

Lime's Role in Fine Turf

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TO most laymen moss indicates acidity, and soil in damp locations is considered "sour." These notions do not fit the soil chemist's conception. To him, prevalence of moss is indicative of impoverished soil and not sure proof of acidity. From tests he knows that soil in damp or wet spots is not necessarily "sour" or acid. Furthermore, even though lime is needed he emphasizes improved drainage as even more important.

Soils may be acid, neutral or alkaline. Modern practice is to express reaction in terms of pH. By that method the figure 7 represents a neutral soil, lower figures denote increasing acidity, and higher figures increasing alkalinity. Since each figure differs by a multiple of 10, pH 6 is ten times, pH 5 is 100 times, and pH 4 is 1,000 times, etc., more acid than neutral (pH 7). Similar differences apply in the alkaline range also. Soils usually fall in the range pH 4 to 8.5, but more commonly within the narrower limit pH 5 to 7.5.

Most plants grow best at pH 6 to 8. However, some continue normal growth below or above these limits, and a very few require a more acid medium.

Among the commonly used grasses, Kentucky bluegrass, the rye grasses, and Bermuda grass are classed as lime lovers; whereas the fescues, red top and the bent grasses, can withstand appreciably more acidity.

Heavy Rains Acidify Soil

Acid soils develop in humid regions; that is, where rainfall exceeds 20-25 inches per annum. As surplus rain water passes down through the soil it dissolves and carries away some of the mineral soil constituents. Calcium is the principal basic element lost in this manner, so unless offset by applications of lime the tendency is for soil in humid sections to become acid.

The so-called physiologically acid fertilizers (sulphate of ammonia, etc.) accelerate the leaching loss of calcium and thus accentuate this natural tendency of soil to become acid.

During most of the decade preceding 1928, the use of lime on fine turf was

frowned upon. Grass authorities attributed clover and weed invasion to its use, and a few went so far as to claim that bent prefers an acid medium. Following that disastrous summer it was realized that soils may become too acid, even for the more acid tolerant fescues and bent grasses, so the acid theory was no longer tenable and lime regained favor.

According to the present concept, the judicious use of lime is advised on acid soil. Although slight acidity is deemed helpful for clover and weed control, grass density is considered even more important. Weeds struggle to survive when faced with competition of dense vigorous turf.

One cannot judge need for lime solely by immediate stimulating effects on growth. Lime may help grass withstand drought and other unfavorable summer conditions, and tends to minimize some types of winter kill in the north.

By stimulating bacterial activity lime helps prevent accumulation of partially decomposed stems and leaves which may cause serious trouble in periods of hot weather when allowed to accumulate as distinct layers. Extreme acidity seems to have an adverse effect on the soil water relationship.

Soil reaction affects supply of available phosphorus. On acid soils applied phosphates gradually revert to relatively insoluble compounds. According to Truog the critical point is pH 6.2 to 6.5. Above this figure phosphates remain relatively available, but at lower reactions gradual reversion occurs. At reactions above pH 8.0 availability of phosphate is depressed also, but to lesser degree.

On very acid soil it is not necessary to apply sufficient lime all at one time to

American Fork & Hoe Co. does a good job of taking its own medicine in golf promotion. It pays the country club at Geneva, O., an annual subscription toward green-fees for company employees. The arrangement results in giving AF&H workers golf at half the usual fee cost inasmuch as the company assumes the other half.

About 50 of the company boys got in on the deal.



An interesting exhibit of tees is that on display at the Passaic County GC, Paterson, N. J. The collection was begun as a hobby by a member of the course maintenance staff and after receiving a good start, got additions from the course's players. It makes a bulletin board, locker-room or lobby display that causes considerable comment.

raise soil reaction up to pH 6, or above. This may unduly favor clover, and actually depress rather than improve turf growth. The better and safer course is to apply a lesser quantity of lime, or at most twice a year until reaction reaches the desired point. After that use lime on greens annually at minimum rate, but the labor saving scheme on fairways is to apply enough lime at one time to last two to four years.

As a rule, finely ground limestone is cheaper than hydrate, and is the safer material to use. It can be applied all at one time without danger of burning the grass. Hydrate is caustic and hence may scorch the grass, so when rate exceeds 1,000 lbs. per acre it is safer to split the quantity and make two equal applications at intervals of 7 to 14 days. Heavier rates are permissible in late fall or early spring than during warm weather. In neutralizing value 70 lbs. hydrated lime are equivalent to 100 lbs. ground limestone.

Two Types of Lime

Based on chemical composition, there are two types of lime, so-called calcite and dolomite. The calcite type contains calcium only, whereas dolomite possesses both calcium and magnesium. The latter should be used where soil content of available magnesium is low. A dolomite containing 15 to 20% magnesium oxide, or its equivalent, should be selected. If not stated on bag this information can be procured from the producer.

Lime should be applied in fall or early spring. One advantage of fall is the fact that deeper penetration is likely because of more plentiful moisture, and the heaving action of alternate freezes and thaws.

When used in spring, applications should be as early in the season as possible.

Where lead arsenate is used for grub control, it is best to apply needed lime several months before the arsenate. Lime tends to convert arsenate into a less effective basic compound. Likewise when phosphate is needed, best practice is to apply lime first, and the phosphate several months later.

For all practical purposes, need for lime on fairways and lawns is indicated when soil reaction falls below the following limits: Kentucky bluegrass, pH 5.5 to 6.0; fescues and bent grasses, pH 5.0 to 5.5; Bermuda grass, pH 5.5 to 6.0.

Soil type affects quantity required because less lime is needed on a sandy soil than on a heavy soil to produce the same change in reaction, even though acidity is the same at the start. All these factors are taken into account in the following table. Suggested rates are based on high quality finely ground limestone. If hydrate is substituted rate can be reduced one-fourth to one-third.

Suggested Rates for Ground Limestone on Fairways and Lawns

Soil Texture	Degree Acidity	POUNDS PER ACRE	
		Kentucky bluegrass and Bermuda	Fescue and Bent
Sands and sandy loams	slight	1,000	None
	medium	2,000	1,000
	strong	3,000	2,000
Loams, silt			
loams, clay	slight	2,000	None
Loams, clays	medium	3,000	2,000
	strong	4,000	3,000

On greens need for lime is clearly indicated when reaction falls below the following limits: bent grasses pH 5.0 to 5.5; Bermuda and winter rye, pH 5.5 to 6.0.

When pH readings lie between these limits and neutrality, pH 7, the effect of lime should be tested on portions of one or more greens. Besides its direct effect on growth, enhanced ability to withstand drought and hot weather, increased immunity to disease, etc., are possible secondary benefits not to be overlooked.

Aside from soil pH, there are two other important indicators of need for lime on greens. When growth response to applications of ammonium sulphate ceases, need for lime is strongly indicated. Likewise, when disease is severe and control not easily obtained, lime may prove beneficial. This applies only when the growth factors are favorable and does not follow when greens are over-fertilized or over-watered,

or during excessively hot, humid weather when accompanied by frequent downpouring rains.

At times in mid-summer when grass looks sickly and algae (green scum) appears on surface of water-logged areas light applications of lime usually prove helpful. Hydrated lime is often preferred because of its greater solubility. Only light rates can be used, 2 to 8 pounds per 1,000 square feet, and immediate watering to prevent burning is essential. Exceedingly fine ground limestone is almost equally effective and safer if fertilizer containing ammonium sulphate was used during the preceding week.

The following table is offered as a guide for estimating quantity of lime needed on greens. Indicated rates are pounds per 1,000 sq. ft.

LIME REQUIREMENTS OF GREENS

Soil pH	Degree Acidity	Lbs. Ground Limestone Needed per 1,000 Sq. Ft.
4.0 to 4.5	very strong plus to very strong	60-80
4.5 to 5.0	very strong to strong	40-60
5.0 to 5.5	strong to medium	20-40
5.5 to 6.0	medium to slight	10-20
6.0 to 6.5	slight to very slight	0-10

When pH readings indicate need for lime, tests for soil content of available calcium and magnesium are helpful in deciding upon rate of application and type of lime to use. When both are reasonably high, the lower recommended rate will suffice even though pH approaches the lower limit recorded in the first column.

Ground limestone can be applied at any of the recommended rates without danger, but this is not so with hydrated lime. It is caustic, so not more than 20 to 25 lbs. per 1,000 sq. ft. can be applied at one time even in spring or fall. When more is needed split applications are advisable. In summer even 20 lbs. may scorch the grass, so rate should not exceed 5 to 10 lbs. Immediate watering to wash it into the soil is advisable.

In conclusion, a word of caution regarding the use of lime and any fertilizer containing nitrogen in the form of ammonia. These materials react with lime, liberating gaseous ammonia which is extremely toxic and may scorch or kill grass, or it may escape into the atmosphere. With hydrated lime the reaction is almost instantaneous, but it may occur with ground limestone also. Hence at least 7 to 14 days should elapse between the use of lime and fertilizer containing compound of ammonia. This applies to commercial mixtures containing ammonium sulphate, ammo phos, etc., as well as the pure materials themselves.

MANAGERS REVIVING EPICURISM

ONE of the greatest achievements of country club managers in 1938 has not been given extensive recognition by officials or members of golf clubs, although the feat of the managers has had definite effect in bringing about a revival of country club distinction other than that based on expense of membership.

This notable feat has been the great performance in bringing about a rebirth of epicurism, although the epicures of food and drink are still so rare that their presence may be known only to the observant managers of their clubs.

The sad truth is that in this land of abundant food the fine art of eating has deteriorated sadly so there's not one well-bred young man of 30 years or so, among a thousand of his class, who knows much more about cuisine than to know whether a steak is tough or tender, or who knows any more about liquors than could have been learned during speakeasy days.

Not Matter of Money

What's going on behind the scenes to educate these young people and their parents, makes one of the most interesting stories in the chronicles of upper-class living today. The matter of education in epicurism is not primarily a matter of money. The average Italian or German family of limited means eats much better in the United States than does the very well-to-do American family.

To show back-stage views of how talented managers are pondering over the problems of human relations, finance and mastery of the culinary and liquid arts in order to serve their clubs better by cultivating a new breed of the old-time "prominent clubman" we reprint some extracts from the excellent "Bulletin" of the Metropolitan Club Managers' Assn. of the New York Metropolitan district. This Bulletin is edited by Adolph Koenig, mgr., Fairview CC, Elmsford, N. Y. It's impossible to make an appraisal of the value of this Bulletin in dollars-and-cents to the clubs served by the MCMA members, but after one reads a year's files of the publication, it's easy to believe that the Bulletin is worth many thousands of dollars