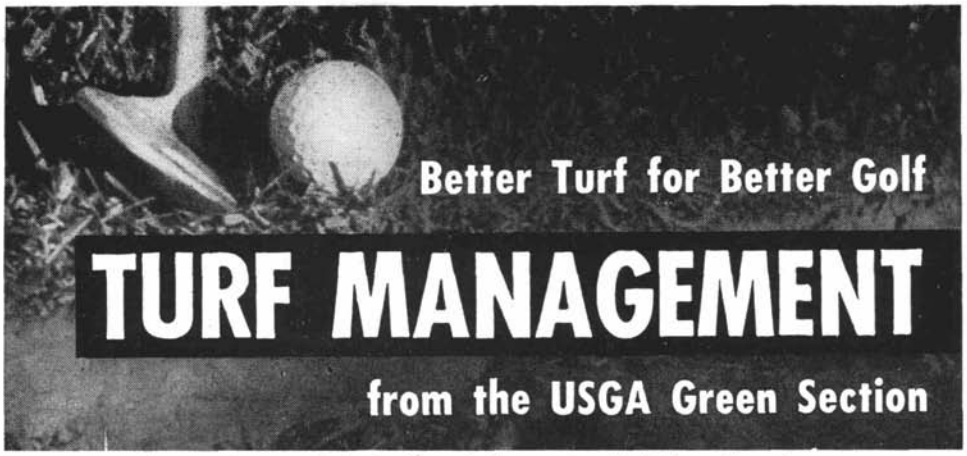

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NATIONAL COOPERATIVE TURF FUNGICIDE TRIALS

By CHARLES G. WILSON and FRED V. GRAU
USGA GREEN SECTION

The disease problem has been attacked in many ways since the USGA Green Section and the progressive golf-course superintendents initiated a control program in 1925. Research pathologists with agricultural experiment stations and chemical manufacturers have developed effective fungicides, and research agronomists and plant breeders have selected resistant grasses and developed intelligent management practices in an effort to control turf diseases.

Today it is known that good management is paramount if the fungicides we use are to perform to the best of their ability. Fertility levels, water management and drainage, aeration above and below the turf surface, mechanical damage and compaction and the degree of mat formation have considerable bearing on the ability of a proven fungicide to prevent or cure an infection.

Cooperative fungicide testing, established in 1949, has been responsible for increased knowledge concerning the effectiveness of fungicides on a local as well as on a national scale. Results of these trials in the past have shown that cadmium compounds and mercury chlorides are most effective against dollarspot and copperspot, mercury chlorides and tersan adequately control brownpatch and mercury chlorides are effective against snowmold. In addition, it has been noted that Cohansey and Arlington bent are highly resistant to brownpatch; Elk 16, Arlington, Congressional, Highland and Velvet bents were least susceptible to dollarspot, and Congressional bent was highly resistant to snowmold.

Results of the cooperative testing in 1951 again indicate that the trends remain the same with regard to our most effective turf fungicides. The following charts contain the tabulated results from the cooperators:

TURF MANAGEMENT

Worth-while discussions of the problems confronting Green Committee Chairmen are contained in TURF MANAGEMENT, a book sponsored by the United States Golf Association. This volume was edited by H. Burton Musser and published by the McGraw-Hill Book Co., Inc. It is available through the USGA, 40 East 38th Street, New York 16, N. Y.; the USGA Green Section, Room 331, Administration Building, Plant Industry Station, Beltsville, Md., and bookstores generally. The price is $6.

DOLLARSPOT
(Seasonal Averages*)

*Treatment***	*Calif.*	*Iowa*	*Mich.*	*Rhode Island*	*Spring Mill Course Philadelphia, Pa.*
Check	127.9	3.1	130.2	21.0	586.0
Cadminate	2.93	0.2	0.07	0.0	26.0
Calo-Clor	20.07	0.29	0.47	0.0	371.0
Crag 531		0.14	0.63	0.0	83.0
C & C 1025	20.3	0.29	0.0		135.0
Puraturf 177	22.8	0.31			24.0
Puraturf GG		0.58			
Actidione			0.23	0.13	
H 258 T		0.52			
Calo-Clor & Vancide				0.0	
Calo-Cure	41.13	0.44	1.8	1.7	253.0
Vancide				3.7	251.0
PMAS	18.6	2.11			235.0
Tat-C-Lect			3.97		
Puraturf		2.55			
Tersan 75		1.81	5.07	5.8	
Special Semesan			5.9		
Orthocide 406	68.53			32.1	519.0
Shell X P50					368.0

* Variance in figures due to method of recording:
California and Rhode Island recorded the average number per 25 Sq. Ft.
Michigan " " " " per 50 Sq. Ft.
Philadelphia " " " " per 100 Sq. Ft.
Iowa used a 0-5 classification with 5 indicating a general infection.

** In accordance with the manufacturers' recommendations.

BROWNPATCH AND COPPERSPOT
RUTGERS 1951

*Treatment**	*Brownpatch %*	*Copperspot #*
Check	19.1	39.4
Calo-Clor	0.0	7.2
Calo-Cure	0.1	2.2
Tersan & Calo-Clor (1-oz. of each per 1,000 square feet)	0.3	1.0
Orthocide 406	5.8	26.8
Cadminate	5.8	0.2
Puraturf	10.0	3.8
Puraturf 177	15.1	0.8
PMAS	10.9	1.6
Crag 531	14.5	2.6
C & C 1182	11.4	32.6
C & C 1207	12.5	48.0
Tersan 75	17.0	16.8

* In accordance with the manufacturers' recommendations unless otherwise specified.

BERMUDAGRASS LEAF BLOTCH
(Curative Treatments)

TIFTON 1951

Material	*Rate per 1,000 sq. ft. in 10 gals. of water*	*% Disease Control**	*Turf Injury*
Check		0	
Special Semesan	2⅔ oz.	60	
Puraturf	1½ oz.	30	
Tersan	5½ oz.	25	
Calo-Clor	1 oz.	15	
Calo-Cure	1½ oz.	15	
Crag 531	3 oz.	10	Slight Yellowing**
Cadminate 3965	½ oz.	0	" "

* Average of two replications and three applications at 10-day intervals beginning September 13, 1951.
**Observable 10 days after first application.

In comparing the materials, it will be noted that organic and inorganic cadmium compounds and the mercury chlorides gave the best control of dollarspot. Actidione showed promise at Michigan and Rhode Island, although Rhode Island reported that with the advent of cool weather a uniformly off-yellow cast developed on the plots where Actidione was used.

Investigations at Rutgers showed that the mercury chlorides gave the best control of brownpatch with a slight discoloration on the bentgrass during midsummer. Tersan, when used alone, gave poor control, but when used with calo-clor, control of brownpatch was excellent with no turf injury. Calo-Cure, which was easier (no discoloration) on the bentgrass, also shows promise for the control of brownpatch. Rutgers reported that "with all application rates of Milorganite, the brownpatch was less than with the 8-6-4 fertilizer on both colonial and seaside bents".

As in the past, cadmium compounds and mercury were effective in controlling copperspot.

Tifton reported that bermudagrass putting greens which are not well drained or are often overwatered seem to be very subject to attack and that resistance to leaf blotch appears not only to be a characteristic of bermudagrass types but also is related to soil fertility.

The USGA Green Section believes that our knowledge of turf diseases is sufficient to suggest management practices which may prove helpful to superintendents. Not all of the cooperators are in complete agreement concerning the suggested management practices, which indicates that considerable work remains to be done in the years ahead. Only those fungicides which have stood the test of time are listed under chemical control.

NEW GREEN SECTION SERVICE SUBSCRIBERS

International Minerals & Chemical Corp., Chicago, Ill.
McCausland, Ross, Seeds, Wichita, Kansas
Mississippi Valley Golf Superintendents Assn., Alton, Ill.
Pacific Toro Co., Inc., Los Angeles, Cal.
Taylor, T. T., Harrison, N. Y.

CONTRIBUTION RECEIVED

Western Pennsylvania Golf Association—$200

This contribution is to be used to help support the new three-year Turf Research Fellowship at the Pennsylvania State College, studying soil compaction, aerification and soil conditioning materials.

Disease	*Fungicide*	*Nitrogen*
Dollarspot	1. Cadmium Compounds (Cadminate, Crag 531, Puraturf 177) 2. Mercury Chlorides (Calo-Clor)	Adequate feeding up to 1½ pounds of actual Nitrogen per 1,000 square feet per month of growing season.
Brownpatch	1. Mercury Chlorides 2. Cadmium Compounds in dollarspot weather, Tersan Calo-Clor combination in brownpatch weather.	Organic source may lessen severity of an attack. Bulk of Nitrogen applied in cool weather. Total same as for dollarspot.
Dual Season Dollarspot-Brownpatch	1. Mercury Chlorides 2. Cadmium in dollarspot weather, Tersan Calo-Clor combination in brownpatch weather.	Over-all feeding same as for dollarspot. Bulk of Nitrogen applied in dollarspot weather. Turf allowed to become slightly Nitrogen hungry in brownpatch weather.
Copperspot	1. Cadmium Compounds	Insufficient information
Snowmold	1. Mercury Chlorides	Avoid heavy Nitrogen feeding as cold weather approaches.

Failure to obtain disease control with these proven fungicides indicates that cultural requirements may bear investigation. Freedom from mat; adequate fertility level; intelligent water management and good drainage; regular close mowing; aeration, brushing and raking; good surface air circulation; and the use of improved bentgrasses contribute to economical and effective disease control.

Editor's Notes on Crabgrass and Turf Diseases

The true relationship between crabgrass and grass diseases has been known by scientific and professional men for many years. The homeowner still thinks that the reason his lawn turns to crabgrass is that he did something wrong. It is time to inform the public as to the real reasons for crabgrass.

We have crabgrass in turf because the turf we have is not dense enough to smother crabgrass. Crabgrass needs sunlight to germinate and to grow to maturity. Shade is its deadly enemy, whether that shade comes from a towering oak tree or from a dense turf cut at one inch or less. When the turf density is reduced so that light can penetrate and reach crabgrass seeds on the soil surface, we will have crabgrass. Here are some of the principal factors responsible for the thinning of turf.

Grass Diseases

The cool wet weather during April and May in many parts of the northeastern states encouraged an epidemic of leafspot disease on common Kentucky bluegrass. From Washington, D. C., to Kingston, R. I., to Boston, through New York state, the plots at Penn State and into Virginia, the story was much the same. Common bluegrass turf looked brown and thin. In spite of excessive soil moisture, it looked as though it were suffer-

ing from drought. Others must have thought it was dry, too, because I saw people watering their diseased bluegrass.

The result of the leafspot epidemic will be more crabgrass. Until leafspot-resistant grasses are planted in these lawns, there will always be too much crabgrass and too many people selling crabgrass killers. But some day soon there will be crabgrass-resistant turf for those who want it. That goal has been reached on both an experimental basis and on a practical basis on a limited scale.

Merion bluegrass is an improved turf bluegrass that is not immune but is highly resistant to leafspot disease. For that reason a Merion bluegrass turf will have less crabgrass than turf of common bluegrass, all other factors being equal, particularly at the lower heights of cut (1 inch or less) because Merion is also tolerant of close mowing. Cooperative research at many points in the United States has proved these statements. The major drawback is that we are still several years away from being able to produce enough seed to satisfy the demand.

Other grasses have diseases, too. Many bent greens have been badly hit this spring by one or more Helminthosporium leafspot diseases. Again, some bent grasses are more resistant than others. W. H. Glover, at Fairfax Country Club, Fairfax, Va., called on May 21 and reported severe to moderate damage on most of his well-managed greens, except the Arlington (C-1) greens. This grass is performing the same way in New England and in other places. H. B. Musser, at Penn State, showed me strains of bent grasses that were eaten alive with leafspot. Next to them were plots in perfect condition. Some of these resistant strains have become parents of his new polycross creeping bent, of which a little seed is available. Another of the USGA Green Section's new bents is Dahlgren (C-115), which apparently is highly resistant to leafspot.

The red fescues (Chewings and creeping red) are susceptible to leafspot, too. But here we can look forward to new red fescues which resist the common grass diseases. It is really encouraging to see clean, beautiful fescue turf of these improved strains right next to plots that are full of Poa annua, clover, chickweed and crabgrass simply because disease thinned the turf and let in these unwanted invaders.

Bermudagrass gets disease, too, and leafspot again is one of the culprits. Not only does common bermuda get crabgrass, but it has a hard time starting again in the spring after a hard winter with a coating of ryegrass over it. Yes, you guessed it. Dr. Glenn W. Burton has given us superior strains of bermudagrass that are highly resistant to disease, so that they can resist weeds and snap back in the spring with plenty of vigor even before the ryegrass starts to die. Tifton 57 bermuda turf, for example, won't need nearly so much crabgrass killer because there won't be so much crabgrass. The same is true of Tifton 127 for greens. There are others, too, such as U-3.

The zoysia grasses are in the news because they are so very disease-resistant, among other good qualities. It is rare indeed to find any evidence of disease on the zoysia grasses.

Common St. Augustine gets hit badly by diseases. The Bitter Blue strain is much more resistant. The tall fescues (Kentucky 31 and Alta) get diseases, too, but Kentucky 31 is more resistant under most conditions that we have observed. Further improvement is in progress. And so it goes. The Colonial bents and all the rest get thinned by disease, and in come crabgrass, chickweed, Poa annua and all the rest. We cannot win until we have truly disease-resistant varieties and know how to establish them and manage them.

Insect Damage

One of our favorite statements has been, "The first principle of weed control is insect control." Insect activity thins and weakens turf and opens the door to weeds. Like diseases, most insect damage escapes the notice of all but the professional observer until the weeds have taken over. Then a renovation problem has been incurred. With excellent insecticides available at stores and with ac-

curate information for the asking through the county agents' offices or from your favorite entomologist or turf specialist, there is no excuse for permitting insects to bring crabgrass into otherwise good turf.

Low Fertility

Turf density usually is directly related to the level of available plant nutrients, with the emphasis on nitrogen, other elements in proper proportion. Please note that I qualified my statement with "usually." If the turf is composed of disease-susceptible grass like common bluegrass, common bermuda, common red fescues and others, crabgrass can still be a serious pest in spite of the best fertilizer program one could devise. In fact, with high fertility, the crabgrass may be more serious because it, too, responds to nitrogen. I have insisted that, as the disease-resistant grasses are developed and brought into wide use, we will have to re-evaluate fertilizer usage in terms of these grasses, which can make much more economical use of the fertilizers we apply. For instance, at the Beltsville Turf Gardens, Clark and Armiger, working on fertilizer field plots, discovered that disease was changing the population from bluegrass to crabgrass, so that their results were of no significance. The same thing happened at Penn State. The only solution was to renovate and establish the improved turf grasses.

Fertilizer can produce perfectly wonderful results, but turf that is ruined by disease or ravaged by insects can't make proper use of it and, of course, a large part of the fertilizer is wasted.

Mechanical injuries or even chemical injuries can invite weeds, but if the adapted, disease-resistant grasses are there, fertilizer and good management will help them overcome the weeds.

Drainage is a big factor in helping grasses grow healthy. So is the proper soil reaction. Diseases are less serious when turf is kept dry. Morning watering is least likely to encourage disease, as compared to evening watering. We do not consider height of cut as a significant factor in weed control, except when unadapted, disease-susceptible grasses must be used. In our work, a certain height of cut is essential to the proper use of the turf, and the grass selected must be able to perform satisfactorily under a specific height of cut. True, raising the height of cut will help a diseased grass to recover because it permits the plant to have a greater leaf surface by which it can make more food to help it recover. It is only a temporary measure, at best, and the final answer must lie in selecting a grass or a mixture of grasses that unqualifiedly is adapted in every way. Watering a disease-stricken turf usually encourages crabgrass. Watering a turf of improved grass does not encourage crabgrass to the same extent, and in addition the disease-resistant turf may not need to be watered as often.

COMING EVENTS

August 5: Field Day, Rutgers University, New Brunswick. N. J. Ralph E. Engel. (Tour starts at 1:30 p.m., from Turf Plots).

August 17-23: Sixth International Grasslands Congress, State College, Pa. W. M. Myers, General Chairman, Plant Industry Station, Beltsville, Md.

August 20-21: Field Day, University of Rhode Island, Kingston, R. I. J. A. DeFrance.

September 3-4: Field Day. Pennsylvania State College, State College, Pa. H. B. Musser.

September 24: Field Day. Greater Cincinnati Golfers' League and Cincinnati Golf Course Superintendents. Taylor Boyd.

October 6-7: Turf Conference, University of California, Los Angeles, Cal., V. T. Stoutemyer.

October 9-10: Turf Conference, University of California, Berkeley, Cal., John J. McElroy.

October 13-14: Turf Conference, Washington State College, Pullman, Wash. Alvin G. Law.

October 22-24: Third Turf Conference, Central Plains Turf Foundation and Kansas State College, Manhattan, Kans. William F. Pickett and L. E. Lambert.

November 17-21: American Society of Agronomy meetings, Netherland Plaza Hotel, Cincinnati, Ohio. L. G. Monthey.

December 1-3: Texas Turf Conference, Texas A. & M. College, College Station, Texas. James R. Watson.