Sprigged bermudagrass needs ample phosphorus at grow-in

Cultivars' attributes get a boost from balanced fertility.

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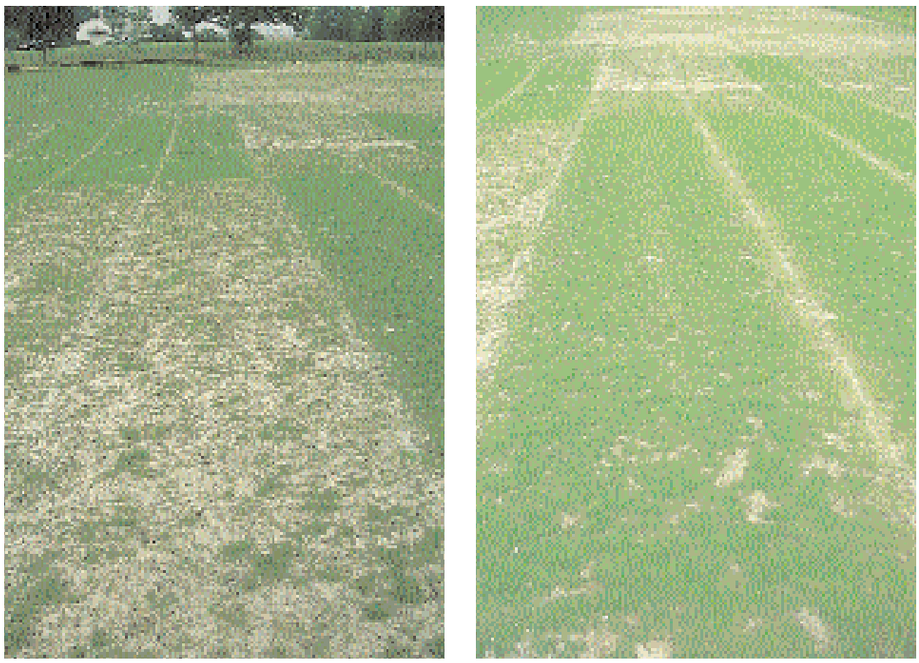
Bermudagrasses are often planted vegetatively to ensure that the desired genetic type is produced. Although bermudagrass is known for its vigor and its tolerance of heat and drought, newly planted sprigs lack sufficient roots to express these strengths.

Thus, rapid establishment is important to managers of bermudagrass, both to achieve a healthy, vigorous, weed-free stand and to allow play as early as possible on bermudagrass golf courses.

Sufficient water is critical. Sprigs must be watered generously because their limited roots are unable to reach percolated water in the soil profile. Proper fertility is also important during establishment. Fertilizers are typically applied in greater quantity during establishment to facilitate turf coverage.



Photos courtesy of Ian Rodriguez

An absence of phosphorus during TifEagle grow-in (left, from a 1:0:2 N:P:K fertilizer) is quite evident after six weeks, compared with grow-in with a phosphorus-containing fertilizer (right, 1:1:1).

KEY POINTS

- The high irrigation needs of sprigs may leach away needed nitrogen and other nutrients in sand-based root zones.
- Phosphorus deficiencies in sprigged plants commonly result from limited rooting during establishment.
- Additional phosphorus is not beneficial once adequate amounts have been applied.

Nitrogen fertility

Nitrogen plays an important role in plants: It's a constituent in proteins, nucleic acids, enzymes and chlorophyll. Turfgrasses require more nitrogen than any other essential element. Nitrogen also influences many turfgrass characteristics such as drought tolerance, color, density and growth rate.

Because of the high nitrogen demands of turfgrasses and their growth on soils that are typically deficient, nitrogen fertilizers are the most heavily applied nutrient during all phases of turfgrass culture.

Nitrogen fertilizers are applied even more heavily and frequently during establishment. This is an attempt to supply optimal nitrogen fertility to facilitate rapid shoot growth and overcome losses of nitrogen from leaching under heavy irrigation. Although excessive clippings are undesirable in established stands, rapid shoot growth during establishment is critical to reduce competition from weed species and to prevent soil erosion. Of course, a point of diminishing returns can occur as excessively high nitrogen rates actually begin to reduce establishment rates (1).

Potassium fertility

Although nitrogen is typically applied more than other elements, a balanced supply of nutrients is needed to establish turf and to maintain existing stands.

Potassium plays a major role in plant water status: It's responsible for regulation of turgidity in guard cells, which control the opening and closing of stomates. Potassium fertilization can affect leaf water potential and drought damage avoidance in bermudagrass (2). Researchers have also found that potassium fertilization had a positive influence on root growth during Tifdwarf establishment on sand (3).

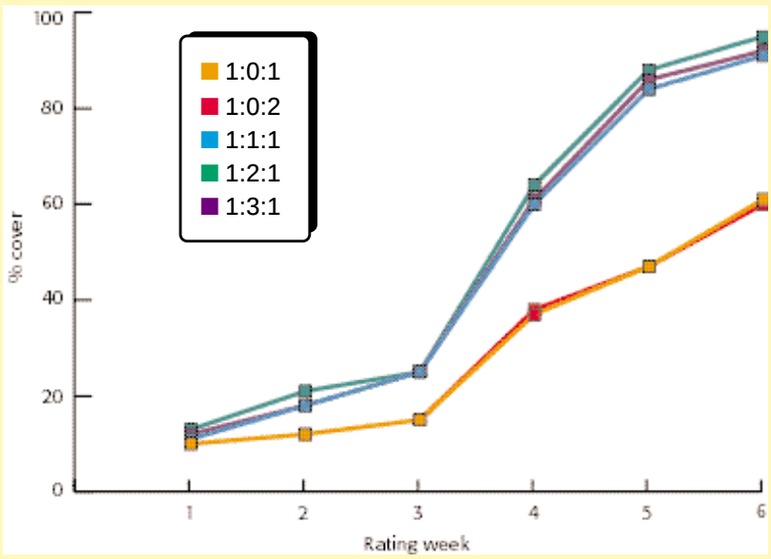
Potassium is very soluble and may be easily leached from sandy soils. Although potassium is not required in the same quantities as nitrogen, grow-in irrigation rates can depress potassium levels, making potassium fertilization important. Excessive potassium, however, may create salinity (burn) problems.

Phosphorus fertility

Phosphorus ranks third among requirements for turfgrass. The element allows transfer of energy for metabolic processes in plants. The highest levels occur in meristematic parts of plants where cell division takes place (4). Unlike nitrogen and potassium, phosphorus is considered relatively immobile in most soils, although exceptions can occur in sandy soils.

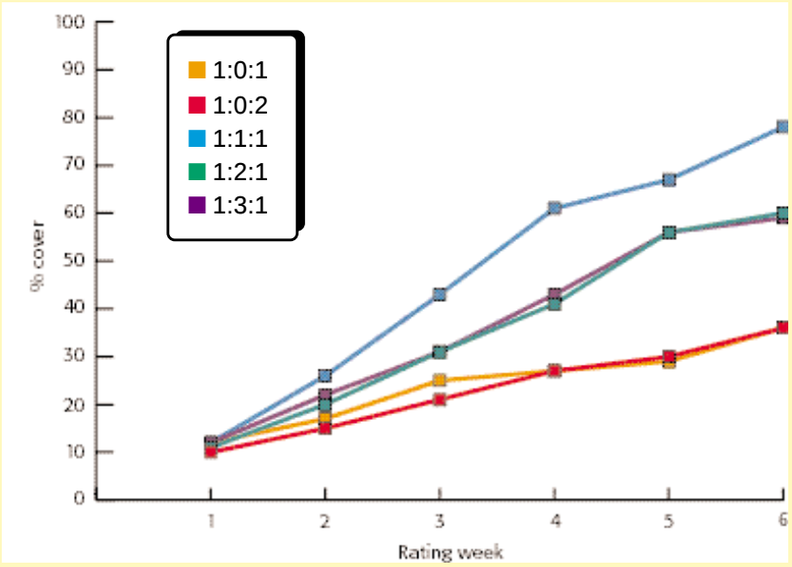
Phosphorus deficiencies commonly result from limited rooting during establishment. As phosphorus is less soluble and less movable by water, roots must grow to available concentrations of the nutrient. This is why most starter fertilizers contain ample phosphorus and are often incorporated throughout the root zone before planting.

TifEagle establishment



Percent cover for TifEagle bermudagrass under five fertilizer treatments during establishment in Clemson, S.C.

Tifdwarf establishment



Percent cover for Tifdwarf bermudagrass under five fertilizer treatments during establishment in Gainesville, Fla.

Experiments

So how much nitrogen, phosphorous and potassium fertilizer should be applied to sprigged bermudagrass? Different situations and soil types should be considered when making this decision. In the case of USGA-style greens, sandy root-zone mixes necessitate additional fertilizers. These soil mixes are typically deficient in nitrogen, phosphorus and potassium.

The construction of new USGA research greens at the University of Florida and Clemson University provided opportunities to examine combinations of fertilizers to aid in the establishment of dwarf-type bermudagrasses. The objective was to evaluate five different N:P:K fertilizer ratios for the establishment of FloraDwarf, Tifdwarf, and TifEagle bermudagrasses (*Cynodon* species).

Materials and methods

In 1996, Tifdwarf and FloraDwarf bermudagrasses were sprigged at the Envirogreen in Gainesville, Fla. TifEagle was sprigged in 1999 at the research green in Clemson, S.C. All grasses were planted on a sand-based mix containing 85 percent sand plus 15 percent peat that met USGA-adopted greens construction guidelines.

Plots were arranged in randomized complete blocks at each location with four replications of five fertilizer combinations applied weekly for seven weeks. Irrigation was performed as necessary to prevent dehydration of the sprigs throughout the experiment.

Five N:P:K fertilizer ratios were applied as treatments. Rates consisted of N:P_2O_5:K_2O ratios of 1:0:1, 1:0:2, 1:1:1, 1:2:1, and 1:3:1. All treatment ratios were based on a nitrogen rate of 1 pound per 1,000 square feet per week. Preliminary soil tests indicated insufficient amounts of N, P and K for quality bermudagrass growth. To quantify the effects of the treatments, data collected included weekly ratings for percent cover, final shoot weights and final root weights.

Results

Gainesville. FloraDwarf had a higher percentage of cover than Tifdwarf at the final rating. The 1:1:1 ratio provided the best cover rate over the seven-week period for both cultivars. Results for shoot and root weights were similar. A 1:1:1 ratio of $N:P_2O_5:K_2O$ was also responsible for greater shoot weights and root weights at the end of the study in both grasses.

Clemson. TifEagle had the highest cover rates when one of the complete fertilizer ratios was used (1:1:1, 1:2:1, 1:3:1). Results were similar for shoot weights, with the complete fertilizer treatments providing greater shoot growth. Root growth was not affected by the treatments, with no differences as a result of fertilizer combinations.

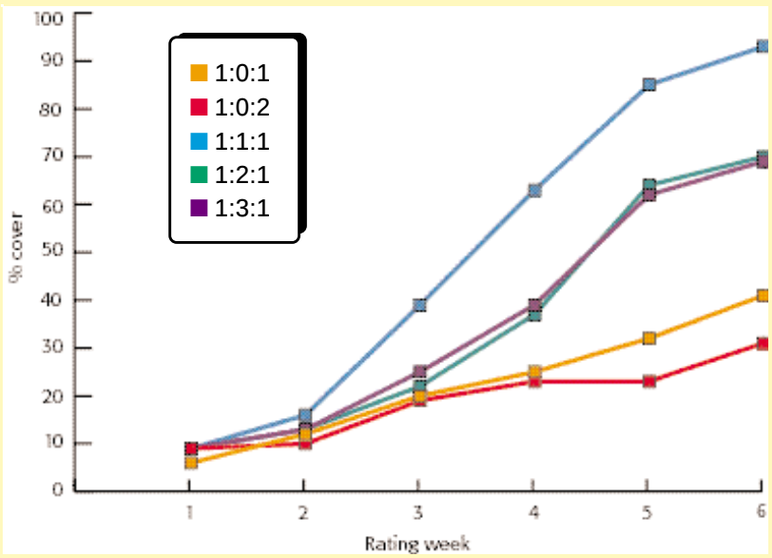
Conclusions

This study indicates the need for more than just nitrogen fertilizers during the establishment of bermudagrasses on nutrient-poor soils such as sand-based greens. In the case of phosphorus, it was apparent that simply increasing the amount applied will not necessarily increase growth. The 1:2:1 and 1:3:1 ratios in both studies were either the same or inferior in terms of growth compared with the 1:1:1 fertilizer treatment. This indicates that excessive rates of phosphorus are not beneficial once adequate amounts have been applied.

Complete fertilizer provided at least a two-week advantage at 50 percent total coverage in both studies. The comparatively poor responses to 1:0:1 and 1:0:2 ratios in both studies indicate that nitrogen and potassium are unable to substitute for a balance of nitrogen, phosphorus and potassium.

These studies indicate the need for balanced nitrogen, phosphorus and potassium nutrition when establishing bermudagrass on deficient soils. Applications of all three nutrients in the right combination for a particular soil can ensure the desirable rapid grow-in and best rooting when establishing bermudagrass from sprigs. ■

FloraDwarf establishment



Percent cover for FloraDwarf bermudagrass under five fertilizer treatments during establishment in Gainesville, Fla.

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