September/October —

The O.J. Noer Foundation is 25 years old in 1984. This issue will look at the history of the Foundation, the Symposium and O.J. Noer. These are important topics in the history **and** future of the WGCSA. Charlie Wilson, Jim Latham and Bob Welch have agreed to carry the bulk of the burden in preparing this issue.

November/December —

The heritage of the WGCSA will be treated in the year's final newsletter.

These coming issues are **not limited** to the above topics, however. Any material you feel important will be included in the GRASSROOTS. Just like anything else, the newsletter will only be as strong as the participation and the support from the membership. Lend a helping hand, please.

## Plan ahead!

That's the advice from Ed Devinger, Turf Division Manager of Reinders Brothers. Ed reports that about 25% of his company's October stocking orders are still short, and that lead time will be more and more important when ordering new equipment. He also pointed out that grass seeds are in a critical shortage situation, and many just aren't available. The poor weather last year in the seed growing areas of the Northwest have left the industry without some bents, and many hybrid Kentucky Bluegrass varieties are sold out. Ed says that situation will be with us until the fall crop comes in.

Reinders Brothers staff have a confident outlook on business in 1984 and are noticing some "loosening" of the municipal markets. They also are finding the lawn care industry professionals are very busy. One factor in this optimistic attitude expressed by Devinger is the fact that product prices are stable, welcome relief after too many years of escalating prices.

Reinders has appointed Paul Feldhake as their Milwaukee area Sales Representative. Feldhake, a native of Verona and a former UW—Madison student, has golf course experiernce in Minnesota and at Nakoma Golf Club in Madison.

## There's still time

There is still time to notify the Wisconsin Department of Agriculture of your interest in participating as a cooperator in the 1984 Gypsy Moth Trapping Program. In the southern parts of the state, traps should be in place prior to July 14, so we are not under the press of time to sign up as a cooperator. Julie Nara, Entomology Specialist for the Department, reports that golf courses are particularly good trapping sites because of executive moves into urban locations where golf courses frequently found. The insect is usually carried into an area by vehicles and possessions of individuals coming from places infected with the Gypsy Moth. Details on cooperating were included in the last issue of the GRASSROOTS. For more details or additional information, contact Julie Nara at (608) 267-7727 or call (608) 266-2295 and leave a message.

## A message from the CMAA-Badger Chapter

It is difficult to imagine when looking out at the golf course from my office that 3 days ago on Easter Day we had 4 inches of snow. The first thing that came to my mind was the Manager-President-Superintendent-PGA Pro Golf Tournament to be held at Milwaukee Country Club on May 14, 1984 and I am keeping my fingers crossed that it will neither snow nor rain.

All preparations are underway and I know it will be an outstanding day for all participants. We have some outstanding prizes and surprises which will make this day one to remember.

I look forward to seeing many of you there, until then, good weather to all of you.

Bernie Sturm
President, Wisconsin Badger
Chapter, CMAA
Blackhawk Country Club

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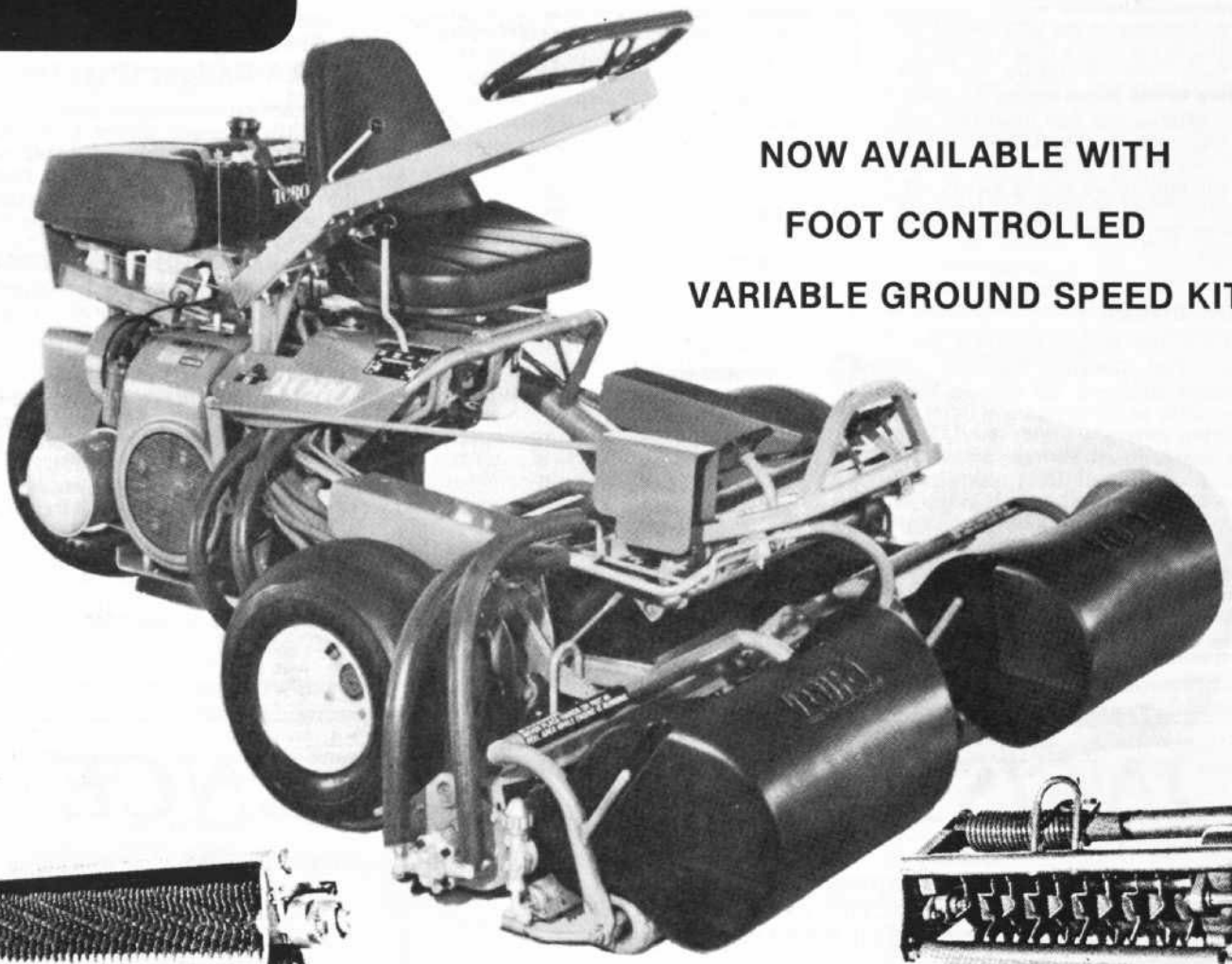

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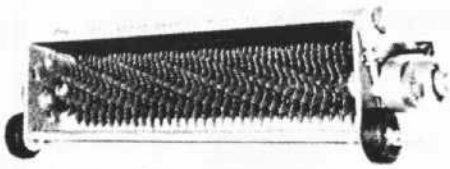
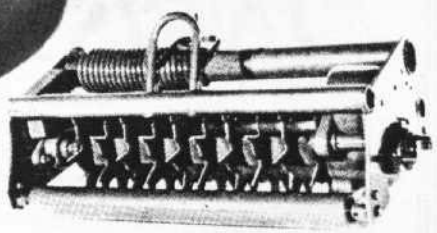


THATCHING REELS



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## TURF EQUIPMENT

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*Editor's note: A native of Wisconsin, Bob Lohmann received a Bachelor of Landscape Architecture from the University of Wisconsin—Madison in 1974. His experience both on the drawing board and in the field are indicative of his qualifications as a golf course planner. Mr. Lohmann has been actively invovled in designing, building and remodeling golf courses for the past ten years. He is a registered Landscape Architect and a member of the American Society of Golf Course Architects and the American Society of Landscape Architects.*

### An Architect's Opinion

# CONTOUR MOWING FOR PLAYABILITY — AND IT'S WORTH IT

*by Bob Lohmann*

Modern equipment utilization, unmaintained out-of-play areas, overgrooming is overspending, the natural look, native areas; these are all phrases of the 80s that everyone is saying and hearing. But let's not forget the elementary rules that a golf course must obey as stated by Bobby Jones over 45 years ago: "The first purpose of any golf course should be to give pleasure, and that to the greatest number of players . . . because it will offer problems a person may attempt according to their ability. It will never become hopeless for the duffer nor fail to concern and interest the expert."

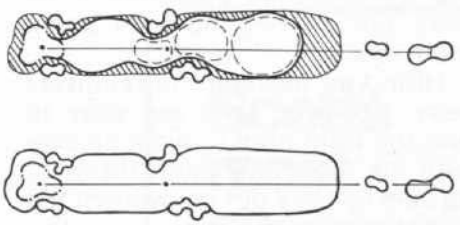
The typical club membership includes players of a wide range of abilities. It must serve men, women, seniors, juniors, beginners, duffers, bogey and scratch. For this reason, playability of a golf course is very important and should be reviewed constantly by the superintendent, professional, and greens committee. Playability can be created or improved by the inexpensive practice of establishing new mowing patterns, not by rebuilding the entire golf course, as many people believe. Playability is the combination of flexibility, fairness, difficulty, distinction, accuracy, finesse, challenge and shot value.

Most American country club members will not accept a completely natural golf course on a daily basis. But on the other hand, the golfer has become educated to the point where he realizes that the wide, long, straight-lined fairways present on many golf courses today are out of date, unimaginative, and overly expensive to maintain. Most golfers are willing to accept the target golf concept as long as it is not a do-or-die situation, and it adds to the strategic playing interest and eye appeal of the golf course.

Many golf course fairways are overmaintained, not in quality, but in quantity. In some cases, if the latter were decreased, the savings could be applied toward the former in either increased or alternative maintenance procedures such as lightweight mowing or chemical applications.

The fairway is more than an open area that receives your golf shots. It is the target area designed to specific widths and depths in order to serve golfers of various abilities. The rough adjacent to the fairways should be maintained so the golfer can find his ball, yet not necessarily have an ideal lie.

Reducing the amounts of highly manicured fairway also reduces the water, chemicals, fertilizers, and manpower and equipment hours needed, saving hundreds of dollars per acre. Along with the maintenance savings, the golf course can stress strategic design principles and aesthetics by establishing specific target areas based on the various tee placements, terrain of the land, and the golfers' shot-making abilities.



Beginning in spring, when the grass is beginning to grow, the new fairway outlines should be established to conform to the terrain of the land and any existing or proposed tree plantings or hazards. Depending on the circumstances, this procedure might have to be completed in the fall. In either case, the golf course must be allowed to mature into its new look as the season progresses. The target areas can start as far as 150 yards from the middle tees and decrease in width and depth as they advance to the landing areas of the scratch golfer. The average width of the fairway can vary from 30 to 50 yards based on the skill of the golfer hitting to each specific area.

When a club decides to revise its mowing patterns, it needs to inform and educate its members and introduce the changes slowly. The golfers' scores will no doubt go up, but the golf course will become more delightful for all classes of golfers as it is studied and played.

# The Assistant

*by Tom Harrison*
*Golf Course Superintendent*
*Maple Bluff Country Club*

*Editor's note: This article was written nine years ago by Tom Harrison when he was the Assistant Golf Course Superintendent at Maple Bluff Country Club in Madison. It appeared in Volume 2, Number 4, June 1976 of the GRASSROOTS. Tom's perceptions are as valid today as they were in 1976 and we thought it would be worthwhile to print them again. They appear with the author's permission.*

The golf industry has undergone many changes over the years. In the last few years, the game has seen graphite club shafts and aerodynamically designed golf balls to name a few. The maintenance end has seen many changes itself. Years ago the prime function of a golf course greenkeeper was strictly mowing and keeping of the greens. But along with a change in title have come added duties and responsibilities. Superintendents are into all phases of construction. They are into planning and design as well as carrying out the work. The actual mowing and other routine course work have changed as well. These functions must now be done with greater burden on the superintendent. He has to deal with many new duties and responsibilities. However, he has met these new challenges with modern equipment and ideas. Bigger and more sophisticated equipment was purchased to get the job done faster. Radio communications and automatic irrigation have been added to increase efficiency. Time has become critical with the emphasis on getting the most out of each man hour per day.

But there is one management tool that could greatly increase efficiency and lessen the burden on the superintendent. That is the use of an assistant. There are many people who are called assistants, but the definition is very broad. In some cases the title assistant is merely that, a title, given to a man in lieu of a pay raise. In some cases the mechanic or fairway man are called assistant. In very few cases is an assistant used to his fullest capacity. The assistant could be a tremendous aid if used to the fullest extent. A superintendent in the course of a day has to perform many tedious and repetitious jobs. They are important to the running of the golf course, yet very time consuming. Some of these routine jobs are crew supervision of routine work, mechanic work and supervision, record keeping and parts ordering. If the superintendent were willing to give up a few or all these duties to an assistant it would free him to concentrate on other areas. He could spend more time planning projects; supervising projects; and increasing communications with members, pro, and manager. He could take a more overall view of the maintenance operation if he were not so tied up with small problems.

Hiring an assistant is relatively easy. However, it is not easy to find the right man to work closely with the superintendent. He must be able to carry out the work of the superintendent the way the superintendent wants it done. The assistant must not let personal ideas interfere with carrying out the job the way the superintendent wants it done. The assistant when called upon to make decisions, must make them along the lines of thought of the superintendent. When the superintendent is absent for a day, a week, or a month the golf course should be able to function fairly close to normal. This closeness in thinking between each man comes with hiring the right man and working together as a team.

From an assistant's point of view, he is looking for a little job security, room to make decisions and some challenge to the job. The assistant has several ways to look at his job. He may feel that his job is merely a stepping stone in his career. He may look at it as a two or three year internship period or he may look at it as a full time job with no immediate plans to move up the ladder. Some people have this hangup about being second in command. They feel that this is like being a second rate person. Not everyone can be a chief or number one. Someone must be number two man in any operation. There is no reason that being number two man cannot be thought of as a full time career opportunity. It would certainly be advantageous for the club hiring an assistant to retain him as a permanent employee. He could become a very valuable member of the club staff. It is up to the superintendent and club officials to provide the two main ingredients to retain an assistant and interest him in becoming a permanent staff member. The first is the right working conditions which include the giving of responsibility, creating job challenges, and room to make his own decisions. The second item is money and fringe benefits. The club cannot pay poorly and expect the man to stay. If the pay is poor, he will work his two or three years and move on. This is of no benefit to the club. The club loses the first year or so to training. It is very difficult to say how much is too little or too great as far as pay and benefits are concerned. Money available for salaries varies from club to club. It would be easier to judge what you should pay for an assistant if you know what others are being paid. There seems to be a great taboo placed upon one man knowing what another makes as far as salary and fringe benefits. It is a strange thing, it is partially wrong, but it is human nature. Some day as professionals, I hope that we can overcome this. I am not afraid to state where I stand financially. I am neither ashamed nor proud of my salary. But I would like to use myself as an example to state my duties, responsibilities and salary. I feel that this would give a better idea of where, at least, one full time assistant stands in our state.

I started in the 1960's at Nakoma Country Club in Madison. I worked there three years under Peter Miller. I then went into the U.S. Navy and when I was discharged I went to work at Maple Bluff under William Eckert. When I was hired at Maple Bluff in 1968 I was to be worked in as assistant if I wanted

the job. I started out at $7,000 a year with no benefits. Over the years my duties and responsibilities have increased. I do all crew supervision and work assignments as far as day to day work. On construction projects and such I take care of the golf course while Bill Eckert personally supervises the construction. I may pitch in when I'm free but my responsibilities lie with the course. I also do some hiring and firing of employees. Up until last November, I did most of the mechanic work. In November I hired a young man from technical school to spend a year's apprenticeship under me as a mechanic. He will eventually take over the greater share of the mechanics duties. Last of all I take care of the parts ordering and inventory system. Since 1968 my pay as well as salary have increased with my duties. I now make a little over $14,000 a year. I have full family medical coverage, full club retirement plan, three weeks paid vacation, paid membership in the GCSAA and WGCSA, paid expenses to the national conference each year and use of a '73 Jeep vehicle for personal transportation. Maple Bluff is not the wealthiest club in the state by any means but they believe in retaining their staff. They believe in as little interference to their staff as possible as long as we produce. It is a very fair and workable arrangement. The relationship between Bill Eckert and myself is very good. He gives me my area to operate in and I try to do my best within this area. We are always ready to cover for one another when either of us must be away. I try to make all decisions along Bill's line of thinking. It is his golf course and he is ultimately responsible for all decisions made no matter who makes them. I would not think of doing something contrary to his line of thinking.

I hope I have shown the areas where an assistant could improve the course operation. Only the superintendent can decide whether an assistant will fit into his operation. An assistant would prove to be a very valuable management tool if used wisely.

## WTA FIELD DAY

The 1984 WTA Annual Field Day has been set for Monday, August 27, 1984 at Oconomowoc Country Club in Oconomowoc. Harvey Miller, golf course superintendent at Oconomowoc Country Club will be the host. There will be a complete display from many industry leaders of outdoor power equipment. It will be a "hands on" type of exhibit where you will be able to discuss and operate the equipment. Dr. Gayle Worf has set up research plots at Oconomowoc that will be available for inspection.

Ed Devinger of Reinders Brothers is the chairman of this event.

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# Wisconsin Turf Disease Research in 1984

*By Dr. Gayle Worf*

Turf interests in Wisconsin are rather diversified, and the problems of golf course superintendents, sod producers, lawn care and landscape personnel are not always the same. When we design our research efforts, we try to keep the major concerns in mind, and to the extent that it is possible to do so, try to emphasize work that will have an interest for the majority of turf groups. Some projects are undertaken to provide information that can be used right away, eg., evalution of fungicides for their effects on various diseases such as dollar spot, necrotic ring spot and snow mold. Others take a longer period of time, such as assessment of varieties to diseases and problems. Still others seem to take a much longer period of time, such as determining the cause(s) of certain disorders such as Poa decline and necrotic ring spot. With those problems, both field, laboratory and greenhouse work is required.

Before we discuss specific projects, I'd like to mention the **location** of some of our major plots in 1984. Our success in developing useful information depends so much upon having opportunity to work on turf sites that are typical of the situations we are trying to research. Varietal reactions may differ in organic soils, or in large plantings vs. smaller plots, so we expect the rather large bluegrass variety trials and Huggett and Kempley sod farms to be useful. We recently completed snow mold trials at the Wausau and Westmoor Country Clubs, which offered information both on the influence of treatment dates, as well as efficacy of several newer candidate fungicides and combinations. Necrotic ring spot field trials are planned in a large area in cooperation with the Waukesha County Parks System. We will continue our study of the influence of soil type, as well as various physical treatments such as dethatching and aerifying upon NRS at the Rieder Experimental Farms (barring its sale for developmental purposes, which is contemplated for the near future). If possible, we wish to examine the effects of continued application of dollar spot applications on the same site to determine whether the residual effectiveness of certain fungicides does in fact diminish over time, not from the development of fungal resistance, but possible from "accelerated fungicide decomposition." This will occur in cooperation with the Nakoma Golf Course. We need to learn more about Pythium control, and hope to accomplish some of that at the North Shore Golf Club. We will continue with general observation plots in cooperation with several cooperators around the state.

But the largest concentration of plots is planned in cooperation with the Oconomowoc Country Club and the Wisconsin Turfgrass Association, where the summer field day is planned. The club, and Superintendent Harvey Miller, has designated substantial areas where we can look at some specific questions during the coming summer. We expect to continue with dollar spot fungicide evaluations and demonstration controls. A number of new candidate compounds and combinations continue to appear. In addition, we want to know whether fertilizer rates and types might influence fungicide effectiveness differentially. (We all know that nitrogen levels influence susceptibility, but will fungicide comparisons differ under different fertility regimes?) The same question prevails concerning anthracnose/Poa decline control. There is considerable interest in knowing whether growth regulators such as Embark can have beneficial influence on Poa health and resistance to summer decline. We want to examine that question, particularly as it may also be influenced by summer fungicide programs. And the interest is very great concerning the combined influence of fenarimol (Rubigan) as a dollar spot control fungicide and a suppressant of Poa in mixed Poa-bentgrass sites. Trials will be in place for a second year, and should be ready for assessment by season's end. Some additional trials are contemplated there.

Our laboratory and greenhouse work continues with efforts to determine the role that several fungi we have isolated in recent years have upon turf health. We are closer to knowing the relationship of the "NRS fungus" now—and it appears that it may be identical to, or closely related to, very similar fungi being reported out of New York and Washington. Its possible role in some of the "yellow patch" situations will be investigated as a part of our effort to gain a better understanding of the impact and prevalence of that particular disease. And the Take-all patch disease has received considerable publicity of late. We've isolated that fungus only occasionally to date, but we must wonder about its possible association to, or similarity to, the NRS fungus. What about the possibility of certain organisms being useful as "thatch control" or "biological control" units? Those questions are a bit more basic, but they're worth keeping in mind as disease situations are examined and analyzed in greenhouse and laboratory situations.

We are fortunate in having an excellent staff of personnel who will be responsible for much of the work. Jana Stewart continues as our primary laboratory and greenhouse technician. Charles Leafblad is a student who will be replacing Glenn Dahl and, in fact, has already started to work with us. Glenn, by the way, has volunteered to continue with some local projects when he joins the North Shore staff this spring. And we will also have the part-time assistance of Mr. Peter Sanderson, a recent graduate, to help with a number of the projects. Their services are made available primarily through the grant of the Wisconsin Turfgrass Association, together with a College Hatch research project.

We described our general objectives two years ago as wanting to: (1) determine the diseases and casual organisms affecting Wisconsin turf; (2) develop suitable field and laboratory diagnostic techniques so that proper selection and application of treatments can be made; (3) develop control measures that meet the needs of Wisconsin turf sites; and (4) learn more about how environmental and cultural factors influence disease, so that long range improvements in turf quality may be possible. Those objectives remain—we hope we're making progress towards them!

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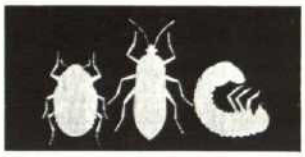

**Wisconsin Entomology Report**

# Some Thoughts on Oftanol Insecticide

*By Daniel L. Mahr*
*Extension Entomologist,*
*University of Wisconsin — Madison*

In late 1983, Mobay Chemical Corporation received EPA labeling for nation-wide use of two formulations of Oftanol turf insecticide. Many managers of turfgrass plantings, especially golf courses, have been awaiting this registration because of some useful characteristics of this insecticide. This article is designed to discuss some of the attributes and usages of Oftanol.

**Properties.** Oftanol is Mobay's brand name for the turf labels of isofenphos insecticide. Isofenphos has also been sold by Mobay under the brand name Amaze (TM) which has applications for agronomic crops. Amaze is a different formulation than Oftanol, and does not have a turf registration. Some other formulators of turf insecticides are selling isofenphos under their own label, sometimes incorporated with a granular fertilizer.

The two formulations of Oftanol currently registered for use nationwide are Oftanol 5% Granular and Oftanol 2 Insecticide. Oftanol 2 is a liquid formulation containing 2 lbs. active ingredient per gallon of formulation.

A major benefit of isofenphos over other currently registered turfgrass insecticides is its longer residual life after application. Because of its residual life, some people have considered isofenphos to be a replacement for chlordane and other long-residential soil insecticides that have been banned. Keep in mind that chlordane was banned because it is extremely persistent in soils, with residues lasting for years. Isofenphos is not persistent to that degree; basically we can expect one growing season of activity under Wisconsin conditions.

**Toxicity and precautions.** Technical grade isofenphos has an acute oral LD50 of 28-38 and an acute dermal toxicity of 162-315. In this form it is one of the most toxic of turf insecticides. However, neither formulation of Oftanol carries a RESTRICTED USE label. While the Oftanol 2 (liquid) formulation carries a "WARNING" signal word, the 5% granular carries only a "CAUTION" label, indicating the lesser hazard of the granular formulation. Both Oftanol formulations are labeled "For commercial applicator use only," meaning that they are not to be used by home owners. However, both formulations can be used by professional applicators on residential as well as commercial turf.

**Registrations.** Oftanol 5% granular is currently registered for white grubs (including Phyllophaga and black turfgrass ataenius), billbug larvae, mole crickets (not a problem in Wisconsin), sod webworm larvae, and chinch bugs. The liquid formulation is registered for the same insects plus billbug adults.

**Application Techniques.** For soil insects (grubs, including ataenius, and billbug larvae) use maximum label rate.

There are two approaches to grub control with isofenphos. It can be used like any other curative turf insecticide when grubs are noted. But it can also be used as a preventive application where grubs are expected from past experience. For example, it can be used effectively as a preventive measure on golf course areas that have had a history of ataenius damage. Also, damage from Phyllophaga grubs frequently appears every third year; areas that were severely infested in 1981 may again be attacked in 1984. Such areas could be treated preventively. Because of the longer residual activity of isofenphos, an application in April or May should carry through the entire season.

Another aspect of the longer residual activity of isofenphos is that the granular formulations do not have to be immediately irrigated in when used in a preventive fashion. If applied prior to the occurrence of damage, as long as adequate rainfall occurs the active ingredient will be washed into the soil where it will eventually be needed for control. HOWEVER, if used to control an active infestation where damage is occurring, irrigation will be necessary as with any soil insecticide. Liquid formulations should be irrigated in as soon as possible after application (preferrably before sprays dry) for both preventive and curative control.

For surface inhabiting insects (sod webworms, chinch bugs, and billbug adults) ¼ — ½ inch of irrigation (or rainfall) must be applied within 12 hours of treatment, regardless of formulation.

**Some Final Thoughts.** In various university tests throughout the country, isofenphos has consistently provided good to excellent control of the labeled pests. However, it should also be noted that other turfgrass insecticides frequently have performed as well in these tests. In other words, as a curative insecticide for soil and surface inhabiting insects, isofenphos performs at about the same level as other good turf insecticides.

The benefits of isofenphos are two-fold. First, it has longer residual activity than other registered insecticides. A single application should provide season-long control. Secondly, because of its residual activity, it can be used preventively for soil insect contol, and when used in this fashion, it does not need to be irrigated in as long as sufficient rainfall occurs before the insects become damaging.

Finally, there are few situations where I recommend any form of preventive insecticide applications on Wisconsin turfgrass. Generally speaking, insect pressures on Wisconsin turf are quite light compared to other location and simply don't justify preventive insecticide applications. The exceptions to this include predictable grub problems, including black turfgrass ataenius. Isofenphos is not the answer to all turfgrass insect problems. Instead, it should be considered as a useful new tool to be used properly in the right circumstances.

# Bacterial Wilt of Toronto Creeping Bentgrass: A Potential Threat to Turfgrass Culture in North America

*by Dr. David L. Roberts and Dr. Joseph M. Vargas, Jr.*
*Postdoctoral Research Association and Professor*
*Department of Botany and Plant Pathology*
*Michigan State University*

*Editor's note: D. L. Roberts is currently a Postdoctoral Research Associate at Michigan State University where he is continuing research in turfgrass pathology. He received his B.S. and M.S. from the Ohio State University. His M.S. research involved the study of Rhizoctonia on sugar beets. In December, 1982, he received his Ph.D. from Michigan State University where his dissertation research determined that a bacterium was the cause of the unresolved C-15 problem-decline on Toronto creeping bentgrass. He has published several articles on the discovery, diagnosis, distribution, isolation, pathogenicity, characterization and control of bacterial wilt, the first known turfgrass disease caused by a bacterium. Dr. Roberts will be the speaker at our June meeting.*

*Dr. Joe Vargas needs no introduction to WGCSA members. He is a long time friend of the golf course industry in Wisconsin.*

## Introduction

Ever since its selection in the 1930s by the USDA and USGA, Toronto creeping bentgrass (Agrostis palustris Huds. cv. Toronto = C-15) was considered the elite among the bentgrasses for propagation on golf course putting greens. During the 1970s, a disease of unknown origin, commonly known as the C-15 problem or C-15 deadline, devastated many Toronto creeping bentgrass putting greens in the Midwest. The disease gained national recognition when it devastated the Butler National Golf Course two weeks prior to the 1980 PGA Western Open. This unpredictable and uncontrollable epidemic of the disease initiated an intensive study of the problem.

## Association of Bacteria with Diseased 'Toronto'

No fungal pathogens, the most common causes of turfgrass diseases, could be consistently isolated from diseased 'Toronto' plants at Michigan State University. Use of transmission electron microscopy (TEM) led to the discovery of bacteria associated with the xylem vessels of diseased plants (Fig. 1). Xylem vessels transport water and fertilizer nutrients from the roots to the crown and leaves. Blockage of these xylem vessels with millions of bacteria readily explained the rapid wilting of infected plants. The discovery of bacteria in diseased Toronto creeping bentgrass was important for the following reasons: 1) it suggested a solution to the unpredictable disease outbreak at Butler National; 2) it provided a pathogenic agent for the unresolved C-15 problem-decline which had affected many midwestern golf courses, and 3) it suggested the first known turfgrass disease incited by a bacterium.

Table 1. Bacterial wilt grasses in Europe. Originally discovered in Switzerland in 1975, bacterial wilt has now been found in numerous genera of grasses in many countries.

| 1975 | |
|---|---|
| **Location** | **Host Grasses** |
| Switzerland | Dactylis (Orchardgrass) |
| | Lolium (Ryegrass) |

| 1982 | |
|---|---|
| **Location** | **Host Grasses** |
| Switzerland | Dactylis (Orchardgrass) |
| Belgium | Lolium (Ryegrass) |
| France | Festuca (Fescue) |
| Germany | Arrhenatherum (Oatgrass) |
| Great Britain | Phleum (Timothy) |
| Norway | Alopecurus (Foxtail) |
| Netherlands | Agrosis (Bentgrass |
| | Poa (Bentgrass) |
| | Trisetum |
| (New Zealand) | Phalaris (Canarygrass) |
| | Agropyron (Wheatgrass) |

## Distribution and Diagnosis

Plants affected with the disease at Butler National exhibited blue-green, shriveled leaf tips indicating a very rapid wilt. At many midwestern locations affected with the C-15 problem, plants were observed to wilt in the manner of a few hours. Usually the plant remains in the wilted stage (blue-green) for a short time before the entire plant turns brown and begins to decompose. This brown, decomposed stage of the disease is most often observed by scientists and superintendents, and has undoubtedly been confused with many other diseases over the past

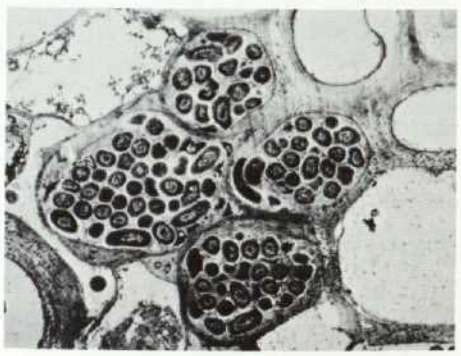

Fig. 1. Transmission electron micrograph of diseased Toronto creeping bentgrass with numerous small, dark, rod-shaped bacteria contained in large xylem vessles. Magnification approximately 6800X.

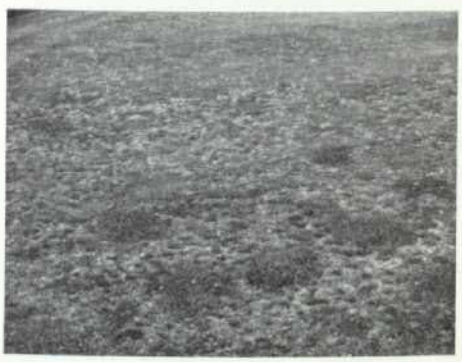

Fig. 2. Individual selection of Toronto creeping bentgrass plants by the disease resulted in characteristic uneven putting surface.