ABOUT THE COVER

Our cover artist Beverly Bergemann features WGCSA President Brian Zimmerman.

None of our men are "experts." We have most unfortunately found it necessary to get rid of a man as soon as he thinks himself an expert because no one ever considers himself expert if he really knows his job. A man who knows a job sees so much more to be done than he has done, that he is always pressing forward and never gives up an instant of thought to how good and how efficient he is. Thinking always ahead, thinking always of trying to do more, brings a state of mind in which nothing is impossible. The moment one gets into the "expert" state of mind a great number of things become impossible. ~Henry Ford, Sr.

We can use this quote as a reference during the offseason to take a renewed look at our operations to examine possible changes.

THE GRASS ROOTS

THE GRASS ROOTS is a bi-monthly publication of the Wisconsin Golf Course Superintendents Association, printed in Waunakee, Wisconsin by Kramer Printing. No part of THE GRASS ROOTS may be reprinted without expressed written permission by the editor.

EDITOR
David A. Brandenburg, CGCS
Rolling Meadows Golf Course
PO 314 Theresa, WI 53091
grassroots@wgcsa.com

Front Row: Brian Zimmerman, Jeff Millies, Chad Harrington, Jim Van HerwynenBack Row: Brett Grams, Scott Bushman, Dustin Riley, Scott Sann, Colin Seaburg, Alan Nees, Not pictured Mark Storby

A New Term

By Brian Zimmerman, *Chief of Operations, Milwaukee County Department of Parks, Recreation and Culture*

Editors Note: We welcome newly elected President Brian Zimmerman as a new contributor to The Grass Roots. *Be sure to check out Brian's Personality Profile in this issue.*

Thank you for the honor to serve as the president of the Wisconsin Golf Course Superintendents Association. It is truly my privilege to work with this outstanding membership. The association is in great shape financially and operationally. Our Chapter manager, Brett Grams, has put a new face to the daily oversight of the association's activities. We have rolled out the new website in the past few months and are in the process of launching the Industry Partners Plan and the Golf for Turfgrass Research. Please check the web site frequently for the most current information at wcgsa.com.

I would like to thank Mike Lyons from Old Hickory Golf Club for years of dedicated service to the association. His insight and passion for advancing the association will be missed. I would also like to welcome Scott Sann from Greenwood Hills, Colin Seaberg from Ozaukee Country Club, and Alan Nees, our vendor representative. I am pleased these members have taken an interest in serving the association.

Many of us will be working under a different set of circumstances this year. In my six years working for the county not seen this type of budget that we are about to administer. We are on track for up to a 30% reduction in seasonal dollars and full time staff will be required to take up to 12 furlough days. My guess is that the greeting card companies are getting ready to roll out a new line of cards that say something to the effect of "Happy Furlough Day." With whatever situation you may find yourself in remember that the most important part of day is when you wake and have the opportunity to begin again. Give your family a hug and kiss and do the best job you can with the resources you are given.

In the words of the Harry Truman, "To be able to lead others, a man must be willing to go forward alone." Here's to hoping we will not walk alone!

I look forward to seeing you at the spring business meeting for a day of education and camaraderie.

WGCSA Mission Statement

The Wisconsin Golf Course Superintendents Association is committed to serve each member by promoting the profession and enhancing the growth of the game of golf through education, communication and research.

WGCSA Vision Statement

The Wisconsin Golf Course Superintendent Association is dedicated to increase the value provided to its members and to the profession by:

- Enhancing the professionalism of its members by strengthening our role as a leading golf organization in the state.
- Growing and recognizing the benefits of a diverse membership throughout Wisconsin.
- Educating and promoting our members as leaders in environmental stewardship.
- Offering affordable, high value educational programs at the forefront of technology and service.
- Being key to enjoyment and the economic success of the game of golf.

Introducing the NEW Jacobsen® AR-522™ Rotary Mower

A New King of the Hill

Jacobsen announces the arrival of the AR-522™ rotary mower. The AR-522 will replace the current AR-5 and couples the improved class-leading performance of the AR-5 with the new TrimTek™ cutting system that was introduced with the launch of the AR-3 triplex rotary last fall. Nothing else climbs or cuts like the new AR-522 – it stands alone by delivering best-in-class performance for rough mowers. For more information, contact your local Jacobsen dealer or call 1.888.922.TURF.

1.888.922.TURF • jacobsen.com   TEXTRON FINANCIAL

Official Supplier of Turf Care Maintenance Equipment

The Official Turf Equipment Supplier to The PGA of America and
The Exclusive Turf Equipment Supplier to PGA Golf Properties.

Phone: (847) 336-1205

Fax: (847) 336-2697

WWW.Burrisequipment.com

Burris EQUIPMENT

Burris Equipment Company
2216 N. Greenbay Road
Waukegan, IL 60087

JACOBSEN®
A Textron Company

When Performance Matters.™

Fertilizer Responses in a Bentgrass Fairway

By Dr. Wayne Kussow, *Professor Emeritus, Department of Soils, University of Wisconsin-Madison*

INTRODUCTION

A researcher's retirement is fraught with tough decisions. Do I throw out old data files that, when re-visited, could hold gems of useful information or provide confirmation of what we already hold to be true? Of concern here is a file containing 1,728 measurements of creeping bentgrass color ratings and clipping N contents collected from a fairway treated for three years with four different fertilizers, each applied at three N rates. I decided it may be worthwhile to take one last look at the data.

FINDINGS

When N rate and source are the variables in a study, researchers typically measure turfgrass responses in one or more ways - turfgrass quality, clipping production, color ratings, or clipping N content. Because the rates of N applied to turfgrass are far below those required for maximum clipping production, there is always a strong, straight line relationship between clipping yield and N content. When taken by the same person, color and quality ratings also bear strong relationships to clipping N content and production, but these are generally not straight line relationships. This is illustrated in figure 1 for the clipping N contents and color ratings recorded in this study. The reason for this is the reluctance on the part of researchers to assign the maximum possible color and quality ratings of 9.0. This is why in this study the decision was made to use clipping N content as the primary measure of creeping bentgrass response to the fertilizers applied.

Figure 1

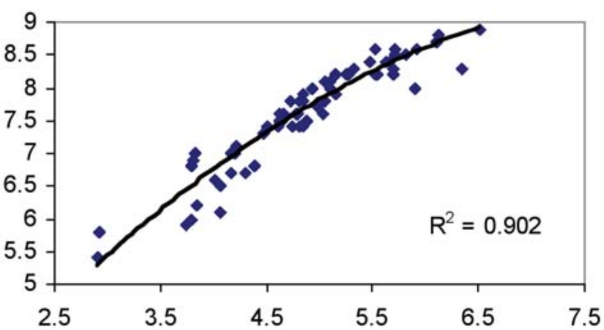
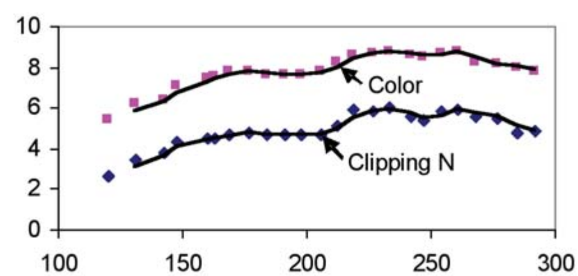


Figure 2



You've likely read or heard about the seasonal bimodal pattern of turfgrass responses to fertilizer. It's generally attributed to the influences of air temperature on turfgrass growth. Near optimal temperatures allow for a surge in early season growth response to fertilizer, elevated summer temperatures suppress these responses, and declining autumn temperatures lead to another surge in growth. In more than 20 years I've never seen this seasonal response pattern and it was not evident in this study as well (Fig. 2). The seasonal pattern of bentgrass color and clipping N content shown in figure 2 was found for all fertilizers, all rates of application, and for all three years of the study. If ever there was a year where air temperatures would have notably suppressed bentgrass responses to fertilizer, it should have been 1988. Most of you may be too young to remember, but in that year we experienced nearly a full week of air temperatures above 100˚F. Even under these conditions there was no evidence in this study of a bimodal seasonal response to the fertilizers. I've always suspected that the classical bimodal growth response of turfgrass is more the result of moisture than temperature stress. Researchers need to revisit this because so many fertilizer recommendations are based on the assumption that a seasonal bimodal growth response is the norm for turfgrass.

As indicated in figure 2, fertilizer response measured in terms of clipping N content peaked at about day 233, which is August 21. This was consistently true regardless of whether the fertilizer was Milorganite, urea or IBDU for all annual rates and frequencies of application. This is vividly illustrated in figure 3 for IBDU applied four times during the season and urea applied biweekly. The IBDU gave a consistently better response, but the pattern of response was the same for urea. Note in figure 3 that there appeared to be a short duration suppression of fertilizer response from days 243 to 261 (August 31 to September 18), but by no means resulted in a seasonal bimodal response pattern.

Increasing the annual N rate of the fertilizers had the same effect on bentgrass seasonal patterns of response. The influence of annual N rate on the seasonal response patterns is illustrated in figure 4 for regular grade Milorganite. The general trend lines largely parallel one another except early and late in the season, where there was separation between responses to the lowest and intermediate N rates. The intermediate N rate elicited a disproportionately greater response than did the lowest rate. This was true for all the fertilizers applied. This suggests that late and early season N rates may need to be higher than during the summer months to sustain high turfgrass quality on bentgrass fairways late in the season and to stimulate early season growth and rapid recovery from winter injury.

A seemingly unending debate among turfgrass researchers is the best form of N to apply late season. In this study the last applications of fine grade Milorganite, regular grade Milorganite, urea, and IBDU were made in mid-October at various N rates. Their stimulatory effects on early season growth were judged based on bentgrass clipping N contents the following April. These were found to be almost exclusively related to the October N rate (Fig. 5). It was virtually impossible to single out natural organic Milorganite, the 100 % water soluble urea or the low solubility IBDU as the preferred late season N source. This was true whether based on color response or clipping N content. Early and late season responses to these three types of fertilizer N were almost identical (Table 1).

In studies such as this the question always arises as to which was the preferred fertilizer. This question was addressed in this study three different ways. The first was to plot graphs that allowed for identification of the annual rates of each fertilizer required to achieve the annual color ratings and clipping N contents indicative of a high quality bentgrass fairways. Depending on the criteria applied, these optimal annual N rates ranged from a low of 1.3 lb N/M applied as IBDU to 6.5 lb N/M in the form of fine grade Milorganite (Table 2). These N rates reflect the fact that throughout this study IBDU always elicited the most bentgrass response per pound of N applied and fine grade Milorganite the least. Responses to urea and regular grade Milorganite were intermediate between fine grade Milorganite and IBDU and were often indistinguishable from one another.

The ideal N fertilizer, yet to be created, is the one that provides near constant color ratings and clipping N contents over time. As seen in figure 2, responses to fertilizers always vary over time primarily due to changing growing conditions. One way to judge the amount of variability in turfgrass responses to a fertilizer is to calculate a statistic known as the standard deviation. The larger the standard deviation the greater the variability in what has been measured. Standard

Figure 3

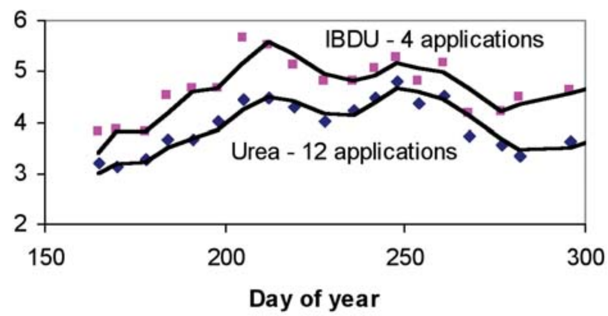


Figure 4

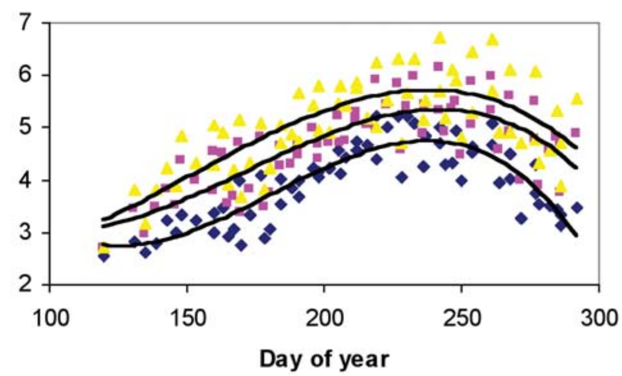


Figure 5

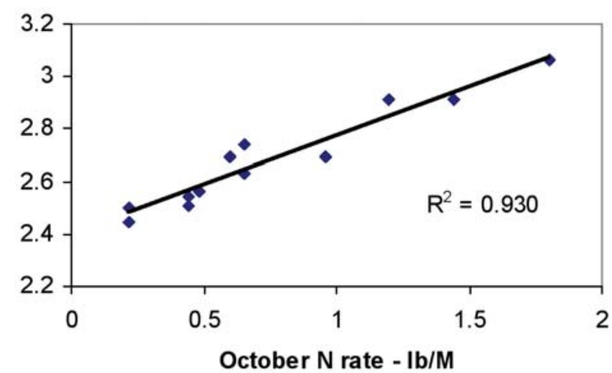


Table 1. Early and late season bentgrass responses to fertilizers.

Fertilizer	Change April 30 to June 9 Color rating	Change April 30 to June 9 Clipping N	Change Sept 18 to Oct. 19 Color rating	Change Sept 18 to Oct. 19 Clipping N
Milorganite	+2.0	+1.86 %	-1.0	-1.09 %
Urea	+2.0	+1.72 %	-0.9	-1.09 %
IBDU	+2.0	+1.91 %	-1.1	-1.06 %

Table 2. Optimum annual N rates based on bentgrass color and N content.

Fertilizer	Optimum annual N rate – lb/M Based on color	Optimum annual N rate – lb/M Based on clipping N
Fine grade Milorganite	5.8	6.5
Regular grade Milorganite	3.3	3.6
Urea	4.1	4.8
IBDU	1.3	2.4

Figure 6

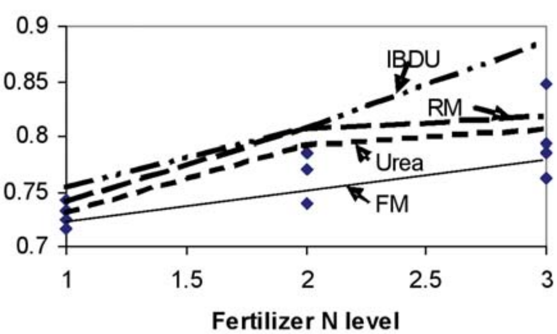
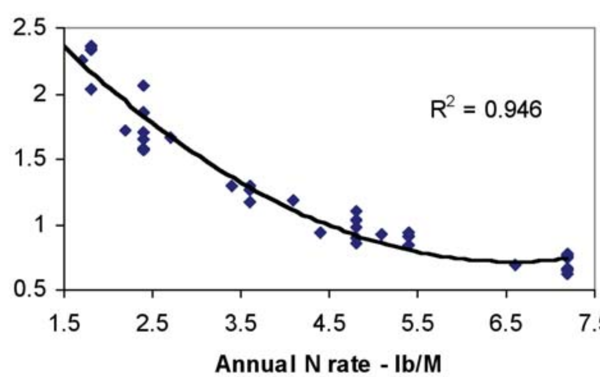


Figure 7



deviations for clipping N content for the four fertilizers tested in this study are shown in figure 6 for the three annual levels of N applied. The first thing to note is that the standard deviations increased with the amount of N applied. This is always true. It is also true that the standard deviation associated with a particular fertilizer is related to how well the turfgrass responds to the fertilizer. The greater the response, the greater is the standard deviation. The consequence is that among the four fertilizers IBDU generally had the highest standard deviations and fine grade Milorganite the lowest.

Because the optimum rate of annual N application differed for each fertilizer applied (Table 2), the standard deviations shown in figure 6 can be misleading. When applied at their optimum rates the clipping N standard deviation for fine grade Milorgante was 0.765, for regular grade Milorganite was 0.758, for urea was 0.740, and for IBDU was 0.715. Therefore, had the fertilizers all been applied at their optimum rates IBDU would have provided the most uniform bentgrass response during each seasons and for all three years. In view of the relatively low optimum rate of IBDU required and the resulting uniformity in bentgrass response, it's unfortunate that economics has led to the demise of this fertilizer.

Yet another way to evaluate N fertilizers is to calculate their nitrogen use efficiency (NUE). The NUE of a fertilizer is the amount of response per pound of N applied. In this study, NUE was calculated as clipping % N per pound of N applied. The efficiency with which turfgrass utilizes fertilizer N always decreases with the amount of N applied. This was clearly evident in this study, where NUE declined from around 2.3 % clipping N/lb fertilizer N when the rate was 1.6 lb/M to 0.7 % clipping N/lb fertilizer N when the annual N rate exceeded 6.5 lb/M (Fig. 7). Examination of the NUE values for the individual fertilizers showed that notable differences arose only when the annual N rates were < 4.5 lb/M. Under this circumstance, regular grade Milorganite and IBDU had the highest and similar NUE values. Fine grade Milorganite and urea had lower and similar NUE values.

SUMMARY COMMENTS

This and many other studies designed to evaluate turfgrass response to different fertilizers have shown that color and quality ratings, clipping production and N content are all highly related to each other. Any one of them provides a valid means for assessing fertilizer performance. The more intense the color development the higher the turf quality, clipping yield and tissue N content. Any superintendent wishing to conduct their own tests with different fertilizers can do so merely by noting color responses to side-by-side applications of the fertilizers. Color is and always has been a reliable

TURF UNIVERSITY CLASS OF 2010

Curalan® EG Fungicide, Emerald® Fungicide, Honor™ Fungicide

Insignia® Fungicide, Iprodione Pro 2SE Fungicide, Trinity® Fungicide

Basagran® T/O Herbicide, Drive® XLR8 Herbicide, FreeHand® 1.75G Herbicide

Onetime® Herbicide, Pendulum® AquaCap™ Herbicide, Pendulum® 2G Herbicide

Pendulum® 3.3 EC Herbicide, Segment® Herbicide, Tower® Herbicide

For diseases, weeds or pests, BASF is at the top of the class.

Contact Randy Lusher at **(630) 235-0104** or **randy.lusher@basf.com**.

betterturf.basf.us

BASF
The Chemical Company

Always read and follow label directions.

guide for determining the frequency and at what rate N should be applied. Use of color as your guide rather than a fixed application rate and schedule compensates for inevitable changes in weather patterns that influence color response to fertilizer. The end result of using color as your guide is custom tailoring of you fertilization program to your golf course.

There is a well ingrained notion in the turfgrass world that during summer months high air temperatures suppress turfgrass growth and its capacity to respond to fertilizer. This often leads to the recommendation that N rates should be reduced at that time of year or fertilizer application actually be suspended until air temperatures decline. In this and many other studies I've conducted, there has never been a pronounced summer decline in bentgrass growth rates as long as the turf was irrigated to prevented moisture stress. With this requirement being met in the present study, turfgrass color and clipping N contents consistently peaked in late August rather than earlier in the year when air temperatures were likely more favorable for bentgrass growth. This contradicts the idea that N rates should be reduced on bentgrass fairways during the summer months.

The results of this study also refute the idea that one form of fertilizer N is preferred over another when it comes to late season fertilization. At issue is the influence of late season N on growth resumption the following spring and rate of recovery from any type of winter injury. When April tissue N contents were the criteria for judging the effectiveness of late season applications of N, rate of application proved far more important than the form of N applied. The differences among Milorganite, urea and IBDU were miniscule and of no real consequence.

The four fertilizers tested in this study varied significantly in their nitrogen use efficiencies. This resulted in substantial differences in the annual rates required to achieve a common level of bentgrass color development or clipping N content. Indications were that the optimum annual N rate ranged from 1.3 lb/M for IBDU to 5.8 lb/M for fine grade Milorganite. Such large rate differentials have obvious implications regarding annual fertilizer expenditures. Not so obvious is the gain in uniformity in bentgrass response over time that results from application of lower annual N rates.

The Fate of Your Fungicides

By Paul Koch, *Turfgrass Diagnostic Lab, University of Wisconsin - Madison*

Every golf course superintendent goes to great pains to develop their pesticide program. Part of that program should include proper inspection of equipment and calculation of proper travel speed and pressure to ensure the proper amount of pesticide is leaving the nozzles. But once it leaves the nozzle, its activity is largely out of the superintendent's control. This activity is important for golf course superintendents for environmental and human health considerations, as well as obtaining proper disease control.

The fate of our fungicide applications on the environment and human health varies immensely with application method and environmental conditions. Despite this variability, two important points consistent amongst most turfgrass sites are (a) pesticide exposure to golfers is very low if proper drying time on the plant is allowed and (b) movement of pesticides or pesticide metabolites away from the target site as either runoff or leaching into groundwater is rarely seen when pesticides are properly applied (Cisar and Snyder, 2000; Clark and Doherty, 2006; Watschke et al., 2000). Two significant reasons for this lack of movement in the turfgrass profile is the hydrophobic nature of thatch and the dense vegetation cover that turfgrass provides. The same chemical reactions in the thatch layer that turn portions of the soil hydrophobic in dry conditions also cause thatch to bind very tightly to most turfgrass chemicals. While this might make location of pesticides to the root zone more difficult for the control of root diseases (and nearly impossible in a home lawn), it does lessen the turf system's susceptibility to contaminate surrounding environments (Figure 1). The dense vegetation cover provided by healthy turfgrass also prevents pesticide runoff by preventing soil runoff, which is the number one cause of non-point pesticide contamination of surface waterways. This in no way means turfgrass chemicals are "safe" or have no negative effect on the environment, but it does suggest that the impact of turfgrass pesticides on the environment and human health is minimal and often over stated in the popular press.

Turning specifically to fungicides and disease control, most would assume that the majority of the pesticide leaving the nozzle reaches the turfgrass a mere couple feet below. But fungicides (and other pesticides) can adhere to plastic or rubber sprayer components, and drift or volatization can prevent the pesticide from reaching its intended target. Most of us also assume that once it reaches the turf, most of it goes toward protecting the plant. According to Sigler et al., 2000 there are six major physical and chemical processes that affect fungicide fate in a turfgrass system (Table 1). Most of these processes will decrease the activity of the fungicide.

Figure 1. The thatch layer can provide a nearly impenetrable barrier for pesticides to pass through. This may negatively affect control of root-inhabiting pathogens, but has a positive environmental effect as pesticides rarely escape the turfgrass system in large quantities. Photo courtesy Dr. John Stier.

In contrast to row crop agriculture where one or two fungicide applications are required for proper disease control, repeated applications are necessary in turfgrass to control certain diseases throughout the entire growing season (or the entire off season in the case of snow molds). Current fungicide labels use a calendar method for the reapplication interval, but that doesn't take into consideration varying conditions that could vary the rate of fungicide degradation and the rate at which a fungicide needs to be applied. The examples of possible degradation variability are seemingly infinite, but two are proposed here. One example would be from varying microbial activity. We know from Table 1 that microbial populations can degrade fungicides, and