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IN THIS ISSUE

The Science of Spring Transition

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The term "spring transition" refers to the change of a winter overseeded cool-season turfgrass community back to a green turf originating from the understory of a dormant warm-season turfgrass, typically bermudagrass (*Cynodon* spp.). Prior to the 1970s the spring transition problem was one in which the winter overseeded ryegrass (*Lolium* species) died before the bermudagrass (*Cynodon* species) greened up in the spring, thereby resulting in several weeks of a brown turf surface. This spring transition problem was particularly severe when annual ryegrass (*Lolium multiflorum*) was used. In contrast, the release of a number of improved turf-type perennial ryegrass (*Lolium perenne*) cultivars eliminated the period of brown vegetation during the normal transition period. However, a new problem emerged in that **the new turf-type perennial ryegrasses and other species including rough bluegrass (*Poa trivialis*) persisted for too long** a period of time, extending beyond the normal green-up period of the bermudagrass. Frequently associated with this persistence is loss of the bermudagrass turf. In some cases the perennial ryegrass persists into the summer period before it dies of heat stress. When this occurs there typically is not sufficient bermudagrass surviving, and thus replanting of the putting greens is necessary.

A number of potential causes for poor spring transition and loss of the winter overseeded bermudagrass have been proposed. Included are a weakened bermudagrass caused by improper autumn cultural practices and injury from such external stresses as spring root decline, direct low-temperature kill, plant water stress, diseases, and allelopathy. However, **by far the most important limiting factor causing poor spring transition due to death of the dormant bermudagrass under the overseeding canopy is light exclusion.** Thus, the first priority in spring transition is to reduce the canopy density of the winter overseeded cool-season grasses to the extent that sunlight is allowed to reach the underlying lateral stems of the bermudagrass. When the temperature rises to the induction threshold, the new leaves start to be initiated from nodes on the lateral stems of the bermudagrass. These leaves will die if there is not sufficient sunlight or radiant energy to sustain photosynthesis due to shading by the upper canopy of winter overseeded cool-season turfgrass. This mechanism is much like attempting to grow bermudagrass in the shade under a tree canopy. The

Continued on page 2

...Spring Transition...

Continued from page 1

bermudagrasses are not shade tolerant and do not form a turf of significant quality. Thus, by far **the most important objective in spring transition is timely reduction of the canopy light exclusion dimension.**

Alternatives in reducing the cool-season turfgrass canopy density include (a) lowering the cutting height, (b) vertical cutting, (c) chemical inhibition of shoot growth, or (d) the use of herbicides selective in killing only the overseeded cool-season turfgrasses. A number of attempts have been made to eliminate the problem of unfavorable spring transition and bermudagrass loss by switching from winter overseeded perennial ryegrass to rough bluegrass. However, at the temperatures during which bermudagrass initiates new leaves, the rough bluegrass is just as competitive in canopy sunlight exclusion as the perennial ryegrass.

A series of experiments were conducted at Texas A&M University by this author to evaluate cultural methods to reduce canopy sunlight exclusion and facilitate spring transition from the winter overseeding without the loss of the bermudagrass. It was found in studies with perennial ryegrass that the following cultural methods facilitated good spring transition. **Ranking most important was elevating the nitrogen fertility level** to a rate of 0.5 pound N/1,000 ft^2 per week (0.25 kg/100 m^2) versus the application of 0.5 lb/1,000 ft^2 every two weeks. **Second in importance was lowering the cutting height** by 1/32 inch (1.6 mm). Surprisingly, **the third most important cultural practice was moderate vertical cutting** at weekly intervals. Of course, the combination of all three cultural practices resulted in the best overall spring transition. This research was completed over 10 years ago. The findings have been successfully used in Texas. Also investigated was the development of a prediction model concerning when to initiate these spring transition enhancement cultural practices. Basically, **they should be initiated when the soil temperature at a 4 inch (100 mm) depth rises above 62°F (17°C).** A caution in utilizing this program is that the higher nitrogen fertilization program should not be used if spring root decline (SRD) has occurred on the bermudagrass. If SRD occurs the fertilization should be delayed for approximately 3 weeks after SRD occurs and bermudagrass root replacement is well advanced.

A number of proposed causes for the loss of bermudagrass during winter overseeding were listed in the front of this article. Under certain conditions they can be contributing factors in bermudagrass loss, particularly when occurring in combination with canopy sunlight exclusion. Improper autumn cultural practices that weaken the bermudagrass prior to entering the dormant period can be a significant contributing factor. **Moderate autumn nitrogen fertilization should be practiced, which allows carbohydrate accumulation to occur.** High nitrogen rates—which cause excessive shoot growth—tend to minimize carbohydrate accumulation. **Examination of the lateral stems of healthy bermudagrass should reveal a plump, thick-diameter condition,** whereas bermudagrass that has been weakened by the autumn cultural practices will be spindly and very narrow in diameter.

A cultural practice that has been recommended by some turf specialists is to induce water stress during the spring transition, on the premise that the bermudagrass is more drought tolerant than the cool-season turfgrasses and thus will transition readily. However, this relative ranking is based on actively growing bermudagrass, which has adequate storage carbohydrates. In early spring the bermudagrass has used most of its storage carbohydrates. If this limitation is combined with spring root decline, the water stress will actually accelerate death of the bermudagrass. It also should be indicated that excessive nitrogen fertilization, which prevents carbohydrate accumulation, also will increase the potential for direct low-temperature kill of the bermudagrass.

Excessively close mowing heights also significantly increase the proneness to bermudagrass low-temperature kill. It generally is a good strategy to elevate the cutting height for at least 3 weeks prior to and during the winter low-temperature kill period in order to minimize potential turf loss in those regions prone to low-temperature kill stress.

Finally, there are those who continue to seek a turfgrass species/cultivar that will transition easily to bermudagrass. To date this has not been a successful approach. **This author would rather induce the transition by cultural techniques at a time selected, rather than depending on the vagaries of mother nature to accomplish this transition.** On those sites where spring transition continues to be a problem, one should consider initiating a cultural program of the type just described to determine its appropriateness in that particular climatic-cultural situation.