MID-ATLANTIC News Letter

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NEWSLETTER EXTRA

Have you ever listened to one of Dr. Fred V. Grau's talks and said to yourself - " I'd sure like to have all that in writing so I could read it and absorb more of it."

The Editors of the Mid-Atlantic "NEWSLETTER" feel that you made such a wish after the Bethesda meeting, so we asked Dr. Grau to put his talk in writing and hereby present it to you in the form of a special "NEWSLETTER" issue.

We express our thanks and appreciation to Dr. Grau for this contribution.

The Editors

HIGHLIGHT FROM LECTURE GIVEN BY DR. FRED V. GRAU on APRIL 7, 1959 BEFORE THE MID-ATLANTIC GOLF COURSE SUPERINTENDENTS' ASSOCIATION MEETING AT BETHESDA COUNTRY CLUB, BETHESDA, MARYLAND

Of all the things that we do to turf, proper nutrition is of the utmost importance. Dr. Couch, of Penn State, has presented lectures showing the very close relationship between grass diseases and nutrition. For years scientists have sought to provide plants with " a steady, uniform supply of nutrients throughout the season". The " feast and famine " routine with quickly available nitrogen materials actually predisposes grasses to disease attacks. This has been minimized somewhat with frequent light applications of materials which, of course, raises labor costs.

Even though I shall stress nitrogen, it must be clearly understood that everything must be <u>in balance</u>. In general, we shall strive for low phosphorus content, high nitrogen and about half as much potash as nitrogen. Potash is extremely important in producing high-quality turf. It acts as a " cleanser " of the " pipes " (vascular system) which move water and sugars about in the plant. Much so-called " winter-kill " on grass has been diagnosed as Potash Starvation. An excess of phosphorus tends to precipitate the iron in solution. Then we say that the turf is suffering from iron chlorosis, which actually is a phosphorus- induced chlorosis. Sure enough, the iron helps. The iron phosphate that is precipitated clogs the system and the grass suffers from wilt and desiccation. Plenty of available potash tends to correct the situation and helps to prevent disease by aiding in the translocation of materials in the plant. Many cases of brown and black rotted roots have been traced to potash hunger.

It is well-known that turfgrasses that produce no fruit or seeds need much less phosphorus than plants like wheat and corn, which produce fruit or grain. It has been said time and again that most putting greens that have been established for five years or more probably have enough phosphorus in the soil to last them for several years, even though only nitrogen and potash were fed steadily for that length of time. Certainly, excesses of phosphate have added to our troubles.

Nitrogen hunger often looks very much like drought. Much turf, therefore, gets irrigated when actually it needed nitrogen. Turf that is well supplied with nitrogen can use water much more efficiently than hungry turf and we know that nitrogen is cheaper than water.

In feeding turf, we actually feed the micro-organisms first. They, in turn, supply the plants with nitrogen, which are feeding at the second table. Micro- organisms that are well supplied with nutrients have a tremendous effect in creating good physical soil conditions. When the " bugs " get hungry (the " famine " part of feeding with quickly-available material) , they lose their power to granulate (flocculate) the soil particles and soil becomes compact again.

Work at the United States Department of Agriculture and at several Experiment Stations has shown that Urea-form nitrogen provides the steady, uniform supply that is needed by bacteria and by plants. We are indebted to Dr. K.G. Clark, of Beltsville, for his brilliant research in producing Urea-form. Urea-form is the generic name for the solid, insoluble product resulting from the chemical combination of urea (46%N, all soluble) with formaldehyde (a disinfectant),both of which are produced from the air. To be a Urea-form, the product must have good fertilizer value.

No two Urea-forms are alike, even though they contain the same content of nitrogen (38%). For instance, NITROFORM is made by the concentrated alkaline method, which forms methyol ureas. Uramite is made by the dilute acid methods,which produces only methylene ureas. Borden's tends to be intermediate, but somewhat more like NITROFORM. When these materials are applied to turf, or when they are blended into mixed fertilizers, we can expect quite different responses. This means that each must be handled differently.

The carbon in Urea-form acts as a source of energy for bacteria, continuing to stimulate activity until we reach the application rate of 20,000 pounds of Urea-form to the acre. By requiring bacteria for the release of nitrogen, we find that nitrogen is released from a good solid Urea-form according to the needs of the crop. When the plants stop using nitrogen, there is a build-up of carbon dioxide in the soil which slows down the bacteria and, consequently, less nitrogen is released. In periods of high temperatures, we find that a properly built solid Urea-form releases less nitrogen. This is a built-in, self-regulating feature, which is a large safety factor. There is no chance of " fast release" from a good solid Urea-form. It is well-known that many natural organic materials release their nitrogen much more rapidly in periods of high temperature, with adequate moisture.

Here are some figures on nitrification of various nitrogen fertilizers which reveal some interesting facts. The studies ran only 15 weeks and then were terminated. Determinations were made at 3, 9 and 15-week intervals to find out how much of the total nitrogen had been converted to nitrate or " useful " nitrogen. No growing plants were involved.

	3 weeks	9 weeks	15 weeks
Cotton seedmeal	49%	54%	54%

These figures show that only half of the total nitrogen was converted to useful nitrogen and nearly all of that became available in the first 3 weeks. This means that this natural organic nitrogen fertilizer is actually quickly available.

Processed tankage	30%	35%	36%

These figures show that approximately two-thirds of the total nitrogen in this material <u>never</u> became available for plants. Most of the one-third that was available was used up in 3 weeks, indicating again that this natural organic actually is quickly available.

	3 weeks	9 weeks	15 weeks
Sewage sludge	42%	49%	51%

Here again, only half of the nitrogen content was converted to useful nitrogen and most of that was released quickly.

NITROFORM	17 %	42%	50%

These figures show the " slow, gradual release " from a good Urea-form. They show that only 17% of the nitrogen was converted to useful nitrogen in 3 weeks, 42% in 9 weeks, and after 15 weeks, only half of the total nitrogen had been converted to nitrate nitrogen. Had the study continued, we would have found that this form of nitrogen is the most efficient of all. Very nearly 100% of the nitrogen eventually is broken down for use by plants. Some of the larger molecules that are borken down with greater difficulty may t ake a year or longer to break down, but when it is all gone, there is no residue and all of the nitrogen has been made available to the plants.

With two or three applications of Urea-form during the season, it can be seen that there will be a constant supply of nitrogen being released gradually to plants. At no time would the bacteria go hungry. After the second application, there will be a reserve of nitrogen built up in the soil. This is a highly effective device to insure continued, steady feeding. Part of a good Urea-form (25- 30%) is soluble in cold water. You cannot make a good Urea-form unless you do have some soluble material. Some folks think that this cold water soluble portion acts like the soluble nitrogen from ammonium nitrate, urea or ammonium sulfate. Actually, when a Urea-form comes in contact with the soil acids, the soluble portion is converted (polymerized) to slowly available nitrogen. This is true particularly of the Urea-forms made by the concentrated alkaline method. This gives assurance that there will be no loss from leaching with a good solid Urea-form. Many soluble nitrogen materials will lose up to 70% of the nitrogen through leaching. Even in a very sandy soil, there are negligible leaching losses from Urea-form.

There is a good evidence that a steady diet of Urea-form nitrogen, balanced properly with other nutrients, produces turf with less disease and with less poa annua. Trials of NITROFORM with mushrooms failed. The fungus refuses to develop. Superintendents report less snow mold and less expense for chemicals. Urea-forms carry a " price per ton tag " that looks exorbitant to many who have not stopped to calculate " cost per pound of nitrogen ". In buying a nitrogen fertilizer, you are buying pounds of nitrogen. For instance :

	Pounds of nitrogen in a ton
Ammonium sulfate, 20%N.	400
Sewage sludge, 5-1/2% N.	110
Urea-form, 38% N.	760

If we were to assign ton values to these materials, we might be off a little one way or the other, but it will serve as an example. For instance:

	Price per ton, estimated	Cost per pound of nitrogen
Ammonium sulfate	$80.00	$.20 (approx.)
Sewage sludge	60.00	.55 (approx.)
Urea-fprm	380.00	.50 (approx.)

Thus we see that, of these three materials, sulfate is the cheapest per pound of nitrogen. Sludge carries some phosphorus and a little potash, which puts it about on a par with Urea-form in cost per pound of total nitrogen. The high efficiency of Urea-form, plus the labor saving feature of fewer applications and less material to handle, make Urea-form, with the highest price per ton, an economical source of nitrogen. Considering that 70% of the nitrogen from sulfate may leach away, the cost of the useful nitrogen goes up to about 60¢ per pound. The danger of burning and the need for frequent applications puts this cost much higher. With sludge, only 50% effective, the cost of the useful nitrogen goes up to about $1.00 a pound. It can readily be seen, also, that the high nitrogen content of Urea-form means that fewer tons of material need to be shipped, handled and stored.

It must be kept firmly in mind that we will get the greatest value from fertlizers when we maintain conditions favorable to bacteria. Good drainage and aeration are tops on the list. Sensible irrigation is a close second. Any nitrogen material can become toxic if soils are saturated and compact so that anaerobic(without air) decomposition converts nitrates to nitrites.
Those who use solid Urea-forms will find that it will be possible to produce excellent density and good color with less topgrowth. This has been observed in many locations,

It must be stated that " there is no bad fertilizer ". Each can be used to produce good results if each is handled properly in accordance with its characteristics. It remains a fact that just as improved grasses have made it easier to produce high quality turf, the newer forms of nitrogen are making it easier to provide steady, uniform feeding with fewer applications, with greater foolproofness, more safety and more economically.

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Excerpts from SPORTS TURF BULLETIN, No. 45, April-May-June-1959. Issued by the Sports Turf Research Institure, Bingley, Yorkshire, England.

Rainfall figures at the Research Station, Bingley, show 34.96 inches for 1957 and 40.26 inches for 1958. For England and Wales in general, the figure of 41.6 inches is quoted. April was the dry month in 1957 with o.32 inches.

In a discussion " For the Lawn Owner " there appears the statement that " there seems to be a tendency to cut lawns far too short. The article points out that ".. a height of cut somewhere between 1/4 and 1/2 inch would seem to be suitable; grass cut at this ight is not being exhausted by constant severe defoliation yet it is short enough to present a pleasing and neat appearance." There is a statement also the " many private lawns tend to be too fibrous." Regular light raking and spiking are recommended.

Bag trolleys (golf carts) are cited as creating many additional headaches. Concentrated wear is a bugaboo. Tees are being worn where the trolleys are parked. Fronts of greens are becoming compacted. Trolleys are parked in front of greens and all foot traffic to and from the cup concentrates in a small area. Some Greenkeepers advocate parking meters at some distance from the greens.

It is of interest to review some of the principal turfgrass seeds that are in use. New Zealand browntop (certified), American Agrostis tenuis, New Zealand Chewing's fescue, Oregon Chewing's fescue, Danish creeping red fescue, S.59 red fesuce (certified), German hard fescue, Fine leaved shepp's fescue, Danish roughstalked meadowgrass, Dutch smoothstalked meadowgrass, New Zealand crested dogstail, S.23 perennial ryegrass (certified), S.24 perennial ryegrass (certified) Danish late flowering perennial ryegrass, N.Z.certified mother perennial ryegrass, Irish perennial ryegrass,Grade"A", Devon Eaver perennial ryegrass, Kent indigenous perennial ryegrass, S.48 timothy (certified),S.50 timothy (certified)

In preparing the seed bed for a turf nursery from seed there are detailed instructions including " hand raking and heeling ".

1958 gave almost incessant rain and MUD plagued any and all who dared to venture out on the courses. Remedies include killing the earthworms, using sulfur to increase acidity, spiking, topdressing with coke breeze and sand, and drainage.

Notes prepared for Mid-Atlantic "NEWSLETTER",Special Issue, May 1959

FVG.