green world
AN INDUSTRYWIDE PUBLICATION OF THE NEW JERSEY TURFGRASS ASSOCIATION
NJTA
Volume 12 No. 1 April 1982

# Lime's Role in Turfgrass Production

Ralph E. Engel

Correcting the pH of very acid turf soils of the Northeastern United States to a slight acidity, in the range of 6.0 - 6.5, is generally accepted practice by turfgrowers. Yet, it has not always been this way. Occasionally some turfgrowers have omitted lime and sought more acid soils for turf. It doesn't seem appropriate to cease liming and permit high acidity without careful study of the known benefits of a slightly acid soil.

The widespread practice of liming should be evidence of its benefit to turfgrasses.

Before considering some of the reasons for changing turf soils from very acid to slightly acid, it's interesting to review the practice of the liming of turf. In the early 1900's, the beginning years of turfgrass science, an Extension leaflet from Rhode Island said *"Sulfate of ammonia is the cheapest form of applying nitrogen and incidentally it makes the soil acid enough to drive out the weeds (and also the clover and bluegrass). However, the grasses (Bentgrass and Fescue) thrive under these conditions. ---Do not use lime, ashes, stable manure or any other substance that will tend to sweeten the soil."* On October 13, 1925, Dr. C. V. Piper, of the United States Department of Agriculture, another early turf scientist wrote, *"the sweetening process with lime we do not believe in, as it multiplies weeds altogether too much. ---the lime-business had better be cut out entirely. ---The acid soil grasses are the bents and the fescues, the latter not much good.*

In the Milwaukee Bulletin No. 1 of 1947 titled "The Role of Lime in Turf Management", Dr. O. J. Noer wrote:

***"Acid Era in Turf Management:*** *The 'acid or sulfate of ammonia era' in turf maintenance was short-lived. It lasted less than a decade. The fad to dose turf with sulfate of ammonia and control weeds and clover by producing an acid soil with it was based on the early results obtained on the lawn fertilizer plats at the Rhode Island Agricultural Experiment Station. During the first years of the experiment, the plats receiving sulfate of ammonia were weed and clover free, in contrast to the more weedy nitrate of soda plats. Both received the same amount of nitrogen. The soil on the sulfate plats was more acid so it was given credit for eliminating clover and weeds.*

**Golf Clubs Were First to Put Acid Theory into Practice:** *Golf clubs were the first to make practical use of the Rhode Island experiments. They tried sulfate of ammonia on greens and it performed a miracle. Clover and weeds disappeared like magic, turf density increased, and grass became dark green in color. Enthusiasm increased to a point where many turf authorities frowned upon the use of any other kind of nitrogenous fertilizer, and strongly condemned the use of lime.*

(Continued on page 3)

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Peter Loft reads plaque

## Expo '81

Peter Loft, recipient of the 1981 N. J. Hall of Fame award, read the plaque he was awarded at Turfgrass Expo in Cherry Hill. Pete was on the founding committee when NJTA was brought into existence in 1970. His advice, enthusiasm, and support was a vital part of the beginning of our organization. He served as the second president in 1972. Pete is President of Lofts Seed (not candy). He and his brother Jon operate the seed firm founded by their father, Selman Loft, which grows turf seeds and markets them nationwide. Congratulations Pete!

Congratulations Pete!

# Comments and Opinions

## "Close Cutting" Evoked Response

We enjoyed the response to the article on the close-mowing of greens in the fall issue.

One writer stated," . . . . surely hit the spot. A lot of golfers say they like a close cut because they think it is the 'in thing' ".

Another reader asked why we did not suggest the Stipmeter for determining the correct height of turf cut? We remember what other uses golf course superintendents have suggested for this cold metal bar — the Stipmeter — so possibly we were timid not to have mentioned it.

Seriously, we visualize that a minimal length of stem and green enhances photosynthesis. We suggested the 3/16 inch cut as a bench setting because we thought that most people would adjust from whatever speed each brand of mower will give for this height. Machines that ride higher can be set at this height or slightly closer. One of the single-unit greens mowers will produce essentially as fast greens at the 1/4 inch setting as other mowers give at 3/16 inch, or slightly closer setting.

One person asked "What's wrong with 5/16 inch cut on greens?" We do not believe this height pleases the typical golfer of this area. If the higher cut, however, satisfies the clientele of certain golf clubs or if it is necessary to cut at this height for brief periods to offset impending turf trouble, then this higher cut has some logic.

Now, to show our bravery; the Stipmeter is a useful tool that helps the golf course superintendent determine the optimum cut — either 3/16 inch, 1/4 inch or whatever — to achieve the green speed most in demand by his clients.

**REE**

## Comments From the "Lyons Den"

Bill Lyons, Sr., of Lyon's Den Golf (Ohio), comments followed the fall issue with the article on combining ryegrass with Kentucky bluegrass . . . . "Twelve years ago, I saw Duich's plots of a Kentucky blue-Manhattan blend. At the time no one knew why the two produced better turf. We were just ready to seed our Lyon's Den #3 (course). We seeded 90 percent Manhattan and 10 percent of an unknown Kentucky Blue variety at 40 pounds per acre . . . 400 pounds of 15-15-15, plus 4,000 pounds of 20 percent superphosphate. After ten years of play, it is a turf to BRAG about; mowed at 1 1/4 inches as growth dictates. Rough (same mix) is cut 1 1/2". This turf is watered sparingly as wilt develops. Red thread is our worst problem. On tees where clippings are removed we get $$$$$spot. But we fertilize it, and it is masked. The economy has me worried . . . . . In 1938, unlimited play on golf courses was selling for 50 cents. One man bought a year's golf for his family with three bags of Milorganite (Latham always said that stuff was valuable)."

Friend Bill, we enjoy your comments! Thanks to one of turf's beloved characters.

**REE**

**Lime's Role**

(Continued from page 1)

***The Acid-Era Died with the Grass in-1928:*** *The reaction came with the disastrous hot, humid and wet summer of 1928. Wholesale loss of grass occurred on greens throughout the North. All the turf on every green disappeared overnight on many courses. The first impulse was to condemn sulfate of ammonia. When reason finally prevailed it was realized that soils can become too acid for the supposedly acid-tolerant bent grasses. Lime came back into favor. Although slight acidity may be advantageous, turf authorities now concede that the maintenance of a dense turf is even more important in the control of clover, weeds and poa annua than an acid soil.*

***The Rhode Island Turf Fertilizer Plats:*** *The Rhode Island lawn fertilizer experiment was started in 1907 and concluded in 1942. The results are summarized in an interesting manner in the 55th Annual Report of the Station. It states that turf on the nitrate of soda plats was unsightly because of its 'un-uniform' character and invasion of weeds. The ones fertilized with a combination of nitrate of soda and sulfate of ammonia were very slightly acid, and the turf was satisfactory. 'Winter-kill' became bad in the sulfate of ammonia plats. It was first noticed in the spring of 1938. The soil was strongly acid, pH 4.0. By raking the plats severely to remove the dead grass, turf was restored so there were few vacant spaces by the end of the growing season. Recovery of the injured areas was very slow in 1939-40-41. Three times more dead grass accumulated in the acid soil (pH 4.0) and there was twice as much on the moderately acid plats (pH 5 to 6) than on the alkaline ones. The turf became 'sod bound' as a result of the matted surface. The grass on the sulfate of ammonia plats was damaged severely by lead arsenate and sodium arsenite used for worm and weed control. Little or no injury occurred from the use of these chemicals on the alkaline, or the slightly acid plats.*

The concluding statements about these 'classic' plats which were plowed down in 1942 are illuminating:

*The plats that received sulfate of ammonia continuously as the source of nitrogen rather than nitrate of soda remained free of weeds and it was from the results of these tests that the 'weedless lawn' dream was realized by the discovery of a long sought fertilizer that would grow grass and kill weeds. This gave rise to the 'sulfate of ammonia era' in turf culture. But as more research was undertaken and further observations were made, it was found that continuous applications of either sulfate of ammonia or nitrate of soda were inadvisable, due to the high acidity produced by the sulfate of ammonia, and the alkalinity produced by the nitrate of soda. However, sulfate of ammonia, when mixed with an equal weight of limestone to prevent the soil from becoming more acid, proved very satisfactory and was also superior to nitrate of soda in maintaining desirable turf."*

## Liming: In or Out of Fashion?

There are several reasons for the cessation of the practice of liming turf. A cyclical pattern emerges where liming is either in or out of favor. The reasons given by growers for giving up liming vary from the complex to a simple excuse, such as avoiding the inelegant chore of applying lime.

The acid soil theory for controlling weeds, once popular in the past, has been revived as a method of annual bluegrass control. While increased soil acidity lowers phosphorous availability, this method is not a solution. In our climate, annual bluegrass will grow within a very wide range of pH values. This weed also occurs with very acid soils and bentgrass will be grown with less than optimum conditions. There are claims that bentgrass performs better with high acidity. These claims need to be examined. With a low pH, bentgrass produces a surface residue and is less robust which often gives it a finer-textured appearance. In England some growers prefer "fiber" at the surface to deter mud in their wet climate. Our turf growers make considerable effort to minimize thatchy accumulations which ultimately lead to the necessity for total turf-renovation after a period of years.

Some of the recent interest in greater soil acidity may have been associated with the use of sulfur on turf. While any large amount of sulfur lowers the pH significantly, Dr. Goss of Washington State, encouraged sulfur application for its nutritional value. Goss, however, did not stress the side effects of using sulfur, such as lower pH or lower available phosphorous.

In some instances, growers have applied lime and observed no results in the following four to eight weeks. They have concluded that their effort and money were wasted. Unfortunately, the value of liming turf cannot be determined this easily in most areas. Occasionally a quick response can be observed if appreciable thatch decomposition releases a helpful amount of nutrients, or, in infrequent cases, the nutrients calcium or magnesium may be deficient.

*Nothing really significant ever happens in a man's life until he wants something. If it is a compelling want, it will set him dreaming. This is the beginning of creativity.*

**Martin**

*The worth of a recent agricultural crop for USA was estimated at 61 billion. American agriculture uses only 3 percent of our energy to produce this massive supply of food and fiber, and exports enough to pay for more than two-thirds of our energy imports in a recent year.*

**Martin**

***Green World is published three times a year by the New Jersey Turfgrass Association, P.O. Box 231, New Brunswick, N.J. 08903. Ralph Engel, consulting editor; Mary Jane Christofferson, managing editor. Please address inquiries concerning advertising to Dennis DeSanctis, Terre Company, Box 1014, Clifton, N.J. 07014.***

## Some Benefits of Using Lime

Soil chemists and turfgrass agronomists agree that optimum solubility or availability of plant nutrients occurs at the slightly acid pH of 6.0 or somewhat higher. It is also known that the efficiency of conversion of nitrogen to the readily available, commonly-used nitrate form is better on slightly, rather than very acid soils. The nitrifying bacteria are more abundant and active with less acidity. Ammonium tends to accumulate in acid soils while nitrate N accumulates in neutral or alkaline soils.

H.B. Sprague's report, in the early 1930's, showed a pH of 5.5 and lower caused two-to-three times greater accumulation of bentgrass roots in the top ten inches of soil than plots with a pH of 5.8 and above. Engel and Alderfer, in 1967, reported that liming reduced the thatch or surface layer of turf residue. They also reiterated the value of lime for increasing earthworm abundance and activity; no turf cultivating machine is as efficient as the earthworm.

Calcium and magnesium are not commonly deficient nutrients for turfgrasses, however, it is expected that some soil mediums, such as the silica base, have a low natural supply and are prone to a deficiency of these nutrients. Liming can minimize this concern.

Both calcium and pH have a great effect on other chemicals. The presence or lack of calcium ions influences the balance as well as the availability of other chemicals. Arsenic, sometimes used as a turf chemical in the past, is greatly influenced by the available phosporous and hence the pH. The phenoxy herbicides have a more severe reaction on plants with more acid nutrient and rooting mediums.

The effect of soil pH on turf diseases has been inadequately researched. Early USGA publications alluded to the possibility that liming deterred some turf diseases. It is known that highly acid soils control serious potato diseases (a type not troublesome to turf). While it is unlikely that all turf diseases react similarly to soil acidity, perhaps the severity of summer-failure can be linked to very acid soils that are more disease prone. If we accept the premise that thatch encourages turf disease, then liming to minimize thatch is a disease deterrent.

The most overlooked value of liming on very acid soils is that turf becomes more resistant to drought injury. Research in New Jersey in the 1930's showed more soil moisture in five types of soil after two applications of lime, two-out-of three years. The mechanism for this has not been proven, but theory suggests that lime effects soil flocculation and thatch which gives turf a surface that is more receptive to water. It is interesting to consider that an abundance of calcium changes the hydration of clay and interferes with soil compaction.

While some weeds have been minimized by highly acid soils, others, such as red sorrel and buckhorn are actually more common on the more acid soils. The "state-of-the-art" in turf is such that we don't know the reaction of our common or serious turf weeds to high or low acidity.

## To Lime or Not to Lime

Whether a turf grower should use lime or not is best observed in instances of very acid soils. There are a number of turf conditions where the positive values of liming far exceed any negative results, such as:

1. when growing Kentucky bluegrass, which does better with a well-limed soil and high phosphorous,
2. on drought troubled sites where there is a lack of irrigation,
3. within a long-time turf program for a species such as bentgrass that rapidly develops a serious thatch problem,
4. the practice of generously using fertilizer with a strong acid reaction.

If growers seek high-quality turf through generous fertilization, disease control, irrigation and careful grooming, it seems illogical to omit lime unless there is a clear reason. Even with low-maintenance turf, liming to avoid serious acidity is one of the better measures for preventing turf failure. With low-budget turf it seems illogical to omit liming in preference to more expensive management practices. While some use of herbicide is usually appropriate on low-maintenance turf, it is not practical to use an herbicide regularly.

Short-term trials for determining the need for lime are often inadequate. Since liming tends to be a control factor for thatch and root mat, turf growers must consider the fact that omission of liming may create additional problems and work for years to come. In contrast, if a turf site will be discontinued, then liming on a short-term basis may not pay. In summary, the practice of liming to correct very acid soil mediums is usually justified for growing turf.

## Will There Be Changes in Theory of Liming?

We predict that there will be refinements in liming procedure. This does not mean that the basic role of lime for turf will change greatly. We will probably learn to avoid occasional overwhelming turf problems by adjusting soil pH for certain species or varieties. A change to high or low pH might demonstrate advantages that will outweigh the nutritional or thatch control attributes of liming.

There has probably been some shift in thought among turf growers toward the practice of increased acidity for bentgrass. Some of us recognize that minimizing thatch problems and building resistance to drought conditions may not be necessary in climates with mild summers and winters. If turf growers want to ascertain the results of decreasing the use of lime they should: start with long-term trial plots; observe slight increases in acidity for a period of time before continuing to a very acid soil.

Some turf growers consider a pH of 5.0 - 5.5 to be adequate for bentgrass, but we might recall the work done at the University of Rhode Island in the early days of turf science which reported twice the amount of dead grass in soils with a pH of 5.0 - 6.0 than on alkaline soil. Since experimenting with greater acidity is counter to the general belief in liming, a grower is advised to concentrate on smaller areas.

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*Changes*

Bentgrass growers might say that lowering the soil pH is justified because it will also lower phosphorous. This might seem like an adequate reason for omitting lime, but is there a need for a rush to lower phosphorous as well? Withholding phosphorous, and using sulfur when it is needed as a nutrient, might give similar results without involving the problems of a low pH.

In closing, some changes in liming can be expected. Turf growers will make gradual and special adjustments.

At the present time, gradual revisions in the optimum balance between lime and pH procedures seems more appropriate for those growers who study changes carefully rather than those who might bolt to a general practice of using very acid soils.

## Cook College Hosts Advanced Turfgrass Seminars

At the recent turfgrass seminars held at Cook College some points of agreement concerning bentgrass fertilization were:

• Bentgrass should be fertilized with comparatively low totals of N per year (totals of 2-3 lbs/Mft² and lower were often reported).

• While there appeared to be unanimous agreement that just enough nitrogen to satisfy turf needs for slow growth and cover was appropriate, some questioned our ability to judge what minimal need is. My response was that if low totals of nitrogen exist, another small application will rarely do any harm.

• In the latitude of New Jersey and New York City, there is seldom a reason for delaying the start of nitrogen treatments in late April and early May just prior to the start of annual bluegrass seedhead abundance.

• Low N programs minimize annual bluegrass encroachment into bentgrass.

• Smaller, more frequent nitrogen applications are preferable to one or two large applications per year.

• Where good, early spring green-up is desired, dormant (early December) nitrogen application can be used.

The other topics at the seminar provoked lively discussion but little consensus. For instance, while nitrogen sources with a prolonged delay of release were liked and used by some growers, this form of nitrogen didn't have general support for bentgrass use.

**REE**

## Nigrospora

Pathologists Brown and Vargas of Michigan State University have found that *Nigrospora* is infectious in Kentucky bluegrass. Their comments, excerpted from the January-February issue of American Lawn Applicator, follow:

"Michigan lawn care and sod growers have suffered considerable losses to what has become the newest disease of Kentucky bluegrass, *Nigrospora* patch. This new disease has been termed *Nigrospora* patch because *Nigrospora* is an organism associated with the symptoms and because patch best describes the overall symptomology.

A seemingly healthy stand of turf begins to show circular areas of yellowing grass and within several days the plants will die. The typical *Nigrospora* patch system is a 4 - 6" circular patch of dead grass, without a healthy center. Foliar lesions are present with a *Nigrospora* infection. Reddish-brown to black irregularly shaped necrotic spots appear on the blades or as streaks on the sheath. Transverse white bands and reddened blades may also be present. Nigrospora is also a saprophyte, being able to derive energy from dead organic matter. Pathogenicity was shown by inoculating pots of Touchdown and Adelphi Kentucky bluegrass with a suspension of *Nigrospora* spores in water. The same symptoms were produced and the fungus was reisolated from the tissues. When compared to the original culture of *Nigrospora* it was found to be identical. Large, black *Nigrospora* spores were found to be abundant within the mesophyll (green, photosynthetic) cells of the leaf blades. It seems to be a stress-related disease and is occurring on the newer cultivars of Kentucky bluegrass. No cultural or chemical recommendations are given."

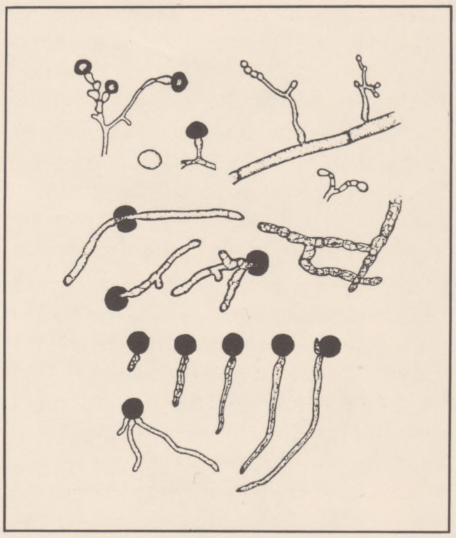

***Figure 1. Germinating spores and mycelium of Nigrospora fungus***

## Editorial Comments

*Nigrospora* patch may be a relatively new disease on turfgrasses but the fungus *Nigrospora* has been known to infect grasses and cereals for a full century (since 1873). In fact, a noted mycologist by the name of Ellis collected this fungus on corn in New Jersey in 1882. In addition to corn, the fungus infects oats, sorghum, rice and wheat. In November 1967 and in January 1968, I isolated *Nigrospora sphaerica* from leaves of *Zoysia japonica* collected at the Linwood Country Club in New Jersey.

Two species of *Nigrospora* that are common on cereals are the small-spored N. *oryzae* and the larger-spored N. *sphaerica*. Both of the New Jersey collections mentioned above from corn and zoysia were the larger-spored *Nigrospora sphaerica*. There is very little cause for alarm concerning *Nigrospora* patch. This fungus is most frequently found as a saprophyte on dead or senescent leaves. When it is parasitic, it is recognized by pathologists as a very weak or even secondary parasite. Others in that category would be anthracnose, *Curvularia*, or *Ascochyta* in turf.

P.M. Halisky
Cook College

*It's not good enough that we do our best; sometimes we have to do what's required.*

**Churchill**

*I have great faith in fools; self-confidence my friends call it.*

**Poe**