Volume 9, Number 4
July–August 2001

TURFAX™

of the International Sports Turf Institute, Inc.

The International Newsletter about Current Developments in Turfgrass

IN THIS ISSUE

Summer Stresses

James B Beard

Summer by definition extends from the June (~22) solstice through the September (~23) equinox in the northern hemisphere. The following discussion emphasizes primarily atmospheric or external stresses imposed directly on turfgrass plants. The major summer environmental stresses of concern on turfgrasses typically are associated with heat or water. Often they occur in combination and are difficult to distinguish. There also are a number of biotic stresses such as diseases, viruses, insects, mites, and nematodes, that occur during the summer period. These will not be addressed in this article.

The major types of summer stress injuries to turfgrasses and their symptoms, causes, and prevention are summarized in the following table. It should be noted that a turf may enter a brown dormancy phase if not irrigated during periods of extreme water stress. **It should be kept in mind that a dormant turf composed of creeping perennial turfgrasses is basically a healthy turf.** Development of a brown dormant turf is a normal occurrence under severe water stress. It enables the turf to survive, with the shoots regrowing from the meristematic nodes on basal crowns and lateral stems once moisture again becomes available, assuming the drought period has not been excessively long.

Many problems associated with summer atmospheric stresses can be minimized by turfgrass cultural practices that ensure maximum root development. This is particularly true of water stress and also of heat stress, since the ability of roots to absorb water from as great a portion of the soil profile as possible is essential in maintaining adequate transpirational cooling. Thus, a review of the cultural practices that are important in maximizing root growth is appropriate as follows:

1. Maintain the soil pH between 6.0 and 7.3.
2. Minimize soil compaction through turf cultivation, as by coring, or by root zone modification to a high-sand mix in the case of putting greens, tees, selected fairway areas, and sports fields.
3. Prevent waterlogged soil conditions that exclude oxygen by ensuring surface drainage through proper contouring and by internal drainage through use of drain lines, slit trenches, catch basins, and root zone modification to a high-sand mix in the case of putting greens, tees, selected fairway areas, and sports fields.
4. Minimize potential problems from pesticides toxic to the root system. Of particular concern are certain preemergence herbicides, which should be used only as needed to control a serious weed problem.
5. Control potentially serious insect, disease, and nematode pests that feed on the roots.
6. Maintain an adequate soil potassium (K) level.
7. Avoid excessive nitrogen (N) fertilization of cool-season turfgrasses that forces shoot growth at the expense of root development.
8. Employ soil and water management practices that minimize the development of saline or sodic soil problems.

Continued on page 7

Common Summer Stress Injuries to Turf and Their Symptoms, Causes, and Prevention

			Practices That Minimize Injury		
Injury	**Symptoms**	**Causes**	**Cultural**	**Soil**	**Specific Protectants**
Heat					
Indirect Chronic Stress	Decreased root growth followed by slowing of shoot growth; reduced shoot density; eventual cessation of growth along with a darker blue-green color	Soil temperatures (above 75 F [24 C] for cool-season species and above 100 F [38 C] for warm-season species), that exceed the optimum range for metabolic/growth processes	Maintain transpirational cooling through irrigation and enhancement of root growth; raise cutting height and use a solid roller when mowing greens; maintain a moderately-low nitrogen level; control any thatch/mat problem prior to the stress period	Provide rapid surface drainage by proper contouring and drainage ways, and adequate subsurface drainage by drain lines, slit trenches, catch basins, and root zone modification to a high-sand root zone in the case of greens and tees	Use heat-tolerant species and cultivars; syringe 1 to 3 times a day during heat stress, especially on closely-mowed bentgrass greens and tees; ensure air movement across greens and tees
Direct Acute Kill	Shoots turn tan to white in large irregular patches; leaves tend to remain erect	Lethal heat levels cause precipitation of the protoplasm in cells	(Same as above)	(Same as above)	Use heat-tolerant species and cultivars; syringe 1 to 3 times a day during heat stress, especially on closely-mowed bentgrass greens and tees; ensure air movement across greens and tees
Scald	Shoots turn tan to brown with scorched appearance; usually occurs in depressional areas; leaves tend to lay prostrate to soil	Shallow pools of standing water in soil depressions plus high sunlight cause rapid rise in water temperature to lethal levels	Raise cutting height; maintain moderately-low nitrogen level; control any thatch or mat problems; spiking or shallow coring	(Same as above)	Remove shallow pools of standing water from greens immediately (a squeegee can be used) until soil drainage problem is corrected
Desiccation					
Atmospheric	Irregular patches of turf wilt and die within a short period at midday due to internal water stress; shoots erect with white to tan color	Shoots desiccate because rate of transpiration exceeds rate of water absorption by roots, even if soil moisture is adequate wet wilt	Enhance root growth; maintain moderately-low nitrogen level and high potassium and iron levels; irrigate lightly as needed to maintain adequate plant water level	Cultivate turf by coring or slicing to enhance water infiltration	Syringe 1 to 3 times a day as needed to prevent wilt, especially on closely-mowed greens
Soil Drought	Shoots erect with white to tan color over large areas that have not been irrigated; extensive cracks may form in clay soils	Lack of rainfall or irrigation over an extended period, along with high summer evapotranspiration rates, causes death of shoots by desiccation	Enhance root growth; maintain moderately-low nitrogen level, and high potassium level; limit use of herbicides, especially preemergence types	Cultivate turf by coring or slicing to enhance water penetration	Use drought-resistant species and cultivars

Wear					
Turf	Leaves and stems bruised, torn, and worn away in distinct patterns where intense traffic has occurred	Mechanical wearing away of turfgrass shoots from severe pressure and twisting action of foot and/or vehicular traffic	Raise cutting height; maintain moderately-low nitrogen level, and high potassium level; use moderate irrigation; provide moderate thatch/mat cushion; use solid rollers on mowers	Improve soil resiliency through turf cultivation, as by coring	Rotate traffic patterns by planned movements of holes and tee-markers; use design features that tend to distribute traffic over wide areas; switch to alternative spiked shoes; use cart paths where traffic is highly concentrated
Flooding					
Submergence	Leaves prostrate with tan to brown color and signs of rapid decomposition in large irregular areas that have been under water for an extended period	Death associated with complex set of conditions created by an anaerobic environment	Maintain moderate but adequate nutritional levels	Provide surface drainage via proper contouring	Construct perimeter dikes to prevent flooding; elevate greens and tees; keep water moving and cool; provide for rapid removal of surface water
Soil Deposition	Soil layer covering turf following flood. (Same effects result from high winds, especially in more arid climatic regions)	Flood waters carrying eroded soil slow to velocity where soil can settle out	Intense coring following soil deposition to open the soil layer	Mechanically remove deposited soil from greens and tees so that turf is exposed, then wash turf; on fairways remove deposits of more than 1 inch (25 mm)	

TURFAX™
© 2001 Ann Arbor Press
Introductory offer: $69.95 + shipping and handling
6 issues/year
Available by mail and/or fax

Ann Arbor Press
P.O. Box 20
Chelsea, MI 48118
Telephone: 800-487-2323; 734-475-4411
Fax: 734-475-0787
www.sleepingbearpress.com

JB Comments

Thatch Versus Stem Biomass

Thatch is defined as an intermingled organic layer of dead and living shoots, stems, and roots that have developed between the zone of green vegetation and soil surface. Inherent in this definition is an assumption that this intermediate zone is dominated by dead organic material. This terminology has been satisfactory for many decades. However, the introduction of newer high-density turfgrass cultivars having vigorous lateral stem development dictates the need for additional refinement in the definition. **In the latter case this intermediate zone is dominated by living stoloniferous lateral stems rather than dead organic material. Accordingly, an additional term is proposed to describe this situation, which is stem biomass.**

It is important to have two differentiated terms because the cultural practices utilized in managing these two types of intermediate zones are distinctly different. In the case of thatch, an accumulated layer can be removed on a corrective basis by vertical cutting into the actual thatch layer dominated by dead organic material. In contrast, such an approach within a stem biomass dominated intermediate layer results in excessive damage to the turf which is quite slow to recover. In the case of stem biomass, the preferred cultural approach is a preventive basis involving a low nitrogen nutritional level, assuming the cultivar tolerates the lower level, combined with a close cutting height, with 1/8 to 1/10 inch (3.2–2.5 mm) being particularly effective for greens situations. An additional preventive approach that may be used when needed is grooming and/or relatively frequent, light vertical cutting. In other words, **stem biomass micro-correction is a surface-oriented approach in which preventive measures are essential.** In contrast, **management of a thatch preferably involves preventive approaches, but in addition, corrective approaches involving interior mechanical operations also are an option if needed.**

Polyoxin D (Endorse®) . . .

Continued from page 6

Brown patch is more intense in dense, high cut turfs when compared to lower mowing in more open stands. However, under high disease pressure conditions, mowing height appears to have little affect on brown patch severity. Generally, mowing high within the recommended range helps turf to better tolerate summer stresses, diseases, insect pests, and helps to reduce weed colonization. Hence, for numerous agronomic reasons, it is generally best to maintain the highest possible mowing height in the summer.

In summary, the best cultural practices for managing brown patch in cool-season grasses include the following: apply balanced N + P + K fertilizers in the autumn using as much slow-release N as possible; irrigate early in the morning; avoid excessive and/or nighttime irrigation; and maintain the mowing height high within the recommended range for the species grown. If possible, improve drainage and air circulation, reduce thatch, and alleviate soil compaction.

References

Fidanza, M.A. and P.H. Dernoeden. 1997. A review of brown patch forecasting, pathogen detection, and management strategies for turfgrasses. *International Turfgrass Society Res. J.* 8:863–874.

Lyr, H. 1995. *Modern Selective Fungicides—Properties, Applications, Mechanisms of Action.* Gustav Fischer Verlag, New York.

Summer Stresses

Continued from page 1

9. Maintain as high a cutting height as possible within the confines of the particular use on putting greens, tees, fairways, and sports fields.
10. Avoid an excessive thatch accumulation that encourages root development in the thatch/mat layer only.
11. Minimize intense mechanical maintenance practices, such as topdressing, vertical cutting, and turf cultivation, during critical summer stress periods.

Adjustment of cultural practices to maximize root growth and development results in a turf with much better potential to survive summer stresses. The importance of roots in relation to turfgrass culture must not be overlooked by turf managers. Warm-season grasses generally possess more extensive root systems than do cool-season turfgrasses. Because of the very close mowing height, turfgrasses growing on putting greens possess a much shorter root system.