Can you impact your soil microbiology?

BY ROCH GAUSSOIN, PHD

Turfgrass managers, especially sports turf managers, are inundated with products that are marketed to improve turf and increase stress tolerance. Often the claims of these products are based on testimonials from end-users or manufacturers marketing departments. Academic institutions across the US and internationally unfortunately do not have the resources to scientifically test the merits of all products available.

One group of products available are designed and marketed to enhance turf “health” of both the plant and the soil through the addition of beneficial microorganisms. In theory these products are applied and the beneficial microorganisms colonize the rootzone increasing the plants capacity to combat disease, take up nutrients and tolerate stresses like drought, heat etc. Until recently little scientific information was available which provided even a rudimentary understanding of turfgrass soil microbiology and the possibility of introducing microbes into the turfgrass environment to enhance turf health.

Work completed at numerous university turfgrass research programs has resulted in information that is helpful in determining the merits of microbial applications. This research has created new and academically interesting challenges for future research, fundamental questions have been answered and common perceptions been found to be untrue or at least, suspect. This article will attempt to summarize these studies and indicate implications relevant to sports turf operations.

Here are common perceptions about microbial relationships in turfgrass soils: Excessive pesticide applications adversely affect soil microbiology; sand-based rootzones are relatively sterile; soil inoculums/additives can alter soil microbiology; turfgrass soils are lower in microbial biomass and diversity than other soils. From 1996-1998, sand-based rootzones located on 16 golf courses in eastern Nebraska were sampled for microbial properties in a project funded by the USGA and the OJ Noer Turfgrass research program. The courses were separated into three distinctly different management groups based on pesticide and fertility inputs. Rootzones ranged in age from 1-28 years. Results indicated that age of rootzone was the most significant factor in microbial biomass/diversity. Management level did not influence microbiology, indicating that higher levels of management, including relatively high pesticide inputs, did not adversely affect soil microbiology.

These findings are similar to data reported from Florida and New York. Microbial biomass of sand-based turfgrass soils 18-24 months after establishment was less than native undisturbed soils, but greater than traditional row crop soils. Similar results concerning microbial levels and stability were reported in work conducted in North Carolina. These data indicated that sand-based turfgrass rootzones reached significant microorganism levels and stability relatively quickly (within 12-18 months), and levels were equal to native soils. They also reported the temporal effects of microbial populations, with the largest populations being associated with the periods of greatest plant growth, i.e., spring and fall, which also agrees with work conducted in Nebraska. It is interesting to note that the period associated with the lowest microbial numbers also coincides with the period of greatest root pathogen activity and other stresses, i.e., summer. Obviously, these other stresses such as heat and drought are contributing to the grass decline during the summer, but the soils microbial “health” should not be overlooked.

In a relatively short time, sand-based turfgrass rootzones reach microbial levels comparable to other “native” soils. This information can be used to develop a theoretical scenario for the use of microbial inoculants. These are products that are packaged and marketed to turfgrass managers to improve the microbiology of the soil. These are often beneficial organisms packaged with other ingredients such as iron or biofertilizers, or in some cases packaged as spores of the desired microbe.

These products may contain up to 10^9 organisms per milliliter of product, and application rates range from 1 to 6 ounces per 1000 sq. ft. Soil contains 10^8 bacteria per gram of soil. The relative quantity of actinomycetes is approximately 100 times less than the bacteria and fungi 100 times less than the actinomycetes, but for our theoretical example, we will disregard both.

Realizing that many soil microorganisms are sensitive to UV light and/or heat instable, and survival from purchase to application is decreased when the packaged organisms are exposed to light and/or heat, assume that all applied microorganisms survive and that the maximum use rates of the product are applied - the ratio of applied vs. native bacteria is approximately 6000 native:1 applied, or the applied represent 0.02 percent of the total bacterial population. When one considers the total microbial population (i.e. actinomycetes and fungi), this ratio is even more unbalanced. The applied microbes are being introduced into a hostile environment at levels considerably lower than the indigenous microbial population. It appears that the applied microorganisms have little or no chance of effectively competing with the already established population. Further, work at Ohio State showed that at approximately 2 years post-construction in a soil/compost vs. sand/rootzone, microbial diversity was not different, even though the former rootzone was significantly higher at establishment. While the compost increased microbial taxa initially, a natural equilibrium ultimately occurred in 1-3 years.

Research has shown the benefits of biological pest control products, where the goal is pest control as opposed to increasing microorganisms in the soil. Stressed research is limited, but work is increasing. Since it appears that new sand-based rootzones take 1-2 years to reach equilibrium, the use of microbial-based products may have merit during establishment. Work in this area continues, and perhaps future research will shed more light on the use of microbial inoculants in turfgrass management. In summary:

* Relatively high pesticide applications do not appear to adversely affect soil microbiology.
* Sand-based greens are not sterile, but in fact, reach levels of native soils in a short time.
* Soil inoculums/additives may alter soil microbiology in the short term, but their use on established turfgrass soils is questionable.

Dr. Roch Gaussoin is an Extension Turfgrass Specialist and Professor, Department of Agronomy & Horticulture, University of Nebraska. He can be reached at rgaussoin1@unl.edu.
OSU's stabilized turf
a Buckeye exclusive

BY CHRIS HARRISON

Being nationally ranked in football is nothing new for the Ohio State Buckeyes. And the field they played on this year justifies national ranking, too. With a brain trust made up of Ohio State alums from the grounds superintendent to the sports turf researchers to the vendors, the Buckeyes got the best possible field they could find.

In summer 2003, Ohio State upgraded its field to a new Prescription Athletic Turf System and TS-II Synthetically Stabilized Turf. The new field is a mixture of perennial ryegrass grown through a synthetic grid and stabilized by a sand base. "This has worked a lot better than we anticipated. The field has held up great," says Ohio State Athletic Grounds Superintendent Brian Gimbel.

The Buckeyes already were familiar with stabilized turf. For three years they had been using a stabilized Kentucky bluegrass field. "It was working well but there were a lot of challenges," Gimbel says. For one thing, they were watching plots put out by Dr. John Street and Pam Sherratt, extension sports turf specialists at Ohio State. The bluegrass was having problems that the ryegrass plots were not experiencing.

The question of whether or not to change turf was made by the fans after the Michigan game a year ago. Excited fans swarmed onto the field and pulled up great chunks of turf, right through the stabilizer. They tore through the thatch and the grass. Gimbel could understand their excitement; he earned his BS in agronomy at Ohio State 10 years ago and now is in charge of all Ohio State outdoor varsity sport facilities, including the field inside the Horseshoe.

The biggest change was the decision to install a seeded ryegrass field, instead of bluegrass. One of the prime concerns was keeping moisture off the surface.

"We grew the field in from seed," Gimbel continues. The ryegrass is a mixture of six cultivars from three breeding groups and suppliers. One of the turf's main features is high resistance to gray leaf spot and pythium.

On synthetically stabilized turf, fertilization, mowing, and irrigation are about the same as any other sand-based field, says Sherratt. She recommends careful monitoring of the fertility levels through soil and tissue testing etc. "Because we used perennial ryegrass this year, we did have a preventative fungicide program developed with our pathologist, Dr. Mike Boehm," she adds.

The three main management differences are verticutting (more verticutting to keep biomass accumulation down); tining (they have done none yet as they know from experience that it ruins the integrity of the stabilizer); and little-or-no topdressing, which would also create a biomass build up and move the stabilizer away from the surface.

Since they grew the field in from seed, they were able to lay the stabilizer in long, full strips. They run about 15 feet wide by 40 yards long. "We were able to lay enormous sections flat and then sow them together," Gimbel says. Then they put the sand on top.

Keeping organic material off the field is a prime concern of Gimbel's. During the season the crew mows every day at fifteen-sixteens to one-inch height. In the off-season, they may mow every other day.

Topdressing strategy is another ticklish area. "I know one field manager who does topdress his field but plans to take all live matter off with the Koro and re-seed onto the stabilizer surface," Sherratt says. "That might be an option for us, but we literally play it week-to-week." In fact, Street and Sherratt meet once a week during the season with the stadium crew (Don Patko, superintendent of athletic facilities; Gimbel; and athletic grounds specialists Brian Blount and Brent Packer) to make plans for the week ahead.

The rye grows more quickly and is sturdier than the Kentucky bluegrass that used to cover the field. Joe Motz of The Motz Group, Cincinnati (www.themotzgroup.com), installed the new system. Keeping it in the family, Motz is also an Ohio State graduate, with a 1977 degree in Horticulture.

The old system, also installed by The Motz Group, was replaced with the TS-II product, a combination of real grass and a synthetic base to hold it in place. It combines sand-filled, fibrillated synthetic tufts and a backing of biodegradable fibers and plastic mesh. The unique matrix shelters the vegetative parts of the grass plant that are essential for vigorous growth and rapid recuperation.

"I personally feel that sand-based fields (those with over 90% sand) have to have some kind of synthetic reinforcement, whether it be Motz TS-II, GrassMaster, Loksand, or Fibresand, etc.," Sherratt says. She adds that these systems usually are too expensive for most high schools but should not be a problem for high-profile facilities.

A plastic grass field costs $800,000; if a stadium manager replaces the stabilized natural grass field every three years, that would still give 15 years for the same money. Ohio State seeded the field during the first week of May and felt that it was playable several weeks after seeding date. "Note we used 100% perennial ryegrass," Sherratt says. "Establishing soil sod is a whole different ball game. If it rains a lot (like it did last year), then the imported sod layer remains saturated for long periods of time and it's difficult to core until it is drier and knitted down a bit."

Research shows that the amount of time it takes to root depends upon the turf thickness, with thicker cut sod, like that used in sports, taking a lot longer than washed or regular cut.

Gimbel was pleasantly surprised that the system required less overseeding than he expected. "I thought we'd be sending out tons of rye seed through the year," he says. "But the stabilizer held the crown of the plant intact."

In 2003, they had no serious divots all season long. There was some leaf tearing from cleats, but Gimbel points out that is exactly what they want to happen. The player's foot is released immediately and the leaf, not the whole plant, gives. "The crown shoots out a new leaf and the divots heal back quickly," Gimbel says.

Ohio State did overseed the field by the fourth game. "It was thinning a bit," Gimbel recalls. But overall, he is quite happy with the new field.

Chris Harrison, like everyone else involved in this article, is a graduate of The Ohio State University.
SOILMASTER

Soilmaster for Turf soil creates vigorous root systems that stand up to intense game day punishment. Its granules, incorporated into turf root zones, resist compaction and promote vital root penetration, as well as improve oxygen, water and nutrient flow to the rootzone for stronger, healthier turf.

For that pro-field look, add Soilmaster(r) Green soil conditioner to the program. Colored to blend with your turf, it's the perfect camouflage for worn areas and it works great on divots too.

Pro's Choice/800-634-0315
For information, circle 072 or see http://www.oners.ims.ca/2912-072

FIELD STRIPER

Tru Mark Athletic Field Marker's Model E-100 field marker with the integrated Paint Boom accessory saves time when painting hash marks. The unit's 4 x 24-in. paint box with two wide fan quick disconnect spray nozzles help complete painting wide area boundary markings and large field stencils.

Tru Mark/800-553-6275
For information, circle 073 or see http://www.oners.ims.ca/2912-073

CONCENTRATE PAINT

Fastliner Super Concentrate Paint, with its 5-1 dilution, can stay in suspension for up to 14 days. This means you can leave it in the application tank until you need to use it again; and when you do, simply agitate and resume painting.

Sold in 4-gal. containers, Fastliner can be combined with color additives to create yellow, red, blue and green lines. Rain resistant.

Broyhill/800-228-1003, x34
For information, circle 071 or see http://www.oners.ims.ca/2912-071

WE HELP MAKE SURE THERE ARE NO BAD VIEWS.

Congratulations to Mississippi State University & Scott Field, the 2004 STMA Collegiate Football Field of the Year

There are no bad seats in the stadium when the field is brightly painted with World Class premium paints and custom field graphics. The most important games in the world depend on World Class for field marking support. When it comes to the appearance of your field, you should trust World Class also.

WORLD CLASS athleticsurfaces
www.worldclasspaints.com • (800) 748-9649

Circle 138 on card or www.oners.ims.ca/2912-138

July 2004 • http://www.greenmediaonline.com
NEW BRITE STRIPER
Pioneer’s Brite Stripper 1600 features a piston compressor for durability and a four-position handle for comfort. Unit is equipped with a standard two-headed sprayer that cuts field striping time in half, says Pioneer. Rear valve outlet makes for easier clean up.
Pioneer Mfg./800-877-1500
For information, circle 078 or see http://www.oners.ims.ca/2912-078

TURF PAINT
Green Lawnger turf paint is a fast, economical way to instantly restore natural green color to dormant or discolored turf. Easily applied with many sprayers, it adds a healthy, natural look to off-colored warm and cool season turf grasses. It won’t wash or wear off after application. Color lasts 10-14 weeks or until mowing removes the colored grass.
Becker Underwood, Inc/800-232-5907
For information, circle 075 or see http://www.oners.ims.ca/2912-075

ONE-PIECE STENCILS
Economical one-piece stencils designed by the same art department that designs many of the NFL logos. They are custom cut from 6 mil poly sheets up to 160 ft. long with color coded half-moon cutouts that you spray paint or mark with chalk, then connect and fill in with spray paint after removing the stencil. Also available are sideline stencil kits, Mautz athletic field marking paints, and Jiffy spray painting equipment.
PARTAC/BEAM CLAY/800-247-226
For information, circle 076 or see http://www.oners.ims.ca/2912-076

EVERGREEN™ Turf Blankets...
...trusted around the world!
“Getting Money’s Worth..., Very Satisfied...”
wrote Ron Crooker, Director Plant Operation,
Upper Iowa University, Fayette, IA

- Earlier spring green-up
- Faster seed germination
- Deeper root development
- Delays dormancy in fall
- Ideal winter blanket
- 3 & 7 yr. warranty covers
- Best for quick turf repairs
- Available in any size

Want to know more?
CALL TOLL FREE
1-800-387-5808

COVERMASTER™ COVERMASTER
COVERMASTER
Masters in the Art of Sports Surface Covers

COVERMASTER INC., 100 WESTMORE DR, 11-D, REXDALE, ON, M9V 5C3
TEL 416-745-1811 FAX 416-742-6837

covermaster.com
E-MAIL: info@covermaster.com

http://www.sportsturfmanager.com • STMA

Circle 131 on card or www.oners.ims.ca/2912-131

SPORTSTURF 17
FERTILIZER INJECTOR
Green Machine Pro proportioning fertilizer injectors for fertigation through conventional sprinkler irrigation systems. Capacities range from a pint to 55 gal. Save even more by using any totally water soluble dry fertilizer. Strong Enterprises/916-797-1056
For information, circle 081 or see http://www.oners.ims.ca/2912-081

Nofireants.com
Bayer Environmental Science launched www.nofireants.com. The website provides homeowners with information on all aspects of fire ant control, including fire ant biology and identification, research and trial data for TopChoice, how TopChoice works as well as testimonials from both homeowners and professionals who have experienced the product. Bayer Environmental Science/201-307-9700
For information, circle 077 or see http://www.oners.ims.ca/2912-077

Double Play!
Perform two jobs with one machine when striping your fields. The Beacon Streamliner 70 or the new Beacon Streamliner 353 can use the optional Beacon Double Play Aerosol attachment to allow you to stripe fields with chalk or paint quickly and with no mess. The Double Play Aerosol attachment grips to the base of the handle and allows for up and down adjustment to ensure proper line width. It can accommodate almost any brand of athletic aerosol field marking paint. Beacon Ballfields/800-747-5985
For information, circle 074 or see http://www.oners.ims.ca/2912-074

Field Marking Machine
Newstripe’s NewRider 2000 has a 55-gal. tank with which you can paint up to 22,000 feet of 4-in. line in under an hour. The unit features a 10-hp engine, hydrostatic transmission, seat-based operator controls, front and side dual spray heads with a hand wand for detail work. Newstripe also manufactures a complete line of wet & dry line markers, infield groomers, drag mats, field layout systems and stencils, all backed by an 18-month warranty. Newstripe, Inc./800-624-5706
For information, circle 105 or see http://www.oners.ims.ca/2912-105

Is your turf as tough as your team?

GN-1™
Patented
Hybrid Bermuda
a product of Greg Norman Turf Company.

GN-1 patented hybrid bermuda is the ideal choice for your athletic field, golf course or residential play yard needs.

- Exceptional dark green color
- Excellent wear recovery
- Good cold tolerance
- Tolerant of high salinity soils
- Lower maintenance costs

Pacific Sod
The Professional’s Choice

800 942-5296
www.PacificSod.com

Circle 136 on card or www.oners.ims.ca/2912-136

July 2004

http://www.greenmediaonline.com