that it produces, and fungicides which should be considered for its control.

THE DISEASE on golf greens was first seen in 1975 in North Carolina, and it showed up on greens in California in 1977. The turf varieties primarily affected in Sacramento are *Poa annua*, bentgrass, and ryegrass. Common bermuda is the only resistant turf species noticed so far. Unfortunately, varietal studies have not yet been conducted, so it is not possible to determine whether tolerant varieties exist.

The fungus is soil-borne and affects over 500 species of plants, including tree fruits, vegetables, and ornamentals. It produces large numbers of resistant structures (sclerotia) which are round, brown in color and resemble mustard seeds. They germinate to produce mycelium (Figure 3) which starts the disease. Initially, the spots on greens appear as yellowish patches that progress into crescent-shaped and eventually circular spots with living turf in the center (Figures 1 and 2). The spots vary from eight to 36 inches in diameter. The disease progresses rapidly at temperatures above 75°F and flourishes with high moisture and thatchy conditions. By providing greater aerification and reducing the thatch, it may be possible to slow down development of the spots, because growth of the fungus is retarded. The fungus also grows best between pH 3.0 and 5.0, and growth is reduced above pH 7.0.

Again, it may be possible to reduce development of the spots by raising the soil pH to above 7.0 with repeated applications of lime. Also, by addition of excess nitrogen in the form of ammonium sulfate, for example, the progress of the disease can be reduced. Keep in mind, however, that these cultural methods of control only reduce development of the spots and do not control the disease or stop it completely. We have tested these methods and have found them to be much less effective and not as practical as, say, the use of effective fungicides.

We also explored the possibility of using biological control against *S. rolfsii*. The soil-inhabiting fungus *Trichoderma* that is present in most soils, attacks the sclerotia of *S. rolfsii*, causing them to rot. *Trichoderma* has been used to successfully control southern blight on blue lupine, tomatoes, and peanuts in other areas of the U.S. By applying *Trichoderma* to the greens, we hoped to destroy the sclerotia already present and so reduce the disease.

In 1979, *Trichoderma* was grown in the laboratory on diatomaceous-earth granules impregnated with molasses solution as a nutrient source, and

Figure 2

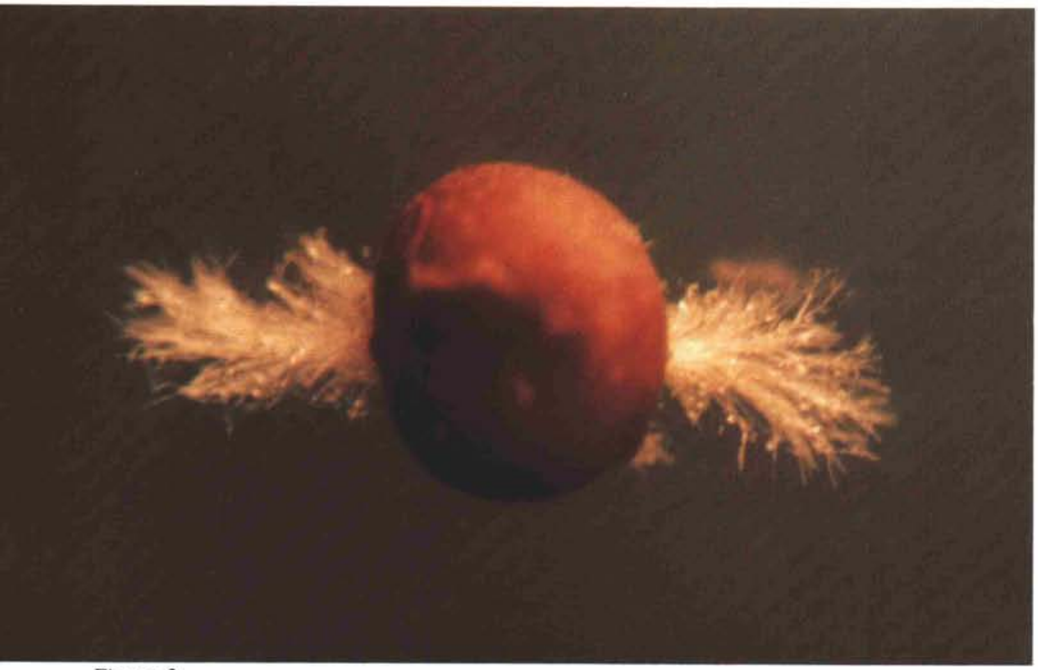

Figure 3

applied to two greens at three different times. By analyses of soil samples taken weekly from treated areas, we demonstrated that *Trichoderma* levels in treated plots were much higher than in untreated areas. Unfortunately, the amount of disease in most of the treated plots was not significantly reduced in 1979, although some treated plots showed reduction in disease. Usually, results from biological control attempts in which one fungus (*Trichoderma*) is used to reduce another (*S. rolfsii*) are not as dramatic, clear-cut, consistent, or rapid as we would like to see. However, it has potential for use in control of disease and deserves further investigation.

BY THE SUMMER of 1980, the southern blight disease was reported on 12 golf courses throughout California. Then, and even today, there were no fungicides specifically registered for the control of *S. rolfsii* on golf greens in California. Studies were conducted at Davis in 1979-80 to determine which of the available fungicides could prevent sclerotia from germinating, because

Sclerotium rolfsii *blight on golf greens. Figure 1: Initial spotting of the green as it appears in the early spring. Figure 2: Severely infected green showing disease spots as they appear in midsummer. Figure 3: Slerotium germinating to produce mycelium. Figure 4: Experimental plots on the practice green showing levels of control achieved with different materials. Most heavily diseased plot on lower left is the check plot. Figure 5: Comparison of PCNB-treated plot (left) with check plot (right).*

Figure 4

Figure 5

TABLE 1

Results from Chemical Control Trials against *Sclerotium rolfsii* Blight on Golf Greens carried out at Del Paso in 1980-81

Treatment	Rate (in ounces active material per 1,000 sq. ft.)	Average number of diseased spots in each plot	Percent of area of each plot that was diseased
1980			
Botran + Actidione	4.9 + 1.4	3	0.9
Captan	26	2	0.2
Dithane M-45	31	31	13.4
PCNB	7	0	0
Vitavax	7	3	0.2
Ammonium bicarbonate	6.4	2	0.8
Ammonium sulfate	8.1	2	2.3
Check	0	20	17.9
1981			
Vitavax + Captan	3.5 + 12.0	0	0
Vitavax + ammonium bicarbonate	3.5 + 3.0	0	0
OAG 3890	2.0	3	0.6
Check	0	15	15.4

these sclerotia spread the disease and occur in large numbers in the thatch. Subsequently, the best of these fungicides were tested in the field in 1980-81 on an experimental basis. Twenty-two different fungicides and 33 inorganic salts (some containing calcium, others with nitrogen, such as calcium nitrate, ammonium sulfate) were first tested in the laboratory against the sclerotia. Of these, eight fungicides and 17 salts showed promise.

In the spring of 1980, the experimental trials were initiated on the practice putting green, on which we observed uniform disease distribution in 1979. Five fungicides (Botran-Actidione, Captan, Dithane M-45, PCNB, and Vitavax) and two salts (ammonium sulfate and ammonium bicarbonate) selected from the previous screening processes were used. The fungicides were applied to the plots at rates two to three times higher than the label rates because previous attempts at control of *S. rolfsii* using label rates of some of these materials were unsuccessful. The materials were applied every 14 days, beginning on May 5. All materials were watered into the turf after application. In 1981, the trials were repeated on the putting green, and the same five fungicides used in 1980 were tested, but at lower rates. Also, we combined Vitavax with Captan, Vitavax with ammonium bicarbonate and also tested an experimental fungicide, OAG 3890. We also tested calcium nitrate and hydrated lime.

Disease severity was assessed by counting the total number of diseased spots of all sizes in each plot and then estimating the percent of the total area that was diseased in each plot. The significant results from the experimental trials in 1980 and 1981 can be seen in Table 1.

The method of applying the materials was very important in preventing burning of the turf. Some of the fungicides cause phytotoxicity when applied in midsummer when temperatures are high. Also, inorganic salts such as ammonium bicarbonate can cause burning, as would any fertilizer if it were not applied at the correct rate. In our trials, if the materials were applied to relatively dry greens and then heavily watered in within minutes of application, there was no phytotoxic reaction. The purpose of the heavy irrigation was to get the material off the foliage and into the area of the crown and into the thatch. This procedure prevents leaf burning and gets the material into the areas where the sclerotia are usually found.

THE RESULTS of the work done in 1980 and in 1981 indicated that PCNB (Terraclor) and Vitavax were very effective in controlling *S. rolfsii* blight (Figures 4 and 5). Botran-Actidione mixture and Captan also prevented serious outbreaks of the disease. Combining reduced rates of Vitavax with reduced rates of Captan or ammonium bicarbonate gave better control than each chemical applied alone at higher rates. Application of nitrogen-containing materials reduced the amount of disease, but it probably is not a practical means of control. Although all materials were applied routinely every 14 days, it may be possible to reduce the number of applications and the amount of fungicide used, or vice versa, depending on the severity of the problem and individual circumstances.

We should point out, however, that none of the materials tested kill the sclerotia; therefore, the fungus is still there and the disease will reappear unless efforts are made to prevent its reestablishment.