Fertilizing Fine Grasses

By PROFESSOR LAWRENCE S. DICKINSON

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FOOD is essential to plant growth, but to believe that fertilizer is the panacea for all turf troubles is as wrong as believing the "little brown pill" will cure all the ills flesh is heir to. Fertilizer does not offset the effect of poor drainage nor will it make Timothy, Red Top or a low grade lawn mixture into a lawn turf, or correct construction errors. On the other hand, the intelligent selection and careful application of fertilizer will surely improve the appearance and health of any lawn. Furthermore, it is far better to fertilize and encourage a poor lawn, than to plow it in and remake it.

PROF. LAWRENCE S. DICKINSON
Massachusetts State College
who is recognized internationally as an expert on turf culture. We are greatly privileged to publish excerpts from his wonderful book.

A lawn should be fertilized with two objects in mind. (1) To replace in the soil the large amount of plant food that is removed in the form of clippings, and to restore the food elements that are lost by leaching from the soil. It is obvious that a close and frequent clipping of a lawn will cause it to need more food than if it is permitted to grow to a reasonable length and less frequently clipped. Also, the amount of plant food lost by leaching is greater in gravelly soils than in the heavier soils. (2) To provide the desirable grasses with food that is delectable, and to create a soil condition that is favorable for their development. Under such conditions any lawn grass will successfully compete with the undesirable grasses and weeds.

GRASSES OBTAIN FOOD FROM THE AIR

GRASSES obtain their food from the air and soil. From the soil it is obtained through the roots and must be in a liquid form. Therefore the fertilizers used must be so constituted that they are soluble in water, or may be chemically broken down by soil bacteria and made available.

Grasses require seven elements from the soil: calcium (Ca), iron (Fe), magnesium (Mg), sulphur (S), phosphorus (P), Potassium (K), and nitrogen (N). The first four are usually present in all soils that would be considered for lawn purposes, and seldom is it necessary to include them in the fertilizer. However, once in five years an application of lime that contains magnesium will be an insurance against a complete loss of calcium and magnesium. Nitrogen, phosphorus and potassium are used in great quantities by the grasses and should be supplied to the soil annually.

Nitrogen, usually considered as ammonia (NH_3), is the element most used. An analysis of the clippings taken from the average lawn (10,000 square feet) will show that from fifteen to twenty pounds of nitrogen have been used in a season. It requires from sixty to eighty pounds of sulphate of ammonia to replace such quantities. More nitrogen is also lost by leaching, and such a loss must be considered in the fertilizer program.

TABLE VI—DESIRABLE PROPORTIONS OF AMMONIA, PHOSPHORUS, AND POTASH TO USE WHEN A COMPLETE FERTILIZER IS DESIRED.

Soil	*Bents*	*Blue Grasses*	*Fescues*
Clay, low in humus	14-2- 2	12-2-2	8-2-2
Clay loam	12-4- 2	12-4-2	8-4-2
Sandy loam (Sandstone)	10-6- 4	12-4-4	7-4-4
Sandy loam (granite)	10-6- 1	12-4-2	8-4-2
Average garden loam	14-4- 2	8-2-1	8-3-2
Weedless lawn	6-5-16		

NITROGEN PROMOTES LEAF GROWTH

NITROGEN promotes the growth of the leaf and stem, and the development of the stool, or crown. In the case of stoloniferous grasses such as creeping bent and Bermuda grass it greatly increases the rapidity of growth in the stolons.

Nitrogen is used in fertilizers in several forms:

1. Organic Nitrogen which is found in vegetable and animal matter.

2. Ammonia Nitrogen example, Ammonium sulphate $(NH_4)_2SO_4$.

3. Nitrate Nitrogen example, Nitrate of soda $NaNO_2$.

4. Synthetic Nitrogen. The nitrogen obtained from the air and combined with such elements as calcium, and carbon. Such fertilizers contain a very high amount of available nitrogen. Numbers 2 and 3 are classed as inorganic fertilizers.

All nitrogen to be available for the grass plant must be in the nitrate form. It is therefore obvious that nitrate of soda and certain synthetic fertilizers (those having the nitrogen in nitrate form) are the quickest acting nitrogen supplying fertilizers. Ammonia nitrogen must be converted by soil bacteria into nitrate nitrogen. The conversion takes place very rapidly and ammonium sulphate is second in rapidity of action.

Organic nitrogen is the most difficult to convert into nitrate form and therefore all organic fertilizers are slow to show effect, as compared with the inorganic fertilizers. Briefly, the process of converting organic nitrogen into nitrate nitrogen is as follows: During the process of decay of organic substances certain soil bacteria convert the organic nitrogen into ammonia, then another group of bacteria converts the ammonia into nitrate nitrogen. Some organic compounds give up their nitrogen more rapidly than others, and are known as quick acting, or quickly available, as compared with those compounds whose nitrogen is slowly available.

Nitrogen is usually expressed as ammonia in the analysis, and is the first element listed. To convert ammonia to nitrogen multiply the percentage of ammonia by the factor .82. To convert nitrogen to ammonia multiply by 1.215.

TABLE VII—FERTILIZERS USED ON LAWNS

Name	*Average Analysis	Notes	Rate of Application per 1000 Sq. Ft. Pounds
Ammonium Sulphate $(NH_4)_2SO_4$	20 - 0 - 0	Ac. C. Io. R.	5
Ammo-phos.	20 -20 - 0	C. Io. R.	5
Blood, dried	11 - 0 - 0	N. O. M.	10
Bone-meal (raw)	4½-22 - 0	N. O. S. W.	18
Bone-meal (steamed)	2½-50[1] - 0	N. M. O. W.	22
Castor Bean Pomace	5 - 1½- 1	Ac. M. O.	21
Cottonseed meal	6½- 2½- 1½	Ac. C. M. O.	16
Guano	11 -15 - 0	Ac. M. O.	10
Manure (stable)	1 - 1½- 1	Al. M. O. W.	50
Milorganite	5½- 2½- ½	Ac. M. O.	15
Muriate of Potash	0 - 0 -48	Ac. C. Io. S. W.	6
Nitrate of Soda	16 - 0 - 0	Al. C. Io. R. W.	5
Nitrophoska	18 -30 -15	Al. C.	4
Peat	2½- 1 - 2	N. O. S.	40
Poultry manure	5 - 3 - 1	Ac. C. O. M.	15
Sheep manure	2 - 1 - 2	Al. O. S. W.	20
Sulphate of Potash	0 - 0 -48	Ac. C. Io. S. W.	6
Superphosphate	0 -16 - 0	Io. N. S. W.	12
Tankage	9 -15[1] - 0	Ac. O. M.	12
Urea	45 - 0 - 0	C. N. O. R. Sy.	1½
Wood ashes	0 - 0 - 4	Al. O. S. W	30

Notes—Ac—acid; Al—alkaline; C—caustic; *C*—very caustic; Io—inorganic; M—medium rapid; N—neutral; O—organic; R—ready available; S—slow in action; Sy—synthetic fertilizer; W—encourage weeds. (1)—Bone phosphate.

*Expressed as nitrogen N, phosphoric acid P_2O_5, and potash K_2O.

COTTONSEED MEAL IS EXCELLENT

COTTONSEED meal is an excellent lawn fertilizer, but as the demand for this product is greatest by the dairy industry as cattle feed, the analysis usually found on the bag is in terms of protein, sugar, fat, etc. To convert protein into nitrogen divide the percent of protein by 6.25 and if the ammonia content is desired, by 5.14. Excessive use of nitrogen undoubtedly increases the grasses' liability to disease.

Phosphorus (P) is the second most used element. For the plant it is available in the form of phosphoric acid (P_2O_5), known to the fertilizer world as superphosphate. It produces strong root growth, especially in the spring and in young plants. Phosphoric acid, contrary to its name, is not acid and it is to avoid such a possible misunderstanding that the term superphosphate is used. Phosphorus is the second element listed in the analysis. In turf culture, an excessive use of phosphorus induces a strong growth of clover and weeds. Phosphoric acid is fixed in the soil and there is no loss by leaching. This fact is one of the reasons why a lawn fertilizer should not contain too much phosphorus.

Potassium (K), as potash, increases the formation of starch, stiffens the stems and probably aids the turf in its resistance to diseases. Potash salts are very caustic and liable to burn the grass leaves. Very little potash is lost by leaching, and comparatively little used by the growing turf. Clover and weeds are favored by its excessive use.

Fertilizers should be purchased according to the price per pound of plant food, and not according to the price per ton of mixed fertilizer. To be able to do this one must understand the label analysis which is required by nearly every state in the whole United States. Such a label guarantees that a certain percentage of the fertilizer is available nitrogen (N) or ammonia (NH_3), phosphorus (P) or potassium (K). Example a 6-8-6 mixture means 6% ammonia, 8% phosphorus and 6% potassium; or in 100 lbs. of the fertilizer, 20 lbs. is available as plant food in the indicated proportions. The remainder (80 lbs.) is filler composed of harmless materials. If the price of such a mixture was quoted at $80 per ton, the plant food would cost 20c per pound.

Having discussed at considerable length the plant food elements, let us consider the grasses themselves and their particular needs.

Bents prefer acid conditions, and many species produce stolons.

Blue grasses prefer alkaline conditions.

Fescues prefer slightly acid conditions and have much less leaf development.

WEEDS DO NOT LIKE ACID SOILS

Weeds do not thrive on acid soils because active aluminum is made available by the acid condition. Aluminum is toxic to weeds.

Clovers and weeds will successfully compete against grasses on alkaline soils and those containing much phosphorus and potash.

The weedless lawn formula was developed over twenty years ago by Dr. Burt L. Hartwell while he was Director of the Rhode Island Experiment Station. The formula is arrived at by mixing equal parts of sulphate of ammonia, superphosphate and muriate of potash. The rate of application is 750 pounds of the mixture per acre, or 17 pounds per 1000 square feet.

Southern lawn grasses do well in slightly acid soil, and cottonseed meal appears to be excellent for Bermuda grass.

USE LIME SPARINGLY

In turf culture, lime should be used only when it is deemed necessary to increase the calcium and magnesium content of the soil, or to correct acidity, or in the case of clay soils to assist bacterial action. If lime is used in a quantity over 40 lbs. per 1000 square feet it will very likely cause an invasion of clover.

Fertilizers should be applied when the grass is dry those that are caustic should be thoroughly worked into the soil by a heavy sprinkling. During the washing process, if possible avoid walking on the wet lawn. The great liability of burning the grass is the only objection to the Rhode Island formula. Spreading fertilizer in the rain is safe provided the storm lasts long enough to wash the solution from the leaves.

If one has screened compost, the caustic fertilizers may be mixed with it at the rate of from five to eight pounds per cubic yard of compost. Such a mixture will be much more effective if allowed to remain in the pile for a week before applying to the lawn, and it should then be applied at a rate sufficiently heavy to assure the proper amount of fertilizer per square unit.

The frequently clipped lawn should have three applications of fertilizer each year. The first in the spring after the young shoots have become hardened, a second about June 1, and a third in early September if there is little danger of loss from leaching.

Poultry manure if taken from the dropping boards and composted with sand for six months is an excellent lawn fertilizer. It should be applied at the rate of 25 lbs. per 1000 square feet.

COMMERCIAL LAWN FERTILIZERS ARE GOOD

Much is to be said in favor of the ready-mixed commercial lawn fertilizers. First they are sold in convenient packages (10 lbs. and up). Second, they have a guaranteed analysis the same as all fertilizers. Third, they are usually mixed, so that their plant food is made slowly available and therefore lasting over a long period of time. Fourth, if used according to directions there is very little liability of burning the grass, and fifth, they can be used on shrubs and flower beds without harm.

As an increase in the amount of quickly available nitrogen in a commercial mixture would give cause

TABLE VIII—SAFE AND RELIABLE FERTILIZERS.
RATES PER 1,000 SQUARE FEET

Spring	*June*	*Fall*
1. Ammonium sulphate, 5 lbs., and Castor bean pomace 21 lbs. or Cottonseed meal 16 lbs.	1. Same as spring	1. Castor Bean pomace, 21 lbs. or Cottonseed meal 16 lbs.
2. Ammonium sulphate, 5 lbs., and Bone meal, 10 lbs.	2. Same as spring	2. Bone meal 10 lbs.

Number 1 for bents and fescues, Number 2 for blue grasses.

for caution in spreading, because of the liability of burning the grass the practical agrostologist accepts the commercial fertilizer ratios as safe and sane, even though not ideal. The home owner who knows how to use ammonium sulphate can have an excellent lawn fertilizer by using it as a supplement to a commercial mixture.

WARNING!

IF THE directions say use 10 lbs. per 1000 square feet don't use any more; many a good lawn has been ruined because the owner or caretaker thought that if a 10-pound application was good a 20-pound application would be excellent.

Golf Course News

A column of information brief and accurate. Items are welcome and will be published.

FROM THE SOUTH

By MERLE ZWEIFEL

WHEN Jay C. Painter, Secretary of the Oklahoma State Golf Association calls greenkeepers together next month to arrange the organization of a state greenkeepers' Association, he apparently is arranging a "new deal" for greenkeepers of the oil country.

The proposed organization will be entirely independent of other groups and its aims will be very much established by the fact that Green chairmen of every golf club in the state will be given an opportunity to join the association as regular members. Mr. Painter believes that by enrolling Green chairmen he will contact many interesting discussions regarding turf culture at proposed future meetings and it will offer an excellent chance to give club officials an idea of what greenkeepers are up against with slashed budgets and their struggle to maintain a good golf course for golf club members. Several Green chairmen have offered their support of such an organization.

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The city of Rogers, Arkansas, in the heart of the Ozarks, will soon be listed among the leading resort cities of the nation if plans of a group of Jersey City promoters are accomplished. Site has been chosen and finances have been arranged for the construction of a magnificent resort hotel together with a thirty-six hole golf course with grass greens and work on the project is to begin by September 1, 1933. Ozark mineral waters with their healing properties are to be the main drawing card.

NEW ENGLAND NOTES

By GUY WEST

THE June meeting of the Greenkeepers' Club of New England was held at the Kittansett Club, Marion, Mass., on June 5. There was an attendance of over a hundred members and guests. The Kittansett Club also invited to this meeting the Green chairmen of clubs whose greenkeepers are members of the Greenkeepers' Club, and provided an additional prize to those presented by the Club. This Kittansett Club is a beautiful course near Cape Cod, and is in fine shape.

Several wives of members also attended this meeting, and were escorted by Mrs. Pierce, wife of Greenkeeper Elliot D. Pierce, to several of the fine estates around Marion.

The tournament season is now on in full swing, and any player wishing to play in a tournament can take his choice of three or four practically any week. Courses in general are in good condition, a little on the dry side at present, with little brown-patch reported as yet. The cuts in course budgets have in most cases meant fewer men, but most greenkeepers are succeeding in getting the essential things done, and leaving undone from necessity the least important items.

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THE Rhode Island Greenkeepers' Association held its monthly meeting on June 19 at the Metacomet Golf Club, East Providence, R. I.