Basics of Fertigation

By James S. Alderson

The controlled application of fertilizers through an irrigation system, *fertigation*, has been used for the past three decades in such areas as nurseries and agriculture. More recently, turfgrass managers have discovered the distinct advantages and benefits that fertigation holds over the conventional application of slow-release fertilizers.

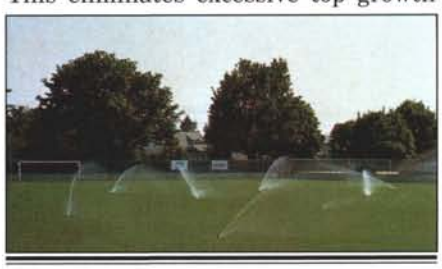
Applying soluble fertilizer through an irrigation system is easy. Since there is no need for agitation or mixing when using liquid fertilizers, there is no need to purchase any special mixing or spraying equipment. And, with the low parts-per-million usage rate, the fertilizer does not cause damage to the irrigation system.

Advantages

Fertigation saves money. Everyone likes to hear that. Over the years, prices for such staples as fertilizers, water, labor, chemicals and pesticides have kept rising. Fortunately, the cost of soluble, liquid fertilizers tends to be less than for slow-release fertilizers. The application of soluble fertilizer through fertigation also requires less equipment, and there are virtually no labor costs.

Another advantage is that nutrients can be more carefully monitored and regulated. Exact amounts of fertilizer can be applied to turfgrass, so managers are able to set an exact mixture to control growth and color. This lessens the chance of burnout or streaking by overapplying fertilizer.

Light feeding with each irrigation cycle keeps turf in a flat growth rate. This eliminates excessive top growth — which in turn cuts down on mowing time, excessive thatch and disease potential.



Because fertilizer is supplied at a low parts-per-million usage rate, fertigation does not cause damage to an irrigation system. Photo courtesy: Hunter Industries.

The uniform distribution of soluble nutrients through both foliar absorption and rootzone uptake is another plus of fertigation. The foliage absorbs about 15 to 25 percent. The rest of the nutrients penetrate to the rootzone and, if applied in low concentrations, will be taken up by roots at about the same rate as the nutrients are applied, thereby decreasing the chance of being washed away or leached out of the soil.

The application at very low concentrations allows the fertilizer to be placed deeper in the soil and more evenly than ever before, even on soils that vary greatly in clay content. When nitrogen is placed deeper, the ammonium ion is converted to nitrate at a controlled rate. This occurs because, deeper in the soil, temperatures are lower, so conversion is slower.

According to Ed Nash, an agronomist and president of PlantStar Inc. in Watkinsville, Calif., when fertigation users allow nitrogen to build up to 1/10 pound or less at the rootzone level, they have "a tremendous rate of success in maintaining healthy turf."

Finally, fertigation offers the opportunity for more frequent applications of nutrients — such as nitrogen, potassium and sulfur — that tend to be used up quickly by the turfgrass. These nutrients can be added through the fertigation system anytime they are required to keep the turfgrass looking its best.

Rates and Timing

The time of day for fertigation and the amount needed, according to Nash, depend on turfgrass usage, geographic location, type of turfgrass and time of year.

Turfgrass Usage. Since irrigation systems can be used day or night, any time is a good time for fertigating as far as the grass is concerned. However, unless you like to hear people complain, you wouldn't use fertigation on your turfgrass when participant usage is high. So, a good time to use fertigation would be *after* a field is closed, especially at night when there is less evaporation. Just set the irrigation system's automatic timer and it'll do the rest. That's about all the labor that is involved.

Geographic Location. Rate of fertigation partly depends on geographic location and soil type. The nutrient requirements of turfgrass in the sandy, acidic soils of the desert Southwest are vastly different from those in the Midwest or Northeast, where many nutrients are already found in the soil.

Types of Turfgrass. Different types of turfgrass have different nutrient requirements. To determine the quantity of nitrogen needed to provide proper growth and color desired for a particular facility, make a light application, say 0.25 pound of nitrogen, and observe the response. The ideal application rate should be approached from the low side.

Time of Year. Since water evaporates at a higher rate during the summer heat, managers may have to use fertigation more often to keep turfgrass looking its best, as opposed to spring or fall, when temperatures are lower and evaporation is less.

Types of Injectors

Key to fertigation is the nutrient injector pump.

The nutrient injector is key to the application control of liquid fertilizer. There are two major types of injection systems: proportional and fixed-rate.

Both are generally available in tank sizes from 7 to 200 gallons. For long-lasting performance, the injection pump should be equipped with stainless steel heads, valves and fittings, along with stainless steel injection lances that are equipped with check valves, antisiphon valves, union disconnects and isolation valves.

Generally, the rate of fertilizer injection should be possible at 0.1% of the irrigation flow rate. In other words, if the irrigation pump is able to deliver 1,000 GPM, a fertilizer injector should deliver at least 1 GPM.

Proportional Injection System. The proportional injection system is generally used on larger sites. The system is controlled by the irrigation flow rate and will apply a constant nutrient-to-water ratio, roughly 50 to 300 parts per million (ppm). Thus, a larger area with a high-gallons-per-minute (GPM) ratio will receive more fertilizer nutrient than a smaller area, where the GPM is less.

How does the injector know how much fertilizer is enough? The unit that reads the amount of flow is the in-line water flow sensor. A batch control unit receives pulses. If the unit is properly calibrated, the injector pump senses that X amount of fertilizer needs to be injected into the system. Any change in the rate of flow is detected by the flow sensor, and it automatically adjusts to the new amount of fertilizer needed.

The proportional injection system can be very accurate. Generally, if a problem does occur, it will be with the improper measurement of the irrigation water flow rate. This can happen for two reasons: the flow meters are inexpensive and inaccurate, or the flow meter is placed near turbulence-causing fittings.

The better injectors come as a complete system and include:

- an electronic controller;
- an in-line water flow sensor that controls pump motor speed;
- mainline injection lances made of stainless steel;
- a pump motor powerful enough to handle your fertigation needs;
- at least a two-year warranty.

Since all components must be designed to work together, beware of hybrid units pieced together from different manufacturers and avoid foreign imports that use different voltages from the U.S. Finally, choose a supplier that has expertise in this subject.

Fixed-Rate Injection System. A fixed-rate injector generally works better on small areas. Whenever flow is detected in the main irrigation line, a flow switch is turned on, allowing fertilizer to be injected at a *preset* rate.

A drawback to this injector is that, if the mainline water flow decreases unexpectedly, the same amount of fertilizer is released, concentrating a greater amount of fertilizer in a lesser amount of water. This could result in overfertilization and the possibility of burning the turfgrass.

Retrofitting

Is it possible to retrofit an existing irrigation system? Yes, it is. After selecting the proper system for your needs, the installation process consists mainly of mounting the fertilizer holding tank and pump assembly above-ground or below-ground. The injector is then tied into the irrigation mainline.

Effective fertigation keeps turfgrass at both its greenest and highest level of nutrient content. "Water," states Nash, "is the limiting factor" in obtaining healthy turf. Decreasing the volume of nutrient-rich water decreases the nutrients available to the turfgrass. Take away the water completely and you can't use fertigation.

Fertigation is increasing in use on a daily basis. That is not at all surprising. Its ease of use, its low cost, its exact coverage and its consistently good results help to make fertigation a popular, low-cost, practical way to add nutrients to turfgrass.

With all the wonders that fertigation can do for you and your turfgrass, does it mean that you should trash your dry fertilizer? No. The dry fertilizer will come in handy either for places the fertigation system can't reach or for a problem area that requires more attention than the system can give it. ❑