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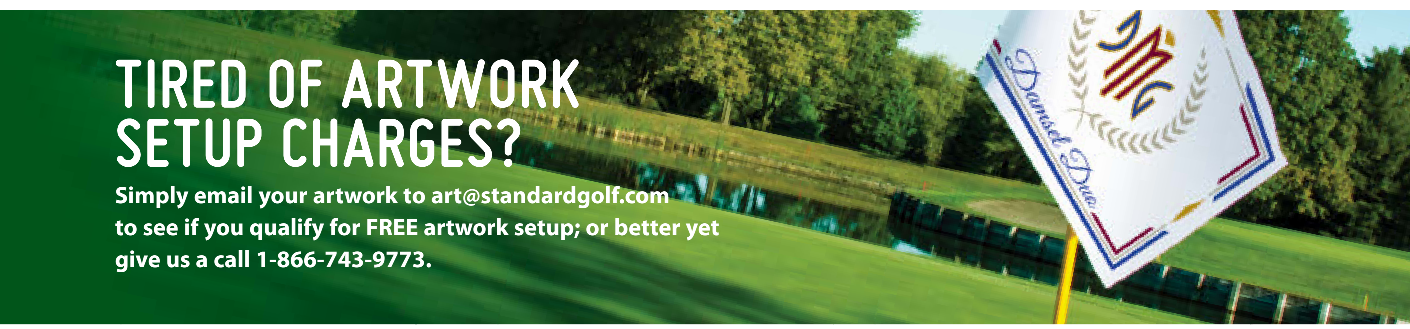

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No Place Like Sedona

Indiana transplant Pat Grimes finds peace and prosperity among the red sandstone outcroppings of Oakcreek Country Club.

STORY AND PHOTOS BY STEVEN TINGLE

PAT GRIMES TAKES a drag off a Pall Mall Blue and shakes his head. "Who'd've thought I'd learn so much about drainage in the desert?" he asks. He points to a sediment trap, one of several he and his crew have installed, and says "I'd rather clean silt out of ten square feet than ten thousand." The "ten thousand" Grimes is referring to are part of 135 acres called Oakcreek Country Club, situated amid the vortexes, psychic healers and red rocks of Sedona, Ariz.

Sedona, a city in the Upper Sonoran Desert of Northern Arizona covered in red sandstone formations with names like Bell Tower, Cathedral Rock and the Devil's Bridge, might be one of the most beautiful places on the planet. It's a landscape most haven't seen in person, one so awe-inspiring it at first appears fake, as if at any moment John Wayne will come riding over the ridge to say, "There are some things a man just can't run away from."

Yet millions run away to this desert each year, searching for things as diverse as lymphatic drainage, sweet grass smudging, herbal colon cleanses, aura photog-

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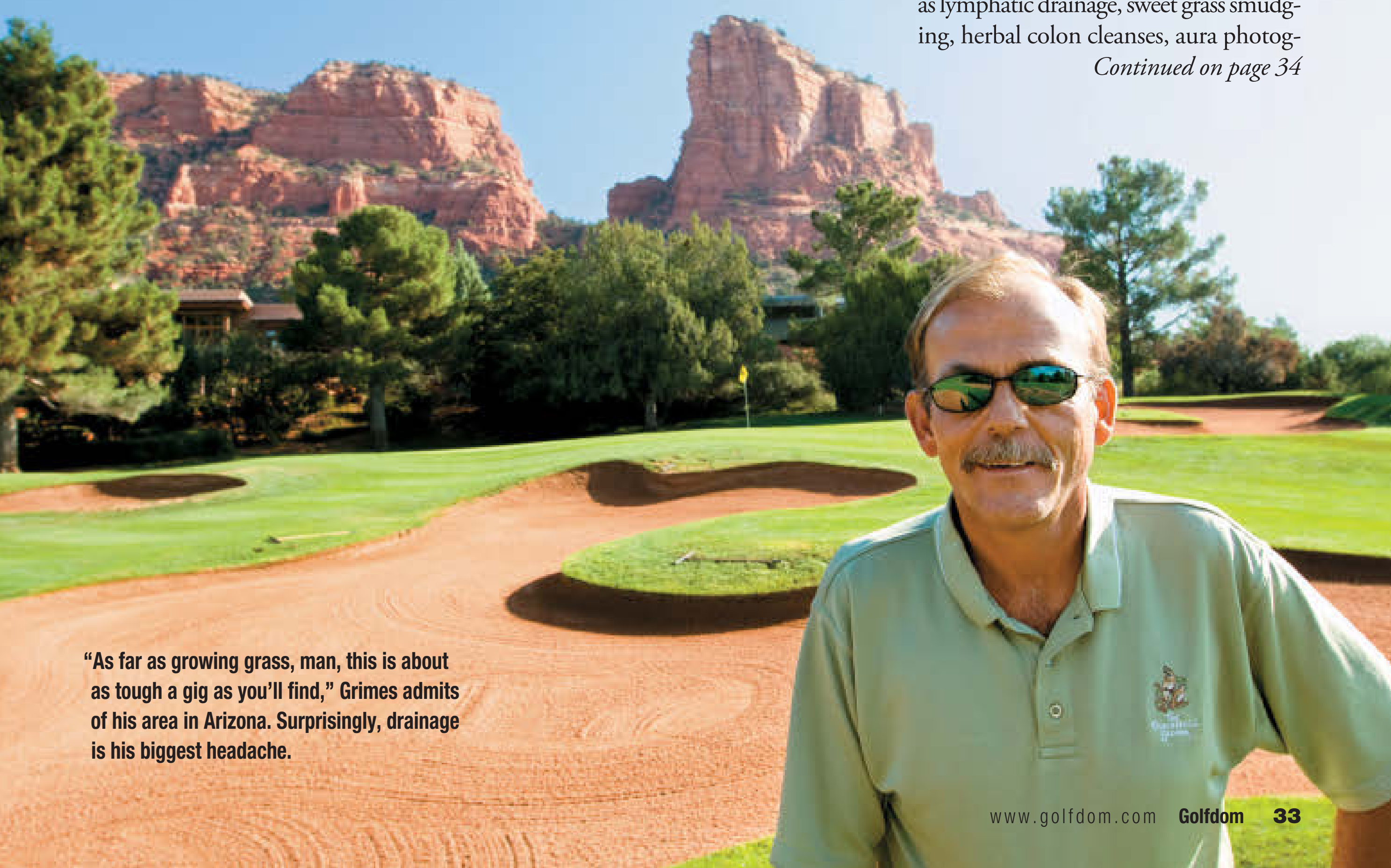

"As far as growing grass, man, this is about as tough a gig as you'll find," Grimes admits of his area in Arizona. Surprisingly, drainage is his biggest headache.

▲ **Grimes has a laugh as Rusty, the course dog, looks on.**

Grimes with assistant superintendent Tom O'Neil, a 25-year member of the crew at Oakcreek. "I've got a great crew. I'm really lucky," Grimes says.

Continued from page 33
raphy, past life regression and wine made by rock stars. They come to scale the red rocks and stand in the vortexes, swirling centers of energy emerging from the surface of the earth. They come to find the path, the way, their center, their calling.

Back in his home state of Indiana, Grimes dreamed of escape, too. "I wanted to move West from the time I read my first Louis L'Amour," he says. Grimes followed that dream and started work at Oakcreek in January of 2006. "It's a beautiful place," he says. "I have no desire to go anywhere else."

Good for everybody

There is a teeny tiny spec of transition zone in the state of Arizona, and Oakcreek is right smack in the middle of it. Built in 1968, the course was a design collaboration between Robert Trent Jones Sr. and Robert Trent Jones Jr., although word 'round the water cooler is there wasn't a lot of collaboration; Junior did the front, Senior did the back. It started out as a typical desert layout but they continued to add grass. The course is flanked by homes and looks as though it could be in West Palm Beach, Hilton Head or Atlanta. Only the vistas and climate betray its location.

"As far as growing grass, man, this is about as tough a gig as you'll find," Grimes admits. "I can have pythium pressure three months solid during monsoon season," which can last from early June through September. Monsoon season in Arizona? Around the city, road signs in low lying areas alert motorists not to cross when roads are flooded, a confusing warning as tumbleweeds roll past. But believe it or not, drainage is Grimes' biggest problem. "We've installed four and a half miles of drainage since I've been here." he says. "The turf requires so much water in these arid conditions it's going to pool and puddle somewhere. Although, I've reduced water usage by 47 percent between 2007 and 2011."

Much of the irrigation water Oakcreek uses is effluent from the community. Grimes points to a pond fountain spewing crystal clear water. "That's my effluent," he says. "It's one UV treatment away from being drinking water." Grimes shakes another Pall Mall from his pack. "The requirements up here are a whole lot more stringent than down in the valley," he says. "We have to sample daily." Oakcreek is working with the community to be able to take more effluent in the near future. "It's good for everybody," Grimes says as he flicks his Bic, "good for everybody."

Oakcreek office

At the maintenance facility Grimes lets the crew know they can knock off a little early as a long-haired mutt runs out and jumps in his cart. "Get back in the office, Rusty," Grimes orders half-heartedly as the dog licks his cheek. Walking Rusty back to his cluttered office, Grimes apologizes for the mess. "I don't spend much time in here," he says. He motions toward the window. "My office is out there."

Out there, Oakcreek is covered in a potpourri of grass. "I'm basically trying to grow rye and blue," he says, "but there's Bermuda all over the place. It just comes in with the storm flows. I've even got some 419 in the tees that's been tracked up from the valley on people's shoes." Oakcreek's greens are mostly *Poa*. "About 65 percent," Grimes says. "The only bent

I really have left are the old German bents from the '60s. You can tell because they turn purple when it gets cold."

Grimes stops at the edge of the rough to inspect what looks like a circular dog cage. "Javelina trap," he sneers. "With the cooperation of Fish & Game we've taken out and relocated 75 in the past four years." Grimes' game warden duties don't stop there. He deals with coyotes, coons, ducks and blue heron with piss so pungent it can turn *Poa* brown in minutes. "We get so many ducks, sometimes you can't see the pond," he says. "I have to get my "banger" out and shoo them off now and then." Grimes now knows to call the authorities before "shooing" — his first attempt caused a lockdown of the neighboring school.

"The only bent I really have left are the old German bents from the '60s. You can tell because they turn purple when it gets cold."

A maintenance employee drives past and Grimes waves, his wide smile as standard as his mirrored sunglasses. "I've got a great crew," he says. "I'm really lucky." He drives his cart toward the golf shop and stops next to the practice green, the course spreading out to the east and west. The red rocks stand in the distance like sentries, guarding 135 acres of green rooted to a brown terrain. Grimes is silent, taking it all in, not letting the view get old, not even after six years. He reaches past the steering wheel for the Pall Malls.

"Like I said, man, I got no desire to go anywhere else." ■

Steven Tingle is a writer, speaker and consultant based in Asheville, N.C. Contact him at tingle@steventingle.com.

Clark Talks Turf

TIMELY TURF ADVICE

Be Aware of Spring Diseases

REGULAR SCOUTING THIS SPRING CAN HELP YOU KEEP AN UPPER HAND ON SPRING DISEASES OF COOL-SEASON GRASSES.

BY CLARK THROSSELL, PH.D.

Fortunately, spring diseases are not a major problem on cool-season grasses in most years. However, they can be a nuisance, and in some cases can cause enough damage to compromise the playing surfaces and bring out the ire of golfers. As spring unfolds, scout regularly for Microdochium patch, yellow patch, take-all patch and leaf spots and melting out.

Microdochium patch or pink snow mold (*Microdochium nivale*) can be a problem whenever there is wet weather and air temperatures are in the range of 30 to 60 degrees F. Symptoms of Microdochium patch are roughly circular patches a few inches to a foot or more in diameter of damaged turf with a border that is often pink. Microdochium patch can occur without snow cover and last well into spring as long as cool, overcast and wet conditions are prevalent. Those superintendents who applied fungicides in late fall or early winter for preventive control of snow mold should be aware that the fungicide is probably no longer effective to control Microdochium patch that occurs this spring. The fungicide applied last fall has long since degraded. If Microdochium patch is present early in spring, consider a fungicide application to priority areas of the golf course. Otherwise you might battle it until the weather warms up and dries out.

Yellow patch (*Rhizoctonia cerealis*) is seen in the spring when air temperatures are 50 to 65 degrees F and the soil is wet. It is more common during cloudy weather or under shade.

If Microdochium patch is present early in spring, consider a fungicide application to priority areas of the golf course. Otherwise you might battle it until the weather warms up and dries out.

Symptoms of yellow patch are rings or arcs that are usually 6 to 12 inches in diameter with a 1- to 2- inch outer margin that is yellow. The good news is that yellow patch only causes cosmetic damage and does not harm the turf. To control yellow patch, wait for air temperatures to reach 70 degrees F or more and the rings will fade away.

Take-all patch (*Gaeumannomyces graminis* var. *avenae*) infects the roots of creeping bentgrass that is less than 10 years old when soil temperatures are in the range of 50 to 65 degrees F, but symptoms are noticed later when air temperatures warm up and the soil dries out. Since take-all patch damages roots, symptoms are not noticed until the turf experiences warm to hot temperatures and dry conditions. Symptoms are sunken bronze patches a few inches to 2 feet or more in diameter.

Leaf spots and **melting out** (caused by numerous species of *Drechslera* and *Bipolaris*) are found under a wide range of temperatures depending on the specific fungal species present. They can last throughout the growing season. On a leaf blade, leaf spot appears as an oval lesion that is dark purple, brown, black or red in color depending on the fungal species present. From a distance, turf infected with leaf spot will have an off-color or perhaps yellowish appearance. Reducing hours of leaf wetness by watering in early morning or dragging to remove dew can reduce leaf spot damage. Avoiding more than 0.5 lbs. soluble nitrogen per 1,000 sq. ft. will also help minimize damage from leaf spot.

Regular scouting this spring can help you keep an upper hand on spring diseases of cool-season grasses. Once a disease has been identified you may decide to use cultural control practices, apply a fungicide or wait for the weather to change. All are appropriate strategies depending on your circumstances.

Clark Throssell, Ph.D., *Golfdom*'s research editor, loves to talk turf. He can be reached at cthrossell@questex.com.

Golfdom'S PRACTICAL RESEARCH DIGEST FOR TURF MANAGERS

TURFGRASS TRENDS

NITROGEN AND LEACHING

Do Organic Nitrogen Sources Leach Less Nitrate from Turf?

By Richard J. Hull, José A. Amador, Haibo Liu and Joseph C. Fetter

In an effort to minimize the amount of fertilizer nitrogen (N) that might leach as nitrate-N into ground water, many turf managers have resorted to using natural organic N fertilizers. This is done in the belief that such materials contain less readily soluble N and thus release nitrate-N into soil water more slowly, resulting in greater uptake by plant roots and less potential for nitrate leaching. While this seems reasonable, there are few published studies that actually compare nitrate leaching from organic and synthetic N sources applied to turf. However, a recent report from the University of Rhode Island concludes that there might be little if any difference in nitrate leaching between organic and synthetic N fertilizers.

Squid hydrolysate vs. synthetic N fertilizers

In this study, a by-product of calamari production (squid waste) was hydrolyzed and formulated into a liquid fertilizer stabilized with phosphoric acid (3.3-7.3-2 = % N-P_2O_5-K_2O) or combined with clay and extruded as granules (7.2-1.2-2). These materials were applied to perennial ryegrass (*Lolium perenne*) turf plots at the University of Rhode Island Turf Research Farm at rates of 1, 3 and 6 lbs. N/1,000 sq. ft./year (43, 130 and 260 lbs. N/acre/year). These were compared with commercial synthetic liquid and granular fertilizers (20-9-20 and 19-5-9, respectively) applied at the same N rates and times. The synthetic liquid fertilizer contained 7.6 percent ammonium-N and 12.4 percent nitrate-N. The synthetic granular fertilizer contained 8.3 percent ammonium-N, 5.5 percent water-insoluble N, 2.2 percent urea and 3 percent other water-soluble N. An unfertilized control treatment was also included for a total of five treatments at each rate of N applied. Eight liquid applications were made between May 2008 and October 2009, while four granular applications were made at twice the N rate during each year. Differences in seasonal values of nitrate-N in soil pore-water and in amounts of nitrate-N leaching among fertilizer types and formulations within or among application rates were analyzed using a Kruskal-Wallis one-way analysis of variance. Statistical significance was evaluated at $p \leq 0.05$ (95 percent probability).

Soil water samples were collected every two weeks in suction lysimeters that had been installed in each plot with the porous ceramic sampling cup set at a

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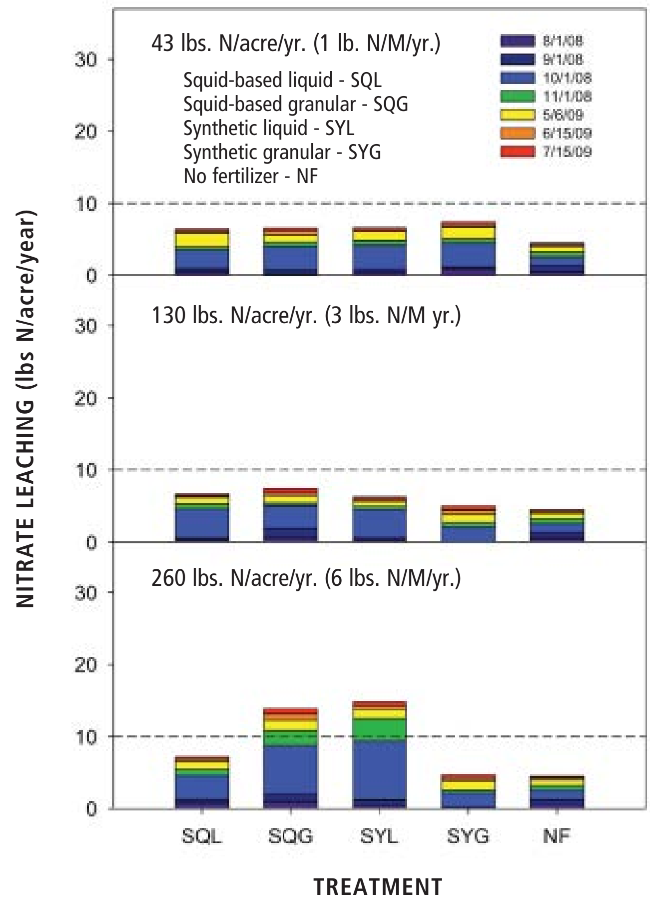
FIGURE 1



Mass of NO_3-N leached from perennial ryegrass plots fertilized with squid and synthetic hydrolysate applied in liquid and granular form at three nitrogen rates between July 15, 2008 and July 15, 2009. Horizontal dashed line indicates N that fell naturally on the turf as particulate deposition and N dissolved in rainfall.

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soil depth of 24 inches. The nitrate-N concentration in soil water samples was determined by a standard colorimetric method. The volume of water percolating through the soil was calculated for each sampling period using a model that totaled rainfall and irrigation and subtracted water loss by evapotranspiration. When water additions exceeded estimated losses for a sampling period, that excess water was assumed to have leached through the soil. Nitrate leaching was estimated by multiplying the volume of water that percolated through the soil for each leaching event by the nitrate-N concentration in soil water collected after the most recent leaching event. The average nitrate-N leached from each fertilizer-rate treatment during the experimental period is summarized in Fig. 1.

It is evident that no significant differences in nitrate-N leaching were detected among the squid formulations, synthetic N sources or unfertilized plots when N was applied at 1.0 or 3 lbs. N/1,000 sq. ft./year (43 or 130 lbs. N/acre/year). Only when N was applied at 6.0 lbs. N/1,000 sq. ft. / year (260 lbs. N/acre/year) did the granular squid hydrolysate and the liquid synthetic N source appear to leach more nitrate-N than the other fertilizer treatments and the unfertilized plots. Even these differences were significant only during a few fall sampling periods and not when nitrate-N losses for the full year were analyzed.

To put these nitrate leaching losses in perspective, only the squid granular and synthetic liquid formulations when applied at 6.0 lbs. N/1,000 sq. ft./year leached more N than that which fell naturally on the turf as particulate deposition and N dissolved in rainfall — an amount approximating 10 lbs. N/acre/year (horizontal dashed lines in Fig. 1). Even these excesses were attributable to only two or three leaching events occurring during the fall from plots receiving N at the excessively high rate of 260 lbs. N/acre/year.

Comparison of six organic nitrogen sources

The results of this comparison in nitrate leaching between organic and synthetic fertilizers reminded us of an earlier study in which nitrate leaching from six organic N sources applied to four cool-season turfgrasses was compared (Hull et al., 1992). This research was presented at the 1992 meeting of the Turfgrass Science Division (C-5) of the Crop Science Society of America but never formally published as a journal paper. The six N fertilizers compared were:

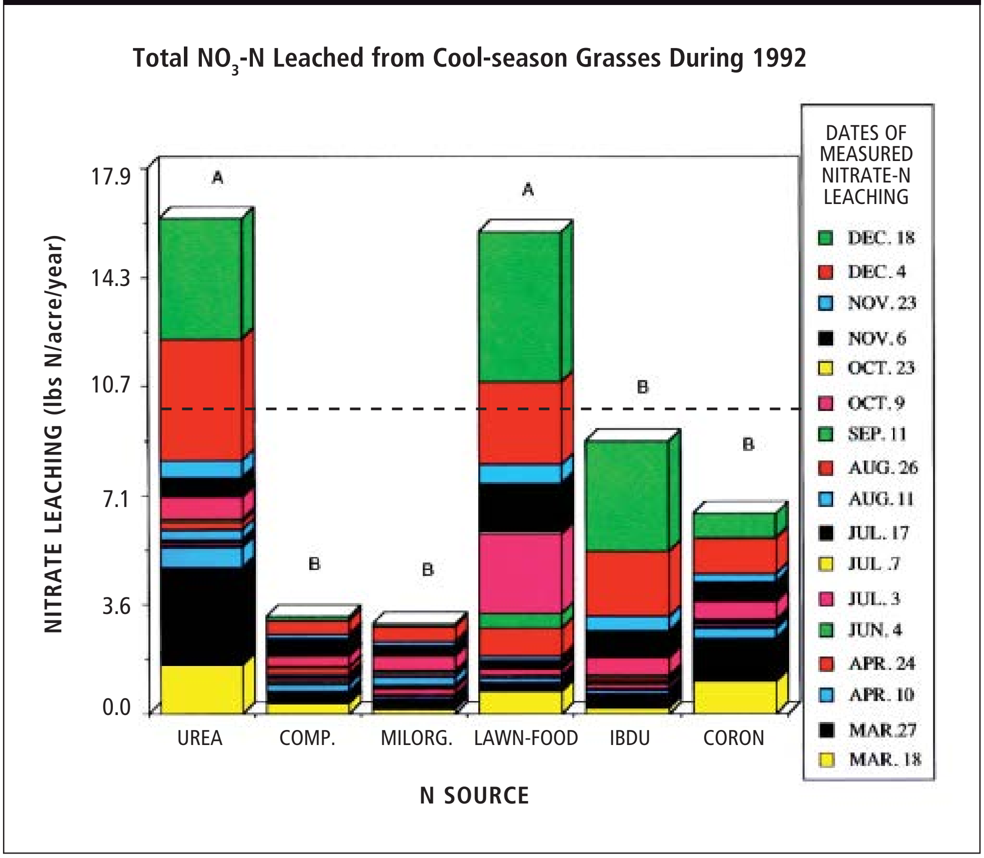
Coron (28-0-0) – Methylene urea liquid formulation

Earthgro cow manure (1.5-2-4) – Cow manure composted soil amendment

Earthgro lawn food (8-2-4) – Leaf and mushroom spoil compost + $NaNO_3$

IBDU (31-0-0) – Urea-based compound – N release via chemical hydrolysis

FIGURE 2



Mass of NO_3-N leached from four turfgrass species fertilized with six natural or synthetic N sources during 1992. Values are the average of four grasses and two fall application dates. Bars topped by a different letter are significantly different. The horizontal dashed line indicates N that fell naturally on the turf as particulate deposition and N dissolved in rainfall.

Milorganite (6-2-0) – Digested sewage sludge

Urea (46-0-0) – Water-soluble organic nitrogen compound

These materials were applied at 3.5 lbs. N/1,000 sq. ft./acre/year (155 lbs. N/acre/year). An application of 2.5 lbs. N/1,000 sq. ft. (110 lbs. N/acre) was made in mid-September or late November, with an additional 1.0 lb. N/1,000 sq. ft. (45 lbs. N/acre) applied in mid-June. The four turfgrasses used in this study were Chewings Fescue cv. Jamestown (*Festuca rubra* ssp. *commutata*), Hard Fescue cv. Scaldis (*Festuca trachyphlla*), Kentucky Bluegrass cv. Georgetown (*Poa pratensis*) and Perennial Ryegrass cv. Repell. Soil water nitrate concentrations and nitrate leaching estimates were determined using essentially the same methods employed in the squid hydrolysate experiment. The cumulative values of nitrate leaching from the six nitrogen sources during the year are summarized in Fig. 2.

The greatest nitrate-N leaching rate was measured from plots fertilized with urea and Earthgro lawn-food (about 16.5 lbs. nitrate-N/acre). The leaching rate was equivalent to 11 percent of the 155 lbs. N/acre applied. Urea would be expected to leach nitrate since it is rapidly hydrolyzed to ammonia (NH_3) and carbon dioxide (CO_2) with the ammonia readily oxidized to nitrate. Earthgro lawn food – being a composted natural organic material – would not be expected to leach much nitrate, had it not been amended with sodium nitrate ($NaNO_3$) to increase its N content so that it could be marketed as a fertilizer. This nitrate would be immediately available for leaching as soon as rain or irrigation provided water to carry it through the soil. By comparison,

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Earthgro cow manure compost contained only ~1.5% N but also was applied at a rate sufficient to deliver the same 155 lbs. of N/acre during the year. So much of this material was required to apply the 155 lbs. of N/acre that the turf received a virtual topdressing. Its N was so slowly released into the soil solution that most was absorbed by grass roots and nitrate leaching amounted to little more than 3 lbs. N/acre (<2 percent of that applied). Milorganite is a digested sewage sludge, so it contained little free nitrate or ammonia and behaved in the soil much like most composted organic N sources. Its N was slowly oxidized to nitrate and was readily absorbed by plants, leaving little free for leaching.

The results of this comparison in nitrate leaching reminded us of an earlier study.

The IBDU and Coron were probably most similar to the synthetic nitrogen sources with which squid hydrolysate was compared in the 2008-2009 study. In that experiment, the 130 lb. N/acre (3.0 lbs. N/1,000 sq. ft.) rate leached between 6 and 7 lbs. of nitrate-N, which was about 5 to 6 percent of N applied; similar to the amount leached from the 155 lb. N/acre (3.5 lbs. N/1,000 sq. ft.) of nitrogen as IBDU and Coron. The most significant nitrate leaching from these materials occurred following the mid-September application, with the mid-November application leaching much less nitrate. In late summer, root systems of cool-season turfgrasses are reduced due to the stresses of summer heat, insect feeding and drought. However, the soil is warm and favorable for hydrolysis of organic N sources and rapid oxidation of ammonia to nitrate. With a weakened root system having an impaired capacity for nutrient absorption, nitrate was free to leach through the shallow root zone. By late November and early December, turf roots have recovered substantially and the soil is colder, delaying the rate of nitrate release from organic fertilizers. Thus, less leached nitrate from late-November fertilizer applications was recovered in the two-foot deep lysimeters. Accounting for the delay in nitrate leaching to the depth of the lysimeter collection cups, the pattern of nitrate leaching observed in these two studies provides support for this scenario. Fig. 2 presents an average of both mid-September and late-November fertilizer applications, so differences in their leaching are obscured. However, it is evident that late season nitrate leaching was greater than at any other time of the year.

A few important aspects of fertilizer-derived nitrate leaching from cool-season turf are suggested by these studies:

A) If any N source is applied at a reasonable rate to healthy turf when the roots are capable of absorbing nutrients, nitrate leaching will account for less than 10% of the N applied.

B) Readily soluble and easily hydrolyzed N sources may leach significant nitrate below the root zone if conditions stated in (A) are not present and rainfall or irrigation are sufficient to promote free percolation through the soil.

C) Frequent applications of N fertilizers in small amounts will result in less nitrate leaching than one or two large applications.

D) The nitrate leaching potential of organic and synthetic nitrogen fertilizers is essentially the same.

E) Organic N fertilizers may leach more nitrate-N if, in their processing, extensive hydrolytic reactions occur, thereby increasing their content of free ammonia or nitrate. Be sure the sources and forms of N are identified on the label of any fertilizer used on turf.

While each situation is unique, following these general rules should minimize nitrate leaching from turf and protect the quality of your ground and surface water resources.

Richard Hull is professor emeritus of plant science at the University of Rhode Island; Jose A. Amador is professor of soil science at URI; Haibo Liu is professor of turfgrass physiology at Clemson University; and Joseph C. Fetter is a graduate research assistant at URI.

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