TURFAX™

of the International Sports Turf Institute, Inc.

The International Newsletter about Current Developments in Turfgrass

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TURFAX EXPANDS

TurFax is now evolving to a new stage including expansion from 6 to 8 pages and an active marketing program to a wider readership. The production and marketing will be assumed by Ann Arbor Press. Dr. J.B Beard will continue to write a majority of the articles. The two page expansion will be represented by three new Contributing Authors: disease management by Dr. Peter Dernoeden, University of Maryland; insect management by Dr. Daniel Potter, University of Kentucky, and weed science-plant growth regulators by Dr. Fred Yelverton, North Carolina State University. Most of the TurFax format will remain the same, with a focus on short, concise topics featuring key trends, innovative new practices/products, and basic practices in turfgrass science and culture. ISTI Affiliates will continue to receive TurFax on a complimentary basis.

JB COMMENTS: ALLELOPATHY.

I received a recent letter indicating they had heard that Dr. Beard had demonstrated a toxic effect of perennial ryegrass (*Lolium perenne*) on other turfgrass species. This in fact is not the case!

The proper terminology for this negative effect is termed allelopathy, which is the influence of a living plant upon another due to the secretion of a toxic substance(s). The classic example is the adverse effect of walnut tree secretions on plants growing under the canopy and above the root system. To date there has been no research that demonstrates an allelopathy affect attributable to perennial ryegrass or any other turfgrass species under real-world turf conditions.

There are a number of experiments where the plant has been macerated and an extract collected that is used to conduct tests by attempting to germinate seeds or to grow plants on the extracted substance. In this case growth suppression may be demonstrated. However, by definition the key word is secretion, with the toxic compound retaining its integrity until it is taken up by the affected plant. In many cases the active microbiological population in the soil degrades the organic secretion before it reaches the adjacent plant. To summarize, it can not be stated absolutely that allelopathy does not occur among certain turfgrasses species. Rather there is no valid real-world research that has clearly demonstrated actual allelopathy secretions to be lethal among turfgrass species.

JB VISITATIONS:

October - Anaheim, California.

Participated in the 1997 American Society of Agronomy Meetings. The C-5 Turfgrass Division was represented by 124 scientific papers on a broad range of subjects. Abstracts of the papers can be obtained by writing the American Society of Agronomy at their Madison, Wisconsin headquarters. Ask for the **1997 Agronomy Abstracts.** Interesting symposia were held on (1) applications of biotechnology to turfgrass, (2) graduate student training for future turfgrass research scientists, and (3) a critical self evaluation as to the impact of turfgrass.

November - Tokyo, Japan.

Visited the Yotsukaido Turf Research Center of Nichino Ryokka. Ongoing research assessments of zoysiagrass (*Zoysia matrella* and *japonica*) cultivars for fairways and of bentgrass (*Agrostis stolonifera*) cultivars for putting greens were discussed. They have an interesting study using a model stadium design to investigate the effects of shading and air movement on turfgrass growth on a sports turf growing within the enclosure. Also being studied are soil heating techniques for use with zoysiagrass turfs, including use in combination with tarp covers during subfreezing temperatures. Will have specific research reports on these topics in a future TurFax as the data are published.

Also had the opportunity to visit the newly completed research and development center of the Nihon Nohyaku Co., which is a US $100 million research facility. The activities range from the synthesis of new basic chemistry; to screening and assessment of new chemicals for disease, insect and weed control; and to development of new cultivars through biotechnology. A recent release using biotechnology gene transfer is a very prolific flowering snapdragon. The research facility was very impressive. It must be a joy for the investigators to work within such a positive scientific environment.

December - Houston, Texas.

Traveled with ISTI Associate Scientist Col. Sam Sifers to the winter overseeding research plots he has established just north of Houston. Various methodologies of winter overseeding into closely mowed, high density turfgrasses are under investigation. Other research sites are located in Palm Springs, California, and Phoenix, Arizona. Summary reports on these findings will be presented in TurFax when the research assessments have been completed after spring transition.

UPCOMING JB VISITATIONS:

Jan. 6 to 9 -	Toronto, Ontario, Canada.
Jan. 14 to 16 -	Orlando, Florida.
Jan. 17 to 19 -	Las Vegas, Nevada.
Jan. 20 to 22 -	Phoenix Arizona.
Feb. 3 to 9 -	Anaheim, California.

ISTI Chief Scientist: James B Beard
TURFAX™ Production Editor: Harriet J. Beard

The goal of the six issue per year TURFAX™ newsletter is to provide international turf specialists with a network for current information about turf. This newsletter is faxed to all Institute Affiliates that use the ISTI technical assistance services on an annual basis. Faxing is more costly, but ensures quick delivery to those outside the United States.

For non-affiliates, a TURFAX™ subscription is **available by annual payment of U.S. $60.00.** Payment may be made by sending a check to the address given below. Foreign orders please send a check or money order on a U.S. bank.

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THREE-DIMENSIONAL VERSUS TWO-DIMENSIONAL ROOT ZONE STABILIZERS

To date there has been a lack of comparative information between the three-dimensional interlocking mesh system and the two-dimensional fiber system of root zone stabilization.

A comparative set of plots was established in 1991 in Australia by Golf Course Superintendent Steve Cole. The construction consisted of a USGA specification root zone and profile which was established to creeping bentgrass (*Agrostis stolonifera*). After five years, two assessments were made in 1996 comparing rooting and infiltration rates among the three treatments.

A golf hole cutter was used to sample a turf-core down to 8 inches (200 mm), which was then gently washed to remove the root zone mix. The two- dimensional Fibreturf treatment had no root growth past the thatch-sand interface at 50 mm. The root depth of the Fibreturf treatment was 60% less than the control treatment, which had no stabilizer incorporation. In contrast, the three-dimensional interlocking Netlon mesh treatment had a much more expensive root system, including an intertwining of the roots in and around the mesh elements that persisted after the sand was washed off. The rooting depth was comparable between this treatment and the unstabilized control treatment, and had a 2.4 fold greater rooting depth than the 2-dimensional Fibreturf.

Assessments conducted with an infiltrometer on all three treatments showed the infiltration rate of the three-dimensional, interlocking mesh treatment to average 15% higher than the untreated control. In contrast, the two-dimensional fibre treatment had a 52% reduction in the infiltration rate compared to the untreated control. During the sampling process the two-dimensional fibre treatment was very difficult to penetrate in contrast to the untreated control and the three-dimensional, interlocking mesh treatments.

TURFGRASS INFORMATION CENTER

The Turfgrass Information Center (TIC) at Michigan State University is now on the World Wide Wed:

http://www.lib.msu.edu/tgif

Additional online content and services will be added steadily to the TIC website, including access to the Turfgrass Information File (TGIF) itself. Some portions of the TIC site will be "public," while others including TGIF, will continue to be "private" subscriber access only.

Included in the website is information about TIC databases and services, the O.J. Noer Collection, subscriptions forms, etc.

Tap into the 39,000+ records in TGIF! Locate materials on your own shelves, in our files, or elsewhere on the Web. TGIF surveys the full scope of the turfgrass research and management literature, from abscisic acid to zymograms! With this new user-friendly face on TGIF, it's even possible to use your mouse to do an entire search.

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CUTTING HEIGHTS AND FREEZING

The closer the mowing height the earlier a turf soil surface becomes frozen. By the same token the closer the mowing height the earlier turf soil surface thaws in the spring.

ENHANCING PARTICIPANT SAFETY ON NATURAL TURFGRASS SURFACES PART II*

by

Col. S.I. Sifers and Dr. J.B Beard

Injuries on football fields and other sports surfaces can be grouped into different categories as related to the type of athlete movement and to the relative softness of the turf-soil surface. Many impact-type injuries are related to varying degrees of surface hardness, with the safety of the participant increasing inversely with a lessening of surface hardness. There are other surface playability characteristics of concern, such as traction, wear tolerance, divot opening/turf recovery, and smoothness. This paper will address primarily the aspects of hardness of surfaces.

Root Zone Effects

Aside from turfgrass species/cultivar selection and culture, the other primary component that can be modified to decrease the hardness of natural turfgrass surfaces is via selection of the associated turfgrass root zone. Assessments shown in Table 5 indicate an increase in surface hardness occurred with changes in soil texture from high sand to soils having more silt and clay. The range in CIV for the 5 lb (2.25 kg) hammer weight on bare soils was 91 to 132 gravities (g) and for turfed soils 88 to 116 g. There was 3 to 16% less hardness in turfed surfaces versus bare soil. The CIV's for the three soils were within the acceptable range of the two proposed standards. Soils with a high clay content develop, overtime, a serious compaction problem that increases hardness and results in a very unfavorable environment for root growth of turfgrasses.

The ever increasing intensity of traffic on golf greens, sports fields, and horse race tracks during the past three decades necessitated the development and use of high-sand root zones such as the Texas-USGA Method (2), for construction of root zones. This development minimized serious soil compaction problems and provided a higher quality, safer turfed playing surface. However, these root zones were relatively unstable under certain playing conditions.

Table 5. Comparisons of the hardness of four moist nonturfed and Tifway bermudagrass (*Cynodon dactylon* x *C. transvaalensis*) turfed root zones expressed as means of multiple observations over 3 years of the Clegg Impact Value (CIV).

Root Zone Texture	Clegg Impact Value (g)		
	Soil Only	Soil and Turf	% Change
high-sand mix (95% sand, 2% silt, 3% clay)	91	88	-3
sandy loam (86% sand, 6% silt, 8% clay)	102	97	-5
sandy clay loam (65% sand, 12% silt, 23% clay)	120	107	-13
clay loam (47% sand, 24% silt, 29% clay)	132	116	-16

Mesh Inclusion Effects

In 1985, the authors began a series of long-term investigations at Texas A&M University to assess the use of randomly oriented, interlocking mesh elements for stabilization of high-sand root zones, while also enhancing the environment for turfgrass root growth. These investigations were

*Part I was published in Vol. V No. 1 of TurFax (1997).

subsequently expanded in 1990 to include root zones with sandy clay loam and clay loam soil textures.

The mesh elements, manufactured by Netlon Ltd., consist of discrete 2 by 4 inch (50 x 100 mm) rectangular units that have dimensional stability and flexural stiffness. Each element has open ribs extending from the perimeter and a square aperture between the mesh ribs of 10 by 10 mm. The open ribs facilitate an interlocking structure that provides a unique three-dimensional matrix of a relatively fixed, but microflexible nature. This three-dimensional, interlocking mesh element-root zone is distinctly different from the two-dimensional, noninterlocking fibrillated polypropylene fibers.

The mesh elements were combined with the soils in specific amounts of 4.2, 6.3, and 8.4 lb. per cubic yard (2.5, 3.75, or 5.0 kg/m^3) of soil, with rigorous mixing to ensure a completely random orientation of the mesh element pieces. The mesh-soil mix was then installed to a depth of 6 inches (150 mm) over a 6-inch (150-mm) depth of the same soil without mesh elements that had been placed over a prepared subbase that included a drainage system. Three replicate plots of each mesh density rate and three plots of the same soil without mesh elements were then compared. In most of the studies, a topdressing mix with 1-inch (25 mm) of the same soil without mesh elements was placed over the mesh/soil matrix before planting the turfgrass, while one treatment was not topdressed. This top layer proved to be of significant benefit, especially in the divot size and divot opening turf recovery assessments.

Two traffic stress components were assessed over a four-year period. The turf wear components were characterized by the divot opening length, width, and depth; the rate of turf recovery in the divot openings; and the turf tear. The second traffic stress component, soil compaction, also was assessed via water infiltration rate, percolation rate, and surface hardness. Playing surface characteristics assessed were traction, ball bounce, surface hardness, and compression displacement. Soil moisture retention and turfgrass quality also were determined.

Results of the original field assessments were summarized in an earlier ASTM publication (1). Results of the subsequent field studies conducted at Texas A&M University, which have been conducted for a minimum of three years for each soil texture, are remarkably similar, except for scale. Generally, as the volume of the interlocking mesh elements added to the root zone increased, there was a corresponding enhancement of the root zone/turfgrass complex, regardless of the soil texture, with the 8.4 lb. (5.0-kg) inclusion rate being best. There were relative scale differences between soils of different texture in some of the assessments. However, in all cases, the addition of interlocking mesh elements was beneficial when compared to the same soil without mesh elements.

Surface hardness results shown in Table 6 indicate that, with the 5 lb. (2.25 kg) hammer, the range of CIVs for turfed soils with interlocking mesh elements was 69 to 87 g or 19 to 29% less hard than the same turfed soils without mesh. All of the soils containing interlocking mesh elements were within the acceptable playability range. The mesh imparted a dramatic improvement in relative softness of the surface providing a cushion against potential injuries to sports participants.

Table 6. Effects of interlocking mesh elements on the hardness of four moist Tifway bermudagrass turfed root zones expressed as means of multiple observations over the 3 years of the Clegg Impact Value (CIV).

Root Zone Texture	Clegg Impact Value (g)		
	No Mesh	Mesh	% Change
high sand	88	69	-19
sandy loam	97	76	-19
sandy clay loam	107	84	-23
clay loam	116	87	-29

Summary

These studies indicate that surface hardness can be decreased, with resultant increases in participant safety, through selection of turfgrass species/cultivar, height of cut, nitrogen fertility regime, root zone texture, and use of interlocking mesh element inclusions.

Based on these and other studies by the authors, the benefits that are to be expected from the addition of interlocking mesh elements to a turfed-root zone installation are the following:

- enhanced soil stabilization.
- less surface hardness.
- enhanced participant safety.
- improved load-bearing capacity.
- resistance to surface rutting.
- 24 to 49% reduction in divot size.
- 29 to 41% faster divot opening recovery.
- improved uniformity of ball bounce.
- decreased soil compaction.
- comparable traction.
- internal microflexing for aeration.
- increased water infiltration & percolation.
- improved soil moisture retention.
- improved turfgrass rooting & turf health.

Although these benefits are realized within each soil type and each volume of interlocking mesh inclusion, the best overall root zone in these assessments was the high-sand root zone with a 8.4 lb. per cubic yard (5.0-kg/m^3) volume of interlocking mesh elements and an inclusion depth of 6 inches (150 mm).

Potential uses for this interlocking mesh elements/turfgrass root zone complex are numerous. Major installation types now in existence using the mesh are sports fields, golf course tees and cart paths, turfed horse race tracks, equestrian event arenas and show grounds, turfed roadways and parking lot areas, and other heavy load-bearing areas such as fire truck access lanes around tall buildings.

To achieve this type of multifunctional surface that performs under a range of diverse stresses, it will be somewhat more expensive to install. However, it will function for a longer time and accommodate a much larger number of events, recreational activities, or traffic pressures, which, makes this system far more cost-effective. Additionally, this system may provide the only answer to some unique, severe-stress turfgrass problems that had no solution in the past.

References

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(3) Beard, J.B and S.I. Sifers. (1989) A randomly oriented, interlocking mesh element matrices system for sport turf root zone construction. In Proceedings of the International Turfgrass Research Conference. Vol. 6, pp. 253-257.

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Best Wishes
for a
Successful New Year