FEATURE ARTICLE

Turfgrass Culture Under Tree Shade

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This article is the second in a series on tree shade adaptation and culture. The shade environment effects on turfgrass adaptation were discussed in the January–February 2002 issue of TurFax. It was emphasized that a major problem in the shade adaptation of cool-season grasses is disease and a shade microenvironment that results in turfgrasses growth characteristics that are more prone to disease plus a microenvironment favorable to increased causal pathogen activity. Many of the following guidelines are based on strategies that will minimize disease activity. The other shade stress dimension relates to the direct effect of the reduced irradiation level under the shade and is particularly important in relation to the growth of warm-season turfgrasses. Two major aspects in growing turfgrasses in the shade will be addressed, including (a) suggested cultural practices and (b) modification of the tree shade microenvironment.

Turfgrass Shade Culture

Cultural practices can be modified to improve the growth and shoot density of shaded turfgrasses. Key practices in turfgrass shade culture include:

- raise the cutting height;
- avoiding excessive nitrogen fertilization;
- deep, infrequent irrigation;
- judicious traffic control;
- use of fungicides when needed; and
- use shade-adapted turfgrass species and cultivars.

A higher height of cut increases the leaf blade area, thus providing a greater capability to absorb solar radiation and synthesize carbohydrates. **A cutting height of 2.0 to 2.5 inches (50–63 mm) is beneficial for shaded lawns of most turfgrass species.**

Excessive nitrogen fertilization produces succulent shoot tissue that is more prone to injury from diseases and wear stress. **Carbohydrate depletion is moderated by using the minimum nitrogen fertilization level that meets the requirements of the turfgrass species.** Surface fertilization of trees is not desirable where the associated turfgrass species has a low nitrogen fertility requirement. The fine-leaf fescues are shade adapted species, but do not tolerate excessive nitrogen fertilization. The loss of fine-leaf fescue turfs may be minimized by deep-root feeding of trees.

Proper irrigation ensures adequate moisture for turfgrass growth. **Deep watering to a minimum soil depth of 6 inches (150 mm) is preferred. A critical aspect of irrigation is avoiding the enhancement of pathogen activity caused by excessive or improper timing of water applications.** The water application rate should not exceed the infiltration rate of the soil. Irrigations should be timed so the water is present on the turfgrass leaves for a minimum period of time, such as during the mid-day period of highest evaporation. The result is a less favorable microenvironment for infection by fungal pathogens.

Shaded turfgrasses should be protected as much as possible through the redirection or control of traffic because of the greater susceptibility to wear stress injury and reduced ability to recover from traffic stress damage. In the case of shaded tees on a golf course, the only alternative may be periodic resodding as needed.

Early autumn establishment of cool-season turfgrasses is preferred under deciduous trees. Autumn seedings provide the longest period of direct sunlight, extending from tree leaf abscission in mid-autumn until the initiation of new tree leaves in mid-spring. Mid-summer is the best time for planting warm-season turfgrasses in shaded areas. The immediate removal of fallen tree leaves is especially important during turfgrass establishment.

Modifying the Three Shade Microenvironment

An underlying principle of turfgrass shade culture involves modification of the microenvironment to improve conditions for turfgrass growth and development. Included are:

- pruning of lower tree limbs, especially for solo trees;
- selective removal of limbs in the canopy of trees;
- removal of dense shrub barriers; and
- pruning of shallow tree roots.

Pruning of tree limbs below 10 feet (3 m) improves the turfgrass quality under individual trees. The irradiance can also be improved through the selective pruning of limbs in the tree crown. This may be needed at 4 to 5 year intervals, depending on the rate at which the tree limbs regrow into the openings. Additional reductions in irradiance can be avoided by the immediate removal of excess clippings and fallen tree leaves. If the landscape plan requires a dense, low-growing shrub or tree that is not to be pruned, one should not attempt to maintain a turf under the canopy. In some cases tree removal is needed, especially on golf courses where a high initial tree density

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Research Summary

Polystand Composition Succession of Cool-Season Turfgrass Communities

Investigations were conducted in which turf-type tall fescue (*Festuca arundinacea*), dwarf tall fescue, Kentucky bluegrass (*Poa pratensis*), and perennial ryegrass (*Lolium perenne*) were seeded in eight combinations as species mixtures at two locations under irrigated and non-irrigated conditions. The experimental site was established in 1991 on a silt loam soil in central Missouri. The turfs were mowed at 0.75 and 2.0 inches (19–51 mm), twice weekly with the clippings returned. The experimental area was fertilized with 1.0 lb per 1,000 ft^2 (48 kg • ha^{-1}) of 20 N-4 P - 8 K in March, September, October, and November, for an annual total of 4 lb per 1,000 ft^2 per year (192 kg • ha^{-1} yr^{-1}). A modified Brinkman Traffic Simulator was applied to the turfs in October 1993, involving 15 passes on one-half of each mowed plot at an interval of three times per week for two weeks. The plot layout was a randomized complete block design in a split-split-plot arrangement with three replications. The study involved a five-year period of observations.

Perennial ryegrass became the dominant species in all polystands with tall fescue, Kentucky bluegrass, or both. This study revealed that the seed mixtures containing only 20% perennial ryegrass by weight with Kentucky bluegrass will eventually result in dominance by the perennial ryegrass under the conditions of this investigation.

After five years the turf-type tall fescue comprised 82% of the polystand with Kentucky bluegrass, while dwarf tall fescue comprised 48% of the polystand with Kentucky bluegrass.

The Kentucky bluegrass was more competitive to tall fescue in the irrigated than in the non-irrigated experimental area. The mowing height caused small changes in polystand composition from year to year, while the one period of simulated traffic had little effect on the polystand composition one year following the stress simulation treatment. In terms of turf recovery following traffic stress stimulation, polystands containing Kentucky bluegrass with tall fescue recovered more rapidly than a blend of tall fescue cultivars.

There was a distinct advantage in using a mixture of species, compared with the use of an individual species in terms of reducing the severity of disease occurrence. Dollar spot (*Sclerotinia homoeocarpa*) was the most prevalent disease during the five-year period and infected primarily the perennial ryegrass, with little occurrence on Kentucky bluegrass. Brown patch (*Rhizoctonia solani*) occurred primarily on the tall fescue, and occasionally on the perennial ryegrass. The irrigated turf plots tended to have more dollar spot. Brown patch damage was more apparent on the non-irrigated plots of tall fescue, possibly because of the slow recovery rate from disease injury.

Comments. The relative competitive ability and the resultant composition of cool-season turfgrass polystands can vary with the location in which the experiment is conducted. This is to be expected in that the environmental stresses and types of disease/insect problems may vary in severity and in relation to the particular turfgrass species they most strongly influence. Thus, **in the interpretation of results from polystand composition studies one should consider the particular regional environment rather than making broad continent application.**

Source. *Turf performance of mixtures and blends of tall fescue, Kentucky bluegrass, and perennial ryegrass* by J.H. Dunn, E.H. Irvin, and B.S. Fresenburg. *HortScience* 37(1):214–217, 2002.

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was planted to achieve the desired initial landscape effect. The original intention was for many of these trees to be removed over time as adjacent trees grow larger.

Wind movement can be improved by judicious pruning and/or the elimination of thick underbrush and shrub plantings that form dense encircling screens. **Maximum air drainage is achieved if selective clearing of underbrush is done in the direction of prevailing winds.** The beauty of a landscape is sometimes enhanced by new vistas through selective shrub or tree removal. More favorable temperature and relative humidity regimes are the benefits of unimpaired air movement. Disease development is also reduced due to the lower relative humidity and more favorable conditions for drying.

Most tree species are shallow rooted. The roots will extend beyond the perimeter of the tree drip line into adjacent irrigated turf areas. Root competition for water is especially critical in dryer climates and in situations where trees are growing adjacent to an irrigated turf. **Pruning of shallow tree roots is an effective practice in alleviating competition for nutrients and water. The best approach is trenching to a 2- to 3-foot (0.6–0.9 m) depth at a 4- to 5-year interval.** The installation of vertical physical barriers is seldom effective.