FEATURE ARTICLE

Post-Drought Stress Recovery of Turfgrasses

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Drought stress has been extraordinarily severe in the eastern and midwestern states of the cool, humid climatic region in the United States during 1999. Under normal field conditions the combination of severe drought and heat stress occurring in combination can be particularly devastating, especially if irrigation is not practiced. Typically the turf will turn brown and enter a summer dormancy period under these conditions. The morphology of a turfgrass species or cultivar can significantly affect the degree of drought stress survival. **The noncreeping bunch types are most prone to damage, the stoloniferous types intermediate, and the rhizomatous types the best in ability to survive extended summer dormancy periods caused principally by drought stress.** This is attributed to the semi-resting dormant meristematic areas or buds on rhizomes and stolons, which possess a particularly high degree of drought hardiness. The comparative drought resistance of 24 turfgrasses is summarized in the accompanying table.

ENHANCING SUMMER DORMANCY SURVIVAL

There are cultural practices that can contribute to the increased potential of turfgrasses to survive an extended summer drought stress, if implemented during the predormancy hardening period of increasingly progressive stress and slowing of shoot growth. **These cultural factors involve avoiding excessive shoot growth stimulation during the hardening period.** They include (a) **moderate to low nitrogen fertilization rates,** which provide only enough nitrogen to avoid a nutrient stress, (b) **high potassium levels,** and (c) **deep, infrequent irrigations,** which enhance root growth and avoid a succulent tissue condition.

POST-DROUGHT STRESS RECOVERY

Typically, the tissues surviving an extended summer drought stress are the meristematic areas on the rhizomes, stolons, and crowns of certain turfgrass species. During the drought stress period these meristematic tissues continue to respire and use stored carbohydrates, which may gradually become exhausted. The first environmental component essential to the initiation of shoot growth following an extended summer dormancy period is the availability of water in the soil as a result of rainfall. **Once this shoot growth is stimulated by rainfall, it is important to follow cultural practices that accentuate the rate of carbohydrate production for recovery of the root and shoot systems.** This involves (a) **the use of moderate to low nitrogen nutritional levels** that are sufficient to avoid chlorosis from nitrogen stress, (b) **sustaining high plant available potassium and iron levels,** and (c) **higher mowing heights,** which aid in more rapid recovery. Once an upcoming rainy period is apparent, the use of core cultivation, slicing, or spiking is needed to loosen the turf-soil surface, which may have become relatively impermeable and compacted from intense traffic. This maximizes the amount of water infiltrated into the root zone and available for uptake into the plant. Finally, the control of many seriously threatening disease, or insect pests during this critical recovery period can be important to the ultimate survival of the turf.

PLANT SURVIVAL ASSESSMENT

It is important to assess the degree of plant survival from an extended drought stress period. A common technique is to **collect a set of 4 to 6 inch (10–15 cm) diameter turfed plugs from representative dormant sites** within the turf area of concern. Then **place them in a moist environment that is favorable for turfgrass growth,** including a temperature of 65 to 70°F (16–21°C) for cool-season turfgrasses and 86 to 90°F (30–32°C) for warm-season turfgrasses. **The amount and density of shoot emergence and regrowth in a timely manner is a good indicator of potential survival for the entire turf area.** An additional assessment technique involves collecting individual plants and cutting longitudinal cross sections through the nodes of the rhizomes and stolons, plus the crowns, and observing their condition. Brown tissue that is brittle and easily fractured is an indicator of death, whereas a white, firm, somewhat moist tissue indicates survival at that point in time. It is critical to make these single point assessments in multiple locations over the area to ensure that a representative area has been monitored.

Continued on page 4

...Drought Stress...

Continued from page 2

The relative drought resistance of 24 turfgrasses*, when grown in their respective regions of adaptation.

Relative Ranking	Turfgrass
superior	dactylon bermudagrass†
	hybrid bermudagrass†
	seashore paspalum
excellent	kikuyugrass
	zoysiagrasses
	American buffalograss
	bahiagrass
good	crested wheatgrass
	St. Augustinegrass†
	centipedegrass
	common carpetgrass
	tropical carpetgrass
medium	tall fescue
	perennial ryegrass
	Kentucky bluegrass
fair	creeping bentgrass
	hard fescue
	Chewings fescue
	red fescues
poor	colonial bentgrass
	creeping bluegrass
	annual bluegrass
very poor	annual ryegrass
	rough bluegrass

*Based on the most widely used cultivars of each species.
†Significant variability occurs among cultivars within the species.

...Spring Dead Spot

Continued from page 3

Azoxystrobin (Heritage®), fenarimol (Rubigan®), myclobutanil (Eagle®), propiconazole (Banner MAXX®), and triadimefon (Bayleton®) have been shown to suppress SDS. **A fungicide should be applied once or twice in mid to late September or about 30 days prior to anticipated winter dormancy.** Fungicides, however, do not provide complete SDS control, and one application usually provides nearly as good SDS suppression as multiple applications. **Control is typically erratic with any fungicide in any given year, with levels of SDS suppression often ranging from 0 to 75%.** As noted previously, complete control with fungicides is seldom, if ever, achieved. **There is no benefit to be gained by applying a fungicide at spring green-up, because most of the root and stolon damage occurs prior to green-up.** Fungicides should be applied in at least 100 and preferably 200 gallons of water per acre. High water dilutions help move the fungicide down to stolons or between leaf sheaths to make contact with vital growing points. Currently, there are no data to support the premise that watering-in of a fungicide to the root zone will improve SDS control. Indeed, bermudagrass generally loses most of its existing root system at spring green-up. Hence, it would appear that protecting stolons and stems, which can live for one or more years, is the correct target for a fungicide. Therefore, until field research demonstrates otherwise, these fungicides probably should not be watered-in.

REFERENCES

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Vincelli, P. and D. Williams. 1998. Managing spring dead spot of bermudagrass. *Golf Course Management*, 66(5):49–53.

Rust Problems Increase in Midwest

In a recent conversation with Dr. Joe Vargas of Michigan State University, he indicated that **increased turf damage has been observed on numerous Kentucky bluegrass (*Poa pratensis*) lawns in Michigan and the contiguous midwestern states that is being caused by rust (*Puccinia* spp.).** These general field observations indicate that the injury is occurring on a broad range of cultivars of Kentucky bluegrass, although there is a need for detailed studies in this regard, as well as a need to address the specific causal pathogen or pathogens involved.

The rust-causing pathogens are obligate-parasitic fungi, which have a distinct sexual cycle, as contrasted to the imperfect fungi, which have an asexual cycle only. The existence of the sexual cycle allows the heterogeneous *Puccinia* pathogens to develop new races of the fungus to which the existing turfgrass cultivars may not be resistant. The development of new races of *Puccinia* is a well-known, periodic occurrence in certain small grains. Specific investigations are needed to confirm whether this in fact is occurring. **If this is the case, there will be a need to develop new Kentucky bluegrass cultivars that have resistance to the newly emerging races of the *Puccinia* fungus.**