Easy with the N

Why slow-release fertilizers can help you eliminate problems caused with turfgrass growth peaks

BY BOB STAIB

The American prairie was once lush in vegetation with no input from humans whatsoever. Intense microorganism activity and consistent turnover of plant and animal residue enabled prairie grasses to flourish. Undisturbed plants had extensive root systems that penetrated to depths of 30 feet or more. In total contrast, modern turfgrass culture is incompatible with the notion of perpetual and natural sustained plant growth.

Unlike prairie grasses, turfgrasses must be regularly groomed for their aesthetic appearance and as a cushioned surface for walking, running and playing. By focusing attention on optimizing root growth and soil microbial activity, it's possible for turfgrass managers to maintain a healthy turf environment with a significant reduction of inputs.

Frequent mowing and irrigation, combined with nitrogen fertilization, result in growth cycles that interfere with the normal exchange of carbohydrates from shoots to roots, and vice versa. The art of turf management is the ability to maintain a consistent shoot-to-root ratio during the time of year when a particular variety enters its most rapid growth period. Left to their own accord, turfgrasses, like prairie grasses, grow massive root systems that sustain plants through seasons of extreme heat and cold. In cultured turf, root growth is often re-

stricted, resulting in inefficient carbohydrate utilization, translocation and storage.

Steady growth the key

Spurts of growth, or "growth peaks," are the most energy-consuming phenomena in the metabolic cycle of all life forms. Plants derive energy from the sun to manufacture carbohydrates in leaves through the process of photosynthesis. They then translocate the carbohydrates to the roots, where they're stored and drawn upon as needed. When top growth occurs in peaks and valleys, the demand for carbohydrates is so great that roots will actually lose mass. When root systems become unable to store and transport water and carbohydrates, turfgrasses decline. A shallow root system — the consequence of growth peaks — becomes even more vulnerable to rapid deterioration at soil temperatures above 80 F.

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A Catch-22 situation

Mowed turfgrass requires a constant, steady supply of nitrogen during the growing season to minimize growth peaks and maintain a healthy root system. This is best accomplished with reserve soil nitrogen from a slow-release source. The shoot-to-root ratio — or the rate of shoot growth compared to that of root mass — should remain 2-to-1 or lower for optimum health and ability to recover from stress. For closely mowed grasses, such as golf greens, this ratio should be closer to 1.5 to 1. Growth peaks precipitate root decline, and mowing more than 1/3 of top growth further shocks a root system struggling to survive.

Thatch is sloughed-off stem and crown tissue that accumulates faster than microorganisms can break it down. Unlike leaf tissue that easily decomposes, these more

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lignaceous parts of the plant create a barrier to air and water movement into the soil. To maintain color and growth, turf managers commonly use quickly available soluble nitrogen. But the long-term results get worse instead of better. Root growth becomes increasingly restricted and confined to the shallow, hotter layers of the soil profile.

Manage your N

Steady growth with good color and a shoot-to-root ratio of less than 2-to-1 can be accomplished by:

- "spoon feeding" light amounts of soluble nitrogen every 10 days to 2 weeks with no more than 1/4-lb. of N per 1,000 square feet, or
- applying slow-release or water-insoluble nitrogen (WIN) every two to four months. A variety of slow-release nitrogen fertilizer products exist in granular or coated-prill forms. They include sulfur-coated urea, polymer-coated urea, isobutylidene diurea, methyleneurea and ureaform.

Each of the slow-release nitrogen sources will supply a reserve of nitrogen in fertilizer form beyond the immediate

Balanced diet for southern turf

Turf managers striving for ideal conditioning in warm-season turfgrasses should focus on early spring and early summer fertilization. Good soil nutrition at that time of year will encourage a deep and vigorous root system going into the heat of summer. A strong root system is the best defense against stress, and will efficiently transport nutrients and water to leaf tissue to maintain color and rigidity.

The ideal strategy for optimum root growth is to approximate an annual NPK fertilizer program of a 3-1-2 or a 2-1-2 ratio of nitrogen (N), phosphorous (P_2O_5) and potassium (K_2O). This principle applies equally to warm-season and cool-season grasses, regardless of geography. In golf and sports turfs, where clippings are removed, potassium levels equal to or exceeding annual rates of nitrogen will help build turf that's more resistant to wear and frequent mowing.

Soil health is vital

Soil teeming with microbial activity supports vigorous rooting and healthy plant growth. Shifting emphasis from turf nutrition to soil nutrition will ensure that turfgrasses have a healthy, sustained color and growth. A biologically active soil has an abundant population of decomposer microorganisms, including bacteria, fungi, actinomycetes and other less prominent species. As these organisms decompose organic matter — dead plant and animal

Warm-season turfgrasses should be fertilized in early spring and early summer before high heat sets in.

needs of the turf. But WIN from ureaform can supply enough residual nitrogen to the soil for release over an entire growing season. Ureaform and methyleneurea release nitrogen through microbial activity while contributing both nitrogen and carbon toward microorganisms' food and energy requirements. Unseen caretakers of the soil, microorganisms are the driving force of the nitrogen cycle.

Ureaform, also known as Nitroform, is used commercially to stimulate microbial degradation of petroleum-contaminated soils. Research at the University of Illinois showed that Nitroform contributed to the least thatch build-up over all other N sources tested. The evidence suggests that well-nourished soil microbes accelerate decomposition of resistant plant residues to humus.

Liquid nitrogen fertilizer can only be

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tissue — they release a smorgasbord of nutrients and enzymes beneficial to soil and all parts of living plants.

When roots do their thing

During early spring and early summer fertilizer applications to warm-season grasses, it's important to strike the correct fertility balance. Manage top growth for good color, but don't allow such rapid growth that there are excessive carbohydrate demands on the root system. Keep a narrow root-to-shoot ratio by applying slow-release nitrogen sources. A sound fertilizer program with proper watering will not only promote microbial activity but encourage roots to penetrate into the cooler depths of the soil before the severe heat of summer.

Warm-season grasses expend the greater part of their energy for root formation in early spring to mid-summer. Root formation also occurs in mid-fall, but to a lesser degree. Timing fertilizer applications to coincide with these periods promotes a more healthy, stress-resistant turf when other good nutritional and cultural practices are employed.

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considered slow-release if it contains suspended water-insoluble nitrogen (WIN) particles. Liquid products that claim controlled-release nitrogen typically contain a third or more free urea nitrogen. The remainder is soluble monomethylol urea, a "prepolymer" compound formed in the urea-formaldehyde reaction, and methylenediurea, the only polymer formed in the UF reaction that will stay in solution. Attempts to produce and market more complex liquid UF polymers containing WIN have been unsuccessful to date.

Nitroform ureaform is marketed in a powdered form. Known as Powder Blue or powder gray, it contains 69% of nitrogen as WIN. Here are some application tips:

- Suspend 1 lb. of Powder Blue or gray in two gallons of water with good agitation.
- Or, suspend 1 lb. of either product in one gallon of water with strong agitation and a suspension agent such as Kelzan-S or Flozine.
- Use flood-tip nozzles or showerhead nozzles with holes a minimum of 9/37-in. diameter for good delivery of a ureaform suspension.
- Remove screen filters to help prevent a backup of solids during application.

Liquid application advantages

Though reacted-urea fertilizer solutions don't supply residual nitrogen, they do exhibit a greatly reduced burn potential over prilled urea or urea solution, which is the principle advantage of their use. They work particularly well in fertigation systems. They require little additional water to effect an even distribution. Nitrogen is released rapidly, mostly by chemical hydrolysis, though there may be slight but rapid microbial conversion of methylene diurea to the ammonium (NH4+) form.

Liquid application disadvantages

Disadvantages include:

- Leaf tissue has a strong affinity for monomethylol urea and methylenediurea. Where clippings are removed, considerable nitrogen fertilizer could be removed with them. Rinse the treated area with clear water as soon as possible, and don't collect the clippings for at least two mowings.
- Larger, more expensive application equipment is required to carry and accurately apply liquid fertilizer. A good spinner applicator can cover the same area with granular products just as fast with minimal downtime due to wind.
- Applying 1 lb. of nitrogen per 1,000 sq. ft. from urea or reacted urea solutions will nearly always result in excessive growth for one to two weeks. The more soluble nitrogen available to the plant, the more water it takes to satisfy the demands of new growth. Applications of no more than 1 lb. of N from liquid nitrogen (all sources) per 1,000 sq. ft. at two-week intervals will avoid growth peaks that contribute to root mass decline.

Potential for leaching and volatility loss of nitrogen is significant when nitrogen is applied as a soluble liquid. Several research projects have shown that ureaform resists leaching and volatilization. In fact, N loss is nearly insignificant in sandy soil.

Summary

Peaks and valleys in turfgrass growth cycles contribute to root mass decline and thatch build-up. Slow, steady growth promotes a dense turf with a greater root mass in the

Mowed turfgrass requires a constant, steady supply of nitrogen during the growing season.

deeper, cooler layers of the soil profile. Only water-insoluble nitrogen (WIN) contributes to a soil reserve of N from which plants can draw as needed.

Ureaform and methyleneurea fertilizers supply both useable nitrogen and carbon to soil microorganisms. In turn, ammonium nitrogen (NH4+) is gradually released back to the soil and subsequently to the nitrate form that plants prefer.

Reacted-urea N solutions have less burn potential than straight urea, and provide controlled release of nitrogen. They shouldn't claim slow release or water insoluble nitrogen unless they contain ureaform in suspension. **LM**

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