How to Grow Turf in Shade

By Greg Bell and Kyungjoon Koh

FIGURE 1

Light-reduction structures were covered with shade cloth on the top to reduce light. Airflow restriction structures were covered on the sides.

There are few conditions more detrimental to turfgrass growth than shade. Low light levels result in poor photosynthesis, low energy levels and general turfgrass decline. Changes in light quality encourage rapid vertical shoot growth, resulting in less energy for root growth (Bell et al., 2000). In most cases, tree roots compete with shaded turf for water and nutrients and surrounding vegetation or structures restrict airflow.

Although some grasses grow better in shade than others, there is really no such thing as a shade-loving grass. Nearly all grasses prefer full sun.

Managing turf in shade is not easy. Many factors combine to discourage turfgrass growth in a shade environment. The three most common and most important factors are poor light, restricted airflow and tree root competition. Tree root competition can be extremely detrimental but it is relatively easy to manage. The key to managing root competition is to closely monitor the conditions and provide enough water and nutrients to satisfy both the turf and the trees. Each situation is different and providing too much water or too much fertilizer can be just as detrimental as providing too little.

Consequently, closely monitoring soil moisture and turf growth is essential. Trees require little, if any, nitrogen and the same is true for turf in shade. Over-fertilizing shaded turf is a more common problem than under-fertilizing.

The poor light and restricted airflow commonly found in shade are difficult problems to manage. In order to increase the amount of light reaching the turf, the offending structures or trees have to be removed, and that is rarely possible. Improving air circulation is usually easier but generally requires extensive labor and a substantial amount of money. Such an expense can't be justified if it does not result in better turf. We wanted to determine if improving air circulation would truly benefit shaded turf if the light conditions remained the same. Consequently, we designed a study to identify the effects of reduced light and restricted airflow independently (Koh et al., 2003).

We chose creeping bentgrass (*Agrostis stolonifera*) golf greens as our medium for this study because of their high value and short mowing height. The shorter the mowing height, the less leaf area that remains to gather light and perform photosynthesis. Turf mowed short is less likely to survive in shade than turf mowed high.

The study was performed on an L93 putting green and an older SR1020 putting green. By observation, the L93 green was somewhat resistant to our two most common diseases, dollar spot caused by *Sclerotinia homeocarpa* and brown patch caused by *Rhizoctonia solani*. Structures were made of PVC pipe and covered with shade cloth to restrict light (Fig. 1).

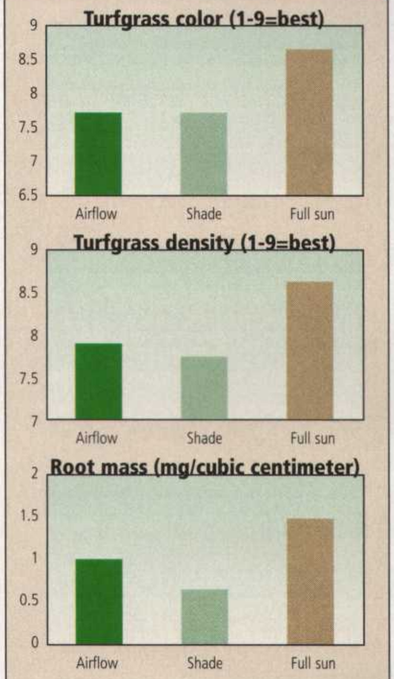
The sides of these structures were not covered so that air could move freely across the turf. Additional structures of the same design were used to restrict air movement. These structures were covered with cloth on the sides to restrict airflow but were left open on top to allow sunlight to penetrate. The structures were only 1 foot high, so the turf was not in the shadows for longer than one hour in the morning and one hour in the evening.

The results of the study were interesting. The L93 green survived both airflow restriction and light reduction better than the SR1020. Both airflow restriction and light reduction caused declines in color and density in the L93 compared with turf in full sun. The color and density declines were approximately equal for both stresses (Fig. 2).

Root mass also declined under both airflow restriction and light reduction in approximately equal amounts compared with full sun. The L93 had no noticeable disease during the two years of the study. We concluded that the L93

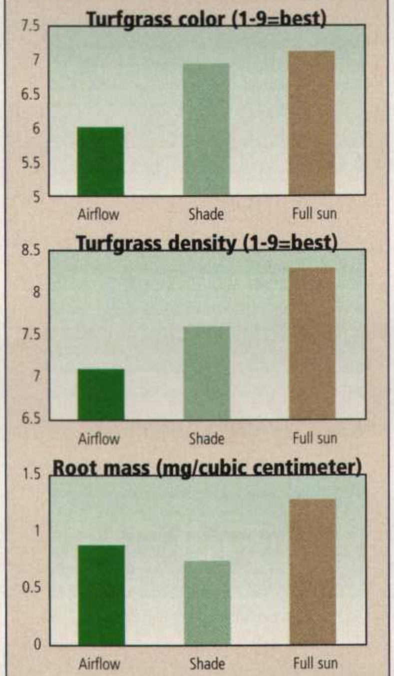
Continued on page 70

FIGURE 2



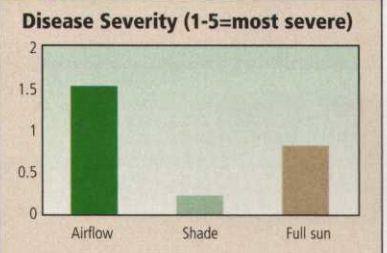
Light reduction and airflow restriction caused approximately equal declines in color, density and root mass, compared with full sun on the L93 green. Results are an average of 13 monthly measurements collected over two seasons.

FIGURE 3



Disease symptom severity was greatest under airflow restriction on the SR1020 green.

FIGURE 4



Light reduction and airflow restriction had different effects on the SR1020 green.

Continued from page 68

green could be managed under conditions of either airflow restriction or light reduction with equal efficiency, but a combination of the two stresses might cause an unacceptable decline.

The results on the SR1020 green were more definitive. We measured disease on the SR1020 in nine of the 13 months that data were collected. Surprisingly, the shaded turf always had the least disease. More disease occurred in full sun than occurred under light reduction (Fig 3). We attributed that to the fact that the shade cloth covering the structure did not allow for heavy dew formation on the turf underneath so the shaded plots dried the fastest each morning.

The air restriction plots had the most severe disease and were the last to dry each morning in spite of their exposure to full sun. On the SR1020, the air restriction treatment caused the greatest decline in turf color, and there was no significant difference between turf color in light reduction compared with full sun. The turf density on the green was greatest in full sun, less under light reduction and least in airflow restriction. On the other hand, root mass was greatest in full sun, less in airflow restriction and least under light reduction.

Based on the results of this work, airflow restriction and light reduction may cause different problems but are equally detrimental to turfgrass health. Therefore, if both of these stresses are present and one is removed, an immediate improvement in turfgrass health can be expected. Increasing the air circulation in a shaded environment should lead to improved growing conditions and more manageable turf. Historically, methods such as removing all low-growing brush and trimming tree limbs to at least 10 feet off the ground have been effective for improving air circulation.

Opening east to west corridors through existing vegetation or structures can help air circulation immensely. Sometimes re-grading is required. Fans can also be effective. Trying to remove trees always antagonizes somebody. Perhaps improving the air circulation in the area is all that is required to make the turf manageable.

Dr. Greg Bell is an associate professor of turfgrass science at Oklahoma State University in Stillwater, Okla. His research focus includes turfgrass shade management, management practices that reduce runoff from turf and the use of spectral sensing for practical turf management. Kyungjoon Koh is a research technician in the turfgrass program at Oklahoma State.

REFERENCES

Koh K, Bell GE, Martin DL, Walker NR. "Shade and airflow restriction effects on creeping bentgrass golf greens." *Crop Sci.* 2003;43:2,182-2,188.

Bell GE, Danneberger TK, McMahon MJ. "Spectral irradiance available for turfgrass growth in sun and shade." *Crop Sci.* 2000;40:189-195.