A PRACTICAL RESEARCH DIGEST FOR TURF MANAGERS

TURFGRASS TRENDS

Volume 10, Issue 10 • October 2001

WEED CONTROL

Maximize your preemergence herbicide performance

By Tim R. Murphy

Preemergence herbicides persist in the soil and control susceptible weeds for two to six months. The level of control depends on the specific herbicide and rate being used, soil physical and chemical properties, soil moisture levels, soil temperatures, as well as the species of turfgrass. Additionally, the type of herbicide formulation and uniformity of application also has a major influence on the level of control achieved.

Each year there are instances where for some reason preemergence herbicides fail to control weeds or injury occurs to turfgrasses. Why?

Let's examine the factors that will maximize the effectiveness of a preemergence herbicide.

Application before germination

Preemergence herbicides must be applied prior to weed seed germination. The mode of action for most preemergence herbicides (e.g., bensulide, benefin, dithiopyr, oryzalin, pendimethalin, prodiamine) is the inhibition of certain phases of cell division during the seed germination process. As the weed seed germinates, the herbicide is absorbed by the root or shoot, cell division is blocked, growth is inhibited and eventually the immature seedling dies.

In general, sprayable and granular formulations of preemergence herbicides are equally effective in controlling susceptible weeds.

Emerged weeds visible at the time of application are not controlled by preemergence herbicides. Although the majority of herbicides may be classified as preemergence or postemergence chemicals, atrazine, simazine, dithiopyr, ethofumesate, and pronamide are exceptions.

Dithiopyr will control seedling crabgrass (prior to tiller development), but will not control seedling goosegrass. Both atrazine and simazine exhibit preemergence and postemergence control of a wide range of winter annual broadleaf weeds and annual bluegrass. Similarly pronamide has preemergence and postemergence activity on annual bluegrass.

Germination factors

Application timing counts. The various species of crabgrass and goosegrass are among the most troublesome annual grass weeds in turf.

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IN THIS ISSUE

TURFGRASS TRENDS

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Crabgrass initiates spring germination when soil temperatures at a four-inch depth reach 53 to 58°F. Goosegrass germinates at soil temperatures of 60 to 65°F. Because of higher temperature requirements for germination, goosegrass normally germinates two-to-eight weeks later in spring than crabgrass. The old rule of thumb is to apply the preemergence herbicide two weeks before crabgrass seed germination. However, recent research has shown that most preemergence herbicides can be applied in December and January and still provide high levels of crabgrass control the following summer months.

Preemergence herbicides are degraded primarily by soil microorganisms. Degradation is higher under warm, moist soil conditions and lower under cool, dry soil conditions. The low activity of soil microorganisms involved in herbicide decomposition during the cold, winter months is a major reason why preemergence herbicides can be applied in December and January several weeks in advance of crabgrass and goosegrass seed germination and still provide high levels of control the following summer.

Repeating applications

Application frequency also plays a role. Repeat applications have been shown to increase control of crabgrass and goosegrass, particularly if soil seed populations of these species is high.

While research has shown that December and January applications can provide effective control of crabgrass in the following summer months, research has also shown that applying at one-half the recommended rate at the normal application time and again six to eight weeks later will improve crabgrass and goosegrass control for most products.

Some research has also shown that after the use of normal herbicide application rates for one or two years, subsequent yearly rates may be reduced. B. J. Johnson (1982) showed that in properly maintained bermudagrass, herbicide rates required to control crabgrass or goosegrass could be halved or eliminated in subse-

TABLE 1. SOUTHERN CRABGRASS CONTROL

Influence of formulation particle size on southern crabgrass control 6 months after treatment with preemergence herbicides. (Kelly and Coats, 1999)

Particle Size	Oxadiazon[1]	Dithiopyr	Oryzalin	Prodiamine
number/gram		0.5 lbs. ai/acre	3.0 lbs. ai/acre	0.75 lbs. ai/acre
		(%)		
23	58	66	42	43
58	67	75	64	71
165	72	75	62	74
465	72	84	74	81
1,310	70	82	75	82
3,728	66	75	75	83
10,606	68	82	76	83
LSD (0.05)	**7**	**8**	**8**	**7**

1 CONTROL RATINGS ARE FROM 1995 AND WERE AVERAGED ACROSS OXADIAZON RATES THAT RANGED FROM 1.0 TO 6.0 LBS. AI/ACRE.

quent years when a normal rate was applied the first year.

Tolerance considerations

Remember turfgrass tolerance characteristics. When considering any herbicide, the first consideration is the tolerance of the desirable turfgrass species to the chemical in question. As a general rule, preemergence herbicides are not as phytotoxic to established turfgrass species as postemergence herbicides. Notable exceptions are atrazine, simazine and pronamide on cool-season grasses. Additionally, the tolerance of fall-seeded tall fescue to several preemergence herbicides is low. Research has shown that tall fescue seeded from mid-September through mid-October was tolerant to most preemergence herbicides applied the following early March (Johnson and Murphy, 1991).

Extremely small particle sizes are not necessary to achieve high levels of control.

However, if tall fescue was seeded in mid-November, most preemergence herbicides applied in early March caused moderate to severe injury expressed as stand reduction.

Reference to the herbicide label will show recommended turfgrass species and time intervals that are required to prevent injury from time of seeding and herbicide application date.

TABLE 2.

Smooth crabgrass control with various formulations of prodiamine. (Yelverton, 1998).

Prodiamine Formulation	Rate	Smooth Crabgrass Control
	(lbs. ai/acre)	(%)
65WDG	0.75	98
0.29GR	0.75	91
0.5GR	0.75	81
LSD (0.05)		**9**

TABLE 3.

Smooth crabgrass and goosegrass control with emulsifiable concentrate (EC) and granular formulations of dithiopyr. (Johnson and Murphy, 1993).

		Control	
Dimension Formulation	Rate	Smooth Crabgrass	Goosegrass
	(lbs. ai/acre)	(%)	
1EC	0.5	64	31
1EC	0.75	91	29
0.25GR	0.25	82	55
0.25GR	0.38	100	78
0.25GR	0.5	100	82
LSD (0.05)		**22**	**15**

Difference in weed species

In general, crabgrass is easier to control with preemergence herbicides than goosegrass. Herbicides that have consistently controlled crabgrass in most university tests include members of the dinitroaniline herbicide family (benefin, oryzalin, benefin + oryzalin, benefin + trifluralin, prodiamine, pendimethalin), dithiopyr, bensulide and oxadiazon. High levels (>80%) of goosegrass control have consistently occurred with oxadiazon, prodiamine, dithiopyr, pendimethalin, oryzalin and benefin + oryzalin. Atrazine and simazine rarely provide acceptable levels of either crabgrass or goosegrass control.

A key factor to effective performance of a fertilizer/herbicide product is the percent load of the herbicide.

HOW TO GET MAXIMUM CONTROL OF SUMMER WEEDS

Maximum control of summer annual weeds with preemergence herbicides can be achieved by following these basic guidelines:

1. **Apply the product at the recommended time and rate.** Weather varies from year to year and it may be necessary to apply earlier than normal. Reference to 30-day weather forecasts can help with this decision.
2. **Apply the product before rain is expected or water it in with two inches of irrigation water.** Numerous instances of poor weed control occur each year because of the lack of rain or an irrigation event within seven days of preemergence application. Additionally, irrigating-in the herbicide is an excellent method to prevent losses due to volatility and lateral herbicide leaching. Turfgrass preemergence herbicides essentially do not leach in downward direction beyond a depth of one to three inches due to binding to soil colloids and organic matter. But they can move laterally, particularly if heavy rainfall occurs shortly after application. Thus, irrigation will usually improve weed control and will help to prevent lateral movement.
3. **Calibrate all application equipment.** Uniform application is critical to achieving good weed control.
4. **If fertilizer/herbicide formulations are to be used, select a product that has uniform particle size.** Be sure the product is applied with a sufficient number of particles to ensure even, uniform application. Also, be sure that the herbicide load is sufficient to apply the recommended rate of the product. Johnson and Murphy (1993) showed that dithiopyr rates can be reduced if applied on a dry granular carrier (Table 3). However, with most other preemergence herbicides the amount of active ingredient applied per acre should be the same either for sprayable or dry formulations.
5. **Delay mowing until after a rainfall or irrigation event.** Studies have shown that mowing and bagging operations can remove significant quantities of a preemergence herbicide if conducted before the herbicide is moved into the soil by rain or irrigation water.
6. **Properly maintain the turfgrass.** Following recommended cultural practices that promote normal turfgrass growth and development will enable the turfgrass to compete with weeds. The first line of defense against weed infestations has been, and probably always will be, a thick, healthy, properly maintained turfgrass. Adherence to recommended soil fertility and pH levels, proper irrigation, controlling other pests, and mowing at the correct height and frequency will improve the effectiveness of most chemical weed control programs.

Role of aerification

Core aeration generally has not been recommended or practiced following a preemergence herbicide application. Core aeration was believed to disrupt the herbicide barrier in the soil and stimulate weed emergence. Research conducted in Georgia (Johnson, 1987) showed that core aeration immediately prior to or one, two, three, or four months after applications of benefin, bensulide, DCPA, and bensulide + oxadiazon to common bermudagrass did not stimulate large crabgrass emergence.

Aeration at one or two months after application increased large crabgrass cover 5% for oxadiazon at 2.0 lbs. ai/acre, but not at 4.0 lbs. ai/acre.

In a related Georgia study (Johnson, 1982), it was shown that core aeration at one, two, or three months after an application of oxadiazon did not decrease goosegrass control on a Tifgreen bermudagrass putting green.

Preemergence herbicides are degraded primarily by soil microorganisms.

In Michigan (Branham and Rieke, 1986), core aeration, or vertical mowing, immediately or one month after an application of benefin, bensulide, or DCPA did not affect large crabgrass control in annual bluegrass.

A study conducted in North Carolina (Monroe et. al., 1990) showed that aeration did not affect the activity of several preemergence herbicides in controlling crabgrass species in either 'Tifgreen' or common bermudagrass.

However, in creeping bentgrass, significantly greater amounts of crabgrass occurred in aerified plots with the cores returned than in plots not aerified, or aerified plots with the cores removed. While most herbicide labels do not recommend aeration after preemergence herbicide application, university conducted research has not shown an adverse effect on crabgrass control.

Results can vary between research plots and commercial turfgrass sites and there may be situations where core aeration after preemergence herbicide application could stimulate crabgrass and goosegrass emergence. But, if the site requires aeration to encourage turfgrass growth and development, then it should be done.

The various species of crabgrass and goosegrass are among the most troublesome annual grass weeds in turf.

If crabgrass or goosegrass emerges, there are excellent postemergence herbicides that can be used.

Formulations matter

Preemergence herbicides are available as a sprayable or dry formulation. Dry formulations consist of the herbicide impregnated on an inert carrier such as clay or various analyses of fertilizer. Herbicide/fertilizer carrier products have become extremely popular in the turfgrass industry. Applying a herbicide/fertilizer product is convenient and enables two operations to be conducted at the same time.

In general, sprayable and granular formulations of preemergence herbicides are equally effective in control susceptible weeds. But keep in mind that regardless of the formulation, herbicides must be uniformly applied to the site for acceptable control.

Uniform coverage is usually easier to achieve with a spray than with a granular application. Several factors impact the results obtained with a herbicide formulated on a fertilizer carrier. Of these, application uniformity and percent load of the herbicide are the most critical.

Application uniformity is determined by particle size, uniformity of particle size, and application equipment. Particle size and uniformity of particle size is determined by the manufacturer or formulator. As particle size decreases, the density of

particles per unit area increases. Uniform particle sizes are equally important to prevent ballistic segregation. Research conducted in Mississippi (Kelly and Coats, 1999) showed that southern crabgrass control increased to a point then leveled off as particle size of a dry fertilizer/herbicide product decreased (Table 1).

Extremely small particle sizes were not necessary to achieve high levels of control. This research concluded that with dithiopyr and oryzalin a particle size 465 particles per gram or greater was necessary to achieve high levels of control. For prodiamine, a particle size of 165 particles per gram or more was sufficient. For oxadiazon, a size fraction of either 58 or 165 particles per gram or greater were equivalent in activity on southern crabgrass.

Another key factor to effective performance of the fertilizer/herbicide product is the percent load of the herbicide. High load products usually are applied at a lower amount of total material per acre than a low load product. Research conducted in North Carolina showed that prodiamine formulated on a 0.29GR (granule) product controlled smooth crabgrass better than when formulated as 0.5GR product (Table 2) (Yelverton, 1998). The increase in smooth crabgrass control was attributable to the better coverage with 0.29GR product.

Author Tim R. Murphy is a researcher in the College of Agricultural and Environmental Sciences at the University of Georgia. He completed his B.S. degree in Agriculture at Berea College and his M.S. and Ph.D. degrees at Clemson University. He joined the University of Georgia in 1985 and is currently a Professor in the Crop and Soil Sciences Department in Griffin, Georgia. He is responsible for extension weed science efforts in turfgrasses, noncropland, ornamentals and forage crops. Tim also conducts turfgrass and noncropland weed science research and teaches the weed science portion of a Turfgrass Pest Management course at the Athens campus. He has authored or co-authored two books, five book chapters, 23 journal articles, 55 Extension bulletins and circulars and 64 popular articles in national or regional magazines and newsletters. The majority of these publications deal with weed control in turfgrasses. He has responsibility for developing the Cooperative Extension Service weed control recommendations for these commodities in Georgia.

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China offers great growth for turfgrass industry

By Karl Danneberger
The Ohio State University

The Peoples Square in Dalian is the focal point of the city's main visitor area.

Recently, I attended the 2001 International Turf and Golfing Conference and Expo in Dalian, China from August 29 through September 1. This was the second visit I have made to China in the last year.

My hope is to provide you with some of my observations of China and the turfgrass industry. Given the few visits I have made, my observations could be construed as rather myopic. I would say however that I think the turfgrass industry – whether in parks, sports turf, or golf – from a global perspective has the greatest potential for growth in China.

From a global perspective, the turfgrass industry — whether in parks, sports turf or golf – has the greatest potential for growth in China.

Dalian landscape project

Dalian is located in the northeastern part of China (northeast of Beijing) along the Yellow Sea. The city itself is not that old, around 100 years old, with a population of between 3.5 to 5.0 million people. The architecture of the city strikes me as being quite western and is considerably more "laid back" than Beijing, Shanghai or Shenzhen.

In China, Dalian is known as the "Black Pearl" due to its beauty. Approximately 10 years ago, the city focused its attention on enhancing its beauty and the surrounding areas through a massive landscaping project.

The focus of the effort was to create green spaces through the creation or renovation of parks, large city squares and to a lesser extent golf course development.

Turfgrasses used are not much different than what we would use in the temperate regions of the United States.

In parks and large recreational areas, Kentucky bluegrass is the turf of choice.

One of the golf courses under construction in Dalian. This course is being built along the Yellow Sea. Typically one finds perennial ryegrass tees and fairways and creeping bentgrass on greens.

The varieties of choice on golf courses (at least the ones I saw) are predominantly Kentucky bluegrass in the roughs, perennial ryegrass tees and fairways and creeping bentgrass on greens.

In Dalian, and also in Beijing, summer temperatures are usually quite warm. I observed many of the diseases we would associate with warm weather like summer patch (*Magnaporthe poae*) on Kentucky bluegrass, brown patch (*Rhizoctonia solani*) on perennial ryegrass and dollar spot (*Sclerotinia homoeocarpa*) on creeping bentgrass. As you move farther south through Wuhan (transition zone) tall fescue is used more and into the southern coastal regions bermudagrass and zoysiagrass.

On some of the golf courses that I visited, the water issues — both quantity and quality — are major concerns (not much different than here).

Soccer (as in much of the world) is the most popular sport played on athletic turfs. Little, if any, turfgrass is used on sports fields below the professional or elite team situation. The traffic and wear that most of the school fields are subjected to is so intense that sustaining turf is nearly impossible.

Knowledge levels

The knowledge base for maintaining turfgrass is growing but is still not at the level found in the United States. Thus, turfgrass conferences that are staged around China are extremely important in providing information for maintaining turf under local conditions. The turf grass conference that I attended in Dalian was started to help provide information to golf course superintendents.

Golf course superintendents in China were enthusiastic, willing to ask questions and share experiences even with a language barrier.

The conference in many ways reflects the potential of the turfgrass industry in China, initially a moderately attended conference but the potential for growth is great. The conference itself ran for three days with both educational sessions and a trade show.

One of the great things that I like about the turfgrass industry in the United States is the quest for new information and a

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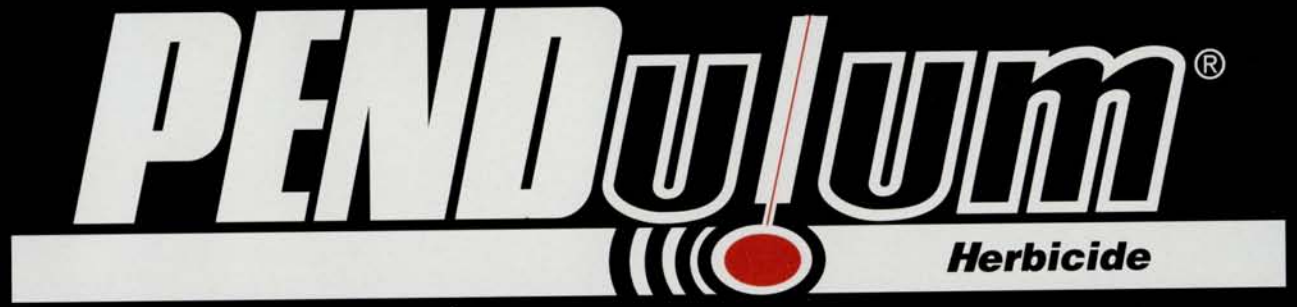
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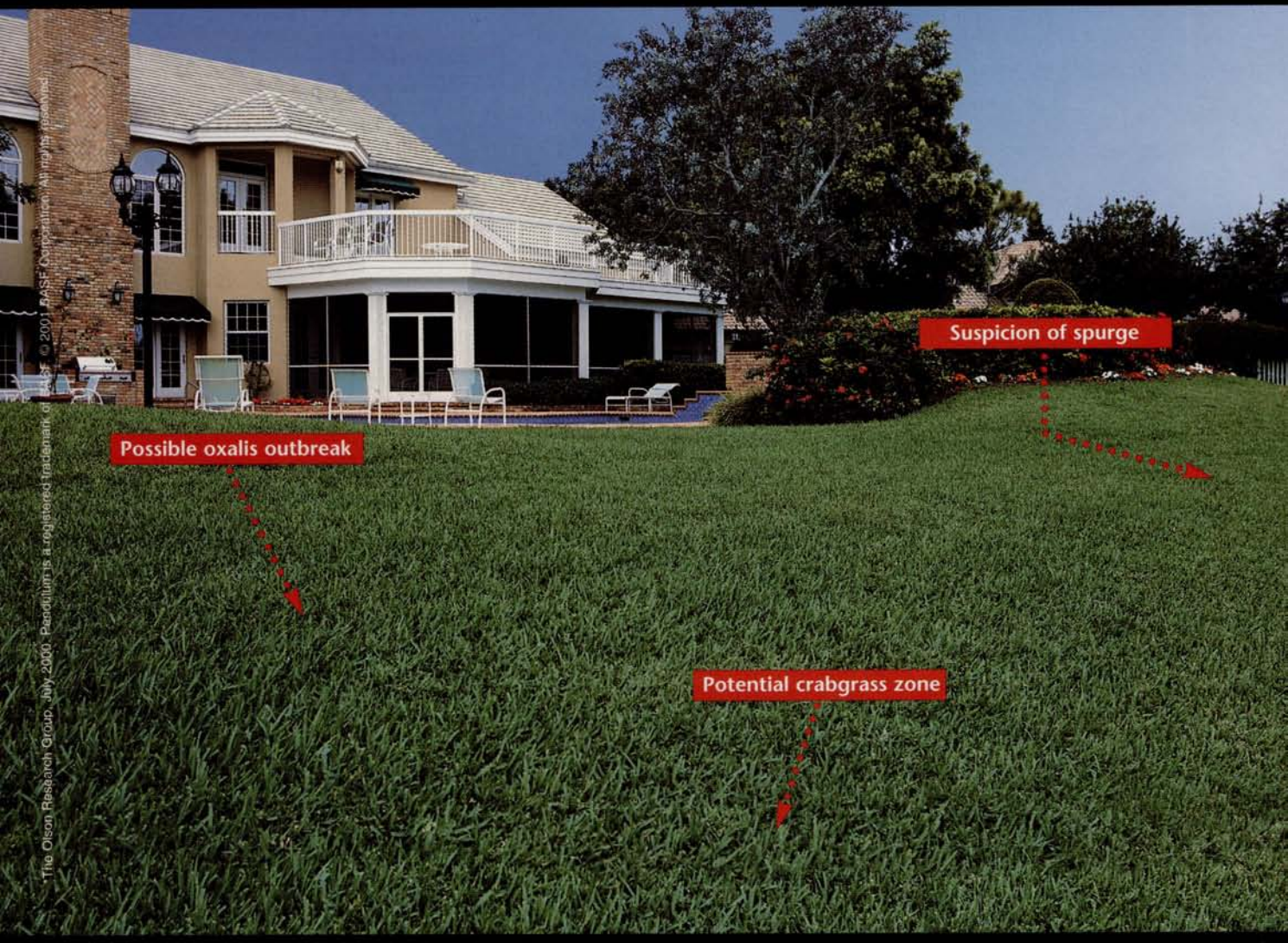

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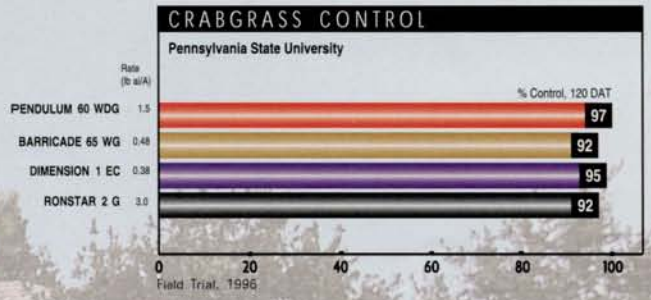

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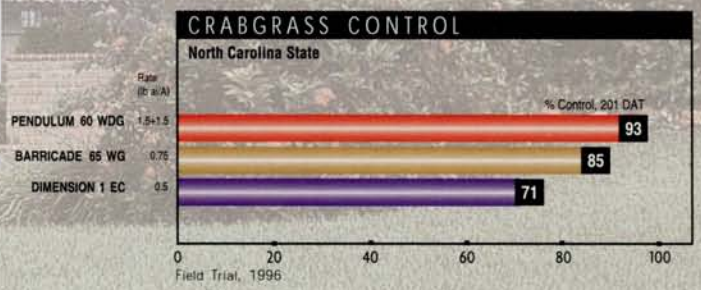

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willingness to share ideas and new information. This was demonstrated with the range of speakers from academia (both the U.S. and China) to industry representatives (again from both the U.S. and China) and Chinese golf course superintendents.

My experience from traveling globally is the universal quest for turf managers to learn as much as they can. The golf course superintendents in China were enthusiastic, willing to ask questions, and share experiences even with a language barrier.

The facilities for the conference facilities and hotel accommodations were excellent. The hotel I stayed in was similar to any Marriott or Hilton. I could watch HBO or CNN (in English) on the room TVs. In Dalian, as in other major cities in China, hotels that cater to an international clientele provide amenities like restaurants and shops similar to those found in any European or U.S. city. If you get away from the major metropolitan areas it gets a littler rougher.

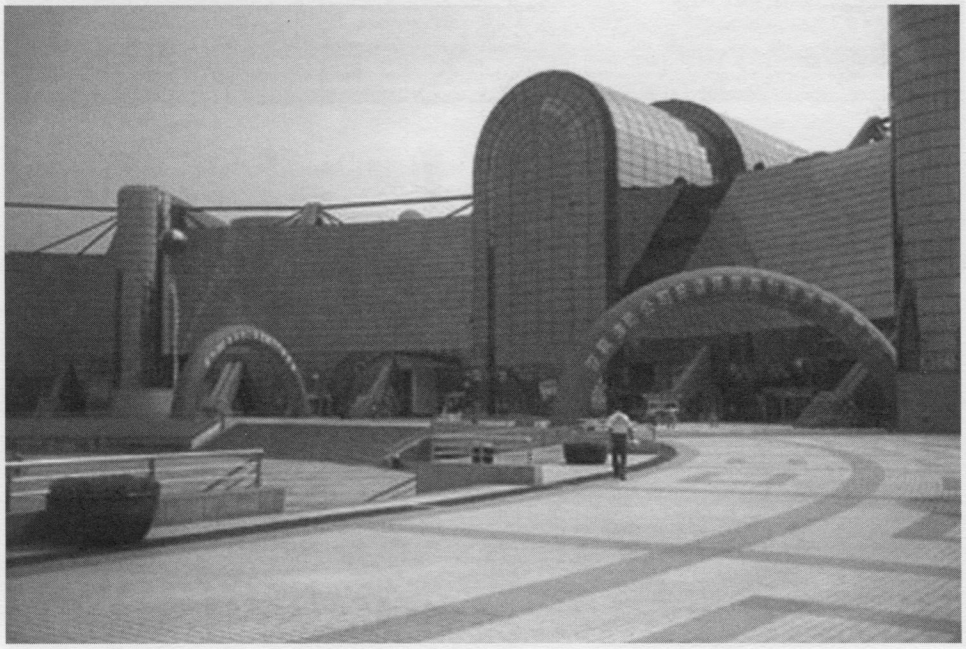
And, yes, I found the food to be excellent!

The international speakers and exhibitors were provided (if needed) a translator who helped in translating speeches, helped exhibitors communicate with customers, and also served as tour guide. These translators were English majors at the local colleges and universities who had a chance to "practice" their English. The vast majority of Chinese students from grade school through high school study English.

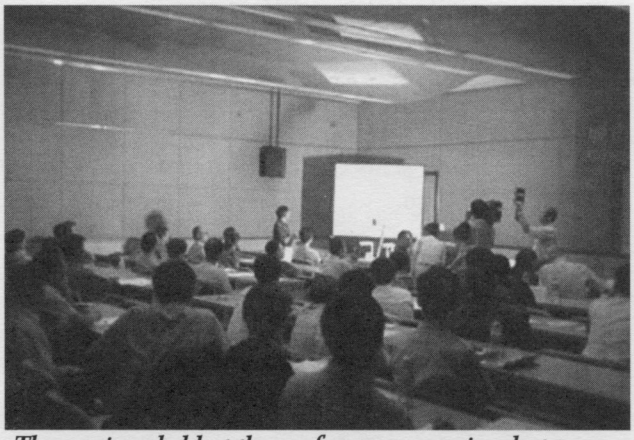
English is common

I was surprised how many people "on the street" have some sort of English proficiency. Interestingly, university students in the United States often complain about their dormitory rooms, in China almost all of the students living in dormitory rooms share them with six to seven other students.

The friends that I have made in China have the same personal concerns that we have. Parents worry about how well their children score on the national tests and which college or university their children will attend. They worry about their jobs and making money as much as we do. There is a strong work ethic among the Chinese in that they are always "busy" and working. The Chinese put a lot of time in developing relationships and these relationships become cornerstones for doing business.



The Dalian Expo Center was the home base for those attending the International Turf and Golfing Conference.



The sessions held at the conference were aimed at providing information to golf course superintendents.

Market potential

China has developed free trade zones that encourage capitalism as a means for expanding their economy. These zones and the general positive attitude of the government toward free trade have provided opportunities for trade with China including the turfgrass industry.

Given the market (population and land size), there is tremendous potential in China. However, as businesses opportunities expand, understanding the culture and how the Chinese work becomes critical for reducing frustration and increasing success.

The biggest change for me personally in visiting China is reconciliation of my prior preconceptions of China (those perceptions developed growing up in the 1960s and 70s) with how it is now.

What strikes me about China is the contrasts in the country are so startling, that it is almost impossible to take in at once. China has undergone a massive change in the last 20 years. The economic growth path that China is currently on will make it a global force in the future. It does however have major problems in dealing with growth (economic discrepancies), and its population.

From a turfgrass perspective, how China develops this industry will be something we should all watch.

Karl Danneberger was an invited speaker to the first annual International Turf and Golfing Conference and Expo in Dalian China August 28 through September 1, 2001. He spoke on managing creeping bentgrass greens and maintaining turfgrass in shade. Dr. Danneberger has traveled and spoken throughout China over the years.

NTEP takes action on TurfGrass Trends article

On page one of last month's TurfGrass TRENDS (September 2001), we featured an article written by Doug Brede on the National Turfgrass Evaluation Program (NTEP) testing program.

At the same time the article was going through the review and editing processes for this newsletter, the author sent several key components of that article to the NTEP Policy Board for its review. In the piece, Brede noted that most people who use NTEP data rely heavily on the single column of Grand Mean averages for recommendations. He questioned whether that is the right thing to do. He noted that there are idiosyncrasies hidden within the statistics that may paint a misleading picture of the data.

Based on the facts in that article, the Board voted to do away with the National Average column in NTEP data reports. Although the National Average column has been around since 1980, the Board agreed with Brede's contention that it no longer is useful to the majority of seed buyers.

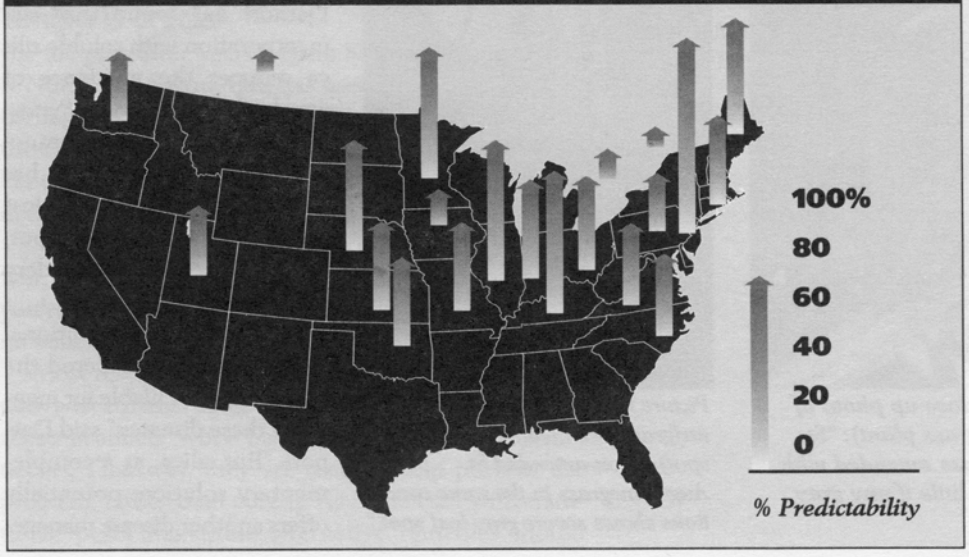
Instead, NTEP results are going to focus on regional averages, which are more realistic and should be more meaningful to the user.

Brede has a long association with NTEP, dating back to 1979 when he attended the planning meeting at Rutgers University to establish the initial protocols for NTEP. Even before that time, he was an evaluator for Penn State University's plots of Project NE-57, which was the precursor of the modern NTEP trial. Brede was an evaluator and host site for NTEP trials from 1980 (NTEP's inception) until 1994, when trials at private companies were discontinued. He served on NTEP's Policy Committee from 1997 to 1999.

We would expect NTEP's Policy Board to revisit the issue when the Board meets again in February.

Thanks to everyone involved: to Doug Brede for a good article, to NTEP's Policy Board for giving his recommendations a fair hearing and then acting upon them, and to you, the subscriber, for making TGT the "go-to" forum for such leading-edge information on our industry.

The map below illustrates the percent predictability of individual state/province quality results versus NTEP's Grand Turfgrass Quality Mean. It was accidentally omitted from the original article which ran last month. The length of the arrows shows the degree of predictability. Sites with longer arrows have better correlation. Values not shown: NJ2 34%, MA1 31%, MO12%, AB1 0%.



Sod producers explore alternative treatments for turfgrass health

By Douglas H. Fender

In the ongoing war against insect pests, fungal diseases and other threats to turf health, many turfgrass sod producers are exploring nontraditional treatment options to promote vigorous, pest-free crops.

In their continuous effort to provide those who buy and maintain turfgrass sod with the highest-quality product possible, turf growers and researchers are testing a variety of inexpensive alternative treatments, including mineral, herbal and live biological products.

While these alternatives don't replace effective traditional pesticides, turf industry professionals are starting to recognize the value of such materials, reporting important successes in the field.

Benefits of mineral silica

For years, rice and sugarcane farmers have used water-soluble silica, a byproduct of phosphate fertilizer mining, to fight fungal disease and promote growth. Now its effects are also being studied on turfgrass, with funding from the International Turf Producers Foundation (ITPF).

Paul Grose, general manager of King Ranch Inc. in Belle Glade, FL, has participated in the University of Florida's ITPF-supported silica/turfgrass trial studies for the past year and a half. While it's still too early to report definitive results, Grose said he has seen improvement in root system density.

"We used silica on our sugarcane for many years and had dramatic results," said Grose. "So when the University of Florida approached us about trying it with our turfgrass, we were interested."

According to Lawrence Datnoff, Ph.D., the University of Florida plant pathology professor who oversees the study, most soils contain considerable quantities of silica.

However, over-planting may reduce the levels that are naturally available to plants. Datnoff has found that soil incorporation with soluble silica reduces the incidence of gray leaf spot caused by *Pyricularia grisea* on St. Augustinegrass. Other research has found it to be effective against pythium blight, dollar spot, brown patch and powdery mildew.

"Right now, traditional fungicides are considered the best method available for managing these diseases," said Datnoff. "But silica, as a complementary solution, potentially offers another disease manage-

PHOTOS COURTESY: DR. LAWRENCE DATNOFF, PROFESSOR OF PLANT PATHOLOGY, UNIVERSITY OF FLORIDA –INSTITUTE OF FOOD & AGRICULTURAL SCIENCES.

Picture #1 (close-up photo of healthy turfgrass plant): "St. Augustinegrass amended with silica shows little if any gray leaf spot."

Picture #2 (close-up photo of turfgrass plant with gray leaf spot): "Non-amended St. Augustinegrass in the same conditions shows severe gray leaf spot."

ment option for turfgrass producers and maintenance crews."

Promising mineral, herbal, live biological treatments

Because much of the current research is still not complete, some turfgrass producers are taking a "wait and see" attitude before they apply alternative treatments to their sod. Since producers are constantly looking for ways to further strengthen the turf they provide to customers, alternative materials for disease management are an attractive option — and the initial research results are promising.

In addition to the silica studies, researchers are testing the effectiveness of sulfur, manganese, iron and other mineral products against pests and disease. Scientists also are studying the health benefits to turfgrass of herbal remedies such as salicylic acid and the bacteria Xanthomonas.

Live biological remedies like the bacteria pseudomonas have been shown to suppress a variety of turfgrass diseases. And beneficial nematodes (microscopic worms of the phylum Nematoda) are being used to parasitically control insect pests, such as grubs, mole crickets and caterpillars (see TurfGrass TRENDS, Vol. 10, No. 5, May 2001).

Some innovators also are exploring the value of alternative materials as fertilizers. For example, in an effort to recycle waste while improving quality and yield, one company is manufacturing fertilizer from used photo and film processing chemicals.

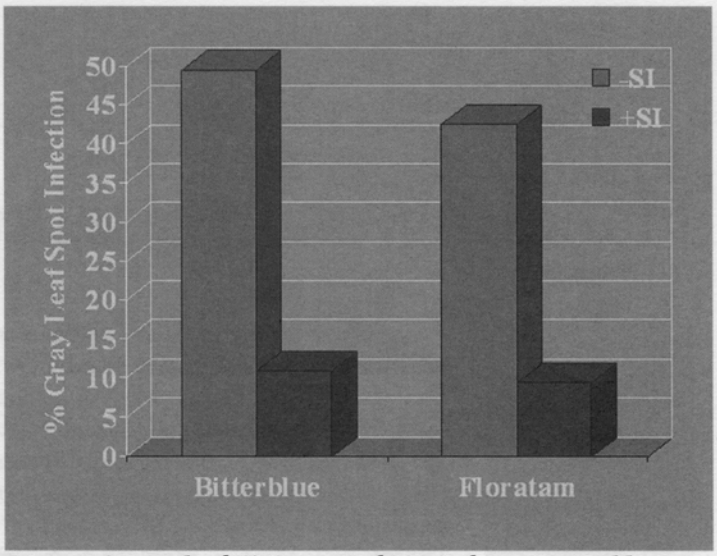
Timing is crucial

For the past three years, Myron Kuenzi of Kuenzi Turf & Nursery of Salem, OR, has used a yeast starter containing the beneficial fungus Trichoderma to combat the Helminthosporium fungal disease. Kuenzi says he has experienced "modest" success by spraying it on turf in the early stages of growth.

"The timing of the application is exceedingly important," he said. "You need to be aware of the life cycle that you're working with. If it's too early or too late, there's no benefit."

Most researchers and producers familiar with alternative treatments agree that timing is crucial, and that these products work best if applied before disease occurs. That way, they are used to help prevent the problem, rather than cure it. As is the case with traditional pesticides, these alternative remedies should never take the place of good maintenance practices.

"I always tell my customers, that's the most important part of disease management," Grose said. "Sod producers are doing all they can to deliver the healthiest product possible, but after the grass is installed, the customer can avoid most fungal problems by maintaining turf properly."



Picture #3 (graph of "% Gray Leaf Spot Infection"): "Red bars represent the percentage of gray leaf spot infection in Bitterblue and Floratam turfgrass varieties not treated with silicon, and green bars represent the percentage of infection in the same varieties treated with silicon. Silica is a silicon-containing compound commonly used in such applications."

Author Doug Fender is executive director of Turfgrass Producers International, a Rolling Meadows, IL-based, not-for-profit association that represents and advances turfgrass sod and seed producers, suppliers, researchers and educators worldwide. Contact Doug at dfender@TurfgrassSod.org or 847/705-9898.

Handling crabgrass, kudzu

A pair of interesting questions came in on weed control. The first reader asked,

Q *"Do you know of a chemical control similar to Drive that can be applied to lawns in a granular form?"*

The second faces a problem common throughout the South.

Q *"I need help killing kudzu. Can you give me some advice?"*

We referred these two questions to Joseph C. Neal, professor and extension specialist in weed science at North Carolina State University.

In response to the first, he says the answer depends upon what you are using Drive to control. Drive (quinclorac) is a postemergence herbicide, unique in that it controls both crabgrass and many broadleaf weeds.

There are granular formulations of 2,4-D + MCPP, Confront (clopyralid + triclopyr), and others that control broadleaf weeds. However, there are no granular herbicides for postemergence control of crabgrass. [One exception, Neal notes, is that granular formulations of Dimension can control very young seedling crabgrass, up to the 4-leaf stage.]

"We have tested granular formulations of Drive that worked fairly well on broadleaf weeds but less well on crabgrass," Neal says. He says he knows of no commercially available granular formulation of Drive.

Good news for our reader with kudzu. Neil says that once you decide to kill kudzu, it is actually fairly easy to control.

The secret to success is perseverance.

Kudzu produces large storage roots that can continue to sprout even after the top of the plant looks dead. Regardless of which control method you choose, you must be prepared for a multi-year battle to defeat this invasive foe.

Many herbicides are effective on kudzu. Neal lists just a few that he says he believes to have the broadest applicability in landscape management (if this were a forest site, his answers would be different). Selective broadleaf herbicides containing clopyralid (Lontrel, Transline, Confront) are probably the most effective alternative.

Treat the new growth in the spring and re-apply as new growth emerges. Nonselective herbicides containing glyphosate, such as Roundup-Pro, Glyfos, Target, and others are also effective.

If you do not wish to use herbicides, mowing and grazing are also effective. Mowing is effective if you mow the entire infestation frequently (about every two weeks during the growing season). Grazing is also an option. Recent work has shown that two seasons of grazing with goats can nearly eradicate an infestation.

Nothing can train you for this

Editor's note: As former president of the Ledgewood Association, a homeowners' association in Strongsville, OH, I oversaw the landscape operations for the association. The following story recounts a chilling event one of our crew members experienced.

Safety is no accident, the pundits say. Common wisdom holds that luck favors the prepared. A recent experience with our grounds crew seems to say that safety is often a combination of both luck and accident.

It was random chance that our second-oldest crew member, Dave, was out mowing a stretch between the lane and a creek with our 54-inch self-propelled walk-behind. It's a job we usually assign to junior members.

The grass he was mowing is about three feet above the stream. We had maintained and mowed it for years. Earlier in the week, there had been some soaking rains, but nothing overly unusual for the season. Suddenly, the ground gave way under him. As he tells it, there was no time to react — he simply shoved the mower away from himself and jumped away from the mower and into the creek. A ten-foot chunk of the stream bank slumped and rolled into the water, taking the mower with it.

Here's where it gets strange. He mustn't have let go quite as quickly as he recalls, for the mower turned over and landed upside-down in the creek, still running. The mower is equipped with the standard positive on, quick-release shut-off handles. They were in working order. Yet, when the mower came to rest upside-down in the creek, the handles were jammed into the bed of the creek, locking the unit into the on position. The mower kept running.

Dave was sharp enough to draw in a deep breath or two before taking action. He gingerly reached over and hit the kill switch on the motor. Then he climbed up the stream bank, walked back to the garage and called it a day.

This is not the kind of accident that one trains for or designs equipment to handle. It was pure good luck that we had a senior person on the job and that he was thinking clearly and logically even after surviving the scare of the season.

This summer, we're planting creeping ivy and several other groundcovers all along the stream bank. Once bitten, twice shy.

Curt Harler
Managing Editor

TURFGRASS TRENDS

TurfGrass Trends is published monthly. ISSN 1076-7207.

Subscription rates: One year, $199 (US); $230 (all other countries.)

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Postmaster: Send address changes to TurfGrass TRENDS, 131 West First St., Duluth, MN 55802-2065.

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