GCSA Convention

What They Said at Houston

Present Day Research-- A Study in Productivity

By WAYNE W. HUFFINE
Associate Agronomy Professor,
Oklahoma State University

Research in the field of turf became more widespread and intensified in the late 40's and is continuing to grow. This period has been very productive with reference to the development of better strains. Some of these are Pennlu and Penncross creeping bent; Pennlawn red fescue; Meyer and Emerald zoysia; and Tifgreen, Tiffine and Sunturf Bermudas.

Most state experiment stations now involved in turf research have turfgrass breeding or selection programs with varying degrees of intensity in conjunction with other turf studies. We can expect a number of new turfgrass strains in the near future.

Despite the release of the existing new

strains, we still find without exception, that there are some areas and some management conditions where these grasses still leave something to be desired. So there is a continuing need for tailor-made strains, for special conditions of management and areas of adaptation.

Fungicide Development

In the realm of fungicides, Bordeaux mixture was the standard material to use for any "blight" on turf prior to the mid 20's. Then, as a result of research work by Dr. John Monteith of the USGA green section, the use of mercurials in the late 20's became standard. Mercurial fungicides remained as standard controls for turf diseases until the start of World War II when mercury became scarce for non-military uses. Attention was then directed to other materials which could be used as substitutes. As a result of these investigations an organic fungicide called Thiram was found to be effective in the control of brownpatch. This material is still widely used today. About 1946, cadmium materials were developed for the control of dollarspot and other less common diseases. The antibiotic type fungicides came into use about 1953. At the present the most promising development in this field is the "broad-spectrum" materials. They are formulated to control a wide range of disease organisms.

In 1874 a German scientist named Zeidler discovered DDT, but it was not until 1939 that its insecticidal value was determined. It was first manufactured in the United States in 1943 and was used on a limited scale for mosquito control. By 1946 it had attained widespread use.

Go to Organic Insecticides

Prior to the discovery of the insecticidal properties of DDT, such materials as lead arsenate, bichloride of mercury and sodium fluosilicate were used almost exclusively for the control of turf insects. Soil fumigation was achieved by the use of sodium bisulfide. The pyrethrins, cube roots and ground tobacco stems were products used for the control of surface feeding insects. Most of these materials except lead arsenate, some of the pyrethrins and synthetic pyrethrin products which are still being used, have been largely replaced by the highly effective organic insecticides.

With the discovery of the insecticidal properties of chlorinated hydrocarbons such as DDT, chemists were provided a basis for formulation of many useful insecticides. Chlordane, toxaphene, dieldrin and aldrin are examples of the many chlorinated hydrocarbons which have been useful in the control of turf insects.

We have reduced the amount of insecticide required for effective insect control from the old standard of 400 lbs. or more of lead arsenate per acre to three lbs. or less of aldrin or dieldrin. Bacterial cultures, possessing no mammalian toxicity, will perhaps be the insecticide of the future for the control of many insects.

Development of Herbicides

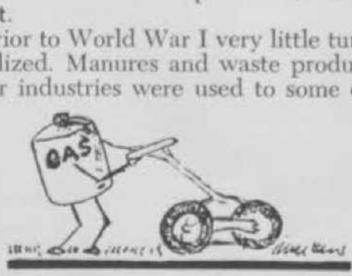
There was very little use of herbicides in turf prior to 1930. One of the first materials used for weed control was sodium arsenite. It is still in use today. Next in the line of herbicides to be used rather widely was sodium chlorate and the dinitro compounds.

The greatest revolution in the use of herbicides came with the development of a highly selective material called 2,4-D. The effectiveness and selectivity of this material was so great that broad-leafed weeds in most cases were no longer considered a serious problem. The development of 2,4-D enabled plant scientists to better understand the chemical mechanisms of selectivity and brought about extensive research in this field. With an insight into the mechanism of selectivity in broad-leafed weeds, attention was then turned to crabgrass, which was the next most serious weedy pest.

Some materials in use at the present time for crabgrass control are potassium cyanate, phenyl mercuric acetate, disodium methyl arsonate and amine methyl arsonate.

The application of herbicides to turf during the dormant season of growth, as pre-emerge controls of crabgrass, is receiving attention in this field. Several materials appear to have promise for this use. In the near future we will probably have herbicid s that are specific for a given plant.

Prior to World War I very little turf was fertilized. Manures and waste products of other industries were used to some extent



but most grass went unfertilized. During World War I factories were built in Germany for the synthesis of atmospheric nitrogen into stable compounds for war purposes because their original source of nitrogen was no longer available. After the war these factories produced fertilizer materials. Improvements have been made in this field especially in the physical condition of fertilizers with the development of granules. Granular material is easier to handle and spread and can be stored more satisfactorily. At the present time the use of high analysis materials and synthetic organic fertilizers that permit an orderly release of nutrients at a controlled rate are the trends in turf fertilization.

Power Broadened Scope

We cannot discuss turf research without pointing out the progress which has been made in the equipment line. Research in this field does not necessarily mean the development of new and different kinds of machines, as the principles of turf equipment have remained rather unchanged, but rather refinements in design or construction for longer wear, greater efficiency and safety to the operator are involved.

The change in the source of power for turf equipment was one of the great accomplishments in this field. Prior to the time of power equipment, good turf management was restricted to a very small area. With the advent of power driven cultivation equipment, which came around 1946, the cultivation of turf became a standard management practice. Other developments which have advanced the field of turf have been planters for vegetative materials and machines for seeding steep slopes, improved mowers, seeders, sprayers and fertilizer distributors.

A 3-Phase Contract to Protect the Club

By GEORGE W. COBB
Golf Course Architect, Greenville, S. C.

I am afraid that many architects feel that the design of a course is the only thing that concerns them. Consequently, there are many cases in which the entire construction phase is tossed in the lap of an assistant, a construction supt., contractor or even an individual club member or a group of members.

We break our course building contracts into three phases. The first is the preliminary layout of holes; the second is setting

up of specifications for building; the third is personal inspections while the course is being built.

I think that the second and third phases are so important that it is clearly stated in the contract that the client is not obliged to proceed with either until he is satisfied with what has been done before. He has immediate call upon my services to straighten out any detail which is not to his liking. I know of quite a number of courses where a designer's name has been attached to the layout although he has done nothing more than route the holes. Architecture, to my way of thinking, is not as simple as that.

It can't be divorced from construction. The overseeing of the building of tees, greens, fairways, and particularly the installation of the course drainage system are far more important functions of the architect than the mere drawing of the design. If he doesn't take the trouble to frequently visit the building site and see that everything is going according to his plans, he has no right whatever after the damage is done to utter those famous last words: "They didn't build it according to my layout or directions."

Nutrition—A Disease Control Factor

By ELIOT C. ROBERTS
Associate Professor of Agronomy, Iowa State University

Fungus produces disease symptoms in grass plants by feeding on contents of the cell. When a fungus pathogen (organism) infects turf it does so in two stages — through entry into the interior or tissue, and by establishing itself so that it can feed on substances produced by the plant. Resistance to the disease may occur at either or both stages.

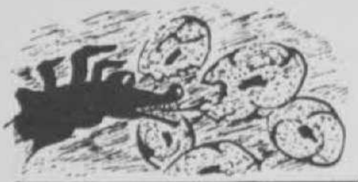
Structural characteristics of the leaf or root surface may favor or repress invasion of the fungus. Waxy coating of the leaf for example, may make it more difficult for a fungus spore to work its way in. Presence of hair on the leaf surface has been known to have a similar effect. The number, size and positioning of stomata (a tiny breathing pore) on the surface of the leaf may also favor or discourage penetration. Another factor is structure of the cell walls on the leaf surface.

Fungus may enter a plant as the result of various mechanical, chemical or insect injuries. Root damage, such as from nematode infestation, invites invasion.

Inner Workings

Production of certain organic acids, sugar, tannin, etc. within cells protects the grass plant against fungus. These materials counteract enzymes produced by the organisms. It is believed that high carbohydrate content in relation to nitrogen and presence of compounds such as magnesium sulphate and potassium phosphate within the cell modify the efffect of enzymes generated by fungus. If these enzyme substances go unchecked, they not only slowly kill the cell but break down structural material between cells. This enables the fungus to spread through the entire plant.

Different species and strains of turf have varying nutritional requirements for strong growth and by-product resistance



to disease. The same may be said of soil types. So, sweeping generalizations can't be made covering nutritional relationship to disease control.

But this much is known:

Nitrogen in proper amounts promotes vigorous growth that enables turf to outgrow the slowly developing fungus infections. In excessive amounts, though, nitrogen stimulates production of thin walled cells that become easy prey to invasion by harmful organisms.

Phosphorous reacts with carbohydrates to produce building blocks for new cells and tissues. Because of this function, growth stimulation brought about by nitrogen when phosphorous is deficient, results in poorly balanced nutrition and the likelihood of increased disease susceptibility.

Speeds Up Synthesis

Potassium in adequate amounts speeds up synthesis of essential disease resisting and growth substances in grasses. Deficiencies of it weaken cell walls and lay them open to penetration by disease organisms.

Calcium strengthens intercellular areas and helps to contain the spread of fungus in a plant. Its balance with potassium is important. It also neutralizes acids and possibly other growth by-products. Calcium deficiency in turf is not common although it must be conceded that weak turf is often tied in with acid-heavy soil conditions.

The secondary elements, magnesium and sulfur, and the minor elements, iron, boron, manganese, copper, zinc and molybdenum, are known to have important regulatory functions within the plant. It is reasonable to assume that their presence in adequate amounts favors disease resistance.

What should be kept in mind so far a good growth, and resistance to disease ar concerned is that it is not the presence o nitrogen, potassium and phosphorous i adequate amounts that is so important a the proper balance and absorption of thes elements in relation to one another.

Drain Green Over Its Entire Width

By CHARLES DANNER
Supt., Richland CC, Nashville

One of our six new greens was built s that excess water was channelled off th green in a narrow area. It didn't take lon to find out that excess water must b drained off the green over the entire widt of the front or sides and not channelled of Another green was built with ample su face drainage with a one way fall towar the front which drained excess water dow to a flat fairway. The result here was th the front approach would become slopp during wet weather. This was a goo breeding place for disease.

This green has been our problem bab every summer. We still have the green as was built but it is only a question of tim until we will have to rebuild it. We hav

found that any low spot around a gree or even a leaky sprinkler valve is a goo breeding place for disease.

In 1953 we converted six more gree to bent grass and finished the remainin greens in 1954. The last twelve gree were constructed by sloping the botto of each green exactly as the finished to We made one change on these greens b changing the way we installed the ti lines. Since we had a fall at the botto and a fill of gravel why use the herrin bone system of tiling? Instead, we p one tile line along the low front and sid of the green. This seems to be as efficient as the herringbone. By this time we had become convinced that the most important thing in building a green is to provide for surface drainage without channelling and to provide for drainage away from the green so as to not have any low spots or flat areas close to the putting surface. Our last twelve greens were built to provide ample surface drainage off and away from the greens. I am happy to say that none of these greens has ever given us any trouble.

Used Concrete Mixer

From our experience with soils, we think that any mixture with high sand content, soil and peat will be good if they are thoroughly mixed. At Richland we used a concrete mixer.

The answer to keeping bent grass greens through Southern summer months is water management. The green should be built to provide for subsurface drainage with tile lines sloped at the bottom. A blanket of gravel, well mixed topsoil and good surface drainage are very important. Water will not move through any soil very fast and the best way to take care of excess water is through surface drainage. If ample surface drainage is not provided for, or if low spots exist, or if excess water is channelled off, disease very likely will result.

Temperature and Light in Growth of Turf

By VICTOR B. YOUNGNER
Asst. Professor, Ornamental Horticulture
University of California, Los Angeles

Some factors affecting grass growth are almost completely outside the range of the supt's influence. The most obvious of these are the climatic factors, temperature and light. Directly or indirectly they are related to every aspect of turfgrass management.

From the moment the grass seed is placed in the soil, it comes under the influence of weather and other environmental factors. For example if the soil temperature is too high or too low, germination will be poor and many seedlings will be deformed. And, so, throughout the life of the turf, every phase of grass growth and development is being primarily controlled by weather and climate.

The activities of the supt., particularly in timing of operations, can work with nature to develop better turf. But if incorrectly done or improperly timed, these same activities may work with nature to weaken or destroy the turf.

Controlled Environment Observations

The recent development of new techniques for the study of environment and plant growth has opened a future full of promise for greatly increasing this knowledge. Such a new technique is the creation of the "phytotron," controlled environment

growing rooms, like the one recently constructed for the UCLA Dept. of Floriculture. With the phytotron we can regulate accurately the temperature, day length, light intensity, etc. at which the plants are grown to study the effects of specific conditions on growth of the grass plant.

Research work of recent years indicates that with many of our cool season grasses root and top growth are opposing growth phases. That is, conditions which promote top growth are not the same as those that promote maximum root development. This is especially true when we superimpose mowing, as we do in turf culture, over all other conditions.

If we recognize three temperature points in respect to growth; minimum, optimum, and maximum, we find that the three points for root growth are several degs. lower than for top growth for many cool season grasses. This is confirmed by field studies which have shown that maximum root development occurs during the late winter and early spring in temperate climates before much top growth is evident and again in late fall when top growth is slow. In late spring and early summer, the period of maximum top growth, root development has practically ceased.

Food Reserve Depletion

Food reserves, carbohydrates stored in roots and other plant parts, increase during the period when top growth is very slow. On the other hand, during periods

(*Continued on page* 110)

Convention Speeches

(*Continued from page 70*)

of rapid foliage growth, these food reserves are rapidly used. As temperatures increase above a certain optimum, the rate of food storage decreases until eventually there is a utilization of previously stored food materials. To further complicate this picture, it has been demonstrated that clipping retards both root development and rate of food storage. This is because the plant, in order to renew its top growth following clippings, must have additional food in the form of carbohydrates (sugars, starches, etc.)

High nitrogen feeding which stimulates top growth, when coupled with clipping has a further restrictive effect on root development. When temperatures are high, activity of soil micro-organisms which convert unavailable nitrogen to a form available for plant growth is increased.

Now, where does this information lead us in turf management? First, it is an accepted premise that in order to have a good durable turf there must be a healthy well developed root system below, and in order to have a good root system we must have a vigorous top. On the surface, it would appear that we are fighting a battle against ourselves when we feed and mow. This indeed may be true if good judgment is not used. We see that as warm summer temperatures arrive, natural root development slows and top growth increases. However, we continue to fertilize and mow further retarding root growth and perhaps actually damaging the root system. At the same time, organic nitrogen in the soil is being converted to available forms to stimulate more top growth which must be removed.

Disease Organisms Multiply

While all this is occurring disease organisms in the soil and organic mat are multiplying as the soil becomes warmer. The result is familiar to nearly everyone with turfgrasses. The time comes when the turf has a shallow weak root system, a soft succulent top and little food reserve. Then, if weather conditions are favorable for disease infection, practically nothing can stop it.

What can be done to prevent this from occurring?

There is no satisfactory solution at present but there are a few things which will help to some degree. First, time fertilizer applications so as to have only enough nitrogen available during the hot weather to keep satisfactory color. Second, if possible, raise the mowing height during this season but retain the same mowing frequency. Third, do not apply herbicides or other chemicals (fungicides excepted) which may damage either top or root system at this time. Finally, control water as much as possible to avoid having a saturated soil but at the same time prevent wilting. It should be quite obvious that turf disaster may result at this time from anything which will damage the root or crown of the plant.

Warm Season Grasses

Warm season grasses, particularly Bermudas, do not exhibit the differential response to temperature such as cool season grasses. Minimum, optimum, and maximum temperatures for root development closely parallel those for top growth. Similarly, food reserves continue to be built up during periods of high temperature. Both food reserves and rot development appear to be affected less by mowing than in the case of cool season grasses.

We have some interesting temperature problems with these grasses, however. These are in respect to low temperatures. It is a common observation that as temperatures drop in the fall, growth of Bermudas ceases and eventually the turf discolors even though freezing weather has not been experienced. We have found that the minimum temperature for growth of Bermuda is approximately 50 degs. F. But growth will continue at even much lower night temperatures provided day temperatures are sufficiently high — 70 or above. Some improved strains, Ormond and Tifgreen, for example, appear to have a somewhat lower minimum growing temperature.

Zoysiagrasses have an even higher minimum — approximately 60 degs. for Meyer and around 55 for Emerald and Matrella.

Light Intensity Factor

Discoloration or winter dormancy of these grasses is an interesting reaction to climatic factors. It is generally assumed that this is caused by temperatures between 30 and 40. However, this is only partly true as we have kept U-3 Bermuda alive and green at a constant 34 for over a month. This would indicate that another factor is involved in discoloration. We have found that this factor is light intensity. The plants held at 34 without discoloration were under artificial lights of low intensity. When plants are exposed to high intensity, light comparable to natural sunlight in conjunction with temperatures of approximately 45 or less, typical winter discoloration develops. Low temperature and high light intensity interact to destroy the chlorophyll (the green coloring material in plants) and at the same time to prevent the synthesis of new chlorophyll. However, if day temperatures are approximately 70 or above, discoloration will not develop even though night temperatures are just above freezing. Of course, freezing temperatures will stop all growth and bring about discoloration because of tissue destruction and disruption of physiological processes.

Discoloration of Meyer Zoysia occurs at slightly higher temperatures and lower light intensities than for Bermuda. Emerald and Matrella Zoysia are more comparable to Bermuda.

Application of soluble nitrate, ammonia, or urea nitrogen in the fall will prolong the period of green color and will cause earlier greening in the spring. How nitrogen functions in relationship to temperature and light to do this is not known.

Close Cooperation in Use of Cars

By MEL WARNECKE
Supt., East Lake CC, Atlanta

At East Lake in Atlanta we have about 85 golf cars. We have given a lot of thought to the proper routing of cars to prevent wear of the courses. There is close cooperation between Harold Sargent, our pro, and myself as to the use of the cars during periods of wet or poor weather. Whether or not the cars are to be used on any given day is left entirely to my judgment. The car subject, as we all know, is a touchy one and when the supt. shuts off the vehicles, he is a rather unpopular man.

I have found that upon notifying the

golf shop, Sargent or his assistants always take time to explain to members why use of the cars on a particular day may cause serious turf damage.

Attend Greens Meetings

Our green committee meetings are held regularly twice a month. Jim Fischer, our club mgr., and Sargent attend these meetings. Fischer often acts as our secretary. Thus all department heads are kept well informed of all course operations, whether they are general maintenance practices or improvement or rebuilding projects.

The club mgr. is a sort of shock absorber between the pro, supt., members and the board. He must be informed at all times on club policies, the wishes of the committees and the progress made in various operations inside and outside the clubhouse. His familiarity with the needs of the maintenance dept. can enable him to help us in discussions with individual directors and when these matters come up for discussion at board meetings. The pro dept. also depends on him. Thus, when the three of us present a solid front when presenting our recommendations, I am sure they carry much more weight with those who make the final decisions.

Closer contact by the superintendent

with both professional and mgr. makes all aware of the work and what it takes to keep a course in good condition. Unfortunately, many of these men have no idea of the extent and scope of a supt's knowledge and what goes into the maintenance of a good course. In this way, also, the pro can act as a go-between between golfers and the maintenance dept.

Superintendent Should Play

I have always thought it most important for the supt. to play his course as often as possible in order to get the players' viewpoint. I think a golf game with the pro now and then, and perhaps a pro-supt. tournament once a year promotes needed harmony. Also, attendance of the mgr. and pro at an occasional meeting of the local turf associations enables them to get a better concept of work being done in the turf field.

I feel that the need for cooperation between the three dept. heads is greater today than ever before with labor and material costs being what they are. This cooperation will help provide the membership with a better organized club, both in services rendered by the mgr. and pro. and in a more playable course.

Closely Examine All Elements of the Job

By J. M. MAC KENZIE

Manager, Institutional Engineering, Toro Manufacturing Corp.

One way to study jobs to reduce the time and effort put into them is to sort their elements into productive and nonproductive work. Perhaps many times sizeable amounts can be eliminated by challenging the entire job or its parts. For example, is it necessary to trim or rake as often as is specified? Can trap raking be completely eliminated or should it be left up to the players? There are many questions such as these that should be asked.

If it is decided that a certain job has to be done, ways should be found in which it is to be done most effectively. Obviously, the first thing to do is to assign it to the employee who does it best. A major part of a supt's success depends on planning, seeing that plans are carried out, and then re-planning to correct errors between plan and action or plan and needs. Delegating authority and responsibility comes under the head of planning. If the supt. has 10 employees, less and less time is available to him for making plans. If he has 20 people under him, it is further reduced. With either number he owes it to himself and to the club to train assistants to relieve him of the task of making hourly decisions. This gives him more or sufficient time to do his planning and, even more important, provides for continued operation of his dept. when he is away due to vacation, illness, etc.

Special Training

Some of the projects in the annual plan, or provided for in the budget, can be carried out by one team of employees. Quite a few of these jobs require special skills. The supt. should give more than passing thought to these assignments and the qualifications and training necessary for the employee or teams of employees to handle them. Careful selection in this respect can produce superior results.

Supervision is justified only insofar as it helps the man who is doing the work. A good supervisor must know what he wants done, tell his men what he wants done and help them do it in the easiest possible way. He must forget his feelings of position and pride to make it possible for the man he supervises to increase his output to the extent that it helps pay the added cost of the supervisor's salary.

Measurement of Performance

The effectiveness of management can be measured in some areas, and comparatively judged in others. Performance can be measured financially against the bud-

get; quality of effort by the total annual compliments or complaints. (Has any supt. ever kept a close record of these? It might be interesting to do so.) The effectiveness of the employees' work can be judged by time standards, but quality only by close personal examination by the supt. He must have definite and preconceived ideas of the kind of quality he wants.

At least twice a year the employee should be brought up to date on his performance. If his work is satisfactory, telling him so not only encourages him but helps to bring even greater improvement.

If it is below standard, he'll never improve unless the supt. tells him that improvement is expected.

Assistance Not Dominance

Management is a function of assistance rather than dominance. Recognition of good work redounds to the benefit of the supt. In most cases, constructive criticism of poor or only average performance can also work to the advantage of the supervisor.

A full manhour of work can be realized only through the courtesy of a sensitive human being. Each employee has feelings of love, hate, happiness, sorrow, pride, shame, security and uncertainty. One management consultant sums up a basic tenet for supervisory employees in the words: "The most insulting and dangerous thing you can do to another person is to disregard him as if he didn't exist. If you can't say 'good morning' to the fellow who works for you, then you are taking money out of your own pocket." Call your employees by name and learn a little something about each of them. Discuss their problems with them if necessary.

You rise or fall because of your employees. Treat them with dignity and tact and they will help you carry out your plans more perfectly than you ever dared to expect.

Sand, Clay, Organic in Green Mixture

By MORRIS E. BLOODWORTH

Associate Professor of Agronomy,
Texas A & M College

Until a few years ago there appeared to be no exact solution to the compaction problem. But recent research by H. L. Howard, R. J. Kunsze, O. R. Lunt and others indicates that compaction can be greatly reduced if proper consideration is given to individual soil mixture ingredients.

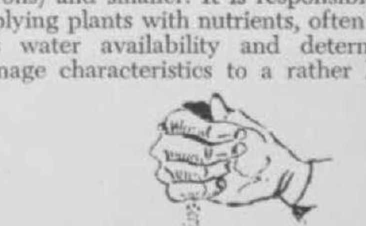
In mixtures for greens, sand, clay and organic fractions, of course, are basic. There are many variables involved in determining what combinations of these give the best results.

As for sand, research at Texas A & M shows that a regular washed, mortar brick sand, from 1 to .1 mm in dia. is desirable. Optimum size is .5 mm. Sizes smaller than .1 mm tend to compact and impair internal drainage. Fractions greater than 1 mm lower the soil's water retention ability, resulting in leaching of nutrients, and, of course, less available water. Larger sizes of sand also don't provide firm footing.

Sand percentage composition that appears to give very good results is around 80. This may seem high, yet many sandy loam soils now found in greens contain from 60 to 75 per cent sand. Indications are that something near the optimum size grain (.5 mm) rather than the percentage cited above is perhaps more critical. But the .5 mm- 80 per cent proportion, mixed with correct proportions of clay and organic material, should provide a most desirable green mixture.

Clay Most Important

Clay, which has been indicated to be the active fraction of the soil, is the most important component of the green mixture. The optimum size fraction is .002 mm (2 microns) and smaller. It is responsible for supplying plants with nutrients, often controls water availability and determines drainage characteristics to a rather large



extent. The three general types of clay are montmorillonite, illite and haolimite. There is a wide difference in their physical and chemical characteristics and understanding of this is essential before deciding upon a suitable sand-soil mixture. Montmorillonite has tremendous swelling and shrinking characteristics and is extremely plastic when wet. Because of their crystalline structure, the other two types of clay do not have these characteristics.

The amount of clay for a desirable green

Golf Day • June 11th

mixture should range between 4 and 10 per cent, according to H. L. Howard. About 4 to 6 per cent of montmorillonite appears to be correct. According to Howard, it is preferable to haolimite and illite but this is not final. It should be emphasized that the silt content should be kept to a minimum since the silt fraction often contributes to the problems of compaction and poor interior drainage.

Use of Peat

There remains about 10 per cent organic material (peat) to be added. W. L. Garman of Oklahoma State University has found that more than 20 per cent peat by volume is detrimental to the putting mixture. Thorough mixing of the three components is a must.

Although peat is an old standby, consideration should be given to certain synthetics and other new materials now available. They may be more desirable than peat in some cases and certainly warrant testing both in the lab and in the field.

Frank H. Goldthwaite Dies in Ft. Worth Home

Frank H. Goldthwaite, 52, who founded the Texas Toro Co. upon graduation from college in 1928, suffered a fatal heart attack in his home in Ft. Worth on Feb. 28. Joined by his brother, Howard, in 1929, Mr. Goldthwaite covered the Southwest in the early years after the company's organization selling mowing equipment, sprinklers, fertilizers and turf supplies. He worked out of Ft. Worth until after World War II and then opened divisions in Houston, Dallas and San Antonio, the latter in 1958.

A strong believer in education, Frank helped establish the Texas Turfgrass Assn. in 1947 and sponsored scholarships at Texas A & M and Texas Tech in turf management. He was a member of the GCSA and a dir. of the O. J. Noer turf research foundation.

Mr. Goldthwaite is survived by his wife, Aniela, who will operate the Texas Toro divs. as pres. of the company, two daughters, Mrs. Hugh Pitts and Frances, and a son, Frank, Jr.