12TH ILLINOIS TURFGRASS CONFERENCE

DECEMBER 2-3, 1971

Arranged and conducted by

COOPERATIVE EXTENSION SERVICE
COLLEGE OF AGRICULTURE
UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

In cooperation with

ILLINOIS TURFGRASS FOUNDATION

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WHAT ABOUT OUR COLLEGES?

Karl E. Gardner

My remarks have two purposes: first, to welcome you to both the University of Illinois campus at Urbana and the College of Agriculture; and, second, to provide a few remarks concerning colleges and college students.

You are well aware of the fact that a university such as the University of Illinois is constantly welcoming various conferences and groups to the campus, where we hope the discourse between faculty and industry people will be beneficial to both. We have always found it so, and hence, we welcome your visit, since you bring to us ideas, problems, criticisms, and assistance from the technical field. We in turn hope to explain some of our research, educate your sons and daughters, and assist you in any way we can.

Finally, may I say that the College of Agriculture also appreciates the fact that you employ, from time to time, what we might consider as our "product," and we need to know whether these graduates are competent and useful to you. So, I think I could say that you are doubly or triply welcome to visit us not only at a conference such as this, but on an individual basis at any time, on matters having to do with your business or when your sons and daughters are considering or are attending our University.

WHAT KIND OF STUDENTS?

What kind of kids are these college students today? I hear this question asked a great deal, and I think it is up to some of us to give our best estimation. Just a short time ago, a matter of one to three years ago, we were quite alarmed, and so were you, at the tendency of some students to practically take the law into their own hands. Many American campuses had disturbances, disorders, and demonstrations against a variety of local, or, more likely, national and international issues. A few professors jumped into the fray and didn't help much, either.

Apparently, this form of protest has been downgraded by the participants as being "self-defeating." I must say that many administrators still cross their fingers when they make such a statement, since we have no way of being absolutely certain that we may not see a repetition of some of these tactics in the future. These actions were disturbing, they were detrimental to education, and they were practically without precedent in the American educational system. The strikes, however, were rather typical of some of the tactics being used by labor and by a wide variety of social groups when attempting to gain public attention to the problems as they see them.

The uproar was not peculiar to American education; but, it was unusual when we consider that it was perpetrated by students who "never had it so good" in their financial support or in their academic pursuits. In any event, we hope we have seen the end of it, so that we can get on with the job of educating youth, conducting research, or extending information beyond the university walls.

College students, as you have frequently read, are smarter than ever before, if we use the customary criteria of standardized tests. Unfortunately, none of these tests measure courtesy, common sense, dedication to principle, or willingness to support the existing system as we know it in the United States. When it comes to ability to do the customary tasks we expect of new graduates of our colleges, they should be as good as we have ever turned out.

Students are much more independent than they were formerly. Some students much prefer to live in apartments rather than dormitories when they reach a certain age. They see their

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K.E. Gardner is Director of Resident Instruction, College of Agriculture, University of Illinois at Urbana-Champaign.

brothers and sisters of about the same age living in apartments as they work in the big cities and they want the same "freedom." To have to live in dormitories or "approved housing" is not altogether to the liking of some of the more independent ones.

These students are quite concerned about national issues, although they are far less sophisticated in this regard than they think they are. The idea of a simple and quick solution appeals to them. The slower, scientific approach is not quick enough. This is the approach of immature minds and of those who are less willing to listen to experts or qualified students of a subject. Progress is never fast enough for them, and, I suppose, this is a function of their age. Most of us who are older just have not found many of these instant success solutions.

Students are a lot less "rah-rah." Here at Illinois they seem not so inclined to get all excited about athletic events, although the failure of our football team up until the last five weeks of the season may be partly responsible. They talk about the poor and the downtrodden, but I do not see that they are as generous as students have been in the past when it comes to charity, yet they certainly have more money than any students have ever had. You should see the college daily newspaper to see the kind of advertising and the number of pages of it to get some comprehension of the amount of money that is spent by students here for the "non-academic." It would amaze you.

At the same time, we do have students who have a hard time making ends meet. Most any student, however, who applies for financial assistance and can prove that he needs it will get it. I can say that because I am chairman of the committee that makes these decisions. I think it is true. It does not mean that every student gets a "free ride," since we expect the student to provide through work or through borrowing about one-half of his unmet financial need.

Still, I do not favor continually elevating the tuition of students. It is not necessary in a state university, since educated persons pay more than their proportionate share of state taxes anyhow.

As to graduates of the College of Agriculture, I honestly believe that we do have some of the most capable graduates that we have ever had. Ordinarily, these students know why they are in college, have a definite objective while they are in college, and, hence, are less undecided and less likely to waste time or follow demagogues.

I do not think students have changed quite as much or as fast as some people try to imply. I suppose this is true of human nature, in general. It just is not amenable to sudden change. It is probably a good thing that we do not have sudden change along these lines, because we would certainly not know how to cope with it.

WHAT ABOUT THE COLLEGES?

Lord C.P. Snow of England has made the unusual remark, "About 80 percent of all the new knowledge, or new truth, obtained since the Second World War, has derived from the large American university." He refers to knowledge in general, not merely that on the American scene. This is a rather generous statement, and I am not certain that anyone could prove it right or wrong. In any event, there is quite a substantial amount of evidence that the large American universities, such as the University of Illinois, have been responsible for the discovery of a great deal of scientific truth.

May I add that to stifle this creative effort, to curb it, or even to fail to support it at about its present rate will be to deny the United States international leadership, and possibly to damage our national safety.

Truth comes high! There is no bargain basement! You cannot make a university great or keep it that way without real cost. This University has been rated in quality about fifth to seventh among the 170, or so, Ph.D.-granting universities in America and among the 2,500 colleges and universities of the country. Top scholars are seeping away from Illinois and it will be harder and harder to recruit new "toppers" as we continue to drop in our salary ratings. We have, however, been fortunate recently to obtain several very fine staff members in Horticulture. I hope you will meet them during the conference.

May I conclude by saying that your College of Agriculture will continue to serve you to the best of its capacity, as always. Come again.

MAJOR CHANGES PROPOSED IN PESTICIDE LAWS

J.B. Gartner and A.J. Turgeon

FEDERAL LAW

The federal legislative House Bill 4152 proposes more stringent laws on the sale and use of pesticides. As the bill is proposed, the states will have to amend their present legislation or propose new legislation to comply with the proposed regulation. All pesticides will be placed in three categories: I. Prescription, II. Restricted Use, and III. General Use.

I. Prescription. When a pesticide is placed on the prescription basis, it is a "hard" pesticide (i.e., DDT, etc.) and may be used only on an emergency basis when no other pesticide will control the pest and there is a danger of an epidemic.

II. Restricted Use. These are pesticides that have low residual activity (i.e., break down rapidly), but may be dangerous to the operator. Paraquat and parathion are examples of these types.

III. General Use. These are chemicals that are safe both to the environment and the operator.

Under the proposed regulation, pesticides in Categories I and II require that a person must be licensed to handle, sell, or use these chemicals. There will be two types of permits:

A. Applicator License. This license will be issued to the owner or supervisor who diagnoses and dispenses the chemical. The test for this license will require that the individual have a good understanding of the chemicals--what they control and how to use them safely.

B. Operator License. This license will be issued to the individual doing the spraying. The test for this license will be less stringent and will stress safety in applying chemicals.

Before a person can use chemicals in Class I or II, they must have a license to obtain chemicals. For Class I chemicals, they must obtain a permit from a governmental agency prior to the use. Chemicals in Class II may be purchased by an individual holding an applicator's license.

Schools will be established in advance to train individuals for these exams prior to the enforcement of the law. They will be given in several areas of the state.

ILLINOIS LAW

This past year the Illinois custom spray operators law was changed to comply with the proposed federal law which has passed the House by a unanimous vote. Previously, the custom spray operators law was for individuals who did custom spraying and only the firm had to have the license. The exam was primarily for general farming and none of the exam covered ornamental horticulture.

Under the new law, the firm must have an applicator's license. This exam will be for those who supervise or diagnose the use of pesticides. In addition to the applicator's license, the individual operating the spray equipment must have an operator's license.

J.B. Gartner is professor and A.J. Turgeon is assistant professor, Department of Horticulture, University of Illinois at Urbana-Champaign.

Who is covered by law?

1. Any person spraying for hire.
2. Any person working for state, county, city, or municipal government.

Who is exempt from the law?

1. Any person spraying on his own property.
2. Persons or firms holding the tree expert license.

The Exam

A. Applicator License. The applicator's exam will have two parts:

1. A general examination covering pesticide safety and handling.
2. Specific examinations in one of the following areas: general crops; landscape nurseries; or turfgrasses.

All individuals will have to pass the general exam and one or more of the specialty exams.

B. Operator License. This will cover safety of spraying and will be less specific than the applicator license. This exam will be given both in English and Spanish.

Cost of License

The applicator license will cost $25; the operator license will cost $10.

Time and Place of Schools and Exams

Schools are scheduled to train individuals at the following locations:

March 6 Champaign, Ramada Inn, Route 45.

March 7 Elgin, Blue Moon Restaurant, Business Route 20 W.

March 8 Rockford, Holiday Inn, Route 51 S.

March 9 Moline, Deere and Co., Administration Center, John Deere Road.

March 10 La Salle, Holiday Inn, I-80 and Route 51.

March 13 Dixie Governor Motel, 175th Street and Governor's Highway

March 14 Pekin, County Extension Office, 116 S. Capital.

March 15 Marion, Holiday Inn, I-57 and Route 13.

March 16 Edwardsville, Flaming Pit, Route 159 S.

March 17 Springfield, Heritage House, Route 66 S.

At these schools, study materials will be handed out and lectures will be given on the various phases that will be covered by the exam.

Agriculture Extension Service personnel, as well as personnel from the Natural History Survey, will train individuals to help them prepare for the exam. Following each session, the Department of Agriculture will have personnel present to give the examination. The Illinois Department of Agriculture has the responsibility for administering the examination and enforcing the law.

If anyone is unable to take the exam at the above dates, special arrangements will be made for them to pick up the study material and take the exam within their local area.

THE POA ANNUA PROBLEM

A.J. Turgeon

Annual bluegrass *(Poa annua L.)* is a low-growing plant that provides a dense, vigorous turf under relatively low cutting heights. It survives reasonably well on compacted soils and is well adapted to moist, shaded conditions. Although it is almost never planted intentionally, it frequently comprises the major component of such turfgrass communities as golf course greens, tees, and fairways.

Annual bluegrass is generally considered to be a weed. Its profuse seedhead production under a wide range of mowing heights and its sensitivity to climatic extremes make it an undesirable grass for turf use.

DESCRIPTION

Annual bluegrass resembles other bluegrasses in having a folded leaf bud and boat-shaped leaf tip. It is distinguished from Kentucky bluegrass by its lighter green color, large ligule, and absence of rhizomes. One outstanding characteristic of annual bluegrass is its ability to produce seedheads at cutting heights below 1/4 inch. Seedhead production is especially evident in mid-spring to late spring.

Annual bluegrass is a highly variable species; some plants develop thick, upright growth while others are more prostrate and less dense in nature. Recent investigations by the author have shown that some morphological variability in this species was associated with a physiological variability in terms of the plants' response to a herbicide. The upright-growing (annual) biotypes of annual bluegrass were killed with a 50-p.p.m. concentration of endothall, applied to the roots, while the prostrate-growing (perennial) biotypes were only stunted at this and higher concentrations of the herbicide.

CULTURAL CONTROL

The basic principle behind successful weed control in turf is the creation of an environment in which the turfgrass plants are maintained in a vigorous and healthy state of growth. This is dependent upon proper mowing, watering, and fertilization practices, as well as the mitigation of injurious factors such as diseases, insects, and traffic. In addition, proper selection of turfgrass species and cultivars for specific environmental conditions is important in maintaining "competitive" growth.

Annual bluegrass thrives on a continuous availability of soil moisture, high soil fertility, and low mowing. Furthermore, it can survive compacted soil conditions better than most preferred turfgrasses, providing soil moisture is not a limiting factor. Cultural control of annual bluegrass requires that mowing, watering, and fertilization practices are performed at near optimum levels for the desired turfgrass species. Proper soil preparation and traffic management are also important in providing for healthy root growth of the desired turf. Periodic aerifying of compacted greens, installation of drainage tiles and slit trenches in poorly drained soils, and elimination of depressions which hold water on turfed surfaces all allow for better root growth. All too often the turf manager attempts to compensate for unsuitable growing conditions through increases in water and fertilizer application--factors which may promote the relative competitive ability of annual bluegrass.

CHEMICAL CONTROL

Arsenates

Lead arsenate was found to discourage the occurrence of annual bluegrass in turf over 40 years ago. Today, lead and calcium arsenates are the most popularly used chemicals for reducing or

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A.J. Turgeon is assistant professor, Department of Horticulture, University of Illinois at Urbana-Champaign.

preventing annual bluegrass infestations. The principle behind this approach is the *gradual* buildup of arsenate in the soil to a level that provides selective toxicity to annual bluegrass. Overseeding with desirable turfgrasses is often practiced in conjunction with arsenate applications.

Preemergence Herbicides

The introduction of DCPA, benefin, bensulide, and terbutol for preemergence crabgrass control spurred investigations of their effectiveness on annual bluegrass. Initial studies showed good control of germinating seeds, but tests in the field generally produced erratic results as these materials have little or no postemergence activity. Many turf specialists had assumed that annual bluegrass plants die after one to three seasons, regardless of management conditions. Under this assumption, the annual bluegrass population would be expected to "turn over" completely (plant-seed-new plant) within a few seasons; hence, two seasonal applications of a preemergence herbicide for several years in succession should completely control infestations of this weed. The data from research conducted throughout the United States do not entirely support this assumption. Furthermore, repeated use of these compounds precludes overseeding of desirable turfgrasses and, in some instances, results in injury to established grasses.

New Approaches

PO-SAN was introduced several years ago for seed head suppression in annual bluegrass. Removal of the reseeding capability of this grass coupled with its relatively short life length constitute the basis of this approach. This has been successful in some areas of the United States.

Endothall has been used for selective growth suppression of annual bluegrass in turf and, at higher rates of application, for renovation of areas where Kentucky bluegrass is the perennial turfgrass species present. Selective growth suppression has been demonstrated in greenhouse tests, but field applications of endothall (1/4 to 1/2 pound per acre) have produced variable results. Higher application rates (1 to 4 pounds per acre) caused a general browning of the turf, especially in late summer, followed by a selective recovery of Kentucky bluegrass from rhizome tissue. Reinfestation by annual bluegrass occurs in bare areas where Kentucky bluegrass has not completely filled in. Perhaps a subsequent application of a preemergence herbicide may prevent reinfestation by the weed and allow more time for the perennial grass to fill in the area.

In recent work, granular formulations of endothall have demonstrated superior selectivity over the foliar-applied liquid formulation. Selective kill of annual bluegrass is possible with granular endothall; however, the required rates of application increase with increasing soil clay and organic matter content. Further evaluation of endothall formulations is required before specific recommendations can be made.

In conclusion, chemical control of annual bluegrass is difficult to achieve with single applications of available herbicides or even with multiple applications of a specific herbicide. In the future, effective control may be achieved by employing selected herbicides in conjunction with specific cultural practices in a balanced and integrated management program. Each herbicide should be chosen for its desired features and its compatibility with the other herbicides used in the program. Future research at the University of Illinois will include the design and evaluation of management programs in attempting to solve this serious problem facing the turf manager.

DEACTIVATION OF HERBICIDES IN SOILS

F.W. Slife

A large portion of the herbicides applied for weed control ends up in the soil. Even those materials that we apply to growing plants (post emergence) will be partially returned to the soil. This happens by rain washing the herbicide off plant leaves, it happens by plants exuding the material out of their root systems, and it happens when the treated plants die and decompose.

The soil is an ideal medium for getting rid of herbicides. First, it contains hundreds of different kinds of fungi, bacteria, and small animals. In addition to eating each other, they live on organic matter and organic compounds supplied by plants and decaying plant residue. Most types of soil life require oxygen to live, but some are anaerobic. The majority of these organisms live in the top two feet of soil because of the oxygen supply and because of organic matter. Clay particles in the soil serve to hold the organic matter and together the clay-organic matter complex has the capacity to hold moisture needed for maximum activity of soil life.

When a herbicide reaches the soil it usually becomes attached to the organic matter or a clay particle. The bonding strength depends on the kind of herbicide and the charge it exhibits. This generally is a useful process because if the herbicide moves slowly through the soil, the microorganisms have maximum opportunity to degrade the compound. If herbicides moved through the soil rapidly, they would contaminate our underground water supplies.

It is not easy to decontaminate soils quickly. Most of the newer herbicides will decompose by the processes mentioned above. The process can be hastened by aeration of the soil and by supplying enough water for microorganism activity. The extremely persistent herbicides, such as soil sterilants, can be partially eliminated by removing several inches of soil and replacing it with new soil. Activated carbon can be added to soil (incorporated) to reduce herbicide residue. This only binds the compound, however, and does not hasten the degradation process. It often allows new plantings to grow where they would not if the carbon had not been added. The effects of high levels of arsenic in the soil can be reduced by adding phosphorus. The additional phosphorus allows plants to adsorb less arsenic and more phosphorus and thus reduce the arsenic effect.

It seems likely that newer herbicides will remain in the soil for shorter periods of time. This may mean that more than one application per year will be needed to achieve weed control.

F.W. Slife is professor, Department of Agronomy, University of Illinois at Urbana-Champaign.

TURF INSECTS AND THEIR CONTROL

Roscoe Randall

SOD WEBWORMS

Turf insect activity in general during 1971 was not a great deal different from any other year. But there was much more sod webworm activity in lawns and other grass areas, especially during September and even into October. Unseasonably warm temperatures, plus continued generations of moths, created some quite high populations of larvae feeding on the grass.

Sod webworm populations fluctuate from year to year, and it is difficult to predict possible infestations for the first generation next June or succeeding generations in 1972. Dr. Joe Maddox, insect pathologist at the Illinois Natural History Survey, has been investigating the disease organisms in sod webworms over the past few years. He has found that from 5 to 65 percent of the sod webworm moths trapped either in a light trap or picked up from a grass area were infested with a microsporidia disease. This disease not only infects the adult moths but also the eggs and hatching larvae. Dr. Maddox found that the eggs laid by diseased moths are also infected and an average of 97 percent do not hatch. Along with climatic factors, diseases probably do more to control sod webworm populations than all of the insecticides.

THATCH AND INSECTICIDES

Here is a brief review of the thatch plot results. The plots were established to determine if insecticides used for insect control would cause thatch buildup.

The commonly used turf insecticides--chlordane, dieldrin, and carbaryl (Sevin)--have been applied to replicated plots at the University of Illinois Turfgrass Research Area. These plots were established in 1967 when two applications of each insecticide were made. Three applications were made in 1968, 1969, and 1970. The application rates for the insecticides, based on ingredient per 10,000 square feet, were: chlordane, 5 pounds; dieldrin, 1-1/4 pounds; and carbaryl, 2 pounds.

Thatch accumulation was measured in the plots in the fall of 1969 and 1970. The results are given in Table 1.

Table 1. Depth of Thatch in Turf Treated With Insecticides

Insecticide	Inches of thatch 1969	Inches of thatch 1970
Dieldrin	1/2	13/16
Chlordane	1/2	3/4
Carbaryl	Trace	Trace
Check	0	0

There was a definite relationship between earthworm activity and presence of thatch (see Table 2). Where earthworms were present under the soil surface, there appeared to be a removal of thatch from the soil surface. The chlorinated hydrocarbons, chlordane and dieldrin, appeared to repel or eliminate earthworm activity in the upper soil surface, thus preventing thatch removal.

Roscoe Randell is assistant professor, Department of Agricultural Entomology, University of Illinois at Urbana-Champaign.

1972 Lawn Insect Control Suggestions

Insects	Insecticide[1]	Dosage per 1,000 sq. ft.[2]	Suggestions
True white grubs (NHE-23) Annual white grubs Japanese beetle larvae Green June beetle larvae Ants (NHE-111)	chlordane 45% E.C. 45% W.P. 10% G. 5%	1/2 cup 5 oz. 1-1/4 lb. 2-1/2 lb.	This treatment provides 5-year protection. In established sod, apply as granules or spray to small area and then water in very thoroughly before treating another small area. For new seedings, mix in soil before planting. Do not plant vegetable root crops in treated soil for 5 years.
Ants (NHE-111) Cicada killer and other soil-nesting wasps (NHE-57,79)	diazinon 25% E.C. 2% G.	3/4 cup 5 lb.	Apply as spray or granules and water in thoroughly. For individual nests pour 1% diazinon in nest. Seal in with dirt.
Sod webworms Millipedes and sowbugs (NHE-93, 115)	carbaryl 50% W.P. 5% G. diazinon 25% E.C. 2% G. trichlorfon 50% W.P. 5% G.	1/2 lb. 4 lb. 3/4 cup 5 lb. 4 oz. 2-1/2 lb.	As sprays, use at least 2.5 gal. of water per 1,000 sq. ft. Do not water for 72 hours after treatment. As granules, apply from fertilizer spreader.
Armyworms Cutworms Chinch bugs	carbaryl 50% W.P. 5% G.	2 oz. 1 lb.	Apply as sprays or granules. Use 5 to 10 gal. of water per 1,000 sq. ft.
Leafhoppers	carbaryl 50% W.P. methoxychlor 25% E.C.	2 oz. 2 oz.	Apply as a spray.
Chiggers	diazinon	1 tbl.	Spray grass thoroughly.
Mites	dicofol 18.5% E.C. malathion 50-57% E.C.	1 tbl. 1 tbl.	Spray grass thoroughly, 2 to 5 gal. of water per 1,000 sq. ft.
Slugs (NHE-84)	Slug baits	Scatter in grass	Apply where slugs are numerous.
Aphids	malathion 50-57% E.C.	1 tbl.	Spray grass thoroughly.

[1] E.C. = emulsion concentrate; W.P. = wettable powder; G. = granules.
[2] To determine lawn size in square feet, multiply length times width of lawn and subtract non-lawn areas including house, driveway, garden, etc. Do not allow people or pets on lawn until the spray has dried.

Table 2. Numbers of Earthworm Burrows in Soil Treated With Insecticides

Insecticide	Earthworm burrows or holes in 4-inch diameter soil plug 1969	1970
Dieldrin	0	0
Chlordane	0	0
Carbaryl	14	20
Check	13	19

Insecticides were applied again during 1971 and thatch depth measurements and earthworm and burrow counts will be taken in November. Those results will be reported at a later time.

NEW TURF INSECT PROBLEMS

In central and eastern Illinois in 1970 and again in 1971 noticeable damage to Kentucky bluegrass was caused by greenbugs (*Schizaphis graminum*). Greenbugs seemed to feed primarily on Kentucky bluegrass, and not on red fescue and certain other turfgrasses. This was the first time this aphid has been observed as an epidemic on turf. The damage was noted as large round dead patches during the late summer months. These patches usually ranged in diameter from 3 to 15 feet or more. A narrow, yellow band of grass divided the brown grass from the green. When examined, individual plants taken from the chlorotic turf were found to be hosting large numbers (100 or more) of aphids. In many instances these dead areas were beneath or adjacent to shade trees in the lawn.

TURF NEMATODE PROBLEMS

R.B. Malek

One of the many headaches often associated with the culture and care of turfgrass is the combating of parasitic nematodes, which are among the most abundant animal organisms on earth. Although nematodes have been recognized as parasites of plants for well over a century, they were largely neglected by scientists until relatively recent years because of their microscopic size and their evasiveness as causal agents of plant diseases. As Dr. H.B. Couch mentioned at last year's Turfgrass Conference, it was not until the last decade that we became fully aware of the importance of parasitic nematodes as turfgrass pathogens. This awareness was realized in the more southern regions of this country, particularly Florida, with its predominantly sandy soils, where nematodes are now considered by most to be the major biotic factor limiting growth of turfgrass.

NEMATODE PROBLEMS IN ILLINOIS

Fortunately, we in Illinois have rarely been faced with the obvious and often catastrophic effects of turf nematodes that face growers in the South. There are three primary reasons for this: (1) the presence in subtemperate regions of a broad spectrum of highly pathogenic types of nematodes, many of which are absent in northern areas, (2) the essentially year-round growing season of the southern climate which permits a more rapid buildup of nematode populations, and (3) the more frequent heat and fertility stress placed on turf the farther south one goes.

In Illinois and the rest of the north central region with its cooler climate and preponderance of heavier soil types, nematode damage to all types of crops usually takes on a more subtle nature and thus is difficult to pinpoint and characterize. Moreover, nematode research is difficult and time consuming because of the nature of these organisms and the environment in which they live. These are probably the major reasons for the relative scarcity of information concerning turf nematodes in this region. Therefore, when we try to talk about turf nematode problems in Illinois, we must rely heavily on information derived from research in the south and speculate to some degree on conditions in our own region.

Nevertheless, we know we have problems in Illinois; we can't escape them. Most turfgrasses are good hosts for many types of nematodes, and the soil environment beneath these perennial plants is more favorable to nematodes than is the frequently disturbed soil beneath annual crops. Moreover, there is a real probability that these problems will become more severe and widespread in the future. The rationale here is that nematodes are benefited by irrigation, better fertilization, more concentrated production, and, in some cases, improved varieties. Therefore, as our culture and maintenance of turf become more intensive and sophisticated from the home lawn to the golf course to the commercial sod grower, nematodes too will have better living conditions.

Briefly characterizing these organisms, most nematodes that parasitize plants are tiny, slender worms, averaging about 1/30 of an inch in length, and therefore are generally too small to be seen with the unaided eye. A few become swollen and spherical at maturity, and by close observation can be seen clinging to roots. Although there are a few forms that attack the above-ground part of a plant, the vast majority of nematodes feed on roots, either externally or internally, puncturing cells and withdrawing cell contents with a stylet resembling a minute hypodermic needle. Nematodes directly damage a plant by sapping its strength, reducing its ability to take up water and nutrients, or disrupting its vascular system.

R.B. Malek is assistant professor, Department of Plant Pathology, University of Illinois at Urbana-Champaign.

SYMPTOMS OF NEMATODE DAMAGE

Symptoms of damage to the root system of a turfgrass may take various forms, depending in part on the type of nematode involved. Most obvious is a general reduction of the overall root system as a result of destruction or growth cessation of individual roots, particularly the fine feeder roots. In addition, the root system may take on an unhealthy yellowish to brownish cast. One type, the root-knot nematode, produces small galls on roots. Secondary organisms of decay may continue the damage until the entire root system is destroyed, which will result in death of the plant.

In general, turfgrasses may express one or more of the following above-ground symptoms as a result of nematode-damaged root systems: (1) off-color cast ranging from abnormally lighter green to severe chlorosis (yellowing), similar to nitrogen or iron deficiency, (2) enhanced wilting during hot, dry weather, (3) stunted growth or reduced vigor, (4) reduced rhizome production, (5) thin stands, (6) decreased winter survival, and (7) increased susceptibility to fungus and other diseases. Areas of unhealthy grass may be very localized or generally widespread.

The degree of damage is dependent on a number of factors, whose relationship requires much further scientific clarification: (1) the types of nematode present, (2) the relative numbers of nematodes, (3) the type of grass, (4) soil texture, (5) fertility status of the soil, (6) climatic conditions, and perhaps other physical factors. Management factors may also be important; the more stress placed on the grass, the more damage is enhanced.

The important point to remember is that parasitic nematodes occur wherever plants grow, but become economically or esthetically important only under certain conditions, about which we as yet have very little understanding.

IDENTIFYING NEMATODE PROBLEMS

As can be seen by now, symptoms of nematode damage are quite similar to those produced by other disease organisms and a number of physiological disorders. As a result, it is virtually impossible for even the trained eye to determine from symptoms alone that a nematode problem exists. Therefore, when nematodes are suspected as the cause of unthrifty turf, soil samples should be collected from the affected area and submitted to the Nematology Laboratory for analysis. The types and numbers of nematodes present will be determined by trained personnel and, if control practices are advisable, recommendations for correction of the problem will be supplied. This service is presently available free of charge at the University of Illinois. The procedure for collecting and submitting soil samples for nematode analysis are outlined in "University of Illinois Report on Plant Diseases No. 1100."

Although our knowledge of the role of nematodes in turf problems in the Upper Midwest is sketchy, in recent years we have gained some insight into the situation in Illinois. For instance, a limited survey in 1963 has shown that, in the northern half of the state, the nematode found most commonly and in greatest numbers on bentgrass golf greens is the so-called stunt nematode. Other potentially pathogenic forms usually present include the spiral, lance, ring, pin, and lesion nematodes. Surveys in neighboring states indicate that the same forms would be encountered on Kentucky bluegrass in Illinois. We now know that at least one species of stunt nematode is capable of stunting bluegrass and that several species of spiral nematodes are the cause of the severe summer decline condition of bluegrass known as "summer dormancy".

In 1967 a form known as the barley root-knot nematode was detected in a single putting green in the Chicago area. Although this is the only known incidence of this nematode in Illinois, it is a potential problem that bears close watch because of the notoriously pathogenic nature of the root-knot nematodes in general. Last year, research by one of our graduate students demonstrated that it is indeed a severe pathogen of bentgrass.

What may become a very important aspect of turf-nematode relationships is the interaction of nematodes with other pathogenic organisms in disease complexes. For several years, we have known that on some crops certain forms of nematodes increase the incidence and severity of some of the fungus diseases, particularly the wilt and root-rot diseases. There is little doubt that the same situation occurs with turf diseases although to what extent is unknown. Recent research here and elsewhere has indeed shown that such an interaction can take place between nematodes and the *Fusarium* root-rot organisms on bentgrass. The implication here is that, by controlling turf nematodes, it may be possible to indirectly bring certain fungus diseases under control.

NEMATODE CONTROL

Turning to nematode control, we have three methods which alone or integrated have potential for controlling nematodes and their damage to turfgrasses in Illinois: (1) resistant or tolerant grass varieties, (2) good management, and (3) nematicides. Resistance to the very damaging southern nematode forms in subtemperate grass species is presently being studied, but resistance in our northern grass species is probably a thing of the future, after we have better defined our nematode problems and the grass-nematode relationships.

What we need to look for in this region are varieties which are tolerant to nematodes, that is, those which will grow well under conditions of high nematode densities. In some cases, this may already have been achieved through turfgrass breeding or natural selection.

Good turf management practices are essential for minimizing nematode damage. Most important are maintaining adequate soil fertility and sufficient soil moisture during dry periods. Failure to do so often brings out or greatly enhances damage symptoms.

In Florida, control of parasitic nematodes with nematicides has become a necessary and integral part of turf management problems, particularly for the commerical sod grower. Chemical control of nematodes on turfgrasses and any other crop is not easy; from a practical standpoint, eradication is next to impossible. A nematicide must be accurately placed on or in the soil and then carried as a vapor or in the soil water into contact with the nematode. Efficient control by this means is highly dependent on a number of physical factors over and above those for foliar diseases, such as the type of chemical, the soil texture and the moisture level, temperature, and organic matter content of the soil.

Most success in the upper midwest has been achieved with the highly volatile soil fumigants such as Vorlex, methyl bromide, chloropicrin, and the like. Commercial sod growers who periodically preplant fumigate for control of weeds and fungi are also achieving near eradication of nematodes. However, these chemicals are of no value to the manager of established turf. Here we need a nonphytotoxic chemical that can be applied as granules or as a drench to the soil surface. However, this is another area where research is badly needed in our region. Although the long-established chemical DBCP (Fumazone or Nemagon) will provide a measure of control, there are a number of relatively new nematicides which are now being used successfully or which look very promising on turf in Florida. However, they have not been tested to any extent on the predominantly heavy soils of the upper midwest. There is also a considerable human health hazard involved in the use of these very toxic chemicals on high-traffic areas such as golf courses, parks, and home lawns.

In conclusion, the difficulties involved in diagnosing and correcting turf nematode problems and in clarifying the relationships between parasitic nematodes and turfgrasses should now be apparent. However, there is a definite and growing need for expanded research in the area of turf nematode problems. Particular emphasis needs to be focused on basic pathogenicity studies of individual nematode species so that we can better understand how, when, and where damage occurs, as well as the role of nematodes in disease complexes. On the applied side, we need to find safe and efficient methods of chemically controlling turf nematodes in Illinois so that when problems do arise we can cope with them quickly.

CURRENT TURF DISEASE CONTROL RESEARCH

J.M. Vargas, Jr.

We cannot talk about current turf disease control without mentioning the new systemic fungicides. They appear to be the wave of the future. The following is an attempt to supply some important information about the systemic fungicides.

Systemic fungicides differ from the older contact fungicides (which for the most part were simply sprayed onto the leaf surface of the grass plant and remained there on the surface to protect the grass plant from infection) in that systemic fungicides are taken up by the plant and translocated throughout the plant either to eradicate a fungus which may already be present or to prevent any new infection from taking place.

What advantages do systemic fungicides have over contact fungicides?

A. They give protection for a longer period of time.

   1. This is because they enter the grass plants where they are less susceptible to being washed away by the first rain or daily watering, and, of course, they are less apt to be broken down by the rays of the sun (photodegradation). This means fewer spray applications will be necessary throughout the season.

   2. With systemic fungicides the protection is not mowed away with the first mowing because the new foliage will also contain some of the systemic fungicides.

B. They can eradicate such systemic diseases as stripe smut where it has been very difficult if not impossible to control with the contact fungicides.

What are some of the disadvantages?

A. They are suspected of changing the physiology of the grass plant and may make it more susceptible to some turf diseases, such as *Helminthosporium*.

B. None of the systemic fungicides currently available will control *Helminthosporium* disease. Consequently, only using systemic fungicides on bentgrass greens could lead to the emergence of *Helminthosporium* as a major problem where it has been a minor disease in the past because most of the materials previously used to control dollar spot and brown patch also control *Helminthosporium*.

C. Constant use of only one systemic fungicide or of chemically similar systemic fungicides could produce a mutation within a species of fungi which would be resistant to a systemic fungicide or group of chemically similar systemic fungicides.

These last two disadvantages and perhaps all three may be eliminated by alternating systemic fungicide sprays with a good contact fungicide.

The following are some of the results obtained at Michigan State University with the systemic fungicides.

FUSARIUM BLIGHT (*Fusarium roseum, F. tricinctum*)

We have found that two 8-ounce applications of Tersan 1991 (E.I. du Pont de Nemours and Co.) per 1,000 square feet at two week intervals will give satisfactory control of this disease.

J.M. Vargas, Jr. is assistant professor, Departments of Botany and Plant Pathology, Michigan State University.

However, the lawn should be thoroughly watered the night before applications are made and then the Tersan 1991 must be drenched down into the root zone with an additional inch of water for it to be effective. Since Tersan 1991 is primarily translocated upward from the roots to the leaves and it is not readily translocated downward from the leaves to the roots, where the Fusarium is doing most of its damage, it became obvious why it is necessary to drench the Tersan 1991 down into the root zone.

Stripe Smut (*Ustilago striiformis*)

Stripe smut is a systemic disease which was almost impossible to control before we had systemic fungicides. There appear to be three systemic fungicides which are capable of controlling this disease. They are Tersan 1991, EL-273 (Eli Lilly and Co.), and T.D. 1771 (Pennwalt Corp.) at both the 4- and 8-ounce rates with two biweekly applications. For the reasons mentioned above, it is necessary to drench these materials down into the root zone immediately after applying with an inch of water before they have a chance to dry on the foliage.

Dollar Spot (*Sclerotinia homeocarpa*)

Dollar spot is probably the most common disease on bentgrass greens. While it has not been a difficult disease to control, spraying every 10 to 14 days during the season is time consuming. We have been able to extend the time interval between sprays with the use of systemic fungicides. We have found numerous systemic fungicides for the control of dollar spot at rates of 1/2 to 2 ounces per 1,000 square feet. They will control the disease for three to six weeks, depending on the environmental conditions. These fungicides are: Tersan 1991, EL-273, T.D. 1771, Mertect (Merck and Co.) and Tobaz (Mollinckrodt Chemical Works).

Powdery Mildew (*Erysiphe graminis*)

While powdery mildew is usually not considered a major disease, it is an important problem for the homeowner with a bluegrass lawn. He always has some area in the shade even if it is only the north side of his house. Spraying for control of powdery mildew in the past has been impractical because it has involved weekly spraying for control. Now with the new systemic fungicides we are able to extend the spray interval. We have found that 4 ounces of EL-273 and 8 ounces of Tersan 1991 per 1,000 square feet will control powdery mildew for four to six weeks.

Typhula Blight (Gray Snow Mold) (*Typhula Itoana*)

Tersan SP has been the only non-metallic fungicide which has given control of Typhula blight in Northern Michigan where the snow continuously covers the ground for a period of five months. Tersan SP appears to be systemic, although it has not been positively proven. We find under our conditions that 9 ounces of the wettable powder formulation per 1,000 square feet is necessary for satisfactory control. There is also a granular formulation being tested which appears effective at lower rates. We have also shown that Tersan SP and Calo Gran can be applied up to a month prior to the first permanent snowfall and still give satisfactory control. This increases the safety margin for application and reduces the risk of being caught unprotected by an early snow.

HOW A MANUFACTURER LOOKS AT DISEASE CONTROL IN TURF

R.T. Miller

Disease control in turf may have a different meaning to different people. To a golf course superintendent disease control could mean the absence of disease problems; to an investigator in plant pathology it could mean an area of work; and to a manufacturer it is a potential market for products.

For a manufacturer to be successful in the turf market, he must use the following program:

1. Understand the problem. (a) Recognize the relation of his fungicides to turf disease. (b) Recognize the environmental and management factors. (c) Write a proper label for use information.

2. Develop new products for turf and reevaluate older chemicals to learn if they have a place in the turf field.

3. Aid the user and provide the desired results for the superintendent.

4. Return a profit to the distributor and manufacturer.

In such a program, it must be recognized that disease control with a given fungicide is relative to the disease pressure. This disease pressure relates to the level of fungus inoculum and environmental factors favoring the disease. It is doubtful that any fungicide will provide the desired results when all conditions are favorable for disease activity, but many people expect complete control.

Too often we have heard disease control referred to as an application of a fungicide, and when it is applied (no matter what practices are followed and independent of the environmental conditions) the problem no longer exists. Gentlemen, if this were the whole answer, there would be no need for meetings such as these.

We have never heard a plant pathologist talk without referring to cultural practices and environmental conditions. We have seen the different types of dollar spot. We know that large brown patch can be more difficult to control in some areas and under some management practices than in other situations. Penn State investigators have reported this to be true in their breeding work. Dr. Halisky has reported that varieties of bluegrass and bentgrass will differ in their susceptibility to diseases. There are many variables, but when a disease problem exists, no one is interested in reasons; they want the answer--complete control.

It is our thinking that as new chemicals become commercially available they will be much more specific in their control than in the past. They will also provide much more effective control for certain organisms than in the past. We believe that the use of fungicides will be programmed for specific purposes and, with proper timing, use rates will be lower. This could mean improved disease control and a reduction of possible environmental problems from excess use of chemicals. With this new approach to disease control, however, it becomes more and more essential for the turf manager to be able to identify the disease correctly and then apply the proper fungicide.

When a manufacturer is testing a potential fungicide, in addition to effectiveness he must also consider:

1. Phytotoxicity--with a provision for a safety factor. When plants are weakened by disease, they can be more susceptible to injury.

R.T. Miller is product technologist, Agrichemicals Sales Division, E.I. du Pont de Nemours and Company, Inc.

2. Hazard to humans and to animals.

3. Residual characteristics needed--lasting qualities desired will depend in part upon the disease pressure.

4. Cost--in manufacturing and to the consumer. Generally, the cost of application is more than the cost of the chemical, but cost is always a factor.

5. Range of control--what organisms will a compound control and will it control these diseases in all sections of the country or the world?

6. Compatibility with other products.

These are a few of the problems. In addition to testing the development of a new chemical, a product faces many challenges at the point of use:

1. Is the proper rate being applied? Normally, the label will show two suggested rates--a preventive rate and an eradicant or control rate. Frequently, with newer fungicides, a single application rate may be recommended; however, the rates may vary for achieving control of specific diseases. A surprising thing is that some applicators do not know the size of the area to be sprayed. We believe it is essential to know the area of a tee, green, fairway, or other turfed surface to use a fertilizer, insecticide, herbicide, or fungicide properly.

2. Has the problem been properly identified? We know this can be difficult at times as some diseases are similar in appearance, and sometimes insect damage looks like a disease. We have all heard the story of the fungicide that failed to control cutworm damage which had been misidentified as dollar spot, but this has happened. The individual who used the fungicide improperly may forget the reason for failure, but unfortunately he will often remember the product and that he was not satisfied with the results. An example could be spring dead spots of Bermudagrass. When the organism or organisms have been identified, I am certain that a control will be found quickly. To control a disease problem, we must be able to identify the disease correctly.

3. Are good management or cultural practices being followed? Several years ago, we called at a golf course in early July and the man in charge was frantic about what he claimed was disease attacking all greens, and he was starting to use a fungicide. When we could finally talk with the man, he claimed he had applied two pounds of a soluble nitrogen two or three days earlier to get good color for the Fourth of July; immediately after the nitrogen application, they had a good rain and then warm weather in the high 80s. Was this a place to apply a fungicide?

Another time, we were called in where dollar spot was a problem. When cadmiums or mercury were applied, activity stopped for a period of 36 to 48 hours, and then began again. When plugs were taken, they showed a very heavy mat. When the matted condition was corrected, the fungicides kept disease under control.

Too often when disease is a constant problem, the cause can be traced back to some agronomic practice or environmental condition.

There are many excellent fungicides now on the market, and we are certain, with all the work now being done on turf, that we can expect new and possibly better ones. But the ability of a turf fungicide to control all of a wide range of disease organisms could very well be one characteristic that future products may lack. Developments point to more specific fungicides rather than the all-purpose product that many hope for and expect. As new chemicals are developed, we believe they could control certain diseases better and, possibly, last longer. Some of the new ones now are systemic in action; they provide longer control with fewer applications and lower use rates.

In this regard, we believe superintendents must identify turf problems better and use specific products for particular problems. This could mean tank mixing of products, but we prefer to believe in the programming of fungicides for specific needs and more efficiency, rather than the use of combinations for general purposes.

We have discussed some of the ways a manufacturer looks at disease control and some of the challenges in providing new fungicides. We can speculate that complete disease control in 1995, in some respects, will continue to be the same as it is today. No doubt many of the products will have changed, but the successful superintendent will:

1. Use the grasses which are the least susceptible to disease under his management program.

2. Use good cultural practices to provide the best growing conditions for the desirable grasses.

3. Use a good preventive fungicide program.

New chemicals will be offered as an aid in management; they are not intended to take the man out of management. Complete disease control is not likely to be found just in a product, nor will cultural practices alone control disease. But good management practices, coupled with regular applications of a fungicide and the superintendent's ability to adjust application rates to meet environmental conditions, will keep turf diseases under control on the golf course.

THATCH ACCUMULATION IN BLUEGRASS AFTER APPLYING PREEMERGENCE HERBICIDES TWO YEARS

A.J. Turgeon, T.D. Hughes, and J.D. Butler

Thatch is defined as a tightly intermingled layer of living and dead stems, leaves, and roots of grass which develops between the layer of green vegetation and the soil surface. Its occurrence is generally associated with conditions that limit the decomposition of organic matter (4) or favor rapid vegetative growth, or both (3).

Thatch accumulation may also be accelerated by some pesticides through their effects on soil organisms. Randell *et al.* (5) reported that two insecticides, chlordane and dieldrin, caused substantial increases in thatch and reduced earthworm activity in Kentucky bluegrass turf. Some herbicides are known to inhibit the growth of turfgrasses or cause effects which are manifested as an increased susceptibility of the turf to diseases and other environmental stresses. Callahan (1) reported increased disease and drouth injury to bentgrasses in midsummer from many preemergence herbicides. Gaskin (2) determined that DCPA, at standard application rates, caused significant reductions in rhizome and tiller development in Kentucky bluegrass turf. Bandane caused these effects only at 1.5 times the standard application rate of 40 pounds per acre. Some herbicides may, therefore, produce effects which simultaneously promote and inhibit processes related to thatch formation.

The purpose of this study was to determine the effects of several preemergence herbicides on thatch development in a Kentucky bluegrass turf.

MATERIALS AND METHODS

An eight-year-old turf of Merion Kentucky bluegrass received two successive annual applications of bensulide, calcium arsenate, bandane, DCPA, siduron, and benefin. Treatment dates were May 22, 1970, and May 6, 1971. Plots measured 10 by 10 feet, and each treatment, plus control plots, was replicated three times. Thatch was measured in centimeters on 10-cm. diameter plugs extracted from each plot in November of 1970 and 1971.

RESULTS AND DISCUSSION

Essentially no thatch accumulation was observed following the first series of herbicide treatments in 1970; however, the second series of treatments apparently caused significant amounts of thatch to develop in plots receiving calcium arsenate and bandane (Table 1). Of the materials tested, these two herbicides are the only ones known to have insecticidal activity, suggesting some deleterious effects on soil biological activity.

Table 1. Thatch Development in Kentucky Bluegrass Plots Following Two Successive Herbicide Applications

Treatment	Herbicide formulation,[a/] %		Rate, a.i.,[b/] lb./A.	Thatch depth,[c/] cm.
bensulide	12.5	G	15	0
Calcium arsenate	48	G	392	1.43
DCPA	5	G	15	0
bandane	10	G	35	2.06
siduron	50	WP	8	0
benefin	2.5	G	2	0
control	...		...	0

a/ Formulations included granular (G) and wettable powder (WP) materials.
b/ a.i. means active ingredients.
c/ Thatch measurements are the means of three replications.

A.J. Turgeon is assistant professor and T.D. Hughes is assistant professor, Department of Horticulture, University of Illinois at Urbana-Champaign. J.D. Butler is now associate professor, Department of Horticulture, Colorado State University.

Increased use of pesticides has in some cases been associated with accelerated thatch formation and other problems in turf. The obvious advantages derived from these materials must be weighed against some of the disadvantages associated with their use in order to evaluate fully their proper role in turfgrass management.

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SLOW-RELEASE NITROGEN FERTILIZER FOR TURF

T.D. Hughes

The technological advancements that have become realities in recent years have provided turf managers with many new tools. These advancements, however, have also made the field of turf management more complex. This new and increasing complexity, in turn, requires that turf managers continually increase their knowledge. New tools usually represent improvements, but proper employment of these tools is necessary if desirable results are to be obtained. Improper employment of these new tools can lead to poor results.

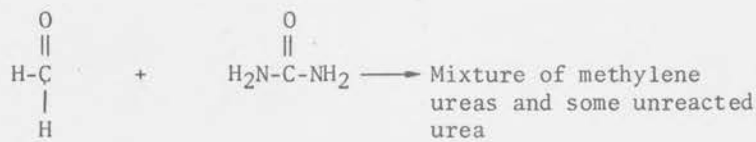
Slow-release nitrogen fertilization of turf is no exception. New materials are coming on the market, and these new materials represent new technological advances or tools that were not previously available to turf managers.

There are a number of slow-release nitrogen carriers currently available. Milorganite, of course, has been available for some time. Urea-formaldehyde and magnesium ammonium phosphate have also been used in the past. Another urea aldehyde condensation product, isobutyldiene diurea, is now available. Other materials having plastic or resin coatings are also available. Oxamide and sulfur-coated urea, as well as other materials, may someday be used extensively on turf areas.

An extensive discussion of all these materials will not be presented here, however it appears that a detailed comparison of urea-formaldehyde and isobutyldiene diurea would be of particular interest at this time. Most turf managers are quite familiar with milorganite and its behavior. Urea-formaldehyde is also familiar to most, but isobutyldiene diurea is relatively new and there are some similarities as well as differences that are important in determining the chemical behavior of these two materials in soils.

UREA-FORMALDEHYDE

Urea-formaldehyde is actually a mixture of chemical compounds. It is formed by chemically reacting urea and formaldehyde (Fig. 1).

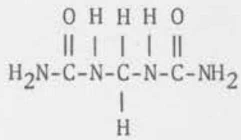


Formaldehyde Urea

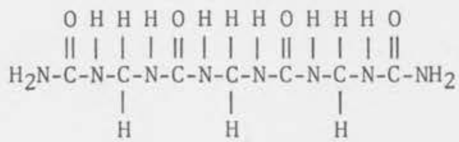
Figure 1. Chemical reaction of urea and formaldehyde.

The mixture of methylene ureas that makes up urea-formaldehyde fertilizers is shown in Figure 2. Some unreacted urea along with the simpler methylene ureas constitute a soluble and readily available nitrogen. The more complex methylene urea molecules are more insoluble and these provide a lasting supply of nitrogen. Usually these polymethylene ureas contain less than 7 urea molecules.

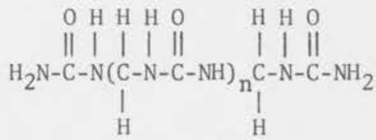
T.D. Hughes is assistant professor, Department of Horticulture, University of Illinois at Urbana-Champaign.



Methylene diurea



Trimethylene tetraurea

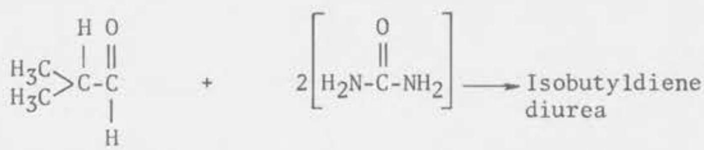


Other polymethylene ureas (n usually <7)

Figure 2. Various methylene ureas included in urea-formaldehyde fertilizer.

ISOBUTYLDIENE

Although isobutyldiene diurea is also formed by condensation of urea and an aldehyde, isobutyl aldehyde is used instead of formaldehyde (Fig. 3). The end result is not a mixture of chemical compounds, but a single compound (Fig. 4). Both urea-formaldehyde and isobutyldiene diurea are not available for plant growth. When in soil, both compounds go through similar reactions before forms of nitrogen available to plants--urea, ammonia, and nitrate--are produced (Fig. 5). The first hydrolysis reaction is actually the reverse of synthesis for these materials. The aldehydes are released at this point. The aldehydes are volatile and are believed to escape from soils. Once this step is complete, all other reactions are identical. As a matter of fact, they are identical with those that occur when urea is applied to soil. Thus, the first hydrolysis step is the rate-limiting step and it is in this step that urea-formaldehyde and isobutyldiene diurea differ. Formation of urea from urea-formaldehyde appears to be largely dependent on biological attack, according to Corke and Robinson (1), whereas Lunt and Clark (3) found that hydrolysis of isobutyldiene diurea to form urea was not (Table 1). This points to an important difference in that formation of urea from isobutyldiene diurea should be affected less by temperature.



Isobutyl aldehyde Urea

Figure 3. Chemical reaction of urea and isobutyl aldehyde.

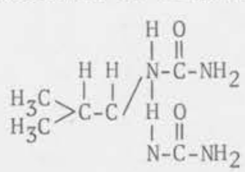


Figure 4. Isobutyldiene diurea.

$$\underset{\text{IBDU}}{\text{UF}} \xrightarrow{\text{Hydrolysis}} \underset{\text{Urea}}{H_2N\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2} \xrightarrow{\text{Hydrolysis}} \underset{\text{Ammonium}}{NH_4^+} \xrightarrow{\text{Nitrification}} \underset{\text{Nitrate}}{NO_3^-}$$

Figure 5. Reactions of urea-formaldehyde and isobutyldiene diurea in soil that yield nitrogen forms that are available to plants.

Table 1. Conversion of IBDU-N to Forms Available to Plants, Lunt and Clark (3)

IBDU Diam.,(mm.)	Incubation condition	% of added N converted 50° F.	80° F.
.15-.24	Nonsterile	35	45
.15-.24	Sterile	32	43
1-2	Nonsterile	21	25
1-2	Sterile	19	24

Soil pH has been shown to have drastic effects on rates of conversion of isobutyldiene diurea (Fig. 6). Kralovec and Morgan (2) have also shown a pH effect for urea-formaldehyde. However, this appears to be somewhat less drastic and, in contrast with isobutyldiene diurea, the maximum release occurs at a slightly acidic pH. This points to the importance of considering soil pH when comparisons are made between these two materials. Moisture and particle size also have definite effects on both materials.

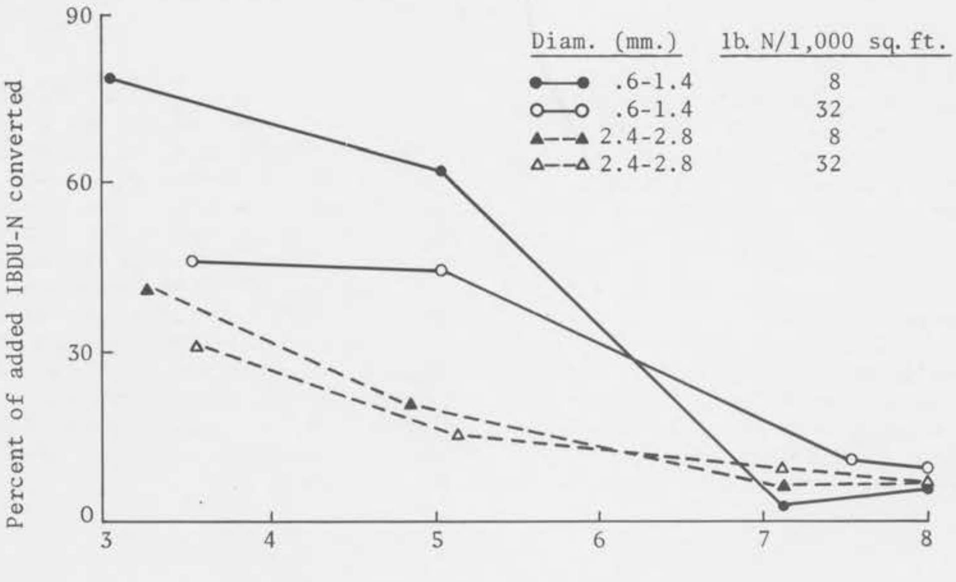


Figure 6. Percent of added IBDU-N converted to plant-available forms at various soil pH levels, Lunt and Clark (3).

Now to a more practical discussion. From the previous discussion we saw that slow-release nitrogen fertilizers do, in fact, release plant-available forms of nitrogen slowly. Thus, they offer the advantage of safety or protection against foliar burning. Also, it should be possible to maintain turf areas with fewer fertilizer applications. But, purchase costs for slow-release nitrogen materials are considerably higher. This tends to offset the labor savings. Certainly, one should be able to produce the ultimate in terms of quality turf by use of readily soluble carriers. Use of readily soluble carriers facilitates the ultimate in control of nitrogen supplies and some of this control is relinquished when slow-release materials are used. Thus, the decision as to the "best" nitrogen fertilization program to follow depends on many factors and is a management decision that is not necessarily the same for all situations.

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WINTER INJURY PROBLEMS

A.R. Mazur

SNOW MOLD

In the northern areas of the United States, snow mold is a common cause of winter damage. There are four distinct snow-mold pathogens--*Fusarium nevale, Typhula spp., Sclerotinia borealis*, and an unidentified basidiomycete. Although the effects are not usually obvious until spring, these fungi may initiate growth in the cool, moist periods during late fall. Snow-mold damage is generally most severe when snow cover is established before there is frost in the soil. Snow cover, however, is not necessary for the development of snow mold, since it can develop at any time of the year when light intensity is low and temperature and moisture are at the optimum. When damage is confined to leaf tissue, the grass plant will easily recover. However, if optimum conditions for fungi growth persist, then damage to crown tissue will require renovation of dead areas.

DESICCATION

Desiccation occurs any time during the season when moisture loss from the leaf tissue through evapo-transpiration exceeds the rate at which roots replenish moisture to the plant. During the winter, when the availability of moisture is reduced in frozen soils, desiccation can result. In the Midwest, conditions of open, windy winters and low precipitation can result in severe damage. Elevated areas which are exposed to the effects of drying winds are usually the hardest hit. Thatchy areas with elevated roots and crowns are quite susceptible to this type of damage.

LOW-TEMPERATURE INJURY

Freezing or low-temperature kill is the third form of winter damage. Turf damage is often evident in the spring despite the fact that the cool-season grasses are well acclimated to the freezing conditions of winter. The grass plant, under normal conditions, has a built-in protection against low-temperature damage by a gradual change in cell metabolites as it hardens with the onset of winter. In the hardened state the grass can tolerate extremely low temperatures. Most damage from freezing usually occurs in the spring when the plant has come out of this hardened state and is ready to initiate growth. If the weather turns cold again and the turf is covered by ice or snow, low-temperature injury can result. Damage is usually greatest in low, poorly drained areas or where traffic results in the accumulation of ice around the crowns of the plants. Damage can also occur in the early winter if cold weather comes before the turf has attained the hardened state.

MANAGEMENT

Management is the key factor influencing winter survival. Initially, grass varieties should be selected that are most suited to the local environment. In the transition zone, you are taking a chance with warm-season grasses by trying to extend their normal geographic limits. In the north, we are interested in selecting turf varieties such as Toronto that have a history of tolerance to winter injury.

Management operations in the late summer and early fall are particularly critical to winter hardiness. Fertility levels should be slackened off in the fall to allow adequate time for turf to harden off. Early fall fertilization has been reported to increase the development of both pink and gray snow mold. If potassium is to be applied to improve winter hardiness, it should be applied early enough in the season to take full advantage of its effects. Late

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A.R. Mazur is a graduate research assistant, Department of Horticulture, University of Illinois at Urbana-Champaign.

fall fertilization with readily available materials can result in an overstimulation of turf and a high salt index in the soil solution which will considerably reduce winter hardiness.

Early fungicide application with Demosan or organic mercury fungicide about the time leaves begin to drop from the trees appears to give the best degree of snow-mold control. A second application in early winter just prior to the first snow coverage affords added protection against snow-mold damage. A close watch should be kept during the spring thaw, because curative application may be necessary to reduce turf losses and suppress sclerotia formation by Typhula. Sclerotia provide an excellent source of innoculum for future years. Brushing and raking of matted turf prior to fungicide applications will improve results.

In northern areas it has been the general practice to recommend late spring or early summer weed control. All herbicides adversely affect the metabolism of the turf to some extent, and it is not advisable to weaken the turf just prior to the winter season.

A regular program of thinning and topdressing should be underway to keep thatch in the desired proportions. Excessive thatch promotes elevated crowns and restricted roots that are subject to desiccation and low-temperature injury. The thatch also provides an excellent environment for the development of snow mold. Renovation and seeding operations should be completed early enough in the fall so that the turf will have recovered or established prior to the onset of cold weather. A late seeding can be severely damaged by the thrusting action as a soil freezes and thaws in the fall. Aerating greens late in the fall and leaving the aeration holes open over the winter can be risky business. Although this improves drainage around the crowns of the grass plants and reduces the threat of ice damage, it greatly increases the likelihood of injury from desiccation during open winters. It is always advisable to follow aeration with a topdressing. Observations over the past few seasons indicate that a late, heavy topdressing at about twice the normal rate (2/5 cubic yards of material per 1,000 square feet) has afforded the turf an extra measure of protection during the winter.

It is obvious that turf areas should be mowed as long as leaf tissue continues to develop. Tall, matted turf provides an excellent environment for the development of snow mold.

The importance of good drainage cannot be overstressed. Excessive moisture in contact with plant tissue at critical periods often results in low-temperature kill. Good surface drainage is essential, because little, if any, moisture percolates through the frozen soil profile. Swales and slit-type drains also have been used effectively to intercept and divert runoff water.

Generally, moisture from natural sources is adequate to maintain turf areas through the winter. However, a need for supplemental moisture can develop after an open winter with limited precipitation. The turf can be severely desiccated when subjected to drying winds without a snow cover. Desiccation is imminent when moisture is constantly lost from exposed tissue and little if any moisture is being replaced by the root systems in the frozen soil. Supplemental water applied during the day, when temperatures are above freezing, will help reduce or eliminate injury from desiccation. Since the watering systems are winterized during these periods, the water must be applied from sprayer tanks.

Precautions should be taken to avoid traffic on dormant turf. This is particularly critical during wet, slushy periods. In addition to attrition, traffic packs the wet snow close to crown tissue which greatly increases the chances of low-temperature kill.

ARTIFICIAL PROTECTION

There are a number of products on the market that can be used for winter protection. In the past, brush or snow fences have been used effectively to collect snow on exposed greens to afford them an extra measure of protection. In the last few years, anti-desiccants, protective screens and covers, and electric heating cables have been used on turf areas with variable success.

In effect, artificial protective measures are an attempt at regulation of the environmental conditions near the plant. By controlling moisture loss, restricting low temperature, and buffering against rapid temperature fluctuations, we hope to minimize or eliminate the damaging effects of winter weather.

Although anti-desiccants have been used effectively on horticultural plantings, recent results have shown them to be ineffective in reducing moisture loss from turf during the winter months.

Over the past eight or ten years, many different types of screens and covers have been tried in various sections of the country, at universities, by industry, and on golf courses. Generally, they have been a topic of mixed emotions. During difficult winters, all covers reduced or eliminated winter injury. During normal seasons, the covered areas greened up two or three weeks earlier in the spring, but there was no difference between protected and nonprotected areas by the time they were put into play.

The response of turf to the materials was wide and varied. Factors such as the color of the materials and the amount of air exchange contribute to the varying results. Prior to the selection of a material, it might be advisable to check recently published results on the subject.

Preventative fungicide treatments should be made before the screens and covers are put in place in the fall, because the environment under these covers is ideal for the development of snow mold. The critical factor associated with the use of protective coverings seemed to be timing their removal in the spring. The covers should be removed early enough to avoid over-stimulation of succulent foliage, yet late enough to provide full protection. Covers left in place too long can create mowing difficulties; therefore, removal a few days too early is better than being late. After removal of the covers in the spring, mowing should be delayed a few days to allow the turf to adjust to the open environment.

Heating cables provide another source of winter protection. They have been used alone and in conjunction with protective coverings. To date, the use of heating cables has been confined principally to athletic fields. The use of heating cables on golf courses in the future seems extremely doubtful due to the high cost of installation and operation. Use on limited areas (such as practice greens) to prolong outdoor activity may, on the other hand, prove economically feasible.

RECOVERY

Recovery of injured turf depends wholly on the degree of damage to growing points on crowns. If the damage is confined to leaf tissue, the turf will recover. Where injury involves the crown tissue, dead areas will require over-seeding or sodding.

Aeration, thatching, topdressing, over-seeding, and syringing will be required to bring injured areas back into play. Over-seeding with a mixture of 10 pounds of creeping red fescue and 1 pound of creeping bentgrass per 1,000 square feet reduces recovery time markedly. Although the red fescue does not persist much after the first few months, it helps provide a very favorable putting surface in a shorter period of time than if creeping bentgrass were used alone. The fescue, because of its lack of aggressiveness, only fills the void until the slower establishing bentgrass can take over.

SODDING TECHNIQUES

Ben Warren

A discussion of sodding techniques must be two-sided. Those procedures carried out by the grower just prior to harvesting are as important as the various aspects of planting.

The final maintenance of grass during the two or three weeks prior to harvest is somewhat different from routine. Mowing is stepped up, being done on a daily or two-day schedule. If final inspection for broad-leaved weeds indicates a need, a herbicide application is made at least three weeks before cutting. About 10 days prior to expected cutting, a light application of soluble nitrogen is made. We are investigating the practical application of research, reported from Rutgers, which indicated significant increase in rooting rate of transplanted sod receiving nitrogen within a day or two of transplanting.

Water management becomes crucial a day or two before harvest. Sod that is too dry can suffer during transporting and is a problem for the layer. Sod that is too wet is difficult to handle and increases transportation cost.

A few words about fertilizing and mowing prior to cutting. Heating is an ever-present problem with sod in warm weather when it is stacked on trucks for transportation. We have used various methods of avoiding this. In the past, ice was rolled into the sod and this helped some, although it added to cost and increased the weight. Vacuum cooling has been the most effective way of eliminating this trouble, although the equipment necessary is not universally available. Research at Michigan State resulted in the suggestion that this problem was reduced when the nitrogen level was low, and the grass was mowed down to about 3/4 inch prior to cutting. This kind of treatment would result in less attractive turf than the public expects, and only in unusual circumstances would it be accepted.

Grading is one of the most important components of successful sodding. Using the right tools is important. We favor either the Roseman Rake or the Viking Grader. When the area has been filled more than a few inches or has been cultivated deeply, it is important that the area be well compacted before finishing the final grade.

Occasionally we see sod that takes an abnormal amount of time to root. We think that two things may account for this. Some sites have had a history of preemergence herbicide applications. These materials inhibit root development and, because of their widespread use, it is wise to inquire about past use before proceeding with planting. Activated charcoal can be used in neutralizing most of these chemicals. The other practice which seems to cause this condition is the overuse of water.

The actual laying of sod is not complicated. Certain practices must be followed, such as avoiding too much stretching, butting edges tightly together, avoiding overlapping, and applying water immediately after unrolling.

Fertilizer is a most important component of successful sodding. We prefer that an inorganic complete fertilizer, having a 2-1-1 ratio, be raked into the final grade just after the final grading. Where tests show low phosphorus, superphosphate should be incorporated to a depth of 4 to 6 inches.

The final responsibility of successful sodding is the immediate post-planting maintenance. There should be definite understanding regarding who assumes this responsibility between the contracting parties. If the new owner assumes the chore, he should be well informed regarding practices necessary to assure satisfactory establishment.

Ben Warren operates Warren's Turf Nursery, Palos Park, Illinois.

REASONING BEHIND TODAY'S FERTILIZER RECOMMENDATIONS

J.M. Latham

In the relatively short period of time fertilizers have been used on turfgrasses, the name has changed from a four-letter word to several multi-letter words. Use patterns have gone from zero to literally thousands of pounds per acre, from low-analysis to high-analysis materials, and from annual to weekly applications. This was called progress.

If that be so, why are we now regressing to smaller, less frequent applications, to special minor-element applications or having these chemicals included in mixed goods, to the total elimination of nitrogen during some periods of the year? Maturity!

About six or seven years ago we attended a turf conference in northern New England and talked about using fertilizer according to growth needs of the plant. One of the professors berated us mightily afterwards, saying that their recommendations were two to three times higher. They did this assuming people would use only half of what they recommended anyway, so everything would be fine. Hence we were "way off base."

All too often, however, fertilizer use on turf has gone the other way. In the Midwest, for example, some people insist on making organics work on cold, wet soils in the spring. When no results are seen, another application is made. Then comes sudden warm weather and boom! Trouble. And there are those who still believe if a little does a little good, a lot will do a lot of good. They are bound to *make* the grass perform in ways which it is incapable of performing.

Recently, thoughtful turf managers and agronomists have finally realized that prime interest doesn't rest in the crop being harvested, but in the plant residue remaining *after* harvest. In doing so, they found that color is not the most important factor in turf quality. The maturing process began.

When we *look* at fertilizer test plots, our first judgment is made on greenness. The greener the plot, the better the turf. But what about other factors such as thatch formation, and susceptibility to damage from diseases, insects, and traffic? What about putting quality in the late afternoon under a heavy nitrogen program? We soon learn that color is less important than other quality measures.

Let's move away from the side-by-side comparisons. What color comparisons are made on a football field? Green and brown or black. Over-fertilized athletic fields are almost as poor as unfertilized fields from the standpoint of wear. On golf courses there are several color comparisons: greens versus aprons, fairways versus roughs. This is as it should be since differentials in green color, target visibility is improved. But to maintain a fairway like a green means growing more hay and thatch than can ever be controlled mechanically. Also, why should a green be super-green if it brings on more trouble and work and expense, if nothing is added to putting quality? In fact, putting quality and uniformity may even be reduced.

The advent of high-analysis fertilizers was hailed as a boon to agriculture, since shipping weight per pound of nutrient was reduced as was bulk to be handled by the consumer. This is true. Then, lo and behold, all sorts of minor element deficiencies began showing up. Sulfur is one, since there is little ammonium sulfate or 20 percent superphosphate used in mixed goods today. In some areas magnesium is lacking because dolomite is not used as a filler anymore. This means that sulfur and other minor elements have to be *added* to mixed goods. Sure, the freight is still cheaper, but what do you pay for mixing?

The value of potash to high-quality turf is undeniable. Early research by O.J. Noer, for one, found that both cool-season and warm-season grasses remove soil nutrients in a ratio of 3 or 4

J.M. Latham is chief field agronomist, Milwaukee Sewerage Commission, Milwaukee, Wisconsin.

parts nitrogen, 1 part phosphate, and 2 parts potash. This became *The Turf Formula*. It is a good one where clippings are removed with mowing. But what happens in areas where clippings are not removed? They fall back to the surface and are decomposed, returning the minerals to the soil. It's a definite recycling process. If we believe in soil tests and if an analysis shows adequate potash content, why pay to put it on? This is true not only for potash, but for other "testable" elements as well.

Research on turf fertilization has matured also. Fertilizer test results are seldom measured in yields anymore, because it doesn't mean anything to a turf manager. High yield means trouble most of the time. The problem lies in the judgment of true turf quality. There are few impirical measurements of quality, and hence results are open to question. Judgment of quality depends on the *use* to be made of the turf--golf, home lawn, industrial lawn, highway rights-of-way, and athletic fields have different criteria of quality and must be so rated.

Because researchers must be noncommittal on nitrogen sources, they contribute to problems of the user. They report that urea-formaldehyde gives good results. You want to purchase some, then comes the question, "Whose?" Uramite, Nitroform, Borden's? They differ in activity index which determines N release. What particle size, coarse or fine? The finer the particle, the faster the release. The same goes for sludges. Do you use a coarse material like Milorganite or fine material like Chicago or Houston sludge. These products *do not* react in the same way. It is now time for products to be identified at least in footnotes so the person who reads the research-based recommendations will know the nutrient-release characteristics of the materials tested.

While on the subject, we think it is high time corn or cotton agronomists stop giving opinions on the fertilization of turfgrasses. This involves inter-departmental maturity at a university level. It's amazing how easily some people become expert in fields where they have never experimented and whose only claim to knowledge is a front yard.

A soil expert told a turf group down south a few years ago that proper fertilization of "turf" (no specific area) required the same fertility as a hundred-bushel corn crop. Some comparison! Recently someone at the University of Illinois said dormant fertilization was a farce and anyone who used a high-priced organic had more money than sense. If he was talking about corn or soybeans,he was right, but many, many *turf* research papers show him to be wrong. You can imagine the consternation of a greens committee chairman looking at 20 tons of a high-priced spread he had just purchased. Upon checking with golf course superintendents who practice dormant fertilization, he didn't feel so bad. But what must he think of agronomists?

Finally, application patterns are changing both North and South. Research in Rhode Island, Virginia, and Michigan proved that golf courses making dormant applications of fertilizer were not out of their minds. In Milwaukee, the Country Club has been doing this to fairways since 1932. It eliminates spring work while encouraging an earlier green-up. Dormant applications in late November to early December are made without pressure and do not contribute to disease occurrence. They carry the turf into June when summer help is available and do not cause excessive spring growth. An August application keeps the grass growing well, but allows for a hardening-off period before winter. Greens also respond well to dormant fertilization.

On the other side of the coin is the "no-nitrogen school" during hot weather. Adapted from the hot southwest, bent growers in warmer areas are getting excellent results by pushing nitrogen applications during the fall and spring with residual nitrogen sources, then applying none or very little from May or June till September. They report better putting, tighter turf, less wilt, less disease, and less worry during the "hot hundred" days. Color, if needed, is supplied either by ferrous sulfate or light,applications of nitrogen as needed. Potash, etc., are applied in spring and fall only to avoid salt problems during the hot weather.

Yes, fertilization recommendations are changing, mostly for the better. We are now thinking about plant usage and quality rather than expediency and quantity. This improves the efficiency of all facets of turfgrass management, not just the small percentage of the budget spent on fertilizer. As long as moderation remains primary--neither minimum nor maximum use--fertilization progress will continue to provide better quality turfgrass. Quality, after all, is the only thing we have to sell.

PROFESSIONAL IMPROVEMENT FOR THE TURF MANAGER

James W. Brandt

The subject of this speech is one that is intriguing. Yet, there is some difficulty in writing or speaking on something that is considered to be an intangible or abstract quality, rather than something that is realistic. It shall be my challenge to prove that professional improvement is something that is real . . . something that is obtainable by each and every one of you.

WHY BOTHER WITH SELF-IMPROVEMENT?

The first question we must ask ourselves is, "Why improve?" The reasons are many, but we will only give you a few. They are: personal gain; personal satisfaction; recognition; and improvement of working and managerial ability. Let us talk briefly about each of these four.

Personal gain. Each of us has a product to sell. Now, we are not talking of sod, landscaping, or grass, but we are speaking of our ability. Each of us is in our present capacities because of certain capabilities. If we improve in our capabilities to produce, it stands to reason that we will be paid for our increased production, whether it be in quality or quantity of our output.

Personal satisfaction. There can be no greater satisfaction than doing what we want to do in life and doing it to the best of our capabilities. We must presume that you are in your chosen profession. Then the only way we can really feel satisfied is to know that we are doing everything possible for ourselves and our employer.

Recognition. What is recognition? Any of you who are currently holding an office or have held office in your organizations have received recognition by your co-workers. This is recognition in its highest sense.

Improvement of working and managerial ability. We have had many occasions to visit golf courses, and can remember instances where we have looked up the superintendent. In one case, we observed a superintendent directing the work of his crew, keeping everyone busy and producing. On the other hand, we have observed a superintendent working to his maximum capacity while his workmen were "goofing off" in the shade. Granted, we must know and teach each operation, but we must not feel that it is easier *to do than to show and teach.*

HOW TO IMPROVE YOURSELF

We have discussed why one should improve. Now let us see how this can be done. We would list three major categories in which one could improve. They are: education, self-expression, and involvement.

Education

Each of you here today is participating in one major phase of education. That is, the attending of turfgrass conferences. We are certain that you will have learned much from the previous speakers on the program. Just as certain as you are sitting there, we are going to be faced with more restrictive legislation in the use of pesticides. By pesticides we mean insecticides, herbicides, and fungicides. Some of you now are required by state law to have a license, either an applicator's or operator's license. It will be the duty of your state universities to set up programs to enable you to qualify for the appropriate license. You, of a necessity, must qualify. When these programs are offered, you must attend.

J.W. Brandt is superintendent, Danville Country Club, Danville, Illinois.

You can learn just as much as you desire by reading. We, as practical people, know that we must fertilize, irrigate, mow, prune, trim, and use preventive and curative pesticides. Have you ever bothered to find out "how" a grass plant can be burned or what happens when we apply a preventative or a herbicide that will eradicate a plant? You might think that returning to school is out of the question. Yet this can be done.

You could add to your knowledge in the following ways:

1. Attend a winter short course, such as the ones offered by Penn State or Massachusetts.
2. Take a correspondence course.
3. Attend night classes at university Extension centers.
4. Golf course superintendents could study for certification. In the certification program the study materials are furnished. The speed with which you complete the study and complete the tests are up to the individual. We would strongly suggest that any of you who are eligible should participate in this program. Participation in local and national meetings of your respective associations is also helpful. You should listen, learn, and contribute at these meetings.

Self-Expression

Here we open up a whole "Pandora's Box." We express ourselves in how we dress, act, and communicate. Dress is a matter of personal taste, but remember that if you are standing with your work crew, any passerby should be able to pick out the man in charge by his appearance. When you go away from home, you should wear your "Sunday best." The old adage, "actions speak louder than words," certainly holds true. Look and act the part of a professional turf manager. Be a good listener. This way you can find out what the other person knows. Then if someone asks you to speak, you may let them listen to your bit of knowledge.

There are two great organizations that would be of great benefit to you in your quest for effective communications. They are Toastmasters and the Dale Carnegie course. Do you have difficulty in having workmen follow your orders? If so, could it be that they are stupid, or could it be that you are not expressing yourself clearly? The classic example of this is the true story of a golf course superintendent telling one of his workers to "hoe up" the roses in the bed in front of the club house. On checking he found the roses were truly hoed up and lying in the bed with their dead roots exposed to the sun.

We had thought that the membership of our club was not very friendly. We were even jealous of the affection that the membership showed to our golf professional. One evening as we were reading the local paper, we saw the picture of a friend who had been elected president of the local Toastmasters Club. We called him that same evening, had all our questions answered about Toastmasters, and were invited to their next meeting. This was quite a rewarding experience. To our great surprise, we found that the greens chairman was a member of Toastmasters. He was greatly pleased that we were joining Toastmasters. He was one of our first speech evaluators. His words written in our training manual were . . . relax, smile, be friendly, and show a genuine interest in others. He even suggested that we spend some time in the pro shop meeting the membership.

Our first Saturday around the pro shop was quite a revelation. The pro was warm, friendly, and showed a genuine interest in each member. We commented to the pro on this. He said, "Jim, these people are my customers, I must do these things." This thought really struck home. After all, these people were our customers, too. True, we were not selling merchandise, but these club members were buying our services on the golf course. We decided to try his same approach. It was amazing what a fine membership we discovered at the club.

Our Toastmaster training has been very helpful at budget time. Many times funds are not allocated on the basis of need, but are awarded on the basis of the presentation of the need. You must show a clear, concise report on expenditures. You must show thoughtful planning and a definite need for any increases requested. Your board members are business men. They expect the budgeting and spending of the club's monies to be handled in a businesslike manner.

The essence of Toastmaster training lies in the objectives of its original conception:

1. Better speaking.
2. Better thinking.
3. Better writing.
4. Better listening.

In 1948 Reggie Moore was a truck driver for a major oil company. That year, Reggie decided to do something with his future. He enrolled in a Dale Carnegie course. When he was getting ready to attend his first session, his wife said, "Any truck driver who thinks of speaking and that other nonsense has to have rocks in his head." The other drivers thought it funny and when someone wanted to thank the company for a Christmas party, they elected Reggie, mostly as a joke. Reggie accepted the challenge and proved he was their spokesman. Shortly afterward, for a management meeting, Reggie was again the spokesman without a vote, as the drivers had accepted him as their leader. He was then offered a job on the sales force. His courage, confidence, and effective speaking ability showed him as a capable leader. Since that time Reggie has received 13 promotions. He is now vice president in charge of consumer sales for a major oil company. Why not avail yourself of the great opportunity for development offered by one of these outstanding organizations.

Involvement

You can greatly improve yourself by becoming involved. Serve on committees in your community. Become involved in garden clubs, Boy Scouts, and trade associations. Speak on your profession when given the opportunity. Why not become involved in organizations dealing with conservation, ecology, and environment? You would be greatly surprised at the amount of knowledge you can impart to these organizations. This will require your becoming more knowledgeable in the use of certain chemicals. Both you and the organization will benefit greatly from your active participation.