# Whether or not to limeSOIL ACIDITY TESTS and their practical uses 

By H. R. COX<br>At Rutgers University Greenkeeping Short Course

ALL plants respond in a deelded way to their chemical environment, and for this reason the importance of soll reaction has long attracted much attention. Two conditions are generally recognized in this respect-soil alkalinity and soil acidity. The latter condition is very prevalent in humid sections.

## Nature of Soil Acidity

Soil acidity may be considered for practical purposes as an unfavorable condition for plant growth arising in the soil through a lack of certain active bases such as calcium and magnesium. This condition may be corrected by the application of some form of lime.

Technically three reasons may be assigned to account for the harmful effects of soil acidity, (1) hydrogen ion concentration or the actual presence of an acid; (2) the presence of active poisonous bases harmful to plant growth such as aluminum, manganese and others; and (3) the actual shortage of calcium and magnesium as a nutrient.

The tendency of all soils in a humid area is toward acidity. The four important factors generally specified as encouraging
acidity are: (1) loss by leaching; (2) loss by cropping; (3) absorption within the soil; and (4) fertilizer residues.

## Tests for Soil Acidity

It is highly desirable that we have means of determining the degree of acidity in soils. Such tests have been provided. The following are flve types of tests which are being used to a considerable extent:

1. Hydrogen ion. This is the most accurate of all tests. It is a laboratory test, however, and for that reason is hardly adapted to the use of the layman. With this test the neutral point is represented by the flgure 7. Below that point is acidIty and above it alkalinity. Most of the sofl samples with which the farmer and greenskeeper has to deal may be tested fairly accurately with one of the other tests.
2. Truog. This test requires several minutes to complete, but it is one of the most dependable.
3. Soiltex. This is one of the "quick" tests and may be regarded as one of the best in that group. An advantage of this


Southern California Greenkeepers got together at Palos Verdes May 6 for one of their profitable sessions. Here are some of the fellows who are making this section a garden of golf.
test is that it indicates alkalinity as well as acidity.
4. La Motte Teskit. Another "quick" test of approximately the same degree of accuracy as the Soiltex.
5. Potassium thfocyanate. This test is put out commercially under the name of "Richorpoor." Our experlence with this test is that it is no more accurate and less convenient than the Soiltex. With a sandy soll or a soft deficient in fron, this test may give inaccurate indication.

## Acid Tolerance of Various Plants

As it is well known, some plants will stand a higher degree of acidity than will others. Alfalfa, for instance, seems to demand nearly a neutral soll in order to do its best. Bent grass apparently will thrive in the presence of a high degree of acidity. The limit of acidity, or the degree or acidity a crop will stand without showing marked decrease in yield, is gtven in the following table for the more important field and vegetable crops. The figures at the left are in Ph values. These may be transtated into the common terms describing acidity as follows: Soils running between 7.0 and 6.3 have a slight acidity; between 6.3 and 5.5 , medium acidity; between 5.5 and 5.0 , strong actdity; below 5.0, very strong acidity.
6.5 Sweet elover.
6.2 Red clover.
5.8 Bluegrass, white clover.
5.5 Alsike clover, crimson clover, soybean, vetch.
5.2 Cowpea, red-top, rye, timothy.
5.0 Bent grass.

## Various Forms of Lime

When limestone rock is run through a crusher and made into pulp, it is called ground or pulverized limestone. When 2,000 pounds of limestone rock is burnt in a ktin it undergoes a chemical change and comes out as 1,120 pounds of lump or stone lime. Excepting for the Impurittes in the original rock this lump lime rep. resents actual lime or total oxides of calclum and magnesfum. When thls 1,120 pounds is water-slaked or hydrated, It takes up water until it weighs from 1,350 to 1,500 pounds; when it becomes airstaked, it goes back to the same chiemical form as the original limestone rock, and weighs about 2,000 pounds.

Lump lime is sometimes ground and sotd for agricuttural purposes. There are certain "agricultural limes" or "by-prodtuet limes" which are largely air-siaked.

They contain varying amounts of actual lime and should be purchased only on an analysis basis. There are pulverized oyster shetts which contatn about as much actual lime as ground limestone. There are also the lime marls which are in the same chemical form as ground limestone but do not, as a rute, run as high in actual lime.

The kind of limes largely used in this region are hydrated pulverized limestone and putvertzed oyster shells. The value of each of them depends largely upon two points. (1) The amount of oxide or actual lime present, and (2) the fineness.
Hydrated ltme is usuatly in good mechanical condition having been reduced to a very fine powder by grinding and waterslaking. In actual lime it varies considerably ranging from 65 to $80 \%$. The reason for this rather large variation is the varying character of the original rock and the varying methods of manufacture.
Ground 1 Imestone runs from $48 \%$ to $55 \%$ actual lime depending upon the character of the original rock. Fineness in ground limestone is desirable but extreme fineness is not mecessary. If all goes through a twenty mesh screen ground limestone is fine enough for most purposes.

Ground oyster shells also vary in composition. Various analyses that have been made show that they do not run quite as high in actual lime on the average as ground timestone but this is made up by their having a small quantity of nitrogen and phosphoric acid. Since shells are softer and disentegrate faster, it is not necessary that they be ground quite as fine as rock.

The presence of magnesium in lime is not considered to be objectionable. In fact, the magnestum is even more effective than calcium in correcting soil acidity.

## How Much Lime to Apply

It may be seen from what has gone before that the amount of lime to use depends, to a considerable extent, upon the crop or crops involved and the degree of acidity of the soil. There are other factors to be considered also including soll texture, amount of organic matter in the solt, and the fertllizer which has been applied. It may be seen, therefore, that the amount of lime to use cannot be arrived at very exactly and that there is opportunity to exercise a great deal of judgment and discretion in this matter. An applicathon of 700 pounds of hydrated or 1,000
pounds of ground limestone per acre is looked upon as a light application; 4,500 pounds of hydrated or 6,000 pounds of ground limestone as a heavy application. The best procedure is to determine the acidity of the soil then gauge the amount of Ifme to use with reference to the crop Involved and the kind of time employed.

## What Is Cheapest Form of Lime to Buy?

A good answer to this familiar question is: Use the form of lime which can be put on the land at the lowest cost per unit of oxide.

According to state law every manufacturer of agricultural lime must guarantee on the bag the content of his product in lime ( CaO ) and magnesfa ( MgO ). The sum of these two figures will indicate the total oxide. By referring to the state chemist's builetins you may see how near the varlous manufacturers come to satisfying the guarantee. Dividing the cost per ton by the total oxide will give cost unit of oxide. Comparing different kinds or makes of lime by this method, however, will give only an approximate idea of their relative cheapness, since cost of hauling has not been considered. Each man will have to figure what his cost will be to get the lfme from the railroad station to his place. In the figures below we have assumed a haul of four milles at a cost of $\$ 0.22$ per ton milfe. We have also assumed that a man has received quotations from four different lime companies. Putting the figures down on paper they would look about as follows:
A. A high-grade pulverized limestone Cost delivered to club's R. R. station $\$ 7.6$
Hauting four mittes. ..... 88
Total cost ..... $\$ 7.88$
Total oxide $52 \%$ or 52 units; $\$ 7.88$
divided by $52=15.1$ cents per unit.
B. A high-grade hydrated lime
Cost delivered to club's R. R.station$\$ 12.00$
Hauling four miles. ..... 88
Total cost ..... $\$ 12.88$Total oxide $75 \%$ or 75 units; $\$ 12.88$divided by $75=17.1$ cents per unit.Some high-grade hydrated actuallyrun as high as $79 \%$ oxide, in whichcase the cost would be 16.3 cents per wnit.
C. A low-grade hydrated lime

Cost delivered to club's R. R.
station . ........................ $\$ 11.50$
Hauling four miles................. . 88
Total cost. . ....................... $\$ 12.38$
Total oxide $63 \%$ or 63 units; $\$ 12.38$ divided by $63=19.6$ cents per unit.
D. Pulverized oyster shells

Cost dellvered to ciut's R. R. station $\$ 6.00$
Hauling four mites................ .88
Total cost . . . . . . . . . . . . . . . . . . $\$ 6.88$
Total oxide $46 \%$ or 46 units; $\$ 6.88$ divided by $46=14.9$ cents per unit.
It may be seen from the above figures that puiverized oyster shells would be slightly the cheapest of the four kinds. These are merely assumed figures, however, set down to show the method of getting at the answer to the problem. Atthough there will be some difference in cost of applying the different forms of lime it will not be considerable; hydrated lime weighs less than pulverized limestone or oyster shells per unit of oxide but it occuples practically the same volume and takes about as long to distribute.

## Lime on Turf

Kentucky bluegrass seems to be greatly stimulated by lime as is white clover. The bents and fescues are not much affected by lime on most soils. As putting grass must necessarily be kept highly fertilized there may be no objection to using a certain amount of lime to increase nitrification in the soil as well as to control certain types of turf disease. On the other hand, lime may stimulate certain weeds as well as Kentucky bluegrass and white clover, and to this extent lime is a detriment.

On fairways there is no reason to doubt the excellent effect of lime where the turf is composed largely of Kentucky bluegrass and white clover especially where lime is used in conjunction with commercial fertilizer. If, however, the turf is composed of red-top, bent or fescue, lime may not be necessary nor desirable.

## J. B. Smith, Club Manager's Head, Dies in Hospital Blast

I BARKER SMITH, secretary and gen. eral manager of the Cleveland Athletic club, and president of the Club Managers' association of America was among the victims of the Cleveland hospital explosion.

P. and A. photo.

Here is the finish of the British open at Murifield with the fellow in the black knickers sinking the putt that made him again wearer of the British crown. The fellow's name is Hogan, or something like that.

# Approach Shots to the Pro's Cash Register 

By HERB GRAFFIS

WITH the track muddy in nearly all parts of the country the shop business has been making no new records this early in the season; ball business naturally being slow with the sunshine being so coy. The boys are doing remarkably well on the club sales, according to most indications. This is one of the surest signs that the technique of pro merchandising is comfng atong in flne shape.

On the group buying proposal there have been no recent definite developments. With the season taunched the pros are "sittin" and whittlin'" with their own individual merchandising situations and find it difficult to spare the time for the required dethberation and action on the plan belng worked out by Willie Ogg's committee of the P. G. A.

Speaking unofficially, some of the P, G. A. dignitarles said a few days ago that the plan was progressing as far as the pros were concerned and needed only an agreement with one or more of the big manufacturers to put pro group buying on a working basis. So it looks like the next move, "if, as and when" made, is to come from the manufacturers.

Ogg, for some time, has been studying
the methods of the "voluntary chains" organized co-operatively in the grocery business by the independents to combat the glant chain store systems. He thinks there may be something in this sort of a buying and distributing procedure that will work out well to the mutual advantage of pro, manufacturer and player.
"Is a member of a club that operates Its own pro shop in the sporting goods business, and consequently a professional ${ }^{\text {m }}$ Some of the fellows are argulng about this. For two reasons your correspondent thinks rag-chewing on this subject is a Wraste of time. In the first place, it's questionable policy, and secondly, the club is not organized for profit.

Again we lam into the boys the reminder to give the women's business a strong play. A lot of the smart boys are pashing in early in the season by making a separate showing of women's clubs. I was talking to Bert Way the other day about this women's business and got another raft of incidents to cite as evidence that the pro who helps the women run successful tournaments, features in his shop what they need, and, in general, doesn't
treat them like a bunch of "Orphan Annies," is the man who makes money, serves his club well, and is all set with $100 \%$ boosting of his members.

Pros are getting a good break from the editors of the various club house-organs. Gorspom has been plugging these editors about the stories there are in the pro shop and the co-operation the pro has coming to him. The editors have responded with energy and deserve the pros' thanks for their help.

Here are a few of the house-organ paragraphs picked at random from club publications we have received:
"Just step into the shop and see for yourself and compare the quality and price with anything in the downtoron district. You can't beat them.
"The golf shop wants the patronage of its members to build its volume of business and to that end has adopted a merchandising system that gives you quality, service, personal interest and high class merchandise priced properly."
"Now, Mr. Member, the place to buy golf clubs and supplies is at the club, where real experts on clubs can give you intelligent advice, and guarantee that your purchases will prove as represented or replaced. Yout knote how it is, sometimes the club you think you want will not do at all. If you purchase it at the club, you can, without inconvenience, exchange it. Furthermore your loyalty to the club shoutd prompt you to patronize it. You may save a dime elsewhere but loose a dollar in the end."
"Whenever any member of the club buys balls dotentoten, or clubs from a cut rate department store, or takes lessons somewhere else than at the elub they are doing all they can do to harm the club and its service. What a howl there would be from the very members who partake of these joy rides, if the golf shop and all of its activities were abolished and yet they do their best to abolish it by trading somewhere else."

Parker Noll, pro at Edgewood (Chicago District), has one of the neatest little shops we have seen lately. Parker keeps his women's stuff separated and has display cards telling the stories of the women's goods. Noll makes as good use of display cards as I have seen made in a pro shop. He writes his own copy; brief, newsy and selling. Some sign painter letters them attractively and Parker puts them on the clubs, apparel, etc., so the member gets the sales story with a punch and the pro has
overlooked no chance to bring members' attention to their needs and desires.

The other boys ought to make more use of this stunt as it is persistent and thorough sales work and doesn't involve the risk of offending members that might be incurred if the pro were continually talking about his merchandise. Noll changes his cards often and keeps them timely. which is one of the main reasons for their success.
'You have to keep reminding them" is Otto Hackbarth's remedy for slow business at the pro shop. Otto advises the boys to send the members a circular of some kind at the end of each month, calling attention to details of the stock carried by the shop, and the fact that the pro is constantly on the job earning his right to preferential consideration by the buying members. Otto says he has no particular problem of hits own in selling at the Cincinnati Country club. He sums up the situation: "My members patronize the shop. They are the highest type of people, those who do the square thing with the pro. Of course, I have been here 13 years and have kept an up-to-date stock, never charging more than goods can be bought for elsewhere. The members know this and never think of buying anywhere else."

Comes the dawn! The sport writers are beginning to give the pros a hand for their shops. Here's what is said about Eddle Loos of the Lake Shore Country club as a merchandiser, the writer being Jack Hoag, golf editor for the Chicago Evening Post:
"Eddie Loos is not only a good golfer, but he is a good salesman, and we never saw a more attractively arranged shop. In the first place, it was clean. If a fy had alighted on a window pane he'd have slipped and broke a leg, and Loos had everything in stock that would appeal to the fancy of a golfer. There were clothes that would have made Johnny Farrell turn green with envy and glistening sets of clubs that looked as if they'd play themselves. Eddie is some dresser and he appreciates the value of a good show-room.
"Of course, golf clubs are golf clubs and elohtes are clothes, but it is a clever guy that knows how to display them, and the time has come when a good golfer must look the part. Loos' shop may not be a sport item, but it was interesting to look at and the whole place fitted into the ensemble of the service which the Lake Shore members demand. Everything about the club.

## I Was Green-Chairman and Got Along O. K., Because-

By SPENCER M. DUTY

JUST why should a man who is trying to better the course be made "a goat?" My observation as a green-chairman indicates that happily in these enlightened days there is not the "martyrdom" that used to be considered part of the greenchairman's job.
Now, while during my term of office we tore up the fair ways during June and July, put in some 32,000 feet of tile, rebuilt greens with all the trouble of playing on temporary greens, and built some new holes while we were rebuilding others, still I can not say that I was a martyr or that I was the subject of very much abuse.
Most of the time the work was of a great amount of friendly interest on the part of the members and they went out of their way to thank me for my efforts. My experience was that members kick more about caddies and starting time. If a member cannot get a caddy he lets out a yell, if a tournament is being held and he cannot start off at once he has a kick which he will forget all about in a short time.
When most men play golf they become boys again and they want to have a boy's right to kick. Of course if they miss a putt it is the fault of the green. I wish I could putt well enough to lay it onto the green when I miss and hope to get away with it.

## Tell Your Problems

Once in a great while some member starts to kick and in time will affect others. As a rule it is without any reason and just because he has gotten into the habit. When we are sure who it was as a rule we went after him and without exception it would result in changing him to a booster. A littie information as to our problems, what we were trying to do and why, made all the difference in the world.
With what I have heard of the troubles of green-chairmen I wonder if I have just been lucky. Without doubt I have been in two respects; first the character of our
members, we have few natural kickers; second and the most important, our pro, Jack Way, who has charge of the course, is rightly popular with the members who have great confidence in his judgment and ability.
Perhaps in another way, not by my desire, I have been lucky. I am a very poor player which fact I am sorry to say is quite generally known by our members. 1 have noticed that the medium and poor players are free to ask for information and seem to appreciate being "in the know."
While it has generally been assumed that the green-chairman should be a good player I have wondered if the good player does not let himself in for a lot of trouble that the poorer player escapes. Just because a man can not play well himself is no reason why he should not understand the game, golf course construction and maintenance. It is a simple matter for the poor player to prove to the good player that he has not the first idea what makes a good course. Let him carefully read "The Links," by Robert Hunter, Jr., and he can run the good player who thinks he knows it all clear off the map and have him yelling for mercy. Add to that, the book by Geo. Thomas, Jr., GOLFDOM, the Green Section Bulletin and the Greenkeepers Magazine, and all the other articles that appear, and when the good player starts in on the poor player who is green-chairman with the tdea of giving him a lesson, it is just another case of turning him upside down. After a little while you can go around looking for them.
This all makes a hit with the great maJority of the members who become sure that the good plaver is not going to be allowed to spoll tie course for them. This seems to be a very real fear on the part of the average member; he is afraid of the good player and his suggestions. There is a basis for this feeling, follow the sug. gestions of the good player and frequently the course will be spoiled for everybody himself included. Most of the members hardly expect that their suggestions will be followed, what they want is to have

them treated with respect and some explanation as to why they will not work.

I really do not see why the chairman of a green-committee shoutd have a rough time. Personally I had a lot of fun while holding the job, with a small amount of trouble. Both Jack Way and I tried in all our changes to keep the rights of all elasses of players in mind. There seems to be no doubt but that this attitude on our part has been recognized and appreclated by our members.

## A Brief on Renovating Poor Turf

*By E. E. EVAUL

BEFORE reseeding or resodding turf that is thin or bare, find out the reason for such conditions and correct them. In trying to locate the reason or reasons for fallure of your turf, the following list of "Turf Trouble Hints" may be of some ald.

1. Is the surface and sub-surface drainage adequate?
2. Is the soil texture as good as it should be?
3. Is there enough organic matter in the soil?
4. Is the water-holding capacity too high or too low?
5. Is the soil reaction too low?
6. Is the soil too compact as a result of rolling?
7. Is the grass that I am growing adapted to my soil and climate?
8. Is there enough plant food for normal growth?
9. Is the fertilizer, insecticide, or fungicide application too heavy for this time of year?
10. Is the poor condition of the turf due to grub injury?
11. Is the disease condition checked and under control?
12. Is my condition due to the presence or removal of weeds?

After the trouble has been tocated by means of the above trouble hinta, some "Ruies for Rejuvenation" shouid be of value. They may be stated briefly as follows:

1. Correct any poorly drained areas, etther by regrading or tiling.

[^0]2. Correct soil texture and water-holding capacity.
(1) Organic matter and clay will be found useful on sandy soils.
(2) Organic matter and sand will be found useful on clayey soils.
3. Level and roll the area to be reseeded or resođded.
4. Scarify this area in all directions.
(1) This will work out old grass and weeds, and atso loosen up the sofl.
(2) A spike roller is a liandy tool for this operation.
5. Mix the right seed for your condltions with screened topsoil or like material and then reseed, rake and roll lightly.
6. If sod is used in piace of seed, cut sod in convenient size strips of equal thickness.
(1) Lay as soon as possible after cutting.
(2) Tamp the sod well.
(3) Top-tress in order to fill up all cracks.
(4) Make aliowance for settling.
7. Water re-seeded or re-sodded area thoroughty.
(1) A light water soon evaporates and leaves a cracked and crusty surface.
8. After grass is up a few days or has started to grow, a light application of a nitrogenous fertilizer applied in solution will hasten growth.
9. Follow best maintenance practices.
(1) Regular mowing and top-dressil.g.
(2) Removal of clippings when disease is present.
(3) Water and fertilizer when needed. 10. Establish a sod nursery.
(1) Area for greens, fairways, and tees.
(2) Every course should have one.

## A. J. Wilder, Young Greenkeeper, Ends Life at Rochester, N. Y.

ALBERT J. WILDER, greenkeeper at Oak Hill C. C., Rochester, N. Y., was found dead from polson, self-administered, on his course May 14. Wilder was 28 years old and a fine lad with a bright career apparently ahead of him. He had a fine record at Kirtland, where he broke into greenkeeping, and at Fenimore where he later located up to the first of this year.

for $20 \%$ of your former remedy costs
Only require 3 ozs. per 1,000 square feet of turf as compared to 1 lb . for the same area for other remedies selling at about the same price per pound.

## Calo-Clor

## and

## Calogreen

are the result of the United States Department of Agriculture's experiments.

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2. Fewer applications are required.
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# Golf Club Makers' association SET SHAFT STANDARDS and plan team-work with P. G. A. 

TWo definite steps that golf club manufacturers believe will tend to emphasize the superiority of American-made golf clubs were taken by the National Association of Golf Club Manufacturers holding its third semi-annual session at White Sulphur Springs, W. Va., May 2. The first of these was the recommendation that all manufacturers adopt the plan proposed by the Committee on Standardtzation of Hickory Shafts, as presented by L. W. Crandall, chairman of the committee, and explained and emphasized by Mr. Seidel, of the United States Bureau of Standarđs, and by Mr . Dickinson, president of the Hickory Golf Shaft Association. Associated with Mr. Crandall on the committee were George W. Mattern and A. C. Link. The committee, Mr. Dickinson, Mr. Seidel and the latter's associates in the Bureau of Standards, have done much work looking to the estabtishiment of deffitte grades in golf shafts and in developing accurate and scientific tests that will reveal the quality, stiffness and resiliency of hickory.

Each member of the assocfation will receive a written report outlining the standard grades and tests and will put the program into effect as soon as factory schedUfes cant be adfusted. Members of the association expressed themselves as believing that adoption of the standard grades and tests will result in more uniform shafts of hitgher quallty. The tests propesed will permit accurate selection of shafts not only for quality and stiffness but also for suitability to various types of clubs, that is, whether No. 1, 2, 3, 4 froms, etc. A resolution was adopted extending a vote of thanks and appreciation to the members of the committee, the Hickory Golt Shaft Assocfation, Mr. Sefdel and others whe participated in the extensive investigations and gave intelligent effort and valuable time to the project.

## Color No Index of Shaft Quality

The second forward step also concerned hiekory shafts. Recently there has grown up in the trade a demand for white hickory shafts in hifg grade matched sets, the impression having been created in some way that white shafts are superior and that red shafts and two-tone shafts are of
inferior quality. A resolution adopted by the association recited this situation and recommended that members help to dispel this incorrect impression by use in thetr advertising, catalogues, etc., the slogan, "All good shafts are not white." In the discussion of this resolution it was pointed out that this demand for white shafts, if not held in check, will leave manufacturers with a lot of high grade red and two-tone shafts on thefr hands, deprive golfers of the excellent playing qualities of the colored hickory and, if the demand for white shafts increases, result in lower grades of white shafts being used. The guarantee policy of the association, adopted at its November meeting, seems to be working satisfactorily according to reports. To emphasize that there is a definite guarantee only on the higher grades of golf clubs, a placard or display sign, carrying the newly adopted emblem of the association and emphasizing the guarantee terms and other trade policies adopted by the association, will be prepared under supervision of Glenn Morris, of the L. A. Young Company, Detroit, and distributed among jobbers and dealers. C. B. Johnson, secretary of the assocfation, presented a plan for the expansion of the delfnquent account service. Closer contact with the Professional Golfers' Association and its state branches will be maintained and efforts will be made to maintain contact with delinquents and to locate those whose addresses are not known, Mr. Johinson explained in his report, which was adopted, that there was no intentfon, however, that the association should act as a collection or arbitration agency. The Vulcan Golf Company, Portsmouth, O., and the Schavoifte Golf Corporation, New York City, were elected to membership.

## Re-elect Officers

The present officers were re-elected as follows:
F. W. Bradsby, President.
H. B. Canby, Vice-President.
L. W. Crandall, Treasurer.
C. B. Johnson, Secretary,

It was voted hold the next semi-annual session in New Yort City, November 14, 1929.


[^0]:    *At Rutgers University greenkeeping short course.

