



Microfertilization control station for school grounds.

# MICROFERTIGATION: Greener, Healthier Turf A Drop At A Time

By Tom Lubin

Controlling the growth rate of turf has long been a hope of sports turf managers, chemists, agronomists and turf-grass breeders. They've explored about every angle, from chemical growth regulators to dwarf turfgrasses. However, there is one more angle to consider — fertilization.

There is no question that nitrogen stimulates growth and improves color. The question remains, however, when does turf have enough fertilizer to be healthy and recuperate rapidly? Too frequently, the answer has been, "If a little is good, a lot is better." But that may be changing. In fact, it may have to change, with concern growing over contamination of ground water.

A good place to start rethinking turf fertilization is the application method. One method that has largely been overlooked is fertigation, the process of adding fertilizer and micronutrients with the irrigation water. It is a widely accepted method of fertilization in agriculture, but the concept has not received the same consideration by the turf and landscape industry, primarily because early methods met with marginal success.

Often a full pound of nitrogen was applied in a single night of irrigation. If sprinkler coverage was not perfect because of a stuck head, or adverse wind conditions, the application was inconsistent. That might be sufficient on crops, but not on turf, and so many systems that were installed have since been abandoned in total frustration.

In 1980, a new concept, microfertilization, was introduced. The process is simple. Nutrients are added in small quantities, 0.005 to 0.01 pounds per treatment, dur-



Nitrogen levels are adjustable to as low as 0.005 pounds per treatment during irrigation.

ing regular irrigation. When nitrogen levels reach 0.25 pound, the process is complete. It's an important alteration of previous fertilization methods because it allows the groundskeeper to have control of the growth rate.

To determine the quantity of nitrogen needed to provide the proper growth and color desired for the particular turf it is necessary to make a light application over a month or so and observe the response. Only after this observation will it be possible to determine the proper application rate. The ideal level should be approached from the low

side. You can always add more, it is hard to take it off.

By injecting two or three nights in succession each week, the process should take two to four weeks to complete. Areas where more growth is desired can be dressed up with light spot watering on the days following fertigation.

Applied in this fashion, the nitrogen acts as a growth regulator. The superintendent or sports turf manager can control growth while still providing color to both turf and ornamentals.

The biggest advantage in using nitrogen as a growth regulator is, that if the growth rate drops, that rate can be increased again by the flip of a switch and the addition of another application of fertilizer. Said one golf course superintendent of microfertilization, "It can be used like a paint brush. If a little more color or growth is needed, all I have to do is turn on the system."

Microfertilization also prevents wide nitrogen swings which are caused by occasional, large granular applications. Light, consistent nitrogen feeding can help soils that are not buffered with high concentrations of bicarbonate ion, which control the soil pH to near 7.0 and make phosphorous and micronutrients more available.

For the first time, the turf manager can make the very small application rates necessary to control growth rate.

But the turf must be allowed to respond to the applications. Excessive fertigation defeats the purpose. With this concept, the application of 1/4 pound of fertilizer should take

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Components of microfertigation system for a park with athletic fields.

## Microfertigation

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an extended period of time. Application at very low concentrations allows for deeper placement of the fertilizer in the soil, and more even distribution than ever before possible, even in soils that vary greatly in clay content.

When the nitrogen is placed in deeper, cooler soil, the conversion of ammonium ion to nitrate takes place at a more controlled rate. This is because the rate of conversion is slower at the lower temperature.

The proportional fertigation system offers the most efficient method of fertilizer application, but a nonproportional system can yield excellent results. The level of sophistication in the system, from running the fertilizer directly into a wet well, to the most complex proportional system with mixing capabilities in the storage tanks, depends on specific needs and budgetary constraints. The only restriction to the results will be dictated by soil pH and the salt content of the irrigation water. However, with the technology available today, even these problems are not insurmountable.

A critical aspect of fertigation is water coverage. No amount of fertilizer will sustain turf that is inadequately irrigated. If uniform turf is to be grown, water must be placed as evenly as possible. It is the combined application of fertilizer with the irrigation water that produces the outstanding results in the field. If coverage doesn't exist, then it must be improved.

On most golf facilities where fertigation is utilized, the water use drops 15 to 25 percent because of improved fertilizer appli-

cation, and because of more efficient water use.

The reason for the improved results is twofold. First, when both water and fertilizer are simultaneously applied, a turf manager is more inclined to ensure that all the heads are working properly with as little run-off as possible. Second, the microfertigation process will allow the grass to grow more evenly. As the turf spreads and covers the soil, the evaporation rate decreases and less water is required. The improved look of the turf will convince the manager that progress is being made as a direct result of the microfertigation.

Fertigation not only saves turf, but also saves money — money spent on labor, materials, and water.

**Labor:** Fertigation eliminates the labor involved in granular fertilizer applications, and post-application watering. Fertilizers can be applied at the touch of a button.

**Materials:** Because the material will be applied only when needed, the cost of fertilizer can decrease as much as 50 to 75 percent. Before, large quantities would be used in order to minimize the number of applications. Now, that is no longer necessary. This also eliminates the need for the more expensive stabilized nitrogen fertilizers. An additional advantage with conventional nitrogen sources is that the rate of conversion is more predictable, and uncontrolled growth spurts during hot weather are virtually eliminated.

**Water Savings:** The savings in water can be realized mainly because of the deeper placement of all nutrients. When nitrogen and ammonium ion are placed at a greater depth, they provide an acidification that

allows increased nutrient availability. Use of a quality, organic, ionic penetrant at extremely low rates during fertigation carries water and fertilizer further into the soil. The deep placement of the ammonical nitrogen helps build a deeper root system.

In soils with high pH, and especially in soils that have high concentrations of calcium, phosphorous is much less available. The pH level must be controlled to make the phosphorous accessible. When the soil pH is under control (6.8-7.0) and a strong root system is built, then less irrigation is needed. This also decreases the salt buildup, again relieving stress on the turf.

Providing a separate pump for penetrant application also decreases the need for excess watering. In areas where evaporation is a problem, nonionic penetrant can help provide better penetration and lower the evaporation rate, giving the turf a chance to survive. Very low application rates of penetrant can decrease the amount of water normally applied to keep shallow roots moist.

In cases where a regimen of light day and night waterings were used, problems arose from localized salt buildups. To combat this, turf managers tried hand watering, which is usually insufficient to carry the salts past the root system. In areas where the soil temperature reaches well over 100 degrees (California, Arizona, Nevada, and Texas), light hand waterings can cause more harm than good. Under these extreme conditions the penetrant is most effective. However, best results are obtained when low application rates are used.

The process also encourages a minimum of runoff which is always desirable, whether fertilizer is applied or not. This is especially important during a drought. Short, repeated irrigation cycles in the early morning hours while soil temperature is still low allows the fertilizer, etc., to be applied even in very steep slope areas without runoff problems.

Microfertigation is a simple, efficient method of placing fertilizer, micronutrients, and penetrant on turf. It decreases the material used by 50 to 75 percent, thus lessening the chance of nitrate contamination of the ground water. In the future, the government will monitor the quantity of fertilizer applied, so converting to a microfertigation system now keeps your facility one step ahead of Uncle Sam.

The microfertigation system has been tested in widely varying soils, temperatures, and wind conditions, with great success. However, each set of circumstances are unique, and require inventiveness on the part of the turf manager. Shared experience of this new concept will maximize the usefulness of this very effective tool in the turf industry.

*Editor's Note: Tom Lubin is professor of chemistry at Cypress College, Cypress, CA. He has also consulted with golf course superintendents and sports turf managers regarding fertilization for ten years as president of Lubin Microfertigation Equipment, Products, and Consulting.*