

advice to the greensman charged with purchasing seeds intelligently for the golf course. He stressed the caution that at least three things should be watched closely when placing an order for seed.

Of major importance is the purity of the seeds. Some fine grass seeds, he said, are very difficult to identify, and very easy to adulterate with the seeds of another grass of the same type. Only an expert can spot this adulteration, so the source from which seeds are purchased should be one in which all confidence can be placed.

Seeds should be weed-free; otherwise the cost of weeding greens far exceeds the slight saving which results from purchasing cheap seeds. Bargain seeds, he said, should always be regarded with suspicion. The smart buyer at all times demands a purity analysis, which tells the proportion of pure seed, other crop seed, weed seeds and inert matter. The buyer is paying for the pure seed. He frequently has no objection to a few "other crop" seed, as for example a few bluegrass seeds in with some bent. He does not want many weedseeds, and he should object to paying for inert matter at seed prices.

Finally, the seeds should have a high germination. It is fallacious to think that the same stand of grass can be obtained from low-germination seed by sowing them thicker. In most cases a seed which does poorly in laboratory germination tests has low vitality and will not develop into a sturdy turf even under the most careful nurturing.

The expert offered one suggestion that greensmen will do well to heed on all purchases. He advised:

When you purchase seed for use on your course always demand a certificate of analysis. Pay to have the seed analyzed before purchase if a certificate cannot be procured otherwise. Always keep a small sample of each lot of seed for further reference in case you later have reason to lodge a complaint. Such samples should be carefully labelled and dated and a note made giving the details of purchase.

Mr. Wright closed his address with an interesting and careful description of the important sources of leading turf grasses and the rigid requirements of the governmental agencies which certify to the purity of seed lots.

Architect Makes Maintenance Job

Robert Trent Jones, of the firm of Thompson and Jones, golf architects, made

it plain in his talk "The Common Interests of the Golf Architect and the Greenkeeper," that inexperienced course designing is something greenkeepers should try to prevent at all costs. Since a course is no better than the condition in which it is maintained, it is deplorable to leave the greenkeeper with an impossible maintenance task due to incompetent construction.

On the general subject of architecture, Jones said there are three main types. First is the penal type, of which Oakmont, Pine Valley and the National Links are examples. On such courses trouble lurks at every turn. On Oakmont, man-made bunkers spray the course, while at Pine Valley there are patches of fairway among sand-swept wastes. Oakmont requires expensive maintenance to keep its bunkers in shape; Pine Valley's sand wastes need no attention. Thus, their greensmen's problems are distinctly different.

The second type of golf architecture is the strategic school, of which the old course at St. Andrews, Scotland, is the most famous example. The landscape has a placid appearance, but the golfer will discover adroitly placed traps, subtle rolls and plateaus, and bold green contours to ruin a good score. Amateur architects find the strategic school most difficult to copy, lacking as they do a thorough knowledge of the stroke and of shot-placement.

Heroic School Has Fine Points

The third type of architecture is the heroic school, combining certain features of both the penal and strategic types.

Diagonal traps from 170 to 220 yards in front of the tees permit the golfer to bite off whatever he thinks he can chew, and an alternate route around the hazard is always furnished. Greens are set at an angle to the line of flight to worry the bold player, with green openings off center to give a safe approach to the cautious player willing to jockey into position.

The greenkeeper's task is easier on the heroic type of course than on the penal, but generally somewhat more complicated than on the strategic layout.

There is a fourth type of architecture that is in great vogue today, Jones said. It is really a combination of the three types outlined, with heroic, penal and

strategic holes alternating. Jasper Park is an outstanding example of this school.

Jones lamented the decreased activity of the Green Section, due to finances, saying it had done immeasurable good for golf. He urged that clubs join the USGA, so that the Section work may be resumed.

A good architect keeps the greenkeeper's needs constantly before him as he supervises each new course. He sees that greens are given good foundations, that drainage is thorough, that surface contours permit efficient use of maintenance machinery, and that the architecture will permit economical installation of fairway watering. A competent architect will remember such details; the amateur architect may bungle things.

Tennis Court Pointers

Paul J. Lynch, as superintendent of recreation of Troy, N. Y., is an expert of 20 years' experience on the construction maintenance and management of tennis courts and swimming pools, and gave the NAGA delegates the benefit of some sound advice relative to these two common adjuncts to golf courses. An abstract of his talk follows:

Tennis courts are divided into three categories; hard surface, turf, and clay. All should be laid out north and south so that there will be the minimum hindrance to the players no matter what the position of the sun. It is unwise to have tall trees in the vicinity of tennis courts because of their shadows. The amount of graded surface needed for each tennis court should be a minimum of 50 x 120 feet. More length is advisable.

Subgrade, whether of cinders, crushed stone, or other porous substance, should be carefully installed, as the final grading of the court depends largely upon this. Standard practice as to grade is 2" from the back of court to center. Greater pitch than 3" from back to net is not advisable.

Hard surface courts such as concrete and various asphalt mixtures practically take care of themselves once installed, the only maintenance being the painting of the lines on the concrete at infrequent intervals. A mixture of four parts clay to one part sand is the usual formula for clay court surfacing. Lynch prefers limestone dust instead of sand. This dust should be practically a powder and it is usually necessary to rescreen the dust. Calcium chloride is used as a dehydrating agent to keep the courts in proper condition. About 600 pounds to a court is an efficient application. The price of calcium chloride at the plant averages about \$26 a ton.

In preparing final surface of courts either after repair or in construction, Lynch uses a cheap homemade device consisting of a 12' two-inch plank with 20-penny spikes protruding about 2". The spikes do the ripping and the plank does the leveling. As perfect grade is approached the spikes are driven until they protrude only about 1/2". In rolling courts it is always advisable to finish rolling in the long direction. Tapes for lining tennis courts are highly unsatisfactory to the players. Any standard wet lime marker is satisfactory.

Different types of tennis court surfacing have been developed during the past several years. A type of surfacing composed of sawdust and oil, which forms a waterproof resilient surface somewhat resembling composition flooring, has worked out very satisfactorily I understand in the South, but Lynch has had no luck with it probably due to severe frost conditions during the winter in Troy. The oil used in combination with the sawdust is any gravity flux oil of the same consistency as No. 11 Louisiana standard. Where night lighting is used in connection with the tennis courts it has been found that the higher the lights are placed the better the results.

Sanitation is Pool Essential

The entire operation of a swimming pool with Lynch means but one thing—sanitation. When building a pool be sure that the runways surrounding the pool slope away from the pool. Be sure scum gutters protrude several inches beyond the pool edge. One of the chief factors of the enjoyment of the swimming pool seems to be the lounging about in a bathing suit. This means that the surface surrounding a pool should be so constructed that people upon returning for another dip will not carry into the pool dirt of various kinds.

As a matter of safety and also a very necessary legal defense in case of suit, depth signs should be placed at regular intervals around the pool. Have a rope suspended by floats strung across the pool where the water starts to deepen rather abruptly below a depth of 3 1/2 feet. Get the best possible diving apparatus; a cheap diving board is a continual expense and nuisance.

Many state laws demand the installation of footbaths at some point between the locker rooms and the pool for the prevention of athletes' foot. These baths should be so placed that the bather will have to walk through them in order to get to the pool. Many different solutions are used in the footbaths, possibly outstanding among them being Alta-Co put out by the Dolge Company. We have

(Continued on page 65)

PUT PEP IN EVENTS

Why Schedule the Same Old Fixtures When There Are Scores of Fresher Ones?

By JACK FULTON, Jr.

EACH of the last several springs GOLFDOM has printed a number of suggestions for club events and invariably the issue containing this feature quickly is exhausted by requests pros make for extra copies to give their men and women committee heads.

As has been pointed out before, the pro who takes these event suggestions and uses them in seeing that his club has a full and interesting program of men's and women's events is going to reap the harvest of merchandise sales that is bound to come when there is a lot of play.

This idea for pro, club official and member service is being made the theme of an excellent booklet of event suggestions which the PGA has compiled and soon will send out to its members and officials of their clubs.

Herewith again are some event suggestions that have proved popular with members. Two events that were not in the last GOLFDOM list lead off. The first one is a cross-country tournament that ends the season at the Peoria (Ill.) CC. Eleven holes are played and no hole is played in the usual route of playing the course. The cross-country course layout is given in a label on a small bottle of "joint oil" which

is given to each player. The "joint oil" is Canadian Club from the Walker distilleries at Peoria. Tournament directions of Peoria's 1934 cross-country tournament were:

Climaxing a successful season—use this bottle of joint oil to keep in condition until spring.

TOURNAMENT DIRECTIONS

One	From	1st Tee	to	3rd Green
Two	"	2nd "	"	10th "
Three	"	11th "	"	16th "
Four	"	3rd "	"	12th "
Five	"	13th "	"	4th "
etc.				

Another idea that has worked out well in lengthening the season and keeping interest alive all along is the league idea tipped off by R. W. (Doc) Treacy. Teams are selected from the positions of players on the club's handicap rack. For instance, if there are to be 10 teams, the ranking 10 players of the club each captain a team. Make-up of teams and schedule of matches is shown by the chart herewith.

The league season runs one less week than there are teams entered. The bright

Captain	Players	Team Name
1-20-21-40-41-60-61		Tigers
2-19-22-39-42-59-62		Senators
3-18-23-38-43-58-63		White Sox
4-17-24-37-44-57-64		Etc.
5-16-25-36-45-56-65	Continue organizing team per-	
6-15-26-35-46-55-66	sonnel in this way until all	
7-14-27-34-47-54-67	members are placed on a team.	
8-13-28-33-48-53-68		
9-12-29-32-49-52-69		
10-11-30-31-50-51-70		

SCHEDULE

1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week	9th week
1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10
3-4	2-4	2-5	2-9	2-7	2-6	4-7	2-8	7-9
5-6	5-7	3-9	3-7	3-8	3-5	5-9	3-10	2-3
7-8	6-9	6-8	4-8	4-9	8-9	3-6	6-7	5-8
9-10	8-10	7-10	6-10	5-10	4-10	2-10	4-5	4-6

thing for the pro to do is to see that the league starts so as to finish later than the regular lay-off time in the fall.

Every match is at medal play, minus handicaps, average medal score to count in case of absence with two penalty strokes added to the absentee's score. All teams play at the same time; nine holes on the same day each week. Each man puts in a dime or a quarter a week, the money being used for prizes and a party at the end of the schedule.

Script Event Is Novelty

A good one-day event is a script tourney. Furnish each player with \$10,000 of stage money. Each player has a partner and play is in foursomes. The pair with the most script after play is over wins. Wins and losses settled whenever incurred as play proceeds. Awards are such matters as: low ball each hole, \$100; low aggregate each hole, \$200; birdies, \$300; eagles, \$500; first ball on green, \$200; first putt sunk, \$200; etc, as the ingenuity of the committee decides. Penalties should include: ball in rough, \$100; ball in wrong fairway, \$200; ball hitting tree and rebounding into right fairway, \$500; fanning, \$300; swearing, \$200; swearing at caddie, \$400; etc.

The golf committee on the lookout for novelty in its season schedule will do well to consider including several of the events listed below. Variety in events encourages play.

ONE-DAY EVENTS

Individual Play

(A)—*Medal play* (generally full handicap). On 18 holes; on odd numbered holes; on even numbered holes; on even holes first-9, odd holes second-9; on 3-par holes; on 4-par holes.

(B)—*Match play vs. par* ($\frac{3}{4}$ handicap or full handicap). On full 18-holes; on odd holes; on even holes; on even holes first-9, odd holes second-9, or vice versa; on 3-par holes, on 4-par holes.

(C)—*Blind bogey event*. Players estimate their own net scores before leaving first tee. Player closest to "blind" bogey figure selected by committee is winner.

(D)—*Kickers tournament*. Contestants may re-play one shot on each hole, putts excepted. A variation is the *Alibi event*, in which the player may replay as many shots as the size of his handicap. Replays permitted anywhere during round.

(E)—*One-club event*. Players carry only one club (a midiron, mashie, or the

like) and must use it for all shots on the round.

(F)—*Tombstone event* (sometimes known as a flag event). Each player is given a small marker, such as a flag, and continues to play until he has taken as many strokes as the par of the course, plus his handicap. The player leaves his marker wherever his ball lies after this last stroke and contestant going the farthest around the course is the winner.

(G)—*Fewest putts*. On this event shots from outside the clipped surface of the putting greens are not considered putts.

(H)—*Most 3's, 4's or 5's* on the round.

(I)—*Sweepstakes*. Players entering the event sign up for one golf ball each. Player with best score takes three-quarters of the balls. Player with second best score takes balance.

(J)—*Point Tourney*. Players are awarded 3 points for each birdie scored, 2 points for each par, 1 point for each hole played in one stroke over par. Player under full handicap; winner is player with most points at end of round.

(K)—*Miniature Tourney*. Contestants, playing under $\frac{3}{4}$ handicap, play nine holes in morning to qualify. Are then divided into flights of 8 players each; three match-play rounds of nine holes each determine winner and runner-up of each flight.

(L)—*Obstacle Tourney*. Played with or without handicap. Each hole presents some obstacle, (such as a stake to one side of fairway that must be played around, or a barrel just short of the green that must be played through).

(M)—*Mystery event*. Send players out without telling them what type of contest they are entering, other than informing them whether it is medal or match play. After all scores are in, release news of what the event was, and figure up the winner.

(N)—*Par Tourney*. Played under full handicap. On 10 holes of the course award 5 points for each par or better. On three other holes award 10 points for par or better. On three other holes there is a 5-point penalty for players who do not shoot par or better. On the remaining two holes make the penalty 10 points. Winner is player with most points.

Twosome Play

Many of the events listed above, under *Individual Play*, will apply equally well to twosomes and therefore will not be listed here. In addition there are the following special events for twosomes:

(A)—*Choice score*. On 18 holes, odd

numbered holes, even numbered holes, or blind holes (generally half the holes of the course, but unknown to the players). In a twosome best-ball contest the score of the player taking the fewer shots, handicap considered, on a given hole, is used.

(B)—More interesting twosome events are where one ball is used, the two players stroking alternately. In such one-ball events all of the contests listed under *Individual Play* may be used. The pairings for twosome play may be limited by special requirements. Among the more common combinations are father and son, pro and amateur, husband and wife, member and caddie. This last event is particularly recommended to clubs interested in fostering the good-will of their caddies. In such an event the caddie plays alternately with the member, the two of them using the same ball. A spirit of friendliness and co-operation cannot be more easily secured.

Foursome Play

(A)—Foursomes can compete, one against another, in a number of the events listed above for individual and twosome play.

(B)—*Monkey Foursome*. In this event each member of the foursome carries only a single club. One ball is played. Each member of the foursome, in rotation, plays the ball from wherever it happens to lie, and with whatever club he has chosen to carry with him on the round. Thus a player may be forced to putt with a mashie or drive with a putter. The four clubs generally carried are brassie, midiron, mashie and putter.

(C)—*Blind low-net foursome*. Contestants play 18 holes with whom they please. At conclusion of play, names are drawn from hat and grouped into foursomes; net scores are added to determine winning foursome.

Larger Groups

Team matches of any number of players are always interesting competitions. These matches may be against teams from other clubs or may be one end of the locker room against the other. Frequently the doctors, dentists, and lawyers in a club challenge the laymen to a team competition. Other combinations will readily suggest themselves.

Special One-Day Golf Events

(A)—*Driving contests*. Each contestant drives three balls from the same teat. A ball stopping in the rough is not count-

ed. The distance of the other balls is added together and the contestant with the greatest yardage wins.

(B)—*Target contest*. This event is the test of players' approaching ability. A green is marked as a target with rings 5, 15, 25 and 35 feet from the cup. Each contestant approaches four balls from each of the following distances: 50, 75, 100, 150 and 200 feet. The idea is to make the balls drop within the circles drawn on the greens; where the ball stops rolling is immaterial. The event is scored: five points for each ball within the 5-foot circle, three points for each ball within the 15-foot circle, two points within the 25-foot circle, and one point within the 35-foot circle.

EVENTS REQUIRING SEVERAL DAYS OF PLAY

(A)—*Match play events*. Under this head fall such tournaments as the club championships, the "southpaw" (or left-handers) championship, the junior championship, the women's championship and the caddie championship. In addition many clubs hold what are known as *class tournaments*, wherein the playing members are divided into classes, according to handicap and regular match play events are then played within each class.

(B)—*Choice score for the year*. Whenever a player negotiates a hole in fewer strokes than before that season, he draws a ring around the new figure on the score card and hands the card in to the tournament committee who post the new figure on a permanent chart. The player who has the lowest total score at the end of the season is the winner. Handicap strokes are allowed on the holes where they fall.

(C)—*Round robin*. Each player plays every other player once at match play. The contestant with the highest percentage of wins is the victor.

(D)—*Ladder event*. In this event the contestants are listed on a score sheet, one under the other, by lot. Any contestant is entitled to challenge the man listed above him to a match. If he wins, his name is posted above the name of the man he defeated. Thus the players, as they play their matches, are constantly shifting up and down as though on the rungs of a ladder, whence the name for the event. At the end of the season the player whose name is at the top of the "ladder" is the winner.

(E)—*Two-man team event*. The best 16 players in the club are paired so that their total handicap is approximately equal.

This is done by the tournament committee, generally near the end of the season. These teams are then arranged as for a regular match play event and points are scored as in a Scotch foursome (one point for low ball, one point for total strokes on each hole). The winners are the two-man team champions of the club.

PGA Tourney Officials Have California Session

OLIN DUTRA, chairman of PGA Tournament committee, Robert E. Harlow, tournament mgr., other PGA and California Chamber of Commerce officials arrived at some mutually helpful conclusions during sessions recently held in the state.

Rules for tournament operation are to be prepared by the PGA and submitted to all tournament sponsors.

No effort is to be made to limit open tournaments to PGA pros. The idea didn't click with press or public which considered PGA's first duty to be to develop golf rather than the PGA. PGA pros with their own tournaments have big edge over non-members in competitive events. However it was agreed that if any pro for valid reasons should be objectionable to PGA pros as a tournament contestant, the tournament sponsors would gladly receive, and probably favorably act on, PGA complaint.

It was suggested that PGA resolve against equal division of money in case of play-offs. Only exceptions to be where players make expensive trip to foreign land.

Proposal was made that a campaign be started to keep players who are club guests from making critical cracks in locker-rooms and have the boys show more regard for condition of clubhouse lawns and fairways in practicing. PGA and C of C officials agreed that these practices were simply bad manners and that trying to legislate good manners was a tough job. Compliments were made to pros' gentlemanly manners and the exceptions of locker-room loud-mouths and lawn hackers were disposed of by agreement that it takes several generations to make a gentleman in a family.

It was proposed that PGA Tournament committee make up a list of players exempt, on their records, from qualifying rounds such as those of the LA open.

There was a debate about asking sponsor clubs to sign contracts except in cases

of new events or clubs that called off previous events.

PGA members are not to play in open tournaments which do not have PGA endorsement, so the boys agreed. Difficulty of endorsing conflicting dates in Florida and in California brought out that the fellows think eventually there may be two groups of winter players; one east and one west.

It was recommended that entry fees be set at \$1 per \$1,000 in gross prizes, that the PGA would underwrite no more open tournaments, and that no pro tournament for week-end dates be endorsed unless prize money is at least \$3,000. Week day tournaments will be endorsed according to the judgment of the Tournament bureau manager.

California asked for the period of December 20 to Feb. 2. There are enough California events lined-up for 1935-36 to run the California schedule to Feb. 16. Harlow is to try to get some of these tournament sponsors to accept mid-week dates so other sections of the country will not be neglected.

Call for Dues and Old Balls from MSC Greens Alumni

ANNUAL dues of members of the Greenkeepers' Alumni assn. of Massachusetts State college should be sent without delay to Wm. Nye, treas., Room 20, Stockbridge Hall, Amherst, Mass.

Members of the Alumni assn. also are requested by vice-president Clinton K. (Kent) Bradley to assist in the alumni's research work financing by sending old balls found on their courses to Bradley whose address is RFD 2, Paterson, N.J. Kent sells these balls to a rebuilding company and the dough is sent to Prof. Dickinson to be spent for the alumni research work on maintenance problems.

Iowa Greens Course Will Have Prominent Speakers

AUTHORITIES of national prominence, including Kenneth Welton, O. J. Noer, Paul Burdett and Earle Barrows, are included in the program of the two-day greens short course at Iowa State College, Ames, Iowa, on March 4-5. Co-operating is the Iowa Greenkeepers Assn., which will sponsor a banquet on the evening of the 4th. I. T. Bode, state fish and game warden, will be the principle speaker.

SOIL TESTS*

By G. N. RUHNKE

ASSISTANT PROF. CHEMISTRY & SOILS
Ontario Agricultural College

**Chemical and Physical Analyses of Soils
Are of Value Only When Weighed
Against Other Factors Always Present**

DURING the past three or four years, rapid progress has been made in the development of really valuable chemical methods for soil examination and diagnosis in connection with fertility problems. Some of these improved methods for soil testing have been in use, in the laboratories of agricultural colleges and experiment stations, for a sufficient length of time to show that if they are properly applied and interpreted, they may provide a valuable index to the fertility of a soil.

Until quite recently, the use of these newer chemical tests has been restricted to the laboratories where soil examination and advisory service has been maintained for samples sent in by farmers, and others. The demand for this service has grown so rapidly as to make it difficult to take care of all the work in the laboratories alone. To meet this increasing demand and to extend the scope of the soil testing service, several of the systems for chemical testing of soils have been modified and adapted in such a way as to make possible testing the soil right out in the field.

Among those, outside of the agriculturists, who have become more and more interested in soil problems, are superintendents of parks, landscape and golf architects, green committees and greenkeepers from the various golf courses. Some greenkeepers have purchased soil test kits and have used them regularly, in checking up on soil conditions in greens and fairways. As time goes on, more testing of this kind will likely be done.

In the final analysis, the soil problem often becomes a very local one, perhaps peculiar to a particular green or fairway. The individual greenkeeper in such case, requires more than general principles to work on; he wants specific information on the soils from the particular course for which he is responsible. What are the limitations in the use and interpretation of chemical tests, made either on the spot or in the laboratory, and what information

may he reasonably expect to obtain from such tests?

At the outset, it is obvious that the golf course presents soil problems quite unlike those met with in ordinary cultivation. This is particularly true of the greens, which are essentially artificial in structure, soil character and cultural treatment. Because of the peculiarities of turf culture on the greens and the use made of them, physical and biological features of the soil become most important factors determining the quality of turf.

Physical Condition of Soil Important

Chemical tests of the soil give practically no information about the important physical factors affecting plant growth, such as drainage, water supply, aeration, and permeability to root penetration. Nor do they give a satisfactory clue to the biological activities of the soil responsible for the turnover of organic matter and the making available of the nutrients it contains. These limitations of the chemical tests apply in dealing with any soil, it is true, but they are especially pronounced in connection with the diagnosis of green soil problems.

If the testing is done at the green, where the physical condition of the soil, the depth of penetration of the grass roots, the possible presence of disease and other factors may be observed and evaluated, the chemical tests may be more safely interpreted, provided, of course, they are properly conducted. In the case of samples of green soils sent to the laboratory, even though the chemical methods of examination may be more accurate and complete, physical, biological and other factors may be responsible for the undesirable condition of the turf and the chemical tests fail to throw light on the cause of the trouble. This has been experienced many times in the course of our advisory work on golf course soils, but the fault does not lie with the tests themselves, since they are intended to study chemical and not physical factors of the soil.

*NAGA Convention paper.

Chemical tests on soils are designed to determine, with varying degrees of accuracy, the reaction and content of soluble nutrients in the soil. The presence of toxic substances or excessive amounts of certain substances is also detected by the more complete methods of examination. Most important among the tests usually made are the following: the reaction, whether acid, neutral or alkaline, and if not neutral, the degree of acidity or alkalinity; soluble nitrogen, phosphorus, potassium, calcium and magnesium; chlorides, sulphates and carbonates. The test for soluble nitrogen compounds may be only for nitrates, or may include nitrites and ammonia. In strongly acid soils, tests are also made for soluble aluminum. Such a complete series of chemical tests gives a good idea of the relative amounts of the various constituents in a readily soluble form.

It is generally assumed that fertile and productive soils contain much larger amounts of soluble nutrients than infertile or run-down soils, and that fertile soils have the capacity to maintain the higher level or supply of soluble nutrients throughout the critical period of the growth of the plant. Chemical tests of soils to determine the content of easily soluble nutrients are considered to give an index to the possible supply of plant food and to throw some light on the relative amounts of the various constituents, or the "nutrient balance", which is quite as important. When all other factors are favorable for the plant, growth may be limited if the supply of one or more nutrients is too low, or so high as to cause a toxic condition.

Test Results Need Weighing

Chemical tests, in estimating the amounts of easily soluble nutrients in a soil, are of great value in indicating high or low supplies and relative deficiencies or excesses. Although the content of easily soluble nutrients in a soil is fairly well determined by these chemical tests, it does not necessarily follow that the tests indicate what the plant is able to utilize. The plant may be able to get an adequate supply of the necessary nutrients from one soil, which by chemical tests, gives a very low soluble nutrient content at any instant, while another soil, with high soluble nutrient content, may fail to sustain normal growth. Attention is called to this point, to emphasize the fact that the chemical methods of soil testing are es-

entially arbitrary in nature and do not necessarily extract from the soil exactly the same amounts or proportions of nutrients taken up by the growing plant. Further, the chemical test provides an index to the soluble nutrient supply only at a particular instant. At other times during the growth period of the plant, the food supply may be shown to be quite different.

In spite of the above considerations, chemical tests have a real practical value in providing information that cannot be obtained in any other way. They must be used, however, with a true knowledge of what they can indicate in a reliable and accurate way.

The above limitations of chemical tests in revealing the available nutrients of the soil are, in part, overcome by correlating the test results with actual plant response in the field. By testing large numbers of soils from fields of known treatment, with and without fertilizers, and from experimental plots where crop performance and crop yields are obtainable, it has been possible to calibrate the tests so that the results may be more safely interpreted. Most of the tests used in the laboratory or in the test kits designed for field use, have been calibrated in such a way.

This is a further limitation to the wholesale application of any system of chemical tests to golf course soils. Since these tests have been calibrated to indicate high, medium and low levels of easily soluble nutrients for farm crops on field soils, it does not necessarily follow, that the same standards can be adopted for grading the results of tests on golf green soils at least. There is, however, greater likelihood of obtaining more satisfactory results on fairway soils.

No matter how good the chemical tests are in themselves, the results will have to be calibrated against turf performance on the golf courses before they can be satisfactorily interpreted in terms of deficient or adequate supplies of plant food, and fertilizer recommendations for greens and fairways. This is one of the fundamental problems to be dealt with if the results of chemical tests on golf course soils are to be made more reliable and useful. Fortunately, some attempt is being made in this direction.

Careful Sampling Necessary

No matter how good the scheme of chemical analysis, or how accurately it is done, the value of the results depends on whether or not the sample is representa-



Instructors and students of the 1935 Winter School for Greenkeepers, which began Jan. 2 and will continue until March 17, at Mass. State College. Prof. L. S. Dickinson, director of the class, stands in the center of the first row.

tive of the soil condition under study. Too much emphasis cannot be laid on the importance of having a representative sample for the test. Failure in this may make the results and their interpretation practically worthless.

No hard and fast rules can be laid down for sampling under all conditions. Our experience has been that a sample from a single spot in a golf green is not satisfactory. In sampling a green, several cores taken systematically over the green, and sent intact and unbroken to the laboratory are much more satisfactory. If the cores are taken to a depth of six inches at least and are unbroken, some idea of the physical condition and root penetration may be obtained, as well as the vertical distribution of nutrients throughout the soil. Shallow cores of one or two inches are not satisfactory and usually do not warrant the expenditure of time and energy in their examination. If chemical tests are to be made in the laboratory, extra care in sampling is warranted.

In sampling fairways, again the rule is to obtain a representative sample. In this case, a composite sample should be made up from samples taken at a number of places over the fairway. The surface soil and subsoil should be sampled separately. Sampling depths will vary but for a rough guide, the surface may be sampled to a depth of 6 or 7 inches and the subsoil sample include the next 6 to 8 inches of soil below. The several surface samples are thoroughly mixed and the composite sample taken from the mixture. The subsoil samples are treated the same way.

By having composite samples of both surface and subsoil from the fairway, more complete information can be obtained from the tests and a more reliable interpretation made.

There are several advantages to be derived from making the tests right on the greens. Physical and other factors likely to influence the growth, are more readily noted and considered in relation to the test results. Many more tests can be made. Local variations in soil can be more easily taken care of. Comparisons between tests on different greens or fairways are more conveniently made. Tests may be repeated at intervals during the season with a minimum expenditure of time and labor.

Use of Chemical Test-kits

On the other hand, there are certain disadvantages and limitations in the general use of the chemical tests kits in the field. Simplified as they have been in most cases, these chemical tests are, nevertheless, delicate reactions, involving the production of various colors, or degrees of turbidity, in the test solutions. In field testing, the colors or turbidities are compared with printed charts supplied with the test kits. It is extremely difficult to reproduce on paper the true colors actually obtained with the tests and, as a result interpretation of tests by an inexperienced operator, is not always easy. Since the reactions are so delicate, the least contamination of glassware or reagents used in the tests will also nullify the results. Unless precautions are observed to follow instructions to the letter and keep glassware and chemicals free from contamination, much trouble will be encountered.

Some of the reagents used are also unstable and deteriorate on standing. Tests made with such reagents are not reliable. Certain tests are also subject to interfering substances. For example, in the test for soluble phosphorous, arsenic gives the same color reaction and on golf greens when arsenicals are used for insect and worm eradication, the phosphorus test may give wholly erroneous results. Con-

siderable amounts of ammonia in the soil, also interfere with the test for potassium and where large amounts of compost, organic nitrogen carriers, or ammonium sulphate are being used, the potassium test may give much higher results than it should. The test for nitrates may also be affected by interfering substances and the results may indicate much larger supplies of nitrates than actually exist in the soil.

The above considerations apply more particularly to the short chemical tests made with test kits. In the laboratory, the chemist can better control the freshness and purity of his reagents; he can prepare standards of known concentration for comparison with his tests, and by modification of his methods overcome the effects of otherwise interfering substances in the soil. In these respects, the chemical testing done in the laboratory, is likely to be more satisfactory, than that done on the course by the inexperienced operator with a chemical test kit.

Correlative Studies Needed

In summarizing what has been said about the use of chemical tests in diagnosis of soil problems in general, and golf course soil problems in particular, it must be

emphasized again that interpretation of the results in terms of needed treatment is the real problem at the present time. The limitations of the tests themselves have been briefly discussed with regard to the information they can give on the soluble nutrient content of the soil. When used with these limitations in mind, and for the purpose of studying fertility problems of the golf course, chemical tests are undoubtedly of great value. What is needed, as far as conditions in this Province are concerned, is systematic application of chemical tests to golf course soils under various systems of treatment, to determine the relationship between the results of the tests and the actual response of the turf under the different conditions of treatment. When considerable test and response data have been accumulated, and properly correlated, the basis for reliable interpretation will have been established. Only then, will the chemical tests have their greatest usefulness. The need for further research and investigation along such lines is evident. The standards for comparison ordinarily used, in the interpretation of chemical tests on cultivated soils in general agriculture, do not necessarily apply to golf course soil conditions, according to our experience.

BROWN-PATCH*

By J. HUNTER GOODING

**It's Better to Use Preventives
Than Be Forced to Cure It**

THE only genuinely satisfactory method of maintaining greens free from brown-patch lies in preventive rather than in curative measures. By preventive measures, we mean the systematic application of disinfectants to the turf during that portion of the summer when brown-patch infections are likely to occur.

Delaying the application of fungicides until the disease gains a foothold on the greens, can hardly be called brown-patch control.

Once brown-patch fungus has attacked an area of turf, the damage is done. Damage occurs even before we can see the symptoms of the infection on grass. No control measure is effective in so far as that area is concerned. All we can do is to wait a couple of weeks or more until nature restores that section of turf to nor-

mal healthy conditions. We all have been slow in realizing that entirely too much emphasis has been laid on the matter of curing brown-patch attacks, and too little attention paid to the far more practical question of preventing attacks.

In 1922, when brown-patch was becoming recognized as one of the major problems of turf maintenance, Lyman Carrier wrote, "The value (of the treatment) lies in prevention rather than cure. After grass has become infected with the fungus nothing can be done for the areas that are hit. Those who have had brown-patch on their greens in the past had better not wait for the disease to appear before beginning treatment."

Professor Carrier's words are just as true today as when they were written 13 years ago.

Brown-patch gives no warning. Like fire, it strikes quickly—and usually at

*NAGA Convention address.