

Little Bluestem Research—

(Continued from Page 29)

from parks, nature preserves, railroad right of ways and other natural areas. Seed was germinated and plants were established in three replications of eight plants each on the St. Paul campus. Plants continue to be evaluated for variation in flower time, height, color, and lodging. In 2004 a selection from Benton County that has been evaluated at several Research and Outreach Centers was advanced to a new release and a plant patent has been applied for *Schizachyrium scoparium* "Blue Heaven"™. This selection is taller, with dark blue summer foliage color and bright blue to pink fall color. Commercial growers interested in propagating this new release should contact the U of M for a non-exclusive license. Work will continue to identify other new ornamental forms of little bluestem.

Propagation Time & Aeration Porosity

Little bluestem plugs and field divisions grew equally when propagated in the fall or spring in another study. Both over-wintered well and grew adequately in all aeration porosities from 5-41%. Little bluestem appears to be well adapted to diverse growing conditions and methods of propagation.

Competition Study with *Miscanthus*

This study has not been finalized for publication, but in an additive competition study little bluestem was not affected by adding

Miscanthus, a non-native ornamental grass that has been shown to be invasive in Middle Atlantic states. Little bluestem was not reduced in root or shoot growth when grown with one or two *Miscanthus* plants in this 22-week greenhouse competition study. Thus little bluestem is a competitive, adaptable native grass.

FOR FURTHER INFORMATION

For further information on these topics see the following references:

Meyer, M. H. and B. Cunliffe. 2004. Effects of media porosity and container size on over-wintering and growth of ornamental grasses. *HortScience* 39(2):248-250.

Meyer, M. H. and V. A. Gaynor. 2002. Effect of Seeding Date on Establishment of Native Grasses. *Native Plants Journal* Vol. 3(2):132-138. University of Idaho Press.

Cunliffe, B. and M. H. Meyer. 2002. Propagation Time Affects Winter Survival and Finishing Date for Ornamental Grasses. *Journal of Environmental Horticulture* Vol. 20(4):201-203.

Meyer, M.H. and V. Gaynor. 2000. A Field Guide and Key to Fifteen Grass Seedlings. *Journal of Natural Resources and Life Science Education*. 29:141-147. <<http://www.JNRLSE.org>>.

Gaynor, V. and M. H. Meyer. 1999. Effects of Seeding Date of Establishment of Prairie Grasses in Minnesota. Final Report. Minnesota Department of Transportation. St Paul, Minn.



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715-344-9152

Gary Nelson Class A - GCSAA
Lee Park Golf Course
Aberdeen, South Dakota
605-626-7015

Wesley G. Salo Class A - GCSAA
Ridgeview Country Club
Duluth, Minn.
218-728-2583

Kenneth M. Septon Class A - GCSAA (pending)
Roughrider Golf Course
Minot, North Dakota
701-723-6863

Jason Swanson Class A - GCSAA
Hidden Greens
Hastings, Minn.
651-437-3085

Casey R. Flatten Class B - GCSAA
(pending)
Shamrock Golf Course
Hamel, Minn.
763-478-9977

Christopher G. Hyman Class B - GCSAA
St. Clair River Country Club
St. Clair, Mich.
810-329-6813

James W. Bezanson Class C - GCSAA
Prestwick Golf Club
Woodbury, Minn.
651-459-0288

Geoff Jordan Class C - GCSAA
Mystic Lake Golf Club
Shakopee, Minn.
952-270-6808

Travis Kiel Class C
Milaca Golf Club
Milaca, Minn.
320-983-2110

Erin McManus Class C - GCSAA
Rolling Green Country Club
Medina, Minn.
763-478-2179

Daniel Baert Class C
City of Pierz
Pierz, Minn.
320/468-2768

Joseph R. Tart Class C - GCSAA
(pending)
TPC of the Twin Cities
Blaine, Minn.
763-785-0696

Mark Adams Student - GCSAA
Anoka Technical College
Hillcrest Golf Club of St. Paul
St. Paul, Minn.
651-777-5186

Scott Craig Student - GCSAA (pending)
Anoka Technical College
Anoka, Minn.
763-576-4700

Matthew D. Pap Student - GCSAA (pending)
North Dakota State University
Bellwood Oaks Golf
Hastings, Minn.
651-438-3839

Adric Ryan Student - GCSAA (pending)
University of Minnesota
Town & Country Club
St. Paul, Minn.
651-263-2393

Gregg Brodd Affiliate
National Mower / Turfco
Minneapolis, Minn.
763-785-1000

Randy Dufault Affiliate
Dakota Peat & Equipment
Grand Forks, ND
701/746-4300

John Meyer Affiliate
Agrotain International
952/892-6694

Wally Freier Affiliate
The Finley Group
Synthetic Turf Solutions
Chanhassen, Minn.
651-738-0379

Reclassifications

G.M. Jerry Murphy, CGCS
Class A - Retired

Andrew Larsen
Rolling Green Country Club
Class C to B

Daniel J. Rickbeil
Red Lodge Mountain Golf Course
Class C to B

- Submitted by James Gardner, CGCS
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Evaluating the Effects of Foliar Iron Formulations on Turf Quality

By Peter Bierman, Carl Rosen and Brian Horgan
Departments of Soil, Water, Climate and Horticultural Science
University of Minnesota

Maintaining dark green leaves is a key aspect of turfgrass management. A rich green color is aesthetically important, as well as an indicator of turf health and quality. Color is affected by many factors, including nitrogen fertility, disease symptoms, and iron deficiency. Iron (Fe) is required in only small amounts, but is important because of its essential role in chlorophyll synthesis.

Inadequate Fe in leaves is frequently due to conditions that limit iron uptake, rather than low amounts of Fe in the soil. High soil pH, compaction, water-saturated soil and cool temperatures can induce Fe deficiencies. Foliar applications of Fe are frequently used to maintain and improve the appearance of turfgrass on golf course greens. Foliar Fe has been shown to promote a darker green leaf color, even when Fe is not limiting the growth of turfgrass. In some cases, the effect of Fe may be to stain and darken leaf surfaces rather than a physiological effect due to improved Fe nutrition. Application of foliar Fe is a recommended practice for improving green color of golf greens.

Research Objectives

This project evaluated the effectiveness of different spray formulations to increase foliar Fe uptake and improve turfgrass color on golf course greens.

Specific objectives were to:

- 1) Compare foliar Fe applications using a spray adjuvant to foliar Fe applications with no adjuvant
- 2) Compare Fe sulfate foliar sprays with foliar nitrogen applications and Fe + nitrogen foliar sprays
- 3) Evaluate treatment effects on turfgrass quality and the longevity of any observed improvement in leaf color through subjective visual observations

Experimental Procedures

This research was conducted at the Turfgrass Research, Outreach, and Education Center on the St. Paul campus

of the University of Minnesota. Plots were established on a recently constructed golf course green. Standard cultural practices following University of Minnesota recommendations were used for all aspects of green maintenance other than the experimental treatments imposed by the study.

Six treatments were tested:

1. Control (no Fe applied)
2. Foliar Fe-sulfate (no adjuvant, no N)
3. Foliar Fe-sulfate + adjuvant (no N)
4. Foliar N + adjuvant (no Fe)
5. Foliar Fe + N (no adjuvant)
6. Foliar Fe + N + adjuvant

Each treatment was replicated three times in a randomized complete block design. Treatment plots within each block were 5 ft x 5 ft. Fe was applied at a rate of 0.4 oz/1000 sq ft in a total solution volume of 3 gal/1000 sq ft. For treatments containing the spray adjuvant, the rate was 2.5% by volume. The adjuvant being tested is an experimental product. A commercial product (Origin Six-Iron, Agriliance L.L.C.) was used for the treatments containing both Fe and N. This product is 6% Fe (from Fe-sulfate) and 15% N (from urea), so in these treatments N was applied at a rate of 1.0 oz/1000 sq ft. The foliar N (no Fe) treatment was applied at the same 1.0 oz N/1000 sq ft rate using urea as the N source.

Foliar Fe treatments were applied on June 11 and visual evaluations were made on June 13. A second set of treatment applications and evaluations was done on July 21-22, preceding the Turf Field Day. Visual evaluations of turf quality were made on a rating scale of 1 (light green color) to 5 (dark green color). Digital photos of each treatment were also taken.

Results

Figure 1 shows the results of visual evaluation of treatment effects on turf quality following the first application date. These ratings were made two days after foliar applications on June 11. Foliar Fe seemed to improve turf color and

appearance. Applying N in combination with Fe provided no additional benefit compared to Fe alone. All Fe treatments had higher quality ratings than the unsprayed control or foliar N without Fe, although only the treatments with the spray adjuvant were significantly higher. Adjuvant + Fe treatments (with or without N) were also significantly higher than comparable Fe or Fe + N treatments with no adjuvant. Improved appearance was short-lived and no visible differences among treatments were observed five days after application.

The absence of an N effect on turf color indicates that the standard fertilizer program was supplying sufficient N for optimum appearance. The rapid and transient nature of Fe effects on turf quality suggests that the responses to Fe may have been due to changes on the leaf surface rather than Fe movement into the leaf, improved Fe nutrition, and increases in chlorophyll synthesis. This is supported by the observation that changes in appearance and differences among treatments seemed to occur immediately after spray application. Although ratings to document these rapid effects were not made, they were consistent with the trends observed two days later and appeared most pronounced for the adjuvant treatments. The adjuvant effect may have been due to more uniform spreading of the spray solution over the leaf surfaces. If improved color was due to darkening of the leaves by a surface coating of Fe, thorough coverage and better distribution of Fe could have created a more uniform staining effect.

The short duration of the color change was probably due to the frequent mowing of greens and associated removal of treated leaves. This effect of frequent leaf removal would probably be the same whether Fe was darkening the surface of the leaf or taken up by the leaf and affecting color physiologically, because Fe is relatively immobile in plants and not

(Continued on Page 35)

Foliar Iron—

(Continued from Page 34)

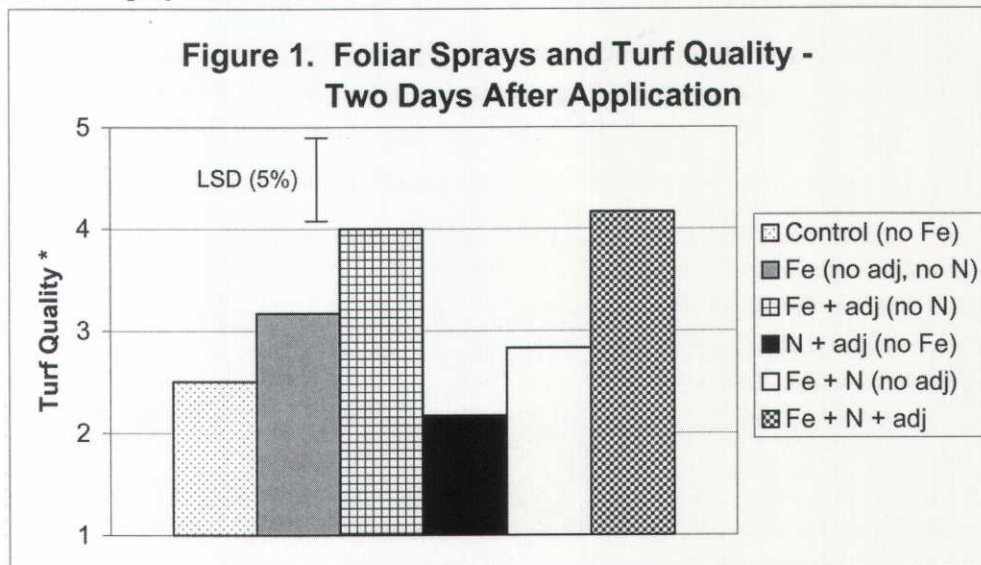
readily translocated from older to younger leaves.

Figure 2 shows the results of visual evaluation of treatment effects on turf quality for the second set of treatment applications. These ratings were made on July 22, one day after foliar applications. Results were similar to the first treatment date, but none of the observed differences was statistically significant. There was a trend for improved turf color and appearance with foliar Fe application and adjuvant + Fe treatments had numerically higher quality ratings than treatments with Fe alone. Plots were not revisited until ten days after initial evaluations, but no visible differences among treatments were observed at that time.

Conclusions

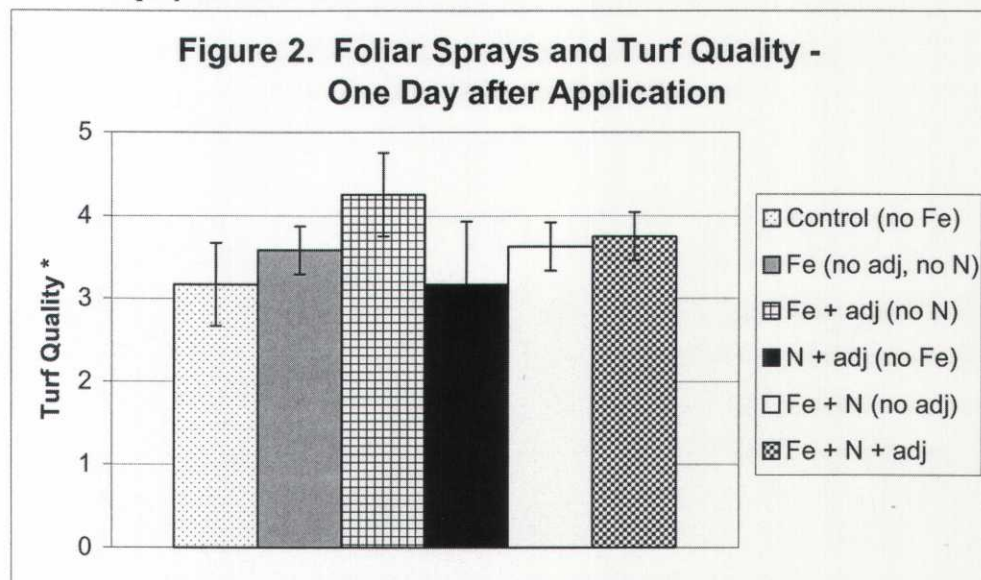
All Fe treatments had higher quality ratings than the unsprayed control or foliar N without Fe, although only the treatments with the spray adjuvant were significantly higher. Improved appearance was short-lived and no visible differences among treatments were observed five days after application. The rapid and transient nature of Fe effects on turf quality suggests that the responses to Fe may have been due to changes on the leaf surface rather than Fe movement into the leaf, improved Fe nutrition, and increases in chlorophyll synthesis. This is supported by the observation that changes in appearance and differences among treatments seemed to occur immediately after spray application.

For the 1st spray date on 6/11



* Turf Quality: visual rating on a scale of 1 (light green color) to 5 (dark green color).

For the 2nd spray date on 7/21



* Turf Quality: visual rating on a scale of 1 (light green color) to 5 (dark green color). Vertical bars are standard errors of the mean.

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E-mails often bounce back to the MGCSA office because of full mailboxes.

It's recommended that you check your "inbox" on a regular basis and delete or file all incoming mail to maintain adequate space in your inbox.



Musing the Minutes

By Rick Traver, CGCS
Monticello Country Club

I have just returned from the "People vs. the Pro" event at North Oaks and want to thank Jack MacKenzie, CGCS and company for preparing the golf course. Thanks also to Dave Oberle for bringing this event to Minnesota. It was a wonderful time, a beautiful golf course, and despite a cold start, turned into a great day.

I would also like to thank Jeff Vinkemeier for hosting our Spring Mixer and our most recent Board of Directors meeting. Despite again a cool windy start it was a great time. Since I am supposed to write about the Board meeting, without further ado here is the info on the latest MGCSA Board of Directors meeting. It was held on Monday, May 17th at the Glencoe Country Club.

The business office reports that the Membership Rosters have been mailed. Any late entries or new members will now be included in the Hole Notes magazine

and formatted to fit into your three-ring binder.

Scott Turtinen also reports that we will be receiving service points from the GCSAA for attending all MGCSA functions. While they could be as little as .1 point it all adds up.

Dave Oberle reports that they have received \$13,650 on the new fundraiser. He has been aggressive with the fundraising committee to generate new revenues for the MGCSA, Research and Scholarships. The fundraiser asked vendors to sponsor a hole during the year for each of our golf events. While much of the money will go to the research and scholarship events, there was some discussion about how the balance should be spent. It was decided that the balance should be used for external activities or the promotion of our association. Please thank all the sponsors as you see them for promoting our association's activities.

In other news Rick Fredricksen, CGCS reported that he was just recently inspected by the MDA and that the factory air gap on older sprayers no longer conforms to standards. It must be an air gap such that your hand can pass through it. Look for more on this issue in the future.

Paul Eckholm, CGCS reported that the governor signed the phosphorus bill, so all superintendents in the entire state have to be certified to apply phosphorus to their golf courses. He also stated that the Lakes association is being very aggressive in trying to stamp out the use of phosphorus completely, which would mean on golf courses, in soaps etc...

Dr. Horgan introduced Dr Watkins and they announced that despite a poor showing last year there would be a Field Day at the U of M. It is scheduled for July 29th, so mark your calendars and let's show our support for the U of M and the effort the guys are putting out for this event

I hope all is well with everyone and your courses are recovering from the winter despite this cold spring. Thanks again to Jack and Jeff for hosting events and for all the effort in prepping your courses for us to enjoy.

Have a great month!

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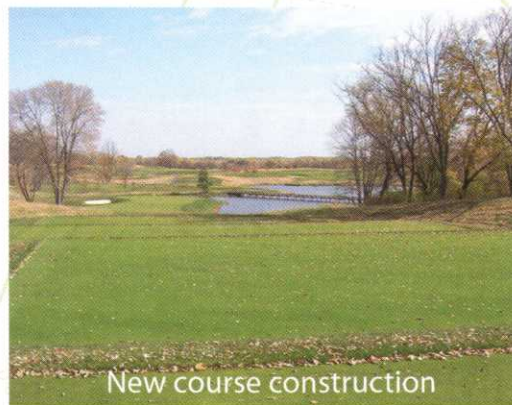
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In Bounds

By Jack MacKenzie, CGCS
North Oaks Golf Club

My son recently earned his driver's license. It didn't surprise me, as he has been practice driving since he was five. You name it: E-Z-Go, Club Car, Harley, Yamaha or Cushman, he has mastered them all. One of the multiple advantages of being the kid of a Superintendent! In fact, mastery of motion is critical for all rookie drivers.

It was no different for me growing up on a golf course. As I have mentioned before, my siblings and I spent many fun evenings driving the White Bear Yacht Club in "sun charged" carts. And once employed on the grounds crew it was only a matter of natural progression for me to move up to a three-on-the-tree manual Cushman complete with clutch.

Ah yes, the old indestructible backbone of the turf industry. With all of the gear grinding, heavy hauling, multi-driver abuse the units received, it was more usual than not to have one unit upon the lift for repairs or a tune up.

During the fall of 1978, while an orange flat bed Cushman was being worked upon, a prank developed among the senior members of the crew. A tall tale really, devoted to the annual rally of professional Cushman drivers and their mechanics, called the Cushman Nationals.

While the utility vehicle was on the lift, we would tell the story of how each club in the state would send a rookie driver and the mechanic to a local speedway for time trials and the opportunity to compete against other drivers. State elimination took place at Brainerd International Speedway. The annual fall event would prepare the winners for the "National" to be held at Daytona speedway in Florida sometime around Thanksgiving time.

Just imagine the look on the faces of our newbees as they learned of a buggy race that only they were eligible to entertain. Of course there were strict criteria. Accidents during the year disqualified the racers from entering. Participation was up to the judgment of the Superintendent. And there would be no practice driving upon the course!

It really helped to have the whole senior team on board with the fictional ruse. Roger Zolner, a long time employee with an interesting permanent facial expression that added to his tale of a meet and greet on an inside bank, would begin the twist. While changing a flat tire, Max Olson might subtly mention the advantages of smooth verses grooved tires in the speed runs. And of course the "older" college kids would turn the screw deeper with expanded drama

detailing fast Cushmans and even faster women at the competitions they were selected for.

For many weeks the young lads surely lost sleep dreaming about their chance to impress the world with impeccable driving skills. Rotary mowing had to have flown by as the kids went mindless thinking of tight turns, tank tops and taking home the gold! Indeed, the discussions while edging bunkers truly reached epic proportions as they verbally bantered the Cushman Nationals and the opportunities the challenge would provide. As the season waned, our contestants would take themselves out of the running. Perhaps an accident while raking bunkers, insubordination or even the request for a family vacation would gradually eliminate the first-year employees from the event. That was until only one potential participant remained.

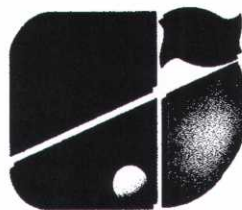
The build up was intense. Team colors and outfits had to be decided upon. The Cushman, back on the rack for an oil change, was being fitted with a nitrous tank. An old employee would visit and discuss strategy in the straightaway. The addition of winter inventory parts added to the illusion of preparation. Soon the date was decided for the state competition.

Dang it, the Cushman National Board of Directors once again selected the Tuesday after Labor Day to host the event. Nuts! That always happened to be the first day back to school!

Oh the fun we have!



North Oaks green staff members getting ready for the Cushman Nationals: I am looking for group and individual pictures of green staff members and crews along with club name. Everyone loves a picture, especially our key players. -- JM



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