Organic And Slow Release Fertilizers

Golf course superintendents are expected to produce quick results at a low cost. In the case of turf fertilization, demand resulted in the use of salt-based, high-nitrogen fertilizers. However, the use of such fertilizers had its price. Fertilizer burn was a constant possibility, and the high solubility could lead to groundwater contamination. Additionally, many repeated applications during the year were required, tying up valuable labor.

The trend in fertilization today has moved away from the "quick fix" philosophy toward fertilizers that deliver a sustained delivery of essential elements throughout the growing season. Nitrogen, which is necessary for the synthesis of enzymes, proteins and chlorophyll in a plant, has especially been a major focus for turfgrass researchers and manufacturers.

Nitrogen is abundant in nature. The air is a blend of nitrogen and oxygen. However, these elements are not found in a compound, only in a mixture. This "free nitrogen" can combine with another element or elements to form a compound. Since turfgrass cannot use free nitrogen as a nutrient, it must be "fixed" in a compound in order to be serviceable to the plant.

The nitrogen cycle in nature employs soil micro-organisms to fix nitrogen. Bacteria and certain algae combine the nitrogen with hydrogen to form ammonia. Through a process called nitrification, the ammonia is further converted to nitrate, which then can be used by the plant.

Legumes, the pea and bean family, is one plant group that can use free nitrogen. Legumes generally have nodules on their roots containing bacteria which fix nitrogen. In the past, farmers would "grow" nitrogen by cultivating legumes inoculated with *Rhizobium* bacteria.

Animals have the ability to fix nitrogen. An animal can ingest plant material with a relatively low nitrogen content and produce manure, which is rich in nitrogen.

The power of a lightning strike can also fix nitrogen. (One theory even states that nitrogen fixed by lightning made the first forms of life on Earth possible.) Fertilizer manufacturers use energy to fix nitrogen, similar to an artificial lightning strike.

The nitrogen is combined with hydrogen under pressure in the presence of heat to form ammonia, and then fused with oxygen or other elements to form substances such as ammonium sulfate, urea, ammonium nitrate, sodium nitrate and calcium nitrate. These forms of nitrate nitrogen are all available to the plant very quickly.

Slowing Down Delivery

Faced with demands from turf managers, nurseries and other landscape professionals, fertilizer manufacturers have produced a wide array of products that accomplish slower delivery of nutrients, especially nitrogen. Some have been developed only recently, while others have been available for years.

Quick-releasing forms of nitrogen, such as urea, may be coated with various substances to allow sustained release as the coating wears off. The "triggers" that cause these fertilizers to release their nitrogen include soil moisture, temperature, microbial activity and particle size. In addition, the soil's pH can also play a role.

Sulfur-coated urea (SCU) has been an industry standard for several years. The urea, held from escaping by the sulfur coating, escapes through cracks and pores. The breakdown of the coating and release of the urea is accelerated by microbial activity. In addition, the varied sizes of the particles cause some to release more quickly than others.

Resin-coated fertilizers are also a popular option. Water vapor penetrates the coating and dissolves the nutrients inside. The fertilizer is then slowly diffused through the coating. These products rely on the temperature of the soil as a release mechanism. The warmer the soil, the quicker the release.

The latest coatings are polymer-based. This polymer coating depends mainly on soil moisture as a release mechanism. However, once the diffusion process begins, varying levels of moisture do not affect the speed of release, which is governed by the thickness of the coating. Polymers and sulfur also have been combined to create a "hybrid" coating.

Uncoated, slow-release fertilizers are also available. Ureaformaldehyde (UF), synthesized by combining urea and formaldehyde, is dependent on both temperature and microbial activity to initiate release. Isobutylidene diurea (IBDU) is manufactured in a similar manner, but depends on soil moisture as a release mechanism. It it relatively unaffected by either microbial activity or temperature. The rate of release is determined by various particle sizes.

Superintendents that favor liquid fertilization also have a slow release option. Methylene urea (MU), used in liquid formulations, depends on both microbial activity and soil temperature for release.

Organic Fertilizers

Ten years ago a superintendent who admitted using organic fertilizers may have been considered a bit eccentric. However, today there are several organic fertilizer formulations on the market, with more and more superintendents exploring their possibilities.

"Organic" simply means that a substance contains carbon. Strictly speaking, IBDU and UF are organics, because they also contain carbon. There are even formulations available that combine organic and synthetic fertilizers. Perhaps a more accurate

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term may be "natural." That is, these fertilizers are generally derived from animal, plant or mineral sources, as opposed to a manufacturing process.

Organic fertilizers are derived from a huge number of sources. Manure of all types, sewage sludge, blood meal, cottonseed meal, granite dust and rock phosphate are but a few. Generally, organic fertilizers have a lower nitrogen content then chemical fertilizers. They rely on microbial activity to slowly break down the nitrogen into a nitrate form.

Processed sewage sludge is perhaps the most widely known organic fertilizer. Available for years, it is especially used in warmer months, when soil temperatures and microbial activity is higher.

If the thought of using a manure-based fertilizer brings odors and golfer complaints to mind, think again. Today's formulations of manure-based fertilizers are deodorized and sanitized, and for the most part even the most demanding clientele will not be able to detect any unpleasant odors.

In the past, many superintendents who have experimented with organics have been disappointed. For the most part, organics do not produce the fast results a green committee might demand. However, it is possible to incorporate organics into an existing program and achieve good results.

Since organics depend on microbial activity for release, a healthy soil is essential. On many golf courses, years of chemical usage may reduce the quantity of soil microbes. Many organic fertilizers supply a small quantity of organic matter, which will gradually increase the general soil health and quantity of microbes. In addition, new formulations supply their own microbes (or bacteria) to help them release.

Top dressing with organic material such as compost can also increase the soil's organic content, and thus the amount of microbes it contains. Enzyme formulations and other biologically-active products are available to increase the soil's microbial activity. These are mainly liquid formulations that can simply be sprayed on. One company even specializes in designing customized "microbial soups" that are injected through the irrigation system.

If it's been awhile since you've experimented with your fertilizer program, this might be a good time to start. There are a wealth of new fertilizer formulations that promise good results with less labor. Remember, too, sometimes the parts add up to greater than the whole. Perhaps the addition of a new formulation to your regular regime may make the overall program work better. Start small, if it makes you more comfortable. Or try tackling your problem spots with different formulations. You'll find that a little innovation can make you a more environmentally-sound superintendent.