PROCEEDINGS

TWENTY-FIRST ANNUAL

SOUTHEASTERN TURFGRASS CONFERENCE

GEORGIA COASTAL PLAIN EXPERIMENT STATION

and

ABRAHAM BALDWIN AGRICULTURAL COLLEGE
COOPERATING

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UNIVERSITY OF GEORGIA COASTAL PLAIN EXPERIMENT STATION

In Cooperation With

ABRAHAM BALDWIN AGRICULTURAL COLLEGE,

UNITED STATES GOLF ASSOCIATION GREEN SECTION,

and

SOUTHERN GOLF ASSOCIATION.

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FOREWORD

Man's horizon never stays put. We develop a good turf, or a good herbicide, or a good turf-management program, and immediately we try to make them obsolete by finding something better. And that is as it should be. Man should never be satisfied at any segment of his life, whether it be in the area of religion and morals, economics, recreation, or whatever.

Here at the Coastal Plain Experiment Station, we have only one real goal in all of the dozens of areas of research — that goal is to make something obsolete by developing something better.

This goal in our turf work has led to an especially strong and effective turf-research program. Many friends in many areas of business and government have supported us in this endeavor. With gratitude for this support, financial and moral, we conducted this 21st Annual Turfgrass Conference. We are grateful to all who attended and participated. The kind of support that you have given the program has helped those of us who are responsible for its year-to-year operation. You have helped make what could be a thankless job a challenging and rewarding one.

Frank P. King, Director
Georgia Coastal Plain Experiment Station

OUTSTANDING GREENS AROUND THE WORLD

Tom Mascaro
President, West Point Products Corporation, West Point, Pennsylvania

ABSTRACT

(Colored slides were shown of outstanding greens beginning with greens on the East Coast of the United States, through the Midwest, Canada, West Coast of the United States, the West Indies, Southeastern United States, and returning to the Northeastern United States.)

Golf greens are works of art. They are sculptured out of the earth and outstanding greens always blend with the terrain and other surrounding features. An outstanding green is of a free-form design with flowing lines that fade away into its surroundings. Free-flowing lines of a green are gradually changed through maintenance practices until the green proper becomes "saucer-like" in shape, the collar disappears, and the sand traps become shapeless hollows in the earth. To re-shape a green back to its natural beauty, the green proper should be re-outlined, allowing for generous collars to bring out the beauty of the green's shape. Sand traps should be re-shaped to flowing lines attractive to the eye of the beholder when viewed from tee and fairway.

An important part of the game of golf is the psychological effect a hole has on the player. One that is beautiful to the eye has a pronounced effect on the golfer's approach to his shot. When a golfer plays a beautiful course, he is less apt to complain about his score.

GOLF-GREEN DESIGN AND CONSTRUCTION

Panel Discussion

Moderator: E. R. Jensen, Agronomist, Southern Turf Nurseries, Tifton, Georgia

Panel member: Willard Byrd, Golf-Course Architect, Atlanta, Georgia

Talk by Mr. Jensen:

The topsoil mixture for putting greens is one of many factors, such as tile drainage, contour and design, and subgrading, that largely determine whether you will boast or apologize for your greens. Naturally, everyone wants high-quality greens, but you cannot have them unless the topsoil meets rather specific requirements.

The first step in getting the proper topsoil mixture is a laboratory analysis of the physical characteristics of the base soil. Testing should be in accordance with procedures outlined by the Green Section of the U.S. Golf Association. The analysis will show what modifications and implementations are needed to formulate a soil medium that will fulfill some exacting requirements of soil permeability and porosity. The standards, as recommended by the U.S.G.A. Green Section for compacted soils at a moisture content near field capacity, are as follows:

Permeability - A core of the soil mixture should permit the passage of not less than one-half inch of water per hour nor more than 3 1/2 inches per hour when subjected to a hydraulic head of .25 inch. Bermudagrasses will tolerate a slow permeability rate of 1/2 inch per hour, but a higher

permeability rate is required for best growth of bentgrasses.

Porosity - The mixture should have a minimum total pore space of 33%. Of this pore space, the large (noncapillary) pores should comprise from 12 to 18% and the small (capillary) pore space from 15 to 21%.

If there is an excess of small pores, the water is held too tightly, whereas an excess of large pores results in a rapidly drained soil of low moisture and nutrient capacity.

Rarely do the natural soils possess the combined moisture-retentive and drainage requirements of high-quality greens. Invariably it is necessary to include additional sand, clay, organic matter or additives such as calcined clay, vermiculite, or colloidal phosphate. Oftentimes, a combination of several ingredients is used.

Sand is by far the most versatile and widely used component of the topsoil mix. Even the soils from south Georgia and Florida, that contain 90 to 100% sand, can be improved by adding sand of larger particle size. In the Atlanta area, the topsoil of Cecil sandy loam provides a good putting green when mixed with 50 to 70% sand. As much as 90% sand must be added to some Midwest soils to meet green standards.

Peat moss, an occasional additive, affects different soils in different ways. In some soils, it increases water movement; in others, it reduces the permeability. Usually, it increases small pore space, an important factor in sandy soils.

In Florida, where sand predominates, colloidal phosphate is useful in reducing water movement and increasing small pore space. Unlike

peat moss and sawdust, that oxidize within six months to a year, colloidal phosphate remains in the soil indefinitely.

In some soils, such as the fine sands along the Georgia coast, the burned clays are beneficial, but their effect is usually different than generally believed. They may increase permeability in clay-type soils and provide a slight increase in large pores, but rarely do they increase the small pore space and reduce water movement in sands.

My own preference is to use sand and clays, as they are stable, accessible, and relatively cheap. An "off-site" mixing is the best way to insure a thorough and accurate blending of materials. The mixing should not be haphazard, particularly for such additives as plastic clay or colloidal phosphate, where a small-percentage error could be of serious consequence. Simple mixes of 10% sand or 5% colloidal phosphate can be made with a rototiller. For more complicated blends, a soil shredder or mixer should be used.

After the soil has been mixed off site, it should be transported and dumped on the green. A crawler-type tractor is useful in pushing the mixture over the prepared base. Grade stakes, spaced at frequent intervals, serve as a guide for indicating the proper depth of the soil mixture.

When the soil has been spread uniformly over the surface of the green, it should be compacted or firmed uniformly. "Footing" or trampling the surface will tend to eliminate any soft spots. Raking and footing

should be repeated until uniform firmness is attained.

Watering is also useful in settling and firming the surface. This practice will also reveal any water-holding depressions which might interfere with surface drainage.

PLANTING GOLF GREENS TO BERMUDAGRASS

Panel Discussion

Moderator: W. A. Roquemore, General Manager, Patten Seed and Turfgrass Company, Lakeland, Georgia.

Panel member: Jim Shirley, Construction Superintendent, Atlanta Country Club, Atlanta, Georgia.

Talk by Mr. Roquemore:

Thirty years ago, planting golf greens in bermudagrass was a simple proposition — merely seed with common bermuda. Keeping a decent putting green was a different story, but that is not pleasant history to review.

A few people interested in high-quality bermuda turf, mostly greens superintendents, began selecting, favoring, and increasing better strains. Many of these went unnamed and unnoticed, while others such as Gene Tift and Hall's (selected by Mr. Lester Hall, Savannah Golf Club) proved markedly better than seeded strains for putting greens.

It was necessary to propagate these better strains vegetatively, and the lives of more conscientious superintendents became more complicated. Fortunately, labor was cheap, time was plentiful, and everyone knew how to hand-sprig.

By 1950, Dr. Burton had released Tiflawn (Tifton 57) bermuda and held five Turf Conferences. Tiflawn is still a superior bermuda, but it never was a very good putting grass. Three years later, the finer-textured Tiffine (Tifton 127) created more interest, but a majority of the superintendents were still "fromkMissouri."

Eleven springs ago, Tifgreen (Tifton 328) was released, after it had been tested and rated superior to other bermudas for putting greens by 16 golf-course superintendents in nine states. The Milorganite had really hit the fan. Labor was getting scarcer and time shorter, and the thought of hand-sprigging nine or 18 greens caused many a restless night for plenty of greens superintendents.

We were then associated with Ray Jensen in turfgrass production and marketing. Interest in Tifgreen was fantastic. Sales were good, too. Almost as much manpower was required to harvest and ship the grass sold from two or three acres as to respond to the inquiries. Hand-sprigging was still the order of the day, and who wanted to buy that much work?

By 1958, we had perhaps 10 acres of Tifgreen and Ray figured the answer to selling it was to plant it under contract. I thought he was nuts, and about 100 odd people who have busted out of the contract grass-planting business since that time must still think so. In any event, he built a modified disk-harrow, which had straight disks (no curvature) mounted on a rigid frame, followed by a roller. The disks embedded shredded sprigs broadcasted manually on a prepared seedbed and the roller firmed the soil to the sprigs and smoothed the surface.

This machine, a tractor for carrying it, a Wichita grinder for shredding, and a 10-man crew could comfortably plant nine greens in a day, and with good watering and post-planting management, coverage was obtained in less than half the time normally for hand-sprigging.

At about the same time, broadcasting shredded sprigs on a new seedbed and top-dressing had also caught on, and by the end of 1958, something like 100 golf courses had most, or all, of their greens in Tifgreen.

The word was out. Tifgreen could be bought at reasonable prices and planted under contract. Hundreds of old greens were converted to Tifgreen and virtually every new golf green built was planted in one of the improved hybrids.

In the spring of 1960, we planted the first golf greens at Milledgeville Country Club with a self-propelled, wheelless machine, which we had designed and perfected during the winter. For the lack of a better name, we called the machine a "Greensplanter." It was portable and highly maneuverable, but the big advantage was that it had no wheels and, therefore, left no ruts on the putting surface.

Golf Architect George Cobb was so impressed with the results that he immediately began specifying that only this type machine would be used for planting his greens. Other architects followed suit. We applied for a patent and after the routine red-tape battle, finally secured a patent giving the broadest possible coverage on this machine, the novel features of which were propulsion by the embedding disks themselves and the flexibly attached roller.

For several years, the greensplanter has been standard equipment for planting hybrid bermudas on greens from Tokyo to Tobago. The system

is simple. Manually broadcast, shredded sprigs at a rate of 10 to 15 square yards of shredded material per 1,000 square feet onto a seedbed that has been fertilized and fumigated. Embed the sprigs with the greensplanter per slides which will follow, immediately apply good irrigation, and thereafter irrigate frequently enough to keep the surface of the soil constantly moist.

With good post-planting management and warm weather, a turf can be matured in three to five weeks and a good putting surface developed in four to seven weeks with Tifgreen. Tifdwarf is slightly slower.

We have continued to examine and experiment with other planting methods. Soluble wood fibre (Turfibre) is an excellent mulch, minimized moisture loss and sprig mortality, and assists in erosion control. The same can be said for plastic solvents (Soil-Set). Cheesecloth, burlap, and the relatively new fibreglass matting (Famcomat) all have advantages in moisture retention and erosion control. Unfortunately, all involve considerable additional expense, time and trouble, and their usage is usually justified only where a poorly designed green channels all run-off water into a confined area almost certain to erode.

For comparative purposes, we used some Turfibre at Jackson Country Club, Jackson, Mississippi, several years ago. While a crew of specialists from International Paper Company and the manufacturer of the Hydro-seeder were working hard to Hydro-seed one very large green and two very large tees, our routine crew planted six comparable-size greens and five tees. Our labor cost was far less per 1,000 square

feet, and the cost of the Turfibre + its application brought the total planting cost to more than double that of the conventional method. Almost every sprig applied through the Hydro-seeder lived, but use of the Greens-planter enabled a heavier sprigging rate and afforded quicker coverage.

Planting golf greens is now the easy part. Design and construction have been covered. Pre-planting preparation needs emphasis. During the final stages of construction, add limestone, if necessary, to achieve a desirable pH, incorporate a balanced fertilizer high in potash, such as a 5-10-15, 6-12-12, or 10-10-10, at the rate of 30 to 40 pounds per 1,000 square feet.

Drag the green until you have produced a smooth putting surface and firmed it to the extent that footprinting is not severe, but the seedbed is still loose enough that one's index finger can be pressed in to the second joint with moderate effort.

Soil sterilization is the next step. Water, if necessary, to achieve moderate moisture in the soil for three or four days prior to sterilization, so that the seedseed coats are soft and susceptible to sterilant penetration. Sterilize with methyl bromide, applied under plastic covers. Contract application of tillage-injected methyl bromide in solution with Stoddard solvent (Brozone) is recommended. Covers should remain in place 24 hours during hot weather or 36 to 48 hours during cooler weather. After the covers are removed, planting must be delayed until the sterilant has escaped from the soil. During hot, open weather, the gas will escape from porous soils within 24 hours. On heavy soils, 48 hours may be

required. On any soil, the sterilant can be sealed in by a heavy rain, and following the rain, adequate dry weather must be allowed for the gas to escape.

A good irrigation shortly before planting is highly desirable on sandy soils but is not practical on silt, clay, and loamy soils, which will stick to the planter when moist. Prompt and regular watering after planting is the key to survival. We, and most of our competitors, use sprig-harvesting machines that have the sprigs in a truck in bulk seconds after they come out of the ground, and the sprigs are normally quickly transported to the site and promptly planted. If the sprigs are ever permitted to dry out, their survival potential is greatly limited. On the other hand, we have had sprigs tightly packed in bulk shipment to the Bahama Islands and other foreign destinations for many days after harvest. We have unloaded sprigs that were literally too hot to handle, were seriously discolored and smelling like low-grade cow manure. They still gave good survival. Ninety-nine and .44% of all the poor stands we have ever seen resulted from inadequate and/or delayed watering. I am confident that other contract grass planters will verify this statement.

An irrigation system is never needed more than during the planting operation and few people have ever been in a bigger hurry than they are at the time they want grass planted. Notwithstanding the press of time, the one thing most fundamental to getting greens into play in the least time is thoroughly checking the water system and ascertaining that it is fully functional.

My topic does not cover management after planting, which is most vital. Superior management can make a poor planting job look good. Poor management can make a superior planting job look bad. The procedure for the first 10 days is simple: Water as much, and as often, as you can, short of washing the green away. Deliberately try to "drown" the grass. You will not drown it, but the sprigs will root.

As soon as most of the sprigs have sprouted, new leaf growth (seven to 10 days in warm weather), let the surface dry out and apply nitrate of soda or ammonium nitrate (Nitrate nitrogen is essential at this stage.) at the rate of 3 to 5 lbs. per 1,000 square feet, and repeat at weekly intervals. Promptly water well to avoid chemical burn.

Be alert for sod-webworms and spray before they get out of hand. The only thing worms like better than Tifgreen is Tifdwarf, which they really relish.

Permit the surface to cover before mowing is commended. Mow to 1/2 inch, Verti-cut moderately heavy in two directions, quickly sweep the green, quickly top-dress, and immediately water. Water frequently for a couple of days, and begin mowing at a height of 3/16 to 1/4 inch. Apply additional top-dressing as necessary and groom the green for play.

WHAT HAVE WE LEARNED ABOUT TIFDWARF BERMUDAGRASS FOR GOLF GREENS?

Panel Discussion

Moderator: James B. Moncrief, Agronomist, USGA Green Section, University of Georgia, Athens, Georgia

Panel members: Harold Land, Superintendent, Glen Arven Country Club, Thomasville, Georgia

Ed Godwin, Superintendent, Birmingham Country Club, Birmingham, Alabama

Stanley E. Clarke, Superintendent, La Gorce Country Club, Miami Beach, Florida

Talk by Mr. Moncrief:

Tifdwarf, used the past two years on golf courses throughout the Southeast, has proved that it will be in use not only on putting greens, but on lawns also. This panel was formed to give the pros and cons of Tifdwarf. We would like to give facts as they have been observed and experienced by the panelists and others who have been using Tifdwarf under actual play.

Some feel that Tifdwarf was released too early and that it was not under research long enough. It was in comparison with Tifgreen for three years at the Coastal Plain Experiment Station and the results before it was released show that it was equal, to superior, to Tifgreen in all characteristics required for a putting green grass.

We have selected three panelists from the Southeast, who give a representation from the tip of Florida to the upper south. These gentlemen have observed the following performance of Tifdwarf and they will give

their points of view as they have seen it under actual maintenance at their golf courses.

Talk by Mr. Land:

I have been at the Glen Arven Country Club for the past year and so far, the members have been interested in the putting condition of my Tifdwarf and if anything, the greens are too fast. So far, I have had very little trouble with disease, but have had sod webworms. However, there does not seem to be anymore than on the Tifgreen greens. I mow the Tifdwarf at the same height as I do the Tifgreen, but would like to put all greens in the same grass, as I feel that it is the grass for our Club. Since we overseed our greens, we do not have the discoloration that has been mentioned so often.

A nearby club does not overseed and they have as good greens except for a short time when they are brown. The grass greens up immediately and stays green until the next cold spell, which causes it to turn brown again. These greens have been in for two years and have not been overseeded yet. They are as good playing greens as you will find for winter play. My experience with the grass has been very favorable and our Club anticipates planting all 18 greens to Tifdwarf.

Talk by Mr. Godwin:

I first saw Tifdwarf at Tifton in April, 1965, and liked the looks. I obtained a small amount of the stolons to observe under my playing conditions. This was grown in flats and after noting strong root growth and

dark color, I decided to use this grass on a new practice putting green that we were installing.

At the same time, I decided to redo two greens that had repeatedly gone out each winter and were a constant source of trouble. They were No. 15 and No. 17 on the East Course.

The putting green was planted from stock obtained from Southern Turf Nurseries (uncertified), while No. 17 was planted to certified stock from the same company. Both greens were constructed according to USGA specifications. The pH on all greens were 6.5. The No. 15 green was broadcast with Tifgreen (Tifton 328) at 10 bushels per 1,000 square feet as the other two greens. Tifdwarf was sprigged on 8-inch centers on No. 15 to provide a test comparing it with Tifgreen. All greens were given identical fertilization treatments, water, spraying, etc.

At the time of planting, 25 to 30 lbs. per 1,000 square feet of a 12-4-8 mixture was tilled into the top 4 inches of surface. As soon as the grass started growing, it was mowed at 7/16 inch. Grass was grown off with alternate feedings of 2 pounds N per 1,000 square feet per month with off-month feeding of 20 to 26 lbs. of the 12-4-8. The mowing was reduced 1/16 inch per week until 1/4 inch was reached. The greens were smoothed with light vertical mowing to plane off high spots and top-dressed once lightly to smooth the surface two weeks before opening greens to play. Nitrogen was supplied from natural organic sources and ammonium nitrate. The greens were covered in 6 weeks and were just a little slower to get started than Tifgreen.

All of the greens looked great the first year and until early summer of last year. After establishing the greens, we had gone back to regular maintenance of twice yearly applications of P and K with N supplied on 6 to 8-week intervals at 2 to 2 1/2 lbs. per 1,000 square feet.

The greens were good, but did not have that extra-special look and I soon learned that Tifdwarf responded very quickly and performed much better with additional applications of P and K.

The Southern Amateur Tournament was held on our West Course last year and a few bare areas were sodded in Tifgreen greens. At the time of sodding, 12-4-8 was worked into bare areas and Tifdwarf was sodded into place. Although our Tifgreen looked good, the Tifdwarf looked so much better that it stood out like a "sore thumb."

Since that time, we have split our complete-fertilizer program to include several applications of 12-4-8 instead of the usual two or three. During the growing season, we now alternate our feeding program with one application of N and the next application of 12-4-8. All of our greens have responded very well to this feeding program. At present, the greens are being mowed at 1/8 inch and they have never putted so well.

We have installed a 1/2-acre nursery of Tifdwarf and are using it without hesitation at every opportunity. The golfers love it. No. 15 is about 65% Tifdwarf at present and looks as though it will completely take over the Tifgreen.

We have some interesting comparisons with Tifdwarf and Tifgreen. I have two practice putting greens side by side, one Tifgreen and the

other Tifdwarf. My members are unaware of the different grasses, but the only reason they use the Tifgreen is that the other green is too crowded. On the course after playing No. 15, they will be short with putts on No. 16. The same holds true on No. 17 and No. 18. I am often asked the question, "Why do No. 15 and No. 17 putt so much better than the other greens?" or "Why do I have to hit my putts so much harder on No. 18 than on No. 17?"

At present, we are planting three more greens to Tifdwarf. These greens have been a constant source of trouble and I feel sure that Tifdwarf will solve the problem, as it has on my other two trouble greens.

One of the finest compliments I have ever had came from "Scotty," our negro shop boy and caddy from the year one. He came up to me one day last summer and said, "Mr. Ed, I wants to shake your hand. I'se been at dis club for thutty yars and that's the fust time I've everyseen grass on that green for a solid year."

In summary, Tifdwarf with <u>INCREASED</u> maintenance will provide us with <u>SUPERIOR</u> putting surfaces here in the South.

<u>Talk by Mr. Clarke:</u>

Gentlemen, let me say that I am glad to see so many of you here. I hope that the following talk will be of some help to some of you. I have had a 6,500 sq. ft. Tifdwarf putting green approximately two years, having planted it in late April, 1965. It has been maintained under putting green conditions the same as the other greens on the golf course. The information

about grass that I will give in this talk is entirely my own and does not mean it is always correct, as some of you live many miles from the golf course where I am employed as golf course superintendent, and you could have conditions that would change my thoughts on Tifdwarf if I lived there. The following information was obtained by me from fellow workers in the turf trade. All the slides were taken by me. Some are good, some are not so good, but I do think they help in giving a talk such as this. Let me say that I am not telling you to plant or not to plant any particular type of grass. There are better-qualified people in the turf trade who can do this. Any of the disadvantages that I may mention about Tifdwarf could be, and often are, also found in many other types of grass now in use on golf greens.

The following talk is divided into three parts: Part I - Advantages of Tifdwarf, Part II - Points That I Wish Could Be Improved in Tifdwarf, and Part III - Conclusion.

Part I - Advantages of Tifdwarf

Slide No. 1 - View of No. 10 hole, La Gorce Country Club.

Slide No. 2 - View of Tifdwarf plot at Experiment Station - I first saw Tifdwarf at this Experiment Station in April, 1964, in a small 6 x 6 plot. I did not know what type of grass it was at that time, but was impressed with its growth habit and dark green color.

Slide No. 3 - View of Tifdwarf putting green, La Gorce Country Club - Tifdwarf has very few seedheads and does not seem to have as much grain; therefore, a better putting surface is obtained (at certain times of the year), resulting in less maintenance.

Slide No. 4 - View of verticutting.

Slide No. 5 - View of La Gorce putting green - Denser growth results in less weed contamination.

Slide No. 6 - View of verticutting green - Tifdwarf, due to its slower growth habits, results in less verticutting, mowing and top-dressing.

Slide No. 7 - Top-dressing.

Slide No. 8 - View of La Gorce putting green - Tifdwarf can be cut as close as 1/8 inch (at certain times of the year). Watch out for slow growth periods due to the growth habit and cold weather.

Part II - Points That I Wish Could Be Improved in Tifdwarf

Slide No. 9 - View of sod webworm damage - Tifdwarf has a sod webworm problem, resulting in application of insecticides.

Slide No. 10 - View of spraying No. 1 La Gorce green.

Slide No. 11 - View of Bayshore Country Club green - Tifdwarf should be overseeded, as it loses its desirable, dark green color in cool weather. Two methods that can be used to correct this are:

Slide No. 12 - View of 10 ft. wheelbarrow-type seeder - Seeding.

Slide No. 13 - View of No. 14 green, La Gorce Country Club - Coloring green with dye by spraying.

Slide No. 14 - View of gassing Tifdwarf on putting green - Tifdwarf should be planted on the aprons around the putting surface to stop encroachment of other grass.

Slide No. 15 - View of weeds in golf greens - Tifdwarf presents another problem if and when it becomes time to spray out weeds on the putting surface, as it is sensitive to 2,4-D, PMA, and other turf products used on golf greens.

Slide No. 16 - View of spraying weeds on nursery green, La Gorce Country Club.

Slide No. 17 - View of hand-planting Tifdwarf at La Gorce putting green - Tifdwarf is slower getting established and should be planted at heavier rates if time is important.

Slide No. 18 - View of 3-ton roller on green - Of course, if you are in a real hurry to get your green level and in play, you might use this method.

Slide No. 19 - View of leafspot on Hollywood Lakes green - Tifdwarf seems to have a leafspot-type fungus.

Slide No. 20 - View of loft boom, spraying golf green - This makes applications of fungicides necessary.

Slide No. 21 - View of wear around flag on golf green, Bayshore Country Club - Tifdwarf has trouble recovering from club divots (if used other than on greens) and ball divots, as well as heavy traffic during cool weather. One method of overcoming this is by spraying the green with dye.

Slide No. 22 - View of 10 ft. boom, spraying green.

Part III - Conclusion

Slide No. 23 - View of golf green, Indian Creek Country Club - If one could have a grass the color of Gene Tift in the winter

and some of the advantages of Tifgreen (Tifton 328) added to color and growth habits of Tifdwarf as in the warmer months, it surely would make the work of a golf course superintendent easier.

Slide No. 24 - View of Tifgreen green, Indian Creek Country Club.

Slide No. 25 - View of Tifdwarf green.

To sum up my evaluation of Tifdwarf, I would like to do as the two gentlemen are doing in this last picture:

Slide No. 26 - View of Jim Viggilotti and James Moncrief on Tifdwarf putting green at La Gorce Country Club - Study it some more.

At the conclusion of this program, I will try to answer any questions I can. Thank you for your time. I hope I have helped some of you.

SUMMARY OF PANEL AND QUESTIONS

We can summarize this panel by saying that 50% or more of the interested persons present have indicated that with proper maintenance, Tifdwarf can present a putting surface superior to Tifgreen. More emphasis will have to be given to maintenance of this grass than was realized at first for maximum results and each superintendent will need to know how to manage this grass. Complaints have come from those courses (in the minority) that do not overseed for winter play.

Where bermuda is being used as a lawn grass, Tifdwarf has also shown great promise for this purpose.

GOLF GREEN FERTILIZATION

W. R. Thompson, Jr.
Agronomist, American Potash Institute, State College, Mississippi

Greens which have high-quality turf and play well are the result of hard work and a first-class management program. This includes a balanced fertilization plan that supplies plant nutrients in the correct amounts. By furnishing quality turf, golfers are kept happy and playing. Don't make your turf send up signals to tell you it needs food; put the fertilizer on; don't put it off.

There are 16 essential elements required for plant (grass) growth. Three are furnished by air (oxygen and carbon) and water (hydrogen). We cannot control the amounts of these except through irrigation, and then it is drought that limits growth first.

The next three elements required in large amounts are called the "major" or fertilizer nutrients — nitrogen, phosphorus, and potassium. There are three secondary elements — calcium, magnesium, and sulfur — required in lesser amounts than the major elements. The rest are called "minor" or "trace" elements and are required in trace amounts. They are iron, boron, copper, zinc, chlorine, molybdenum, and manganese. Two elements that may be essential are sodium and silicon.

The fertilizer or major elements are the most easily controlled by man. On greens, we furnish nearly all the amounts of these elements used by turf.

Nitrogen (N) is vitally important to plant growth. It is absorbed by grass mostly in the nitrate form sometimes (but seldom) as ammonium. N is essential for good vegetative growth and is utilized in the plant for protein manufacturing. It gives turf a dark green color because it is part of the chlorophyll molecule. Too much nitrogen results in lush, succulent turf that depletes carbohydrate reserves. Late fall applications of N can decrease winterhardiness.

N is required by turf in higher amounts than other major nutrients. Sources of N for turf include:

A. Soluble Sources

1. Inorganic - ammonium nitrate

ammonium sulfate

2. Organic - urea

B. Insoluble Sources

1. Organic - sewage sludge

2. Methylene ureas - ureaforms

Phosphorus (P) occurs in lower amounts in plants than nitrogen or potassium. P promotes good root development and plant growth; it hastens maturity, and increases winterhardiness. It is essential for seed formation, and is used in biochemical reactions in the plant. P is shown in the pentoxide form in fertilizers — P_2O_5. Sources are mixed fertilizers, superphosphate (20% P_2O_5), triplesuperphosphate (45% P_2O_5), sewage sludge, and bone meal.

Potassium (K) is absorbed as the K+ ion. It is found in fairly high amounts in plants, about 1.7 to 2% in bermudagrass. K is mobile in the soil and leaching losses do occur, especially in sandy soils. K is used in the plant in the formation and translocation of carbohydrates, protein synthesis, enzyme activation, and to promote stiff stems, strong roots, winterhardiness, drought and disease resistance.

Research in Florida proved that K increased resistance to dollarspot. Researchers at Auburn University found more resistance to winterkill when soil levels of K were high. K content in the fertilizer bag is given in the oxide form -- K_2O. Sources of K are muriate of potash, KCl (60% K_2O), sulfate of potash, K_2SO_4 (50% K_2O), nitrate of potash, KNO_3 (14-0-33), and mixed fertilizers.

Calcium (Ca) is a secondary nutrient. It is used in cell-wall formation, and to activate enzymes and cell elongation. Ca is best known by its association with soil pH. Soil pH is an indirect measure of soil calcium levels. Low pH soil has low Ca levels and vice versa. Ca is supplied in lime sources, basic slag, and other special sources. The University of Florida recommends lime applications when the soil pH falls below 5.8. Possibly, pH 6 may be better. Soil tests are the best answer; follow recommended rates, and limit applications to 50 lbs. of lime per 100 sq. ft. per application.

Soil pH is important to growth of turf. pH not only affects Ca levels in the soil, but in the range of pH 4.5 to 8, it indirectly influences plant

growth by affecting availability of other essential plant nutrients. Essential elements are most available in the pH range of 6 to 6.5.

Magnesium (Mg), the second secondary nutrient, is the only mineral constituent of the chlorophyll molecule. It makes plants green and increases food manufacturing or photosynthesis. Supply Mg with dolomitic lime or potassium magnesium sulfate (22% K_2O, 18% MgO, 18% S).

Sulfur (S) is the last secondary nutrient. It is required for synthesis of S-containing proteins, activates enzymes, and is a part of vitamins. A deficiency of S causes reduced growth and chlorotic plants. Sources are potassium-magnesium-sulfate fertilizers containing superphosphate and elemental sulfur.

Minor nutrients are important and can be limiting factors. They are just required in lesser amounts or trace amounts than the previously discussed elements.

Iron chlorosis is common on such turf as centipede or St. Augustine. It occurs frequently on soils of higher pH (pH of 7 and above) and iron is insoluble and unavailable to plants. Iron chlorosis can be corrected by applying iron sulfate, iron chelates, or frits. The other minor nutrients are seldom found deficient on turf. Usually, they are found in organic matter in quantities to supply turf needs.

Minor nutrients are required in small amounts. Over-application or low pH, below 5 to 4.5, can cause them to be present in toxic levels. Use caution when applying trace elements.

Soil tests are the best way to determine pH, P, K, Ca, and Mg levels. Take a uniform sample (several cores on each green), composite them, and send to a competent soil-testing laboratory. The laboratory will send you a report. File these for future references after doing something about the results.

Seedbed fertilization is important for greens. At that time, Ca, P, K, and Mg can be worked deep into the soil for roots uptake. It is all but impossible to get Ca and P deep into greens by top-dressings after greens are established.

Apply fertilizers correctly. Don't mar appearance by burns, skips, or overlaps. Know what you are applying. Read the label carefully. After applying fertilizers containing inorganic sources, always water in well to prevent burn.

How much fertilization is needed? Research is conducted at many universities to determine this. Many turf recommendations are based on nutrient removal. The 3:1:2 ratio of N-P_2O_5-K_2O is an example of this. Balanced fertility is essential. Any one limiting nutrient or other factor will limit the whole operation.

Recommendations:

pH - 6.0 to 6.5 is the desirable range. Apply lime according to soil test to raise pH to proper level. It is best to limit lime applications to 50 lb. per 1,000 sq. ft. per application. Apply lime in an off-season. Acid soil + lime = chemical reaction. Try to put out lime when you are not on

your regular program, such as in February or January.

Bermudagrass Greens:

Tifgreen-Everglades - Apply 2 to 2 1/2 lb. of N per 1,000 sq. ft. per month during the growing season, March or April through October or November, depending on your locality. I like to supply 50% of the N from soluble sources and 50% from insoluble.

Tifdwarf - It is said to need less nitrogen than Tifgreen, but I believe that it needs at least 1 1/2 to 2 lb. of N per 1,000 sq. ft. per month during the growing season to keep quality up.

P and K - Don't forget these major nutrients. Apply 1 lb. P_2O_5 for each 3 or 4 lbs. of N applied. Bermudas need about two-thirds as much K_2O as N or 2 to 3 lbs. for each 3 or 4 lbs. of nitrogen applied. Apply these in mixed fertilizers with turf ratios such as a 3:1:2 or 4:1:2. Use of a 4:1:2 may require additional K in the spring. If you use individual sources, apply P_2O_5 in the spring and fall. Apply K_2O as follows: 2/3 in spring and 1/3 in the fall or half in spring, 1/4 in fall, and 1/4 in winter.

Don't forget - Overseeded greens need fertilizing, too.

Bentgrass greens:

N - During cool months, apply 1 lb. N per 1,000 sq. ft. per month; during hot months, apply 1/2 lb. N per 1,000 sq. ft. per month. Use a 3:1:2 ratio to get the required amounts of P and K. The above N schedule will supply 9 lbs. N per 1,000 sq. ft. per

year; therefore, apply 3 lbs. P_2O_5 and 6 lbs. K_2O per 1,000 sq. ft.

Yourall have seen poor results with ureaforms. I believe this is due to improper use, not to a poor fertilizer. In studies at Mississippi State, we found that in the first year, ureaforms gave poor results but in the second year, they were excellent sources. When you have applied about 10 lbs. of N from these sources, results improve rapidly.

Keep your turf fertilized properly and it will provide you with high-quality playing conditions.

In closing, let me remind you to fertilize by reading this poem taken from the SPORTS TURF RESEARCH notes:

Grass has to eat the same as us,
To keep it high and mellow,
When starved, it may not make a fuss
But, boy, can it turn yellow!

MANPOWER FOR GOLF COURSE MAINTENANCE

Panel Discussion

Moderator: T.M. Baumgardner, Vice President, Sea Island Company, Sea Island, Georgia

Panel members: James B. Moncrief, Agronomist, USGA Green Section, University of Georgia, Athens, Georgia

Tom Mascaro, President, West Point Products Corporation, West Point, Pennsylvania

Bill Sumrell, Golf Course Superintendent, Callaway Gardens Golf Courses, Pine Mountain, Georgia

Talk by Mr. Baumgardner:

I think most of you will agree that manpower or labor, if you will, is our greatest, most widespread, and most persistent problem in golf course or turfgrass maintenance today. This problem is due, as the saying goes, "to get worse before it gets better."

Several recent regional surveys and one nationwide survey of current golf-course maintenance costs show that wages constitute 66 to 70%, or almost three-fourths of the total maintenance budget. The surveys show that eight to 12 men are employed for maintaining the average 18-hole golf course, the number of men employed, as well as the wage rates, varying considerably for different parts of the country. The average yearly cost of maintaining the average club type of 18-hole course averages from $70,000 to $80,000 over the country, with a high average of $109,000 for the southern California area.

While wages probably still average considerably less in the South than in other parts of the country, rapid industrialization is changing this picture, making golf course labor not only harder to find, but more and more expensive.

The golf course superintendent, more often than not, competes with industry for labor or must be satisfied to accept the dregs. Industry, of course, offers not only higher wages but a 40-hr. work week, generous vacations, paid holidays, and many other fringe benefits. Maintenance operations are being slowed down with more and more play on our courses, resulting in more unproductive time. These are some of our apparently inescapable problems and we have no alternative but to try to do something about them.

One of the first things which comes to mind, of course, is greater mechanization. The more jobs we can do with machines, of course, the better. Much progress can be made along this line, but we still must have sufficient manpower to operate our mechanical equipment. Automatic irrigation is, of course, a great help. Better management, better supervision, and better budgeting are certainly important tools for improving our manpower situation. Perhaps we should decide to pay higher wages to attract better and more efficient labor; hopefully less hours might be required to do the job.

Night maintenance is being resorted to in some instances of necessity, but this brings many problems in itself and certainly does not promote

the best situation for the superintendent. We all know, too, how difficult it is to keep just one or two night watering-men on the job. Perhaps women workers could be utilized to a greater extent, and why not? Certainly, we will have to rely more on the use of school-age help, not only in the summer but after school hours, and we will have to devise better ways to train and supervise these part-time workers if present high-maintenance standards are to be maintained. Perhaps more factory and office workers can be attracted to work outdoors part-time to supplement their incomes and fill the longer leisure hours.

Various government training programs, poverty and rehabilitation programs, etc. should be investigated as opportunities for acquiring labor. These opportunities, of course, vary from community to community. For instance, in our community, and I trust the same may be true in many other places, under the Federal Manpower Training Act, it is possible for a number of golf courses to jointly request the setting up of golf course maintenance labor-training programs. The local Federal Labor Department will then make a survey to determine the number of job opportunities available for this type of work in the community and will endeavor to recruit the needed number of trainees. It is my understanding that the trainees would be paid at least the $1.40 per hour minimum wage and the government would pay a portion of this wage during the training period, which might be for as long as a year or more. The superintendents involved would have to agree to instruct the trainees and make the necessary reports.

Some high schools are now providing combination-work and -study programs for students with academic learning problems, with special certified teachers in charge of these classes. These students spend a half-day in school and a half-day on the job; when they are judged sufficiently trained or skilled, they are placed as full-time employees under the supervision of the school until graduation time. Some states provide funds to support such programs and pay part of the student's wages under their vocational rehabilitation setup. It would seem that golf course maintenance work might fit very well into such programs.

The Lake City Junior College, at Lake City, Florida, has started a two-year course in which the student can specialize either in horticulture or turfgrass subjects. The College accepts students for these courses whose high-school grades were too low for their acceptance in other colleges. On-the-job training is a part of this program and the College is urging golf course superintendents to hire the students specializing in turfgrass.

It certainly behooves all of us to look into all sources of manpower, as this problem becomes more and more critical.

GOLF-GREEN IRRIGATION

Charles Danner, Capital City Golf Club, Atlanta, Georgia

Gentlemen, when Dr. Burton asked me to talk to you on "Golf-Green Irrigation," I said, "Yes," with many reservations. Utopia has not come to the Capital City Country Club. We still have a manual irrigation system. However, most superintendents are in the same boat, so maybe I can talk about greens irrigation.

I quote from the U.S.G.A. Green Section Record of March, 1966: "The ultimate goal of the irrigation engineer is to place sprinklers in such an arrangement that each square foot of turf receives the amount of irrigation it needs - no more, no less."

Our job, as golf course superintendents, is to see that our greens receive the amount of water our turf requires - no more, no less.

Greens irrigation is one of the most important jobs that we, as golf course superintendents, are faced with. We have found this to be the hardest job to teach a workman. Some workmen are simply incapable of grasping or learning the job of properly irrigating a green. I could fill a book with the incidents of worker inability to learn, or carelessness over the years I have been in this work. When irrigation of greens is necessary, it would be better to turn this job over to your most experienced and trusted workmen and then, the superintendent should keep a close check on this most important job.

We can check the amount of water applied to a green in a given length of time by spacing cans 5 ft. apart around the green; then after irrigation, measure the amount of water in the cans.

Too much water applied to a green too often can only result in disease attacks, shallow root systems, wet wilt, compaction of soil from mowers and traffic, infestation of Poa annua, and other weeds because oxygen cannot reach the grass roots. Any of these can cause a badly damaged green or the complete loss of a green.

Too little water applied to a green will result in desiccation of grass in times of stress, such as high winds or hot sun. Dry wilt will occur when wind or sun draws moisture from the grass leaves faster than the rate of transpiration from roots to leaves.

You will find that no two greens on the golf course can be watered the same length of time. Water pressures vary on different parts of the golf course, and some greens will have more or less water pressure than others. The soil mix may be different, allowing slow or fast penetration into the soil. Compaction may be present, which will result in quick runoff of water. Green contours are different, which might result in quick runoff on one part of the green and fast percolation on other parts of the same green. Severe slopes or mounds should be hand watered.

Studies by Dr. Coleman Ward, at Mississippi State University, show that there is a definite relation to winterkill of bermudagrass when too much moisture is present. When a sudden, sharp drop in

temperature is encountered, plant cells freeze and rupture, causing the plant to die.

In our section of the country, we have different grasses that demand different applications of water. We have bermudagrass during the summer months, winter grasses (such as rye, red top, fescue blue-grass, Poa trivialis, and bentgrass) during the winter months. Some courses in our section have bentgrass the year around. All have different root systems and water requirements vary.

We are convinced that bermudagrass should be deeply watered whenever we irrigate, then no more water should be applied until the grass shows a definite need for it. This will encourage deeper root depth and help to keep disease to a minimum. Bermudagrass seldom, if ever, needs syringing on hot or windy days.

Our winter grasses, due to more shallow root systems, need a deep watering more often and may need syringing on hot or windy days.

Bentgrass has a deep root system during the winter months or cool months but during the summer months, the roots tend to become shallow. Frequent watering of bentgrass is necessary during the hot months and afternoon syringing is a must to prevent or cure wilt. Also, tests have shown that after syringing, the ground temperature will drop 15 to 17°, further helping to keep the bentgrass cool. Grass is no respecter of days, so syringing might be necessary on Saturdays, Sundays, and holidays. Deep watering of bentgrass should be done during the early morning hours. To keep disease attacks to a minimum, bentgrass greens should go into

the night as dry as possible.

To sum this up, I am firmly convinced that most of our troubles stem from over-watering. You will find that a little water goes a long way. Personal supervision by the superintendent on the amount of water applied to each green on his golf course is a must.

Slides

1. There are times when we don't need rain. This is the result of a heavy rain following overseeding at the Capital City Country Club.
2. Water pressures do vary at different locations on the golf course. This was the end of the line at Richland Country Club, inNNashville. The next slide will show steps taken to correct the situation.
3. We corrected this by installing new water lines with larger pipe and installing a perimeter system of valves. This is now obsolete with the new irrigation systems being installed everywhere.
4. This is the center green system - one valve underneath the sod cup. Mel Warnecke, at East Lakes Country Club in Atlanta, likes this system.
5. Brook Hollow Country Club, Dallas, Texas, syringing a green. I believe we can beat this with a perimeter system or a new, modern system.
6. Nematode injury in Florida - Instead of nematode injury, the trouble was found to be the night watering-man setting the sprinkler in the middle of the green and never bothering to move it around the edges.
7. This was a fully automatic system in Florida that had bugs in it.
8. This happened in El Paso, Texas. The watering-man went to sleep.

9. A golf course in Chicago - Failure to syringe on a hot, windy afternoon caused this damage. This could have happened on a Saturday, Sunday, or holiday.

10. Phoenix, Arizona - One result of poor drainage.

11. Detroit, Michigan - Another result of poor drainage.

12. Houston, Texas - Drainage off the green in a narrow area. Algae follows the water course.

13. Kansas City - Traffic injury to a poorly drained green.

14. Los Angeles - Poa annua invasion follows surface runoff of water.

15. New Hampshire - High rim around back of the green. This could never be watered properly, and should be removed.

16. Texas A & M University - Bermudagrass will develop deep roots if given a chance.

17. We, in the Southeast, are blessed with ample water now. These headlines in a Denver, Colorado newspaper might become a reality in the Southeast some day. Gentlemen, don't waste water. A little water goes a long way, especially on bermudagrass.

DISEASE CONTROL ON GOLF GREENS

Fungus Diseases of Bermudagrass and "Overseeded" Cool-season Grasses on Golf Greens

H.D. Wells, USDA, Georgia Coastal Plain Experiment Station, Tifton, Georgia

The greens are the focal points on a golf course. Therefore, it is appropriate that this Conference emphasize construction and maintenance of golf greens. Earlier in the Conference, you were exposed to the engineering and agronomic phases of establishing and maintaining greens. We now come to the disease problems and control measures to assure that all the efforts put into establishing and maintaining the greens are not wasted.

Before discussing specific diseases, there are four major points on general disease prevention that should be brought to your attention. While it may appear that these points belong to the engineer and agronomist, they are prerequisites to growing disease-free turf: 1) Make sure that the green has excellent external and internal drainage. 2) Landscape the green to assure maximum exposure to sunlight (Sun rays are lethal to many pathogens.). 3) Establish a grass that is well adapted to your area and resistant to as many diseases as possible. 4) Follow a fertilization program that will assure you of a steady growth of new grass.

The three major diseases of bermudagrass are brown patch, dollar spot, and the leafspot complexes.

Good surface drainage and full sunlight are adequate controls for brown patch disease on bermudagrass during most of the season. However,

during prolonged warm, rainy and cloudy weather, fungicides offer the only practical control of brown patch. It so happens that during these periods, weather is often unfavorable for applying fungicides. Rains may wash off the fungicide before it has accomplished its purpose. Therefore, it is advisable to practice a preventive program on brown patch control while temperatures are 80° F and above. Biweekly applications of fungicides shown in Table 1 should prevent an outbreak of brown patch.

The leafspot problem is not as severe on the improved varieties released from Tifton as on common bermuda and some other varieties. Both leafspots and dollar spot are usually not serious on well-fertilized greens (especially where nitrogen and potassium levels are adequate). Leafspots on bermudagrass, however, tend to increase during cool weather. A fungicide schedule that will control brown patch is also effective against leafspot. Some additional fungicides, shown in Table 1, are effective in controlling leafspots. These fungicides listed may be used in a biweekly schedule to prevent and control dollarspot.

The cool-season grasses are subject to damage by cottony blight, brown patch, dollar spot, anthracnose, and a number of minor diseases. All of the cool-season grasses are more subject to disease damage at higher temperatures than at cool temperatures. Therefore, it is imperative that seeding of these grasses be delayed until as late in the fall as possible. However, frequent prolonged, warm and humid weather in the fall and winter may force one to use fungicides on the cool-season

grasses. Currently, Dexon (Table 1) is the only fungicide labeled for turf that is highly effective against cottony blight. This fungicide (Dexon) will not control brown patch or the other turf diseases; therefore, it should be used in conjunction with a brown patch fungicide. Dexon is readily decomposed by light, consequently, late afternoon applications are recommended.

Anthracnose is often damaging on the cool-season grasses during warm, rainy periods throughout the winter. I am unaware of any experimental evidence on control of anthracnose on golf greens. However, our observations here at Tifton and on golf greens throughout this area indicate that the disease is readily controlled by biweekly applications of mercury-containing fungicides (Table 1).

Table 1. Turf diseases, causal organisms, and some effective controls.[1]

Disease	Causal organism	Control[2]
Brown patch	Rhizoctonia solani	Mercury-, thiram- or PCNB-containing fungicides. Dyrene, Dacanil, and Fore
Dollar spot	Sclerotinia homeeocarpa	Cadmium- or mercury-containing fungicides and Daconil.
Helminthosporium leafspots and turf spots	Helminthosporium spp.	Zineb-, captan-, dichlone-, Dyrene-, Acti-dione-, and thiram- mercury-containing fungicides, Dacanil and Fore.
Curvularia fading-out	Curvularia spp.	Same as for Helminthosporium leaf and turf spots.
Cottony blight	Pythium aphanidermatum	Dexon- 70% WP (2 oz. per 1,000 sq. ft.)
Anthracnose	Colletotrichum spp.	Mercury-containing fungicides.
Slime molds	Physarum spp.	Remove mechanically or use any turf or garden fungicide
Algae	Microscopic plants	Good turf is best preventive; 2-5 lbs. of hydrated lime per 1,000 sq. ft.; any good copper fungicide (Use according to recommendations on label.).

[1] In most instances, only the active ingredients are given. However, some trade names are listed solely for the purpose of providing specific information. Mention of a trade name does not constitute a guaranty or warranty of the product named and does not signify that his product is approved by the U.S. Department of Agriculture to the exclusion of other comparable products. Chemicals are to be used according to recommendations of manufacturers unless specific rates are shown in the table.

[2] It will be beneficial to add a detergent or commercial spreader-sticker to most of the foliage sprays.

Disease Control on Golf Greens

George M. Kozelnicky, University of Georgia, Athens, Georgia

Several newer fungicides have been tested on Tifgreen (Tifton 328) greens in the last two years. The following comments are made on three:

Daconil 2787 (tetrachloroisophthalonitrile) has been found especially effective against dollar spot, but also controls brown patch and Helminthosporium blights. We have tested this compound against spring dead spot and have detected small responses. The compound was tested, we feel, at too low a rate to control this disease and we are testing the compound further.

Fore (Fe^{++} + Mn^{++} ions of ethylenebisdithiocarbamate) - Effective against dollar spot, brown patch and Helminthosporium blights.

Spring-bak (a coordinated product of sodium ethylenedithiocarbamate) - In some of our tests, this compound has appeared to be effective in reducing spring dead spot. More needs to be known about the erratic behavior of this and other compounds in controlling this disease. Most importantly, the cause of the disease needs to be found.

No new diseases have appeared on grasses on greens. However, spring dead spot is increasing and poses a definite threat to the use of hybrid bermudas on golf greens. We have been working with this disease, not necessarily on greens, but what I will say will probably be applicable to greens culture.

Spring dead spot is a disease affecting only bermudagrass, but is especially severe on the hybrid bermudas. It is evident only in the spring of the year when the grass emerges from dormancy, and is identified by the well-defined, circular, dead spots, which may vary from a few inches to diameter. in diameter. Commonly, the average size is around 12 inches. The margins of the spots are usually even, but may become irregular when the spots coalesce. The grass within the dead areas is of a bleached-straw color. An examination of the stolons and roots reveals them to be a black or blue-black color due to rot and they appear to have been dead for some time. Unfortunately, there are no obvious preliminary symptoms during the preceding growing season or the dormant period. Stolons may bridge the spots but any roots sent down by it are not established properly and, thus, the stolons do not survive the winter. The spots invariably occur in the same place from year to year, with a continual increase in size. Many times, weeds such as crabgrass, Poa annua, etc. fill in the spots.

An interesting observation is that when one takes a plug of soil from one of these spots and introduces it into healthy, 3-year-old bermuda growing in flats in the greenhouse, there is no growth of grass in the "dead" plug.

A number of factors may be involved in causing this disease. It appears that this is a complex involving pathogenic (of varying pathogenicity) fungi, physiological conditions, and environmental conditions.

Elements, including nitrogen and potash, have been found not to be involved in tests. The same is true for nematodes. Drainage (water and air) also appears not to be involved.

At Athens, we have conducted tests of chemicals against this disease for the last two years. We are also investigating tilth of soil, presence of thatch and mat, aerification, verticutting and complete rejuvenation of turf as possible control measures. Methods of control that could be simply performed by the home-owner are being investigated.

Our work has revealed many fungi growing from affected roots and stolons, both of pathogenic and saprophytic nature. The pathogens are being tested in the greenhouse, singly and in combination. The saprobes are also being tested, since the production of exudates may be involved.

The overall picture may be further complicated by the variation in pathogenicity, which exists within one strain of fungus.

Finally, I would like to emphasize the proper application of pesticides to turf. It has been clearly demonstrated many times that effective control results only when one is extremely careful and judicious in his procedures. Nozzles of spray rigs, booms, etc. should be spaced accurately and held at an exact distance above the turf. Pressures should be constant and pressure at the nozzle should be known. The rate of travel should be constant to insure uniformity of application. Operators and applicators should know of the toxicity of the compound being applied and should always wear protective appliances. In order to be sure that the correct rate is

always being applied, nozzles should be replaced with new ones periodically, since they do wear out. These should be dripless or the apparatus should be so constructed. Healthier greens will be the result.

INSECT CONTROL ON GOLF GREENS

V. Rodney Coleman
Extension Entomologist, Extension Service, University of Ga., Athens, Georgia

As you know, several kinds of insects may be found attacking grasses that are used for golf greens. The identification of the insect pests must be determined in order to know what insecticide to use and when to apply.

A slide discussion of the identification and biology of the following lawn pests was presented:

I. Those that infest soil and roots:

   A. White grubs

   B. Ants

   C. Mole crickets

   D. Ground pearls

   E. Seed corn beetle

II. Those that feed on leaves and stems (chewing):

   A. Cutworms

   B. Sod webworms

   C. Armyworms

III. Those that suck plant juices:

   A. Chinch bugs

   B. Spittlebugs

   C. Leafhoppers

   D. Rhodes scales

IV. Those that inhabit, but do not damage lawns:

A. Earwigs

B. Millipedes

Specific control measures are available in publications by the Cooperative Extension Service, University of Georgia, or the U. S. Department of Agriculture.

ATTENDANCE ROSTER

ALABAMA

Name	Affiliation	City
Anderton, Wayne J.	Yielding's, Inc.	Birmingham
Borland, Bob	Arrowhead Golf & Country Club	Montgomery
Brown, William L.	Yielding's, Inc.	Birmingham
Carnes, Robert H.	Birmingham Park & Rec. Board	Birmingham
Dice, Dick	Green Valley Country Club	Birmingham
Dickinson, Thomas	Willow Point Golf & Country Club	Alexander City
Edmondson, Carl J.	Bonnie Crest Country Club	Montgomery
Godwin, George "Ed"	Country Club of Birmingham	Birmingham
Goodwin, Gary D.	Hillcrest Country Club	Birmingham
Jones, John	Yielding's, Inc.	Birmingham
Latta, J. D.	Parks and Recreation Board	Birmingham
Lawrence, Doyle	Maxwell Golf Course	Montgomery
Ledbetter, Bob	Green Valley Country Club	Birmingham
Moses, Cecil G.	Montgomery Country Club	Montgomery
Nelson, Bill	Green Valley Country Club	Birmingham
Powell, John W.	Golf Course Superintendent	Mobile
Rumore, Ross	Parks and Recreation Board	Birmingham

CONNECTICUT

Penotti, Frank	Giant VAC Mfg. Company	South Willington

FLORIDA

Allen, Dick	Paul E. Allen Company	Palm Harbor
Arnold, Charles	Florida Tractor Corporation	Jacksonville
Barrow, J.D.	Twin Palms Golf Club	Orlando
Buckley, H.E.	Rainy Sprinkler Sales	Gainesville
Cale, Edward B.	Timuquana Country Club	Jacksonville
Calhoun, Lawrence L.	Debra Turf Equipment Company	Hollywood
Caswell, Barry	Melbourne Golf & Country Club	Melbourne
Clarke, Stan	LaGorce Country Club	Miami Beach
Collins, Bill	F.E.C. Fertilizer Company	Homestead
Cummins, Smith M.	Gainesville Golf Club	Gainesville
Deatherage, A.M.	City of Daytona Beach	Daytona Beach
Derzypolski, Marion	Capital City Country Club	Tallahassee
Ellison, N.M. "Buddy"	Florida Tractor Corporation	Jacksonville
Ferguson, Larry C.	North Palm Beach Country Club	N. Palm Beach Village
Fortner, Leroy	South Florida G.C.S.A.	Sarasota
Hall, E. T.	Retired Golf Course Supt.	Sarasota
Hines, Reuben P.	Sunset Golf Course	St. Petersburg
Horn, G. C.	University of Florida	Gainesville
Johnson, Lawrence R.	Buckner Industries, Inc.	Jacksonville

Name	Affiliation	City
FLORIDA (Cont.)		
Jones, Ralph F.	Wilson & Toomer Fertilizer Co.	Jacksonville
Mascaro, Charles G.	Florida Milorganite, Inc.	Miami
Moreland, John	Ft. Walton Beachq	Ft. Walton Beach
McKinney, Carl	P.G.A. National Golf Club	Palm Beach Garden
Nixon, Rufus	Eglin A.F.B. Golf Course	Eglin A.F. Base
Noggle, J.C.	American Potash Institute	Gainesville
Ousley, J. E., Sr.	Ousley Sod Company	Pompano Beach
Proud, Roland	E-Z-Go Car Div., Textron, Inc.	Ft. Lauderdale
Reinhardt, Jack F.	Shell Chemical Company	Orlando
Schmeisser, Hans		Hollywood
Schmeisser, Otto	Gulf Stream Golf Club	Delray Beach
Shepard, Willie	Riviera Country Club	Daytona Beach
Sprogell, Frank	Paul E. Allen Company	Palm Harbor
Todd, Leamon W.	Sebring Golf Course	Sebring
Williams, James R.	City of Daytona Beach	Daytona Beach
Wilson, John	Santa Rosa Shores	Pensacola
Wingfield, Joseph	249 Weber Street	Daytona Beach
GEORGIA		
Allen, Dayton	Evans Implement Company	Atlanta
Andrews, Graham P.	Houston Lake Country Club	Perry
Barnhart, George E.	Cherokee Town & Country Club	Atlanta
Baston, Gene	Savannah Inn & Country Club	Savannah
Baumgardner, T. M.	Sea Island Company	Sea Island
Blackmar, Lyman	Route 1	Cataula
Blasingame, W.E.	Getz Lawn & Garden Service	Atlanta
Briguglio, Joseph P.	Naval Air Sta. Golf Course	Glynco
Brodie, Bill B.	Coastal Plain Exp. Station	Tifton
Brooks, Jerry W.	Peachtree Golf Club	Atlanta
Bullock, R. J.	Ashcraft-Wilkinson Co.	Atlanta
Bullock, R. L.	U.S.M.C. Supply Center	Albany
Burnam, Joe	East Lakes #2, Inc. Golf Club	Atlanta
Burton, G. W.	Coastal Plain Exp. Station	Tifton
Byrd, Willard	Willard Byrd & Associates	Atlanta
Carter, R. L.	Coastal Plain Exp. Station	Tifton
Chao, Charles S.	Columbia Nitrogen Corporation	Augusta
Christiansen, J.W., Jr.	Kaiser Agricultural Chemical Co.	Albany
Clements, Lee	Coastal Plain Exp. Station	Tifton
Cole, James B.	University of Georgia	Athens
Coleman, Rodney	Extension Service	Athens
Cottle, Donald	Dixie Turf Farms	Ty Ty
Danner, Charlie	Capital City Country Club	Atlanta

Name	Affiliation	City
GEORGIA (Cont.)		
DaVitte, John C.	Hereford Farm Road	Evans
Dekle, C. I.	Forest Heights Country Club	Statesboro
Derrickson, M.E.	Cherokee Golf & Country Club	Atlanta
Dudley, J. W.	Athens Country Club	Athens
Dunning, Alvin	Augusta Country Club	Augusta
Eberwine, John W.	The Upjohn Company	Albany
Edwards, Neil	Highland Golf Club	Conyers
England, Henry G.	City of Atlanta	Atlanta
Evans, Rufus	Dixie Turf Farms	Ty Ty
Fincher, Bobby A.	Stovall and Company, Inc.	Atlanta
Flanders, C. Dyson	Sea Island Company	Sea Island
Fussell, George T.	Dalton Country Club	Dalton
Goodwin, Wayne	Cowan Supply Company	Atlanta
Greenway, Carlos D., Jr.	Landscape Architect	Alma
Hassell, Grady T.	Lawn and Turf, Inc.	Conyers
Hayden, Harold H.	Cowan Supply Company	Decatur
Hayes, T.R., Jr.	Town and Country Club	Blakely
Hogan, Dennis J.	National Golf Foundation	Atlanta
Holden, Preston L., III	Vineland Chemical Company	Smyrna
Howell, D. B.	Athens Country Club	Athens
Huskey, R.H. (Hank)	Cowan Supply Company	Atlanta
Inglis, David W.	Toro Manufacturing Company	Atlanta
Jensen, Ray	Southern Turf Nurseries	Tifton
Johnson, Dewey W.	Lawn and Turf, Inc.	Conyers
Jordan, Alvin E.	Mystery Valley Golf Course	Lithonia
Kincaid, E. E.	Lawn and Turf, Inc.	Tifton
King, Eugene	Special Services Golf Course	Ft. Benning
Kozelnicky, George M.	University of Georgia	Athens
Kraft, Art	Newnan Country Club	Newnan
Lambert, Jimmy H.	Evans Implement Company	Atlanta
Lambert, Paul W.	Stovall and Company	Atlanta
Land, Harold N.	Glen Arvin Country Club	Thomasville
Lawrence, Lester	Ft. Benning Country Club	Ft. Benning
Lee, Harold E.	City of Atlanta Parks Department	Atlanta
Madden, Loyd	Marietta Country Club	Marietta
Mason, Jack D.	Mason's Turf Grass Nursery	Augusta
Miller, Bill	Evans Implement Company	Atlanta
Miller, John T.	R.R. 3, Box 523	Albany
Moncrief, James B.	U.S. Golf Assn. Green Section	Athens
Murray, Dixie E.	Golf Course Superintendent	St. Simons Island
McKendree, Marion	Sea Island Golf Club	Sea Island
McMath, George	Russell Daniel Irrigation Company	Tifton

Name	Affiliation	City
GEORGIA (Cont.)		
McWhirter, Ben	Robins A.F.B. Golf Course	Warner Robins
Nations, Wayne E.	City of Atlanta Parks Department	Atlanta
Neese, L. C.	Country Club of Columbus	Columbus
Newton, J. P.	Georgia Experiment Station	Experiment
Parker, Ed M.	Columbia Nitrogen Company	Augusta
Patten, Robert L.	Patten Seed & Turfgrass Company	Lakeland
Pendley, Jerry B.	City of Atlanta Parks Department	Atlanta
Perryman, Leslie R.	Swainsboro Golf Club	Swainsboro
Poss, Robert	Russell Daniel Irrigation Company	Tifton
Rampley, K. C.	City of Atlanta	Atlanta
Roquemore, W. A.	Patten Seed & Turfgrass Company	Lakeland
Shirley, Jim, Jr.	Jim Shirley and Associates	Atlanta
Sisk, Robert A.	Swift and Company	Atlanta
Skinner, Albert	Coastal Plain Exp. Station	Tifton
Smith, Joe W.	Lawn and Turf, Inc.	Conyers
Smith, Randolph W.	Jacobsen Manufacturing Company	Atlanta
Southwell, O. F.	Ga. Crop Improvement Assn.	Leesburg
Spinks, Bryson	City of Atlanta Parks Department	Atlanta
Stocks, Joe	Albany Junior College	Leesburg
Storey, James	Warm Springs Foundation Club	Warm Springs
Stovall, J. T.	Stovall and Company	Atlanta
Sumrell, Billy B.	Callaway Gardens	Pine Mountain
Swensen, J. E.	Fort Benning Country Club	Ft. Benning
Teas, Jim	Bainbridge Country Club	Bainbridge
Thompson, A. A.	Ansley Golf Course	Atlanta
Torle, O. L.	Bainbridge Country Club	Bainbridge
Wells, Homer D.	Coastal Plain Experiment Sta.	Tifton
White, Don	Southern Turf Nurseries	Tifton
White, H. G.	City of Atlanta Parks Department	Atlanta
Wilcox, David B.	Stovall and Company	Alpharetta
Willis, Jerry L.	City of Atlanta Parks Department	Atlanta
ILLINOIS		
Eckhoff, Harry C.	National Golf Foundation	Chicago
Walling, Robert	Roseman Mower Corporation	Glenview
INDIANA		
Boyd, Ed	Evansville Country Club	Evansville
Ferguson, John P.	Evansville Country Club	Evansville

Name	Affiliation	City
KANSAS		
Rogers, Buck	Rogers Manufacturing Co., Inc.	Olathe
KENTUCKY		
Posejpal, George	American Air Filter	Louisville
MISSISSIPPI		
Thompson, W.R., Jr.	American Potash Institute	State College
NORTH CAROLINA		
Campbell, Don B.	M.C.A.S. Golf Course	Cherry Point
Corry, James F.	Bur-Mil Country Club	Greensboro
Lineberger, Abel	Gastonia Country Club	Gastonia
Mann, Will C.	Hope Valley Country Club	Durham
McKenzie, Lloyd T.	Pinehurst Golf Course	Aberdeen
O'Donnell, E. J.	Willowhaven Country Club	Durham
OHIO		
Burdette, Al	Parker Sweeper Company	Springfield
PENNSYLVANIA		
Mascaro, Tom	West Point Products Corporation	West Point
PUERTO RICO		
Link, E. A.	Link Landscape Company	Rio Piedras
Paguaga, Felix C.	El Conquistador Hotel & Club	Fajado
SOUTH CAROLINA		
Alexander, Paul M.	Clemson University	Clemson
Carson, William D.	Sea Pines Plantation Company	Hilton Head
Dabbs, Guy M., Jr.	Pineland Plantation, Ltd.	Mayesville
Duffee, William H.	Rolinson Corporation of America	Florence
McFaddin, Richard D.	Pineland Plantation, Ltd.	Turbeville
Ready, E. L.	Agrico Chemical Company	Johnston
Warko, John R.	Litchfield Country Club	Pawleys Island
White, Orville	Midland Valley Country Club	Aiken

Name	Affiliation	City
TEXAS		
Huggins, H. E.	Buckner Industries, Inc.	Irving
VIRGINIA		
Savage, Hurley	309 Mattox Drive	Newport News

TWENTY-FIRST ANNUAL
SOUTHEASTERN TURFGRASS CONFERENCE
Tifton, Georgia

April 10-12, 1967

TOTAL REPRESENTATION FROM EACH STATE:

Alabama	17
Connecticut	1
Florida	36
Georgia	96
Illinois	2
Indiana	2
Kansas	1
Kentucky	1
Mississippi	1
North Carolina	6
Ohio	1
Pennsylvania	1
Puerto Rico	2
South Carolina	8
Texas	1
Virginia	1
TOTAL	177