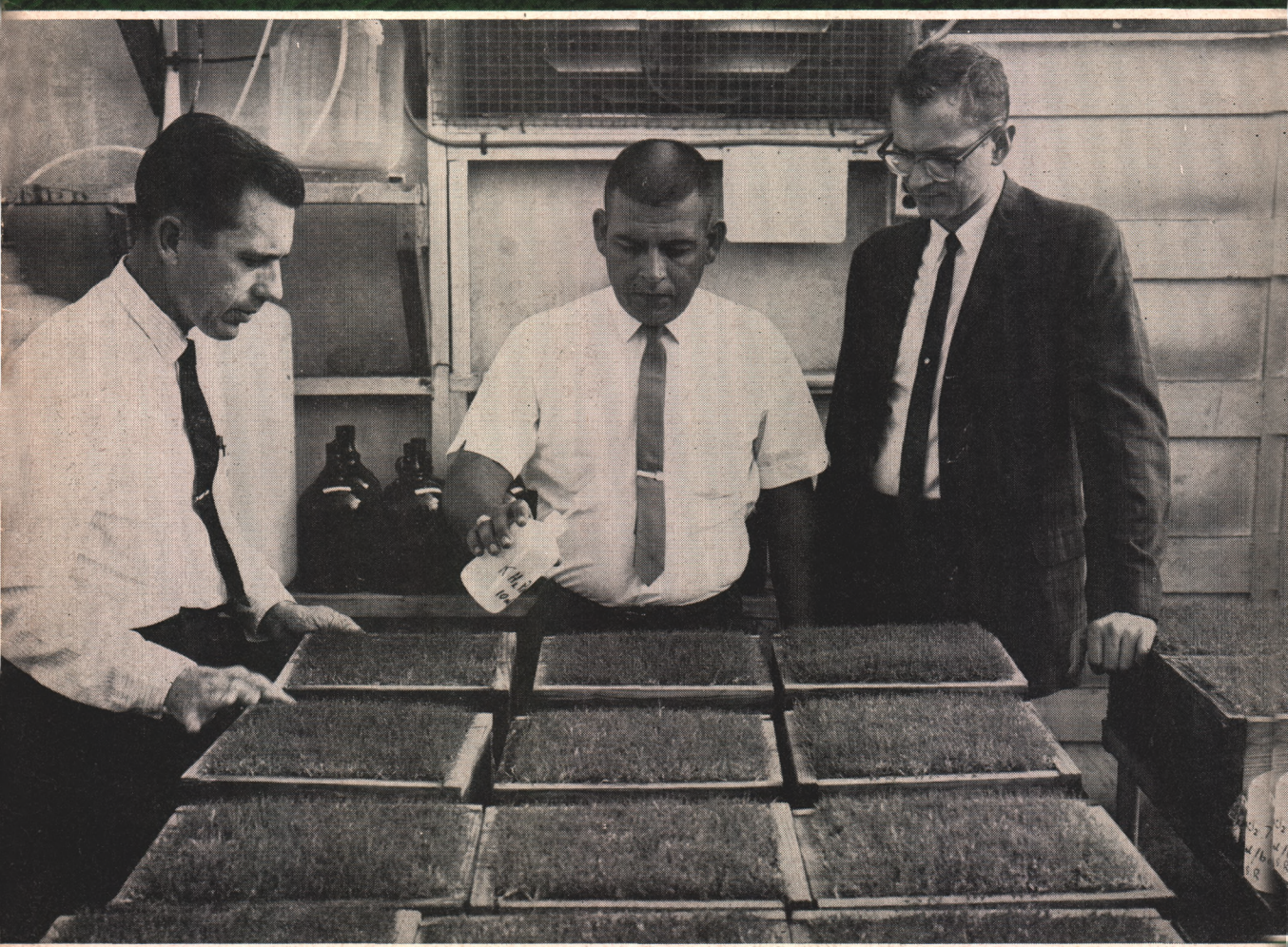
JANUARY 1968

# USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association



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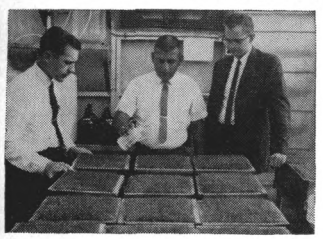
**VOL. 5, No. 5** **JANUARY 1968**





**Cover Photo:** Dr. George G. McBee, Texas A&M University, Turf Research Department, Sim Reeves and Wallace Menn, graduate students in turf physiology, examine Tifgreen bermuda samples being prepared for cold tolerance studies.

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**Editor: William H. Bengeyfield** **Managing Editor: Robert Sommers**

*Tifgreen bermuda nutrition studies being harvested for analysis. Wallace Menn, graduate student at Texas A&M University, obtains samples being grown on a hydroponic system.*

# A Green Section Report on Turfgrass Research

**by MARVIN H. FERGUSON, Mid-Continent Director, USGA Green Section**

Research was one of the primary responsibilities of the USGA Green Section at the time of its establishment in 1921. For 30 years the staff continued to expend most of its efforts in this activity.

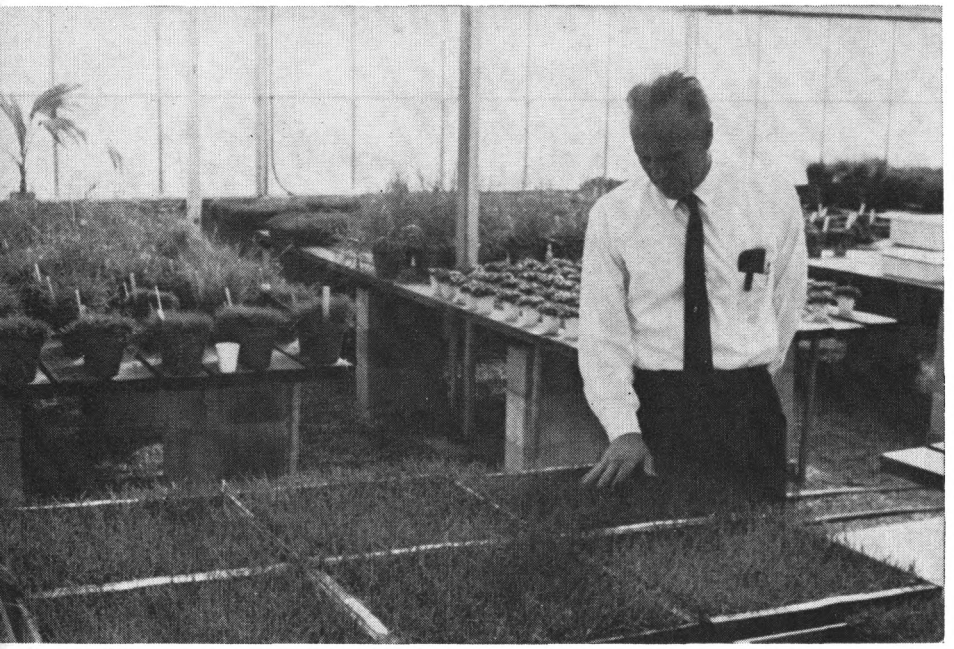
In 1951 the USGA changed the Green Section's plan of operation somewhat and placed greater emphasis upon the dissemination of information. While the staff is engaged primarily in an extension type of work, research is still an important part of the Green Section effort.

Through the U.S.G.A. Green Section Research and Education Fund, Inc., grants are made each year to universities for the purpose of supporting research that promises to be of value to golf clubs. Since 1953 grants have been made at 21 universities. The research which these grants support covers a broad range of subjects. Some of it is research of a fundamental nature, with no immediately discernible application. Much of it, however, is concerned with immediate and pressing problems, such as **Poa annua** control and the effects of certain herbicides upon permanent turfgrasses.

Perhaps the most effective way of describing the Green Section's research efforts is to provide some examples of work under way at the present time.

## *Rhode Island Research*

The University of Rhode Island is working with plastic mesh fabrics in an attempt to alleviate winter damage caused by desiccation and excessive heaving. Dr. Richard Skogley re-



*Dr. Victor B. Youngner, University of California, looks over one of his research projects — an improved variety of bermudagrass known as Santa Ana. It has out-performed all others in tests to date.*

ports that this technique is quite promising. There is less heaving, earlier "green-up" of turf, and covers stayed in place satisfactorily even in strong winds.

### *Wilt at Purdue*

Purdue University investigated the possible role of wilt reducers on bentgrass putting greens. Dr. William H. Daniel reports that wilt reduction can be accomplished and demonstrated under greenhouse conditions. However, more than normal moisture stress is necessary to be able to see the benefits of such materials on putting greens. These investigations are continuing.

Such a technique possibly could be applied in connection with tournaments. On hot summer afternoons, putting greens may need showering to prevent wilt. However, if a tournament is in progress, officials are very reluctant to apply water because of the possible change in playing conditions. A wilt-reducer would be worthwhile in such a case even if it provided only temporary relief.

### *Texas A & M Studies*

For a great many years the Green Section's research grant at Texas A&M was used to support soil studies. From this research came the information which formed the basis for the USGA Specifications for a Method of Putting Green Construction.

At present, however, the emphasis has been placed on nutritional studies. Dr. George McBee and Wallace Menn have devised a water culture method whereby they can provide varying levels of nutrients, and can determine responses to given levels of nutrients in the turf foliage. Such information may lead to a diagnostic technique in which clippings from a putting green may be analyzed to determine nutrient content, and fertilizer amounts necessary to restore optimal levels may be calculated. This study involves the use of Tifgreen bermuda. The nutrient elements being studied are nitrogen, phosphorus, potassium, calcium, and magnesium.

### *Work at University of California*

Research grants supporting work at the Riverside campus of the University of California are not designated for any specific use but are used as needed in the program. Dr. V. B. Youngner has a great many problems under investigation.

Breeding studies are being carried on with bentgrasses, bluegrasses, tall fescue, and zoysia. There are studies on carbohydrate reserves of bermudagrass in relation to winter survival, and planting quality of stolons. Cultural practices which affect carbohydrate reserves are being studied.

Growth retardants for turf provide another area for investigation and these studies are quite promising. A material which will retard top

growth without damaging the root system would certainly be a welcome addition to the list of management tools.

The University of California at Davis has received grants in recent years for the purpose of investigating turfgrass research techniques. Dr. John Madison has observed that some of the difficulties confronting turf investigators are created by the lack of an ability to define and measure turf quality. His work is an attempt to measure in meaningful terms the effects of management treatments. This is an area of study that may not yield direct benefits to golf clubs, but indirectly it may be extremely valuable because it will strengthen the work of other investigators.

### *Pennsylvania State University*

Since 1958 Pennsylvania State University has been engaged in a study of colonial bentgrass. The aims are to investigate the breeding behavior of this species and, if possible, to develop better turf types of plants within the species. Dr. Joseph Duich is the project leader. Since the study began, Dr. A. E. Dudeck has used it as the basis for a doctoral dissertation. A. T. Perkins is presently carrying on the work.

This is an example of a slow, tedious research project that does not yield quick spectacular results. However, the research grant contributes to the advanced study of two scientists who will have the opportunity to make future contributions to our knowledge.

### *Turf Projects at Tifton*

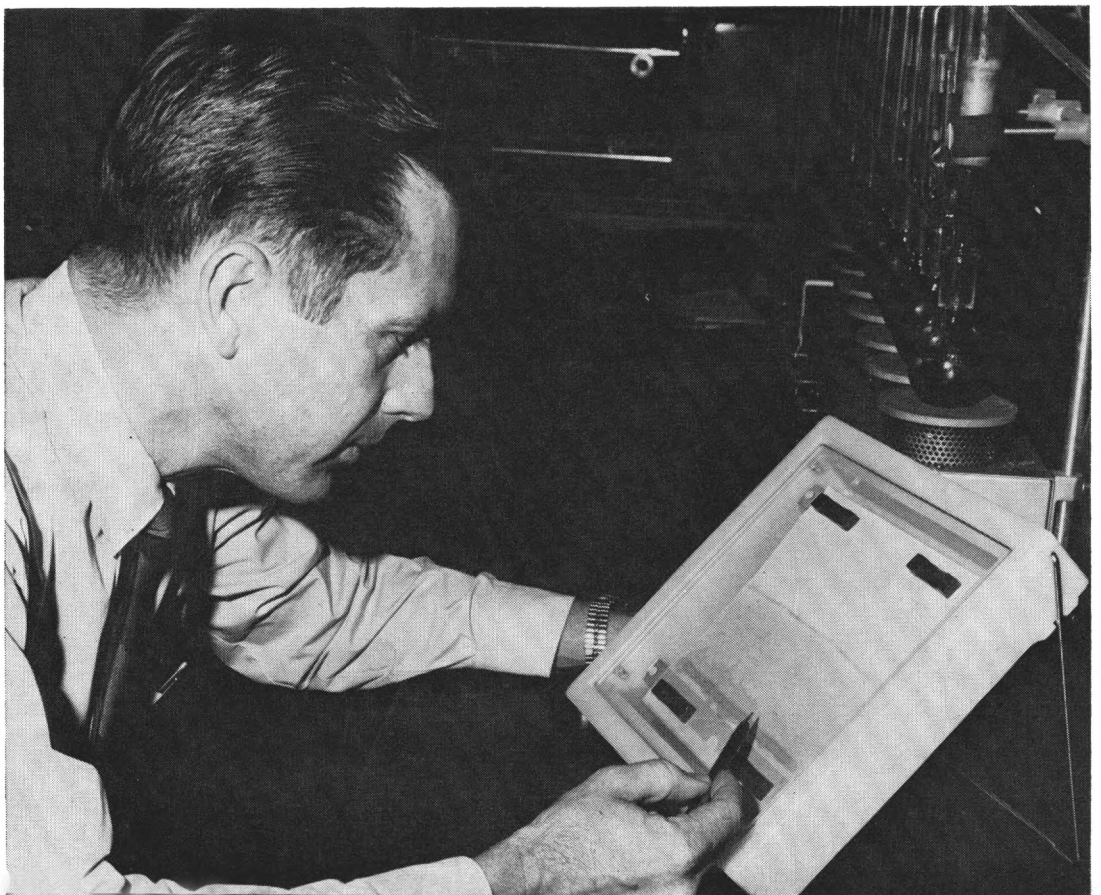
Probably no research station has done more with a given amount of financial support than the Georgia Coastal Plain Experiment Station at Tifton, Ga. Dr. Glenn Burton is the leader of the turf project. From this station have come most of the improved bermudagrasses, including Tiflawn, Tiffine, Tifgreen, Tifway, and Tifdwarf.

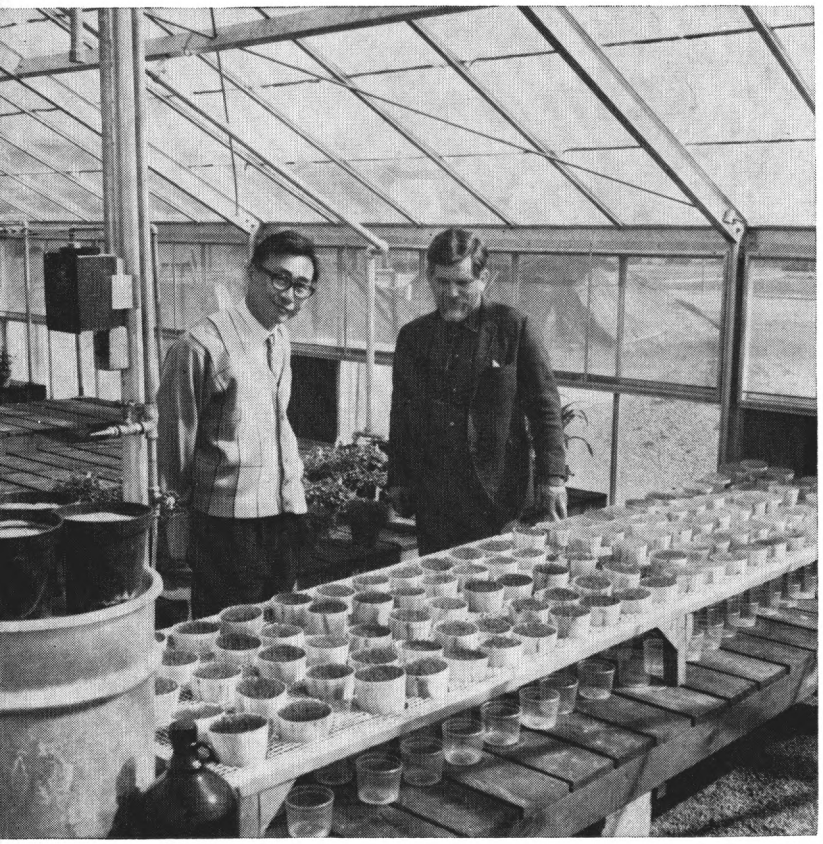
It is difficult to calculate the magnitude of the impact these grasses have made upon the quality of turf for golf in the South. The Tifton station has made other notable contributions to management practices, but these are overshadowed by the tremendous value of the improvement in grasses.

### *Oklahoma and Bermuda*

Dr. Wayne Huffine, of Oklahoma State University, has made a worldwide plant exploration trip during which he collected approximately

*Chromatographs are being examined as part of turfgrass shade tolerance studies by Dr. George G. McBee, Texas A&M University.*





*Nobuo Maekubo research scholar of Kansai Golf Union, Japan, discusses with Dr. John Madison, University of California, Davis, the behavior of turfgrasses and their responses to management treatments.*

700 types of bermudagrass. From these the turf types have been separated. The evaluation of these selections for turf purposes is a project being supported in part by a grant from the U.S.G.A. Green Section Research and Education Fund, Inc.

### *Michigan State and Poa annua*

The grant at Michigan State University supports a study of fundamental facts about **Poa annua.** The studies now under way involve seeding, vegetative growth habit, and heredity variability, environmental adaptation studies, and relative flooding tolerance of annual bluegrass. In addition to these studies, a master's thesis has been published by James Alan Fischer entitled "An evaluation of high temperature effects on annual bluegrass."

These fundamental studies have two aims. They are to learn the fundamental weaknesses of **Poa annua** that would permit the synthesis of an approach to control the species selectively, and to learn how to compensate for its weaknesses in a management program which is based upon keeping **Poa annua** turf.

### *Kansas and Rutgers at Work*

In addition to these studies, Kansas State University is involved in improvement of bermudagrasses and zoysias in the "transition zone" between cool-season and warm-season grasses. Rutgers University has just begun a program of bluegrass improvement.

These brief sketches provide some idea about the scope and diversity of studies supported by the U.S.G.A. Research and Education Fund, Inc. Research is one of the most profitable ways in which money may be invested. It is the source of new information which will provide for continued improvement of turf on golf courses.

Moreover, the same grants which provide the support for an investigation usually help also to further the career of a student. There is a long list of men currently involved in the academic area of turfgrass management who received some support from these grants during their student careers. The importance of the contribution to the education of these men far outweighs the cost even if no value were placed upon the results of the investigations they carried out.

# AN EVICTION NOTICE for Poa Annua on Fairways

by LEON V. ST. PIERRE, Superintendent, Longmeadow Country Club, Longmeadow, Mass.

(Editor's note: This article deals with the control of **Poa annua** on fairways—the archenemy of northern golf course grasses. Several new pre-emergence materials are now being manufactured for **Poa annua** control, such as bensulide, and tri-calcium arsenate. Experiment station results have been variable for the most part, and so golf course superintendents have been hesitant to do much on their courses. More recently it seems that changes in application techniques worked out by practical superintendents are proving successful with one of these pre-emergence materials, tri-calcium arsenate. Tri-calcium arsenate is now being successfully applied at light rates more frequently, rather than one full application of toxicant at one time. Such a success story is being reported here. However, we caution that if you are interested, you first test this material on a small scale because your conditions will not be the same as Longmeadow's.)

Nursing **Poa annua** during the summer months of each year is the least gratifying job that comes my way. After years of worry and heartbreaking experience with **Poa,** we decided to give the pre-emergence herbicides a try on our fairways. We chose 48 per cent tri-calcium arsenate and made the first application on May 11, 1967, at the rate of two pounds per 1,000 square feet. A second treatment was applied June 8, 1967, at one pound per 1,000 square feet. This provided approximately 1.5 pounds actual toxicant per 1,000 square feet. We noticed no thinning of the **Poa annua** until July 18, when it started to weaken.

*A close look at No. 1 fairway. Note the solid rows of bentgrass coming through with virtually no competition from Poa annua, an excellent catch.*

During the first week of August, all fairways were sprayed for broadleaf weeds, including knotweed, with a combination of 16 pounds Dicamba and eight ounces of a MCPP formulation per acre. Control of weeds was estimated at 90 per cent to 95 per cent.

Two weeks later (August 16) we aerated fairways six times over and followed with a thatching operation at ½ inch depth. Fairways were then overseeded with a mixture of 28 pounds Astoria, eight pounds Seaside and four pounds Penncross per acre. This seed mixture was purchased in early spring when the price of Penncross was down. However, our second lot of seed was ordered when the price of Penncross was prohibitive for us and we altered the mixture to 70 per cent Astoria and 30 per cent Seaside. We therefore used these two mixtures on fairways.

Two weeks after seeding, all fairways were fertilized with ½ pound actual nitrogen per 1,000 square feet using 20-0-10. This analysis was chosen because we wanted no phosphorus applied since phosphorus negates the effectiveness of an arsenical.

Our results have astounded me! I have never seen such good control of **Poa annua** with any material and our seeded grasses came through the fall with no real competition from **Poa annua.** Fairways now contain a considerable amount of bentgrass, that which was seeded as well as that which survived the arsenic treatment. In my 12 years here, I have never seen so much permanent grass on our fairways at any time. The balance now favors the bentgrass as once it favored the **Poa annua.** My estimate is that we had 80 per cent control of **Poa annua** this year.


*Sign placed on the No. 1 Tee at Longmeadow Country Club by Superintendent Leon St. Pierre advising of fairway renovation program.*

I have every confidence that our fairways will be a lot easier to manage now and at long last we have a fighting chance to prevent re-infesting. We are still experimenting, but based on these results we plan a three- to five-year period of arsenic treatment at these light rates.

## COMING EVENTS

**NEW JERSEY TURF COURSES—RUTGERS UNIVERSITY**

Winter Turf Course—20 weeks January 3-March 8, 1968 & January 6-March 14, 1969
Three-day Turf Course—January 15-17, 1968
(Lawn, Athletic Field and Utility Turf)
Golf and Fine Turf—January 17-19, 1968

**VIRGINIA TURFGRASS CONFERENCE**

January 23-24, 1968
Golden Triangle Motel, Norfolk, Virginia
Chairman—Dr. R. E. Schmidt

**GCSAA INTERNATIONAL TURFGRASS CONFERENCE & SHOW**

February 18-23, 1968
San Francisco, California
Host—GCSAA, 3158 Des Plaines Ave., Des Plaines, Illinois

**NEW YORK TURFGRASS CONFERENCE**

February 26-29, 1968
New York State College of Agriculture, Ithaca, New York
Chairman—Dr. J. F. Cornman

**MIDWEST REGIONAL TURF CONFERENCE**

March 4-6, 1968
Purdue University
Lafayette, Ind.
Chairman—Dr. William H. Daniel

# *little things* Count in Tiling Golf Courses

by SHERWOOD A. MOORE, Superintendent, Winged Foot Golf Club, Mamaroneck, N. Y.

Much has been written and said about water during the past several years. Its sources and supplies, irrigation systems and practices have all received attention. While this has been going on, another very important facet of water management—drainage—has been pushed into the background. Good drainage is as important as good watering. Surely every golf course and every golf course superintendent has had to deal with a drainage problem at one time or another.

With this in mind, I would like to submit some specifications that I think are necessary for good tile line installation in greens, fairways and roughs. These specifications should help the novice, the club or any individual planning the contracting of drainage work.

A tile line is only as efficient as its weakest piece of tile. Considerable thought and planning should be given to any drainage project.

## TILING GREENS

Tile installation in greens is almost a lost art. The sod should first be cut to a width of one to two feet and removed from the putting green. This opening will show location, direction and distance of the tile lines. Ditches should be from 12 to 18 inches wide, and the depth dependent on the topography and the outlet of the line itself.

All topsoil should be dug by hand and placed on polyethylene or plywood sheets alongside the trench. The subsoil should also be dug by hand and removed from the green by wheelbarrows operating on planks or ½-inch plywood. If a trencher is used, it must be operated on planks or heavy plywood so that the green surface will not be damaged. The trencher should discharge the subsoil on polyethylene or plywood and the soil then removed from the green. Subsoils should never be replaced in trenches in greens.

After removing the subsoil, one to two inches of pea gravel or ⅜ stone or ¾ gravel is placed in the bottom of the ditch. Carefully grade and finish it to the proper slope and depth as determined by prepared drawings or by qualified supervision.

Four-inch agricultural farm tile, concrete porous wall or equivalent tile is used for all drains. The tile must be kept as straight as the general direction of the trench permits, and bends should be made in smooth curves. Tiles

*"And quietly flows the Rhine." One tile line that didn't work.*

*Smooth flowing curves for tile lines are a 'must.'*

should fit snugly together with no more than a ⅛-inch opening permitted at the top, but openings of ¼-inch at the bottom, where most of the water enters, are not objectionable.

Tiles should be turned to fit snugly for joints, on curves, or if tiles are slightly warped or have uneven ends. Any joints that have openings greater than the above permitted maximums must be covered with broken tile, flat stones or strips of heavy tarpaper. Tile that is cracked or broken must not be used.

Laterals must be connected to the main line with manufactured connections or branches such as Y's or T's. If not available, the junction should be chipped, fitted and the connection sealed with mortar consisting of 1 part cement and 2½ parts sand. The upper end of the tile line must be carefully blocked with a flat stone or similar material to prevent soil or animals from entering.

After the tiles are properly laid, they are covered with pea stone, ⅜ stone or ¾ gravel. If pea stone or ⅜ stone is used, the entire ditch should be backfilled with it to within nine to 12 inches of the surface. If ¾ gravel is used, backfill the ditch to within 15 inches of the surface, followed by three to six inches of pea stone or ⅜ stone. Care must be taken in the initial backfilling so that the tiles are not shifted out of place, broken by stones, or the coverings over the joints displaced.

Topsoil is then replaced to a depth of nine to 12 inches. It should be carefully settled by flooding or tamping in place. Final grading and careful resodding will complete the project.

## DRAINING APPROACHES, FAIRWAYS AND ROUGHS

After determining the exact location, direction, and distance of the tile lines, the sod should again be cut to a width of one to two feet and completely removed from the construction site. Ditches should be from 15 to 18 inches wide to a depth dependent on topography and the outlet point of the tile line.

Ditches may be dug with machinery such as a backhoe or trencher instead of by hand. The excavated soil may be placed on the ground alongside the ditch with no plywood or polyethylene required. If a backhoe is used, a one-foot

*Because they will be there for a long, long time, tile drainage line installation should be carefully done and closely supervised.*

*An important facet of good water management is good drainage. And we haven't paid enough attention to it.*

bucket is ample. A greater width bucket would require more soil than necessary to be removed and a larger amount of stone for grading and backfilling. Furthermore, the use of a backhoe will allow you to place the topsoil on one side of the ditch and the subsoil on the other. When backfilling, this will assure that the final four to six inches will be good topsoil.

If a trencher is used, the cut should be at least 12 inches wide to allow proper placing of tiles in the ditch. With a trencher, the topsoil and subsoil will be mixed so provisions must be made to backfill the final 4 - 6 inches with a suitable topsoil acceptable to the superintendent.

After the subsoil has been removed to the prescribed depth, 1 - 2 inches of pea stone, ⅜ stone or ¾ gravel is placed in the bottom of the ditch. It should be carefully graded and finished so that a proper slope and depth is established. The ditch bottom must be graded accurately with no hills or valleys. If the machinery has dug deeper than required, additional stone must be added to conform to the final grade.

Agricultural farm drain tile or concrete porous-wall tile should be used for the drains and the size will depend on the area to be drained. The tile must be kept as straight as the general direction of the trench permits and bends should be made in smooth curves. The same restrictions concerning spacing between tiles, joints and the use of broken or cracked tile as mentioned for greens would apply to fairways as well.

After the tiles are laid, they are covered with pea stone, ⅜ stone or ¾ gravel to a depth of three to four inches over the top of the tile. Care must be taken in backfilling so that the tile is not shifted out of place, broken by stones or any coverings over the joints displaced.

Subsoil excavated from the trench can be used in backfilling to bring the grade up to four to six inches from the surface. If the subsoil is solid clay or other impervious material, it should not be used for backfilling the trench. Instead, backfill to within six inches of the surface with a sandy or gravely bank-run material. Machinery such as a grader blade, front-end bucket or other means can be used in backfilling the trench provided that no damage is done to the surrounding turf. The subsoil should then be thoroughly settled by flooding and/or tamping.

Topsoil is then replaced to a depth of six inches and properly settled. All excess subsoil, stones and debris must be removed from the site and dumped in designated areas. Final grading and resodding will complete the project.

To do any job properly, close attention to every detail is important. In all too many cases, tile line installations are not carefully done or closely supervised. When there's a need for tile, there's a need for doing it properly—the first time!

*In their research at Western Washington Experiment Station Drs. Goss and Gould report that* Ophiobolus *patch had no trouble establishing itself on this plot having "zero" soil potassium levels.*

# *Turfgrass Diseases: The Relationship of Potassium*

**by DR. ROY L. GOSS and DR. C. J. GOULD**
**Western Washington Experiment Station, Puyallup, Wash.**

Fertilizer naturally plays a most important role in the maintenance of good turf. Well-balanced nutritional programs can aid materially in helping to suppress weeds and diseases. Potassium, one of the three major plant food elements, plays an important role in turfgrass vigor, which in turn influences disease development.

Potassium serves many roles in the grass plant and, if it becomes deficient can cause:

1. Accumulation of carbohydrates that cannot be synthesized into proteins.
2. An excess of non-protein nitrogen.
3. Failure to produce new cells for lack of amino acids essential for protoplasm formation.
4. Slower growth of meristematic tissue that permits replacement of diseased tissues.
5. Thinner cell walls and epidermal tissues.

According to George McNew, in the United States Department of Agriculture Yearbook, Plant Diseases, severe potassium deficiency could interfere with the activity of more than 25 different enzymes. He stated that more plant diseases have been retarded by the use of potash fertilizers than any other substance, perhaps because potassium is so essential for catalyzing cell activities. He further stated that the balance

of nutrient elements may be more important than concentration of total fertilizer when plants are exposed to attack by parasites. A deficiency or surplus of any one element often promotes diseases.

### EFFECT OF POTASSIUM

Dr. E. M. Evans and associates at Auburn University have reported a leaf spot disease on Coastal Bermudagrass that is related to soil potassium levels. This is one of the few papers in the literature that links a turfgrass pathologic problem with potassium deficiency. This disease is caused by two fungus species. Severe disease attacks were incited with zero levels of potassium and high nitrogen treatments. They concluded that severity was directly related to the degree of potassium deficiency.

### DOLLAR SPOT DISEASE

W. E. Pritchett and Granville C. Horn of Florida has reported less dollar spot disease caused by **Sclerotinia homeocarpa** where potassium was applied. J. Drew Smith in his book **Fungi and Turf Diseases** in 1955 stated that application of potash assisted slightly in recovery from infection of **Sclerotinia** dollar spot disease. Here are two indications, arrived at independently, that potassium does have some effect on dollar spot.

### BROWN PATCH

Pennsylvania State University has reported that brown patch disease, caused by **Rhizoctonia solani,** increased with increasing rates of nitrogen only when phosphorus and potassium were not concurrently increased. J. R. Bloom and Houston B. Couch in their investigations on the effect of nutrition, pH, and soil moisture on **Rhizoctonia** brown patch concluded that, as nitrogen is increased, there must be a concurrent increase in phosphorus and potassium to help lessen disease proneness and severity.

### RED THREAD DISEASE

Red Thread is a fungus disease caused by **Corticium fuciforme.**

In tests conducted at the Western Washington Research and Extension Center at Puyallup, Wash., we have found that nitrogen produced significant differences in the percent of diseased area or the number of stromata produced by the red thread fungus. Potassium was significant in bringing about a decrease in infection during one of these years. As potassium was increased from the zero level to eight pounds concurrently with nitrogen from four to eight pounds per 1,000 sq. ft. per season, the percentage of area infected likewise decreased. The greatest infection from **Corticium** red thread occurs in the Pacific Northwest in late summer and during the fall. Tissue analyses show that potassium is lower in grass tissue during this period when infection is almost nil. Plots receiving a balanced high level of nutrition escape almost completely from red thread attacks during the growing season, but are infected somewhat during slower periods in fall and winter.

Most agronomists and pathologists agree that in the case of red thread, high nutritional levels increase the growth rate of the leaves, and the infected tissue is removed before becoming objectionable.

### FUSARIUM PATCH DISEASE

**Fusarium** patch disease is caused by the fungus **Fusarium nivali.** In our investigations in western Washington we have found this disease to decrease with increasing levels of potassium from zero to eight pounds per 1,000 sq. ft. per season on putting green turf. Increasing levels of potassium, however, did not prove to be significant in every year.

Increasing potassium levels tend to keep the disease incidence reduced somewhat in the six-pound and eight-pound per 1,000 sq. ft. per season nitrogen range but, when nitrogen was increased to 20 pounds per 1,000 sq. ft. per season, potassium had little effect on disease incidence. This seems to be positive proof that 20 pounds of nitrogen in relation to the four pounds of phosphorus and eight pounds of potassium per 1,000 sq. ft. per season are in balance and do not respond in a reasonable manner. Again, the greatest **Fusarium** patch infection occurs from early fall to early winter when the potassium level of tissue is approaching its lowest level.

### OPHIOBOLUS PATCH DISEASE

This disease, caused by the fungus **Ophiobolus graminis,** var. **avenae** has responded with practical significance to both phosphorus and potassium nutrition. We have reported in a previous paper, published in the Agronomy Journal, that potassium had a suppressing effect on the amount of disease in two years of investigations at Washington State University. Potassium was

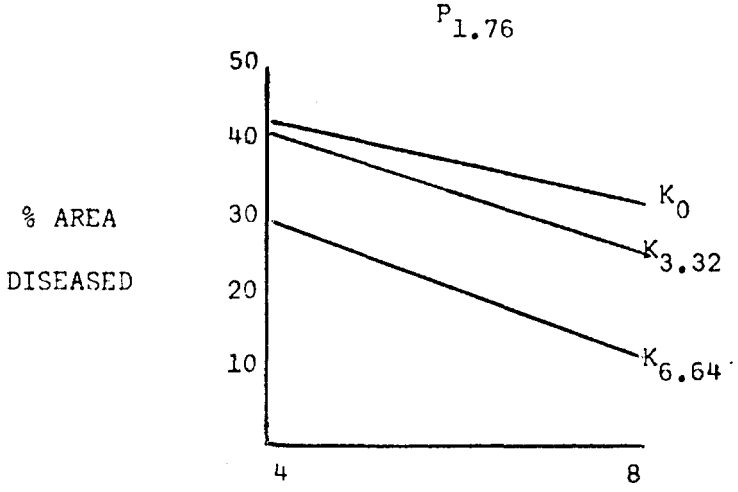



*Figure 1.*

*Decrease in Red thread infection* (Corticium fuciforme) *with increasing rates of both nitrogen and potassium.*

*Note: Both P and K are expressed in elemental and not oxide.*

found to reduce the amount of disease, regardless of nitrogen and phosphorus levels.

## BALANCED NUTRITION IS A MUST

Here again, we cannot deny the value of the overall effects of a balanced nutritional program. Our results at Washington State University to date show that a balanced program made up of three parts of nitrogen, 1 part of phosphorus, and 2 parts potassium is giving best results in our turfgrass management programs. The intensity is quite another factor and, if not brought up to certain levels, means little, particularly in the case of **Ophiobolus** patch disease and red thread. Our results have shown on putting green turf that 12 pounds of nitrogen, four pounds of phosphorus ($P_2O_5$) and eight pounds of potassium ($K_2O$) per 1,000 sq. ft. per season have given us best results. Likewise, on less intensely managed areas, such as good quality lawns or fairways, we have found that six to eight pounds of nitrogen, two to three pounds of phosphorus ($P_2O_5$) and four pounds of potassium ($K_2O$) per 1,000 sq. ft. per season is a good program.

## REMOVAL OF SOIL POTASSIUM

We have observed the decline in soil potassium in our same research plots over the past eight years at the Puyallup Station. Soil potassium levels have declined constantly when nitrogen was applied at 12 and 20 pounds per 1,000 sq. ft. and potassium at four and eight pounds per 1,000 sq. ft per season. These same potassium levels at the six-pound nitrogen rate are holding soil levels fairly constant. Where no potassium has been applied for eight years some plots, particularly in the high nitrogen range, show levels as low as 90 pounds per acre in 1967. These levels have dropped from a level over 500 pounds per acre initially when the experiment was initiated.

## SUMMARY

It is difficult to select any one nutrient and establish a threshold value at which it determines certain degrees of disease susceptibility. We feel that, as nutrient levels approach a critical minimum, we may be able to assign primary roles to these certain elements.

It is obvious from these studies in observing the build-up and suppression of turfgrass diseases that nutritional programs alone are not the sole answer. Carefully planned and executed fungicidal programs must be accepted by the golf superintendent or other turfgrass manager if he is to maintain clean and healthy turf.

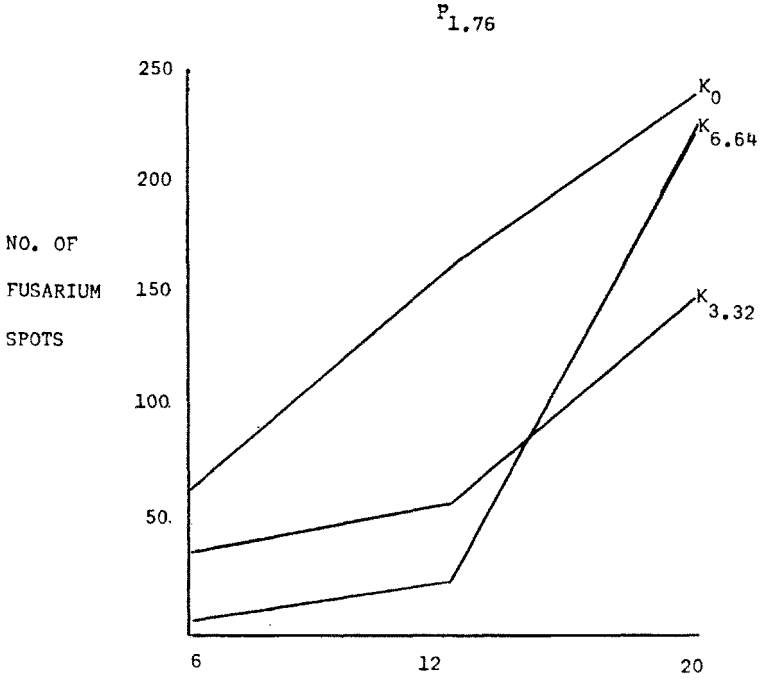



*Figure 2.*

*Number of* Fusarium *patch spots* (Fusarium nivale) *are lowest with increasing rates of potassium but increase with increasing rates of nitrogen.*

Note: *Both P and K are expressed in elemental, not oxide.*

## STATEMENT OF OWNERSHIP

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I certify that the statements made by me above are correct and complete.
Robert Sommers, Managing Editor

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# TURF TWISTERS

## WINTER BLANKETS

**Question:** Should I remove ice from greens this winter or is a "blanket" good for them? (Utah)

**Answer:** A "snow blanket" on greens will usually help protect them from drying out or desiccation injury. However, an extended period of coverage by an "ice blanket" can cause serious damage to the turf, especially **Poa annua.** If solid ice remains on the greens for more than 3 weeks, it should certainly be removed.

## WINTER BIRDS

**Question:** We have had seasonal trouble with coots getting on one of our greens. What do you suggest to minimize these birds on the green? (Florida)

**Answer:** We would suggest you contact the local wild life representative. He may have a solution for your unusual problem. However, we have observed a method of handling this type of problem by placing a fence 24 inches high between the green and the water. This reduced the number of birds on the green about 90 per cent. Note: Webster says, "Coots are stupid fowl, slow in flight and not classified as game birds."

## WINTER GREENS

**Question:** How much harm can we do by playing the regular greens this winter? (Mass.)

**Answer:** Weather conditions change so rapidly that it is difficult to give an unqualified answer. If the ground is frozen solidly or thawed beyond the depth of one inch, there is no cause for alarm as far as soil compaction is concerned. However, some grass blade damage may occur as foot traffic crushes the frozen blades. Real injury occurs when the ground thaws at the surface but not below one inch. Traffic then causes severe soil compaction, a tearing of roots from the plant and a squeezing and displacement of the soil, causing very uneven putting surfaces. The decision to play or not to play regular greens must be flexible and must rest with the superintendent, the Green Chairman and his Committee. And it may have to be changed within a few hours on any given winter day.