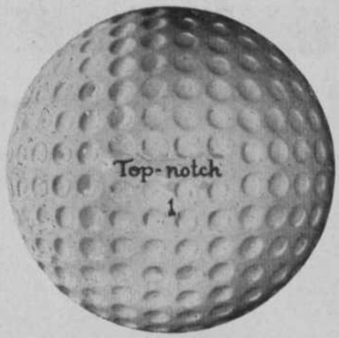

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Fertilizer and Lime Usage on Bent Greens

By O. J. NOER

The fertilization of bent grass greens affects the playing quality of the turf, influences the amount and severity of disease, and can complicate or simplify maintenance during bad weather. These effects are due to nitrogen more than any other fertilizer ingredient. Nitrogen is the growth-promoting element. Its manipulation is the secret of good putting green turf based on fertilizer usage. There is more latitude in the use of phosphate and potash. Both are essential, but secondary to nitrogen in importance. The rate and the time of application is less exacting.

Nitrogen influences the texture of the turf. Abundant nitrogen produces a deep green color and accelerates vegetative growth. When nitrogen and moisture are both plentiful, grass leaves become larger, and the turf is coarser. The grass is more succulent and tender because the cell walls, which give form to the leaves and stems, are thinner. Succulent grass is more susceptible to fungus diseases, and damage by insect pests. Soft turf is less desirable for play. It is more easily bruised and damaged by the physical wear of heavy play. The combination of too much nitrogen and too much water is always bad. The evil effect due to excessive nitrogen can be offset in part by reducing the amount of soil moisture to a point where it is about to become a growth-retarding factor.

Too little nitrogen promotes steminess of creeping bent grasses. Even the better strains, such as Washington, become stringy and undesirable for play when deprived of nitrogen. The turf becomes grainy and the coarse stems are scuffed out by the cleats in the shoes worn by players. Heavier rates of nitrogenous fertilizer promote leafiness and decrease or eliminate steminess. Virginia strain and other creeping bents, which are always coarse and grainy, cannot be markedly improved by increased nitrogen fertilization.

Some greenkeepers attribute disease and scald to the excessive use of nitrogen fertilizer. The faulty use of water is as much or more to blame. Brown patch and scald are aggravated by heavy nitrogen fertilization. Nitrogen-starved grass seldom has either disease. Snow mold is increased by the use of nitrogen in the late fall. Too little nitrogen brings dollar spot as well as too much. The grass must have a continuous and uniform supply of nitrogen to avoid serious attacks of dollar spot. It is a cool weather disease, which is prevalent in the temperature range of 60 to 80 degrees Fahrenheit. Brown patch occurs in hot, humid weather, when daytime temperatures are high. The fertilizer program should provide enough nitrogen to ward off dollar spot in spring and fall. The nitrogen supply should diminish with the approach of midsummer to simplify brown patch control, and again in late fall to reduce the danger of snow mold in the regions where this disease is a serious winter and early spring menace.

Poa Annua Tough Problem

Poa annua, clover, and weeds are problems on some greens. Complaints about poa annua are on the increase. Conquering it is a harder problem than clover, and the final answer has not been found.

The fact that greens are free from poa annua on a few courses where fairways are overrun with it is proof that there is an answer. It has been demonstrated that moderate to heavy lead arsenate treatments in the spring frequently check poa annua. Apparently success has occurred when the lead treatment coincided with a period of weakness in the growth cycle of the poa. Delaying the use of nitrogenous fertilizer in the spring until after poa annua starts to weaken is believed by some to be extremely helpful.

The greens at St. Clair in Pittsburgh have very little poa in them. Dave Bell thinks that the use of enough nitrogen to keep a vigorously growing bent, along with the use of lead arsenate in the spring, is the reason. Clover is most common in spots where the bent is thin, or on greens which do not receive enough nitrogen to produce and maintain a dense turf. The cause for the infestation should be sought and corrected.

A dense sward of bent turf is the logical way to keep clover out of a green, and is the secret of its control. Most of the weeds are introduced in topdressing. Suggestions for making weedfree topdressing were made in a previous issue of GOLFDOM. That is the way to eliminate the vast majority of weeds. Removal by handweeding of the few weeds that are carried onto the green by players and equipment is an easy matter.


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Replace Food Elements

Putting green maintenance resembles farm practice in one respect. The crop is removed. Farmers are urged to replace the plant food elements removed in the crop. This suggestion holds good for greens too, except that there should be enough extra fertilizer to take care of losses from fixation by the soil and by leaching.

During the past three years clippings have been collected and weighed each time the fourth green at Brynwood Country club was mowed. Samples for analysis were gathered by Lester Verhalen each month. Dry weights and the analysis for plant food content was made in the Milwaukee Sewerage Commission laboratory under the direction of H. M. Heisig, chief chemist. Mowing started in May and stopped in early October. The greens were planted vegetatively with the true strain of Washington bent obtained at the Leonard nursery in Lake Geneva, Wis.

The soil was slightly alkaline in reaction (pH 7.4) and contained free carbonates. Milorganite was used as the source of nitrogen, and was applied once a month at 20 lbs. per 1,000 sq. ft., April to September, inclusive, so the actual amount of nitrogen used was 1¼ lbs. per 1,000 sq. ft. per month, or a total of 7½ lbs. for the season. Phosphate and potash were applied in April and again in early September. The rate each time was equivalent to 10 lbs. superphosphate, 20 percent grade, and 10 lbs. of potash, 60 percent grade. The phosphate and potash were applied in two applications to simplify the work. This method gave as good results the year before as monthly applications using quantities which provided the same total amount of phosphate and potash for the season.

Plant Food Removed

The total weight of clippings varies slightly, depending upon the season. With a full six months growing season, and where from 1 to 1½ lbs. of nitrogen is used per month, the dry weight of grass produced per 1,000 sq. ft. is 75 to 100 lbs. The percentage plant food content falls within the following limits:

Nitrogen	4½ to 6%
Phosphoric Acid	1½ to 2%
Potash	3½ to 4%

A good figure to keep in mind is that the plant food removed during a growing season from 1,000 sq. ft. of a well kept green is equivalent to a 100 lb. bag of fertilizer analyzing 5-2-4.

There is more fluctuation in the nitrogen content of grass clippings than any other element. It varies with the amount of nitrogenous fertilizer used, and may not exceed 1 to 2 percent in unfertilized grass grown on a soil of moderate to low fertility, but will be 5 to 6 percent on a well fertilized and well kept green of Washington bent.

Sandy soils without any organic matter or clay particles are the only ones from which appreciable loss of potash may occur from leaching. Other soils which contain humus and some colloidal clay, which is a miracle mineral, are able to absorb and retain the basic elements, such as potash, calcium, etc. The union is a loose one, but sufficient to prevent serious loss by leaching. As the grass roots absorb potash, or other loosely held elements, the carbon dioxide dissolved in the soil water as carbonic acid releases the loosely held potash—or other element—from the clay or humus complex.

Nitrogen is not lost by leaching so long as it stays in the form of ammonia, because it is also absorbed by the clay or humus complex. Loss occurs after the soil microorganisms transform the ammonia into the nitrate form. Either the nitrate is absorbed promptly by the grass roots, or it is lost in the drainage water.

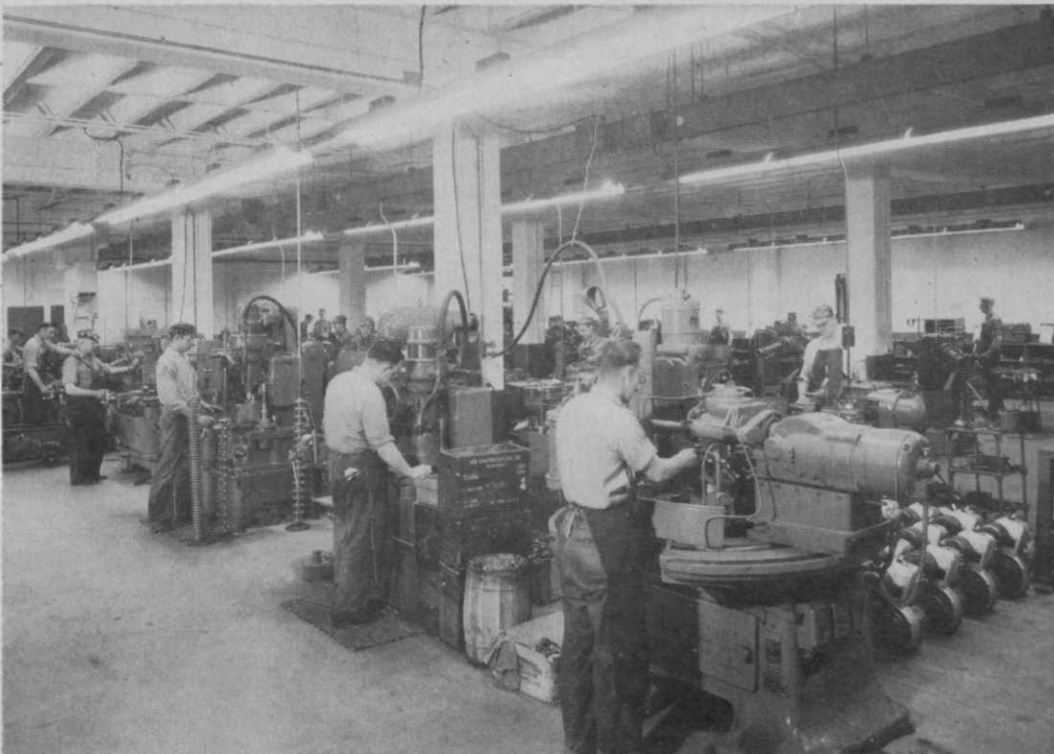
Why Phosphates Are Held

Phosphoric acid is also held in the soil, but in a different manner. Sometimes it is held so tightly that plants cannot obtain the small amount needed for growth. That is one reason why heavy rates are advised occasionally, even though the bent grasses have a low phosphate demand. Phosphates are held more tightly in acid than in non-acid soil. The critical point is pH 6.2 to 6.5. When the soil is more acid than that, and a soluble phosphate fertilizer is applied the phosphoric acid is converted into iron and aluminum phosphates which are relatively unavailable because they are very difficultly soluble.

A calcium phosphate is formed when soil reaction is in the range of slight acidity to slight alkalinity, that is, pH 6.2 to 7.4. The phosphate is finely divided and quite readily available. Here again the carbonic acid in the soil solution is the responsible agent for re-solution.

In alkaline soils with a reaction above pH 7.7, the tendency is for phosphoric acid to be less mobile. These soils usually contain calcium carbonate in appreciable amount. Its presence retards the solvent action of carbonic acid.

The greater efficiency obtained from phosphate fertilizer when the soil is not more than slightly acid is another reason for maintaining soil reaction at or above pH 6.2. Soils in that reaction range do not have a high fixing power for phosphates, so the regular use of fertilizer con-



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taining a high content of phosphoric acid is not necessary because the amount removed in the clippings is only one-third to one-half as much as nitrogen or potash.

Muriate of potash is the principal material used to supply potash. The United States product contains 60 to 62 percent of potash. Before the discovery of potash minerals in this country, Germany was the principal producer of potash fertilizer, and after World War I France produced a limited amount from mines in the area formerly held by Germany. The European product contained 48 to 50 percent of potash.

There is a limited production of potassium sulphate. It is made from the muriate and is higher priced per unit of potash. The sulphate is used on specialized crops, such as tobacco, where chlorine has a bad effect upon the burning quality of the leaf. There is no evidence to show that the sulphate produces better results on grass than the muriate.

Phosphoric Acid Sources

Super phosphate is the principal source of phosphoric acid. It is produced from rock phosphate by treatment with sulphuric acid. The resulting product is a mixture of monocalcium phosphate and calcium sulphate or gypsum. The phosphoric acid content varies from 18 to 45 percent. The ones of high phosphoric acid content are made by treating the rock with phosphoric acid instead of sulphuric. Bone meal is another good source of phosphoric acid. It contains 20 to 27 percent phosphoric acid. The ammonium phosphates are the other class of phosphate fertilizers. They contain both phosphoric acid and nitrogen. The two principal grades are 16-20 and 11-48, although several other analyses are in prospect. The first figure represents the percentage content of nitrogen, and the second the phosphoric acid.

There is a larger variety of nitrogenous fertilizer to choose from. They are divided into the organic and mineral or inorganic forms. The organics should be subdivided into the natural organics and the synthetics, which are manufactured from atmospheric nitrogen. The natural organics are plant or animal residues. They include manures, dried blood, animal tankage, hoof meal, cottonseed and soy bean meal, processed leather, and sewage sludges. They vary in plant food content and in the availability of the nitrogen. The synthetics are cyanamid containing 20 percent, and urea with 40 to 45 percent nitrogen. "Uramon" is the trade name for a urea product guaranteed to contain 42 percent nitrogen. The nitrogen of cyanamid is converted to urea in the soil. Urea is transformed into ammonium carbonate so cyanamid and urea are more like the inorganic forms of nitrogen than they are the natural organics.

Principal Inorganic Nitrogen Sources

The principal inorganic nitrogen fertilizers are ammonium sulphate, containing 20 percent nitrogen, and nitrate of soda, containing 16 percent nitrogen. A new one gained prominence during the second World War, although there was a limited production before then. It is ammonium nitrate, containing 32 percent nitrogen. "Cal-nitro" is the trade name of a nitrogenous fertilizer containing nitrogen in the form of ammonia and nitrate. It was made in Germany before the war.

Ammonium sulphate has long been a favorite quick-acting nitrogenous fertilizer for use on grasslands. It is preferred by golf clubs because of its tendency to check clover and weeds. It tends to make the soil acid. That property was considered advantageous in the early days, but not now. The judicious use of lime is advised to prevent the soil from becoming too acid.

Nitrate of soda is another inorganic, water soluble and hence quick-acting fertilizer. It received a black eye because of the weeds on the nitrate treated lawn plats at the Rhode Island Experiment Station.

Ammonium nitrate is an excellent material and may have some advantages over sulphate of ammonia. It has the same effect on weeds and clover and provides both kinds of water soluble nitrogen. Ammonium nitrate is hard to handle unless it has been processed properly, because it is highly hygroscopic, which means that it absorbs atmospheric moisture. When exposed in very humid weather ammonium nitrate absorbs enough moisture to become liquid. Manufacturers granulate it with kieselguhr and coat the particles to stop moisture absorption.

DETROIT D.G.A. APPROPRIATED $2,500 FOR TURF RESEARCH

The sum of $2,250.00 was appropriated from the surplus funds of the Detroit District Golf Association at a recent meeting for the purpose of establishing a graduate fellowship at Michigan State College, East Lansing, Mich., for the study of Turf Research. This sum will be payable in three equal installments annually on the first day of August to the Green Section of the USGA, which will in turn transmit it to Michigan State College, and its use shall be supervised by the USGA.

This grant is made in consideration of a like amount being given to Michigan State College by the Midwest Turf Foundation for the same purpose, to the total amount making the fellowship possible.

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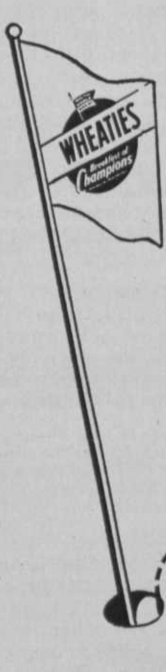

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Spalding Building $2-Million Plant at Willimansett, Mass.

A $2,000,000 plant with about 300,000 square feet of floor space and covering approximately 7 acres is being built by A. G. Spalding & Bros. beside their Willimansett, Mass. factory.

Spalding contemplated this project before the war, shelved it when called upon to convert and operate their plants for the production of several precision articles of warfare. Since shortly after V-J Day Walter B. Gerould, Controller-Sec. of Spalding, assisted by other executives, engineers, and department heads, has directed and coordinated all phases of this undertaking which not only entails new construction and new equipment, but also the simultaneous rearrangement of parts of the Willimansett plant.

The design and plans of the new Spalding building were created by architect Lathrop Douglas. John W. Harris Associates will erect the buildings. The new steel and reinforced concrete structure will join, on one end, the present Willimansett plant which contains about 200,000 square feet of floor space and is situated on a plot of 32 acres.

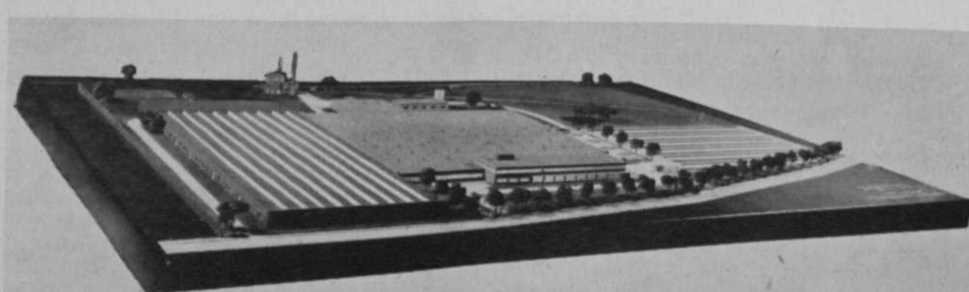
When the new construction has been completed, the two adjoining factories combined with the other smaller buildings will cover approximately 13 acres, leaving adequate space for a 500 car parking lot, a baseball diamond and various outdoor recreational facilities for employees. Also there will be room for the Spalding driving range where for nearly two decades golfing greats have experimented with new designs for clubs and have watched the scientific comparative driving of golf balls; where scores of the top-sluggers in the National and American Leagues have seen their official baseballs in batting trials; and. where the gridiron's finest booters have witnessed kicking tests of the J5-V official football.

Spalding's building plans and specifications include the most advanced methods and machinery and streamline of the many and varied production lines. There will be entirely new ways, means and systems for the handling of the huge quantities of raw materials that pour into their railroad siding daily. For example, Spalding requires around 2,000,000 feet of lumber a year for tennis rackets. When the new plant is finished this lumber will be moved by special machinery and will be routed so that about ten separate 'handlings' will be eliminated.

Interesting features in the new factory are: a large display room, a modern hospital, a cafeteria to feed 500 at a sitting, large quarters for the Spalding Research Laboratory and a very advanced photographic department, which will have a high-speed unit to make pictures of exactly what happens to every kind of sports equipment under the strain and stress of actual play as well as the complete movements of a player in action. The photographic department will be under the direction of George Temple who believes there are unlimited possibilities in its future development and that it will prove of inestimable value to the Spalding Research Laboratory.

Spalding broke ground for this new plant on June 23rd and they expect to have it in operation by late spring of next year. At that time they will vacate entirely the Chicopee factory and warehousing facilities; moving everything to Willimansett

Model of $2,000,000 addition to Spalding plant at Willimanett, Mass., shows latest in outdoor and indoor facilities.



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Spalding has been manufacturing athletic goods in Chicopee, Mass. for over 50 years, having started in Chicopee Falls in 1894 the year before they produced the first golf clubs in this country. In 1904 they moved to their present factory in Chicopee Center. The Willimansett plant and property were acquired in 1930. Other Spalding plants now in operation are: Brattleboro, Vermont, which has been making tennis rackets since 1938 but will close when the new plant is completed and all tennis racket production is consolidated at Willimansett; and Brooklyn which has been functioning since 1895 and will continue in operation after the new construction project is finished.

The addition of a $2,000,000 plant by the Spalding company recalls that the two Spalding brothers commenced business in Chicago 71 years ago with a total capital $800. In the intervening years A. G. Spalding & Bros. has blazed the way in all forms of sport, acquired A. J. Reach and Wright & Ditson, rolled up assets of over 15 million dollars and total sales for last year, 1946, of close to 19½ million dollars.

The new factory will increase production and will add an estimated 20% to the number of employees in the Chicopee-Willimansett locale.

DETAILS LARGE PART OF COURSE UPKEEP

Prof. Lawrence S. Dickinson, U. of Mass. course maintenance authority, was featured speaker at Northeastern NY Greenkeepers' Assn. meeting held at Pittsfield (Mass.) CC May 14. Dickinson said that checking up on details of upkeep neglected during the war was very much in order now. Despite the greenkeeper still having a serious problem in trying to stretch the budget to meet higher wage costs Dickinson noted that club members and officials again have become conscious of time-taking detail jobs that give a course a smartly-groomed look.

Need of renewing attention to these details accented the greenkeeper's job in developing in his men a sense of personal responsibility and pride, Dickinson pointed out.

Gil Middleton, pro-gkpr., at Pittsfield CC, was host. He explained and demonstrated methods and equipment successfully used in his maintenance work. Prof. Glenn C. Russell, asst. to Dickinson, spoke on the school's short course for greenkeepers and the U of M's other work for golf clubs.