

Selection of Bermudagrass Germplasm that Exhibits Potential Shade Tolerance and Identification of Techniques for Rapid Selection of Potential Shade Tolerant Cultivars

Gregory E. Bell and Yanqi Wu
Oklahoma State University

Objectives:

1. Screen bermudagrass germplasm collections and selections for their effectiveness in shaded environments.
2. Determine turfgrass characteristics that may be useful for screening future selections for potential shade tolerance.
3. Create one or two genetic populations by physiological and molecular selections of shade tolerant and susceptible parents for future research.

Start Date: 2008

Project Duration: three years

Total Funding: \$90,000

A research site was assigned and planted using greenhouse-grown bermudagrass plugs on June 22, 2007 at the Oklahoma State University Turfgrass Research Center, Stillwater, OK. The site was specifically constructed to host this and future shade-selection projects.

The research site receives mid to late afternoon shade, depending on season, from a dense, mature evergreen canopy on the west side of the site. The site meets the most important parameters for effective shade research. Late afternoon vegetative shade is provided by conifers on the west side of the plots. These conifers also provide root competition and reduce the predominantly westerly airflow. Maple trees have been planted along the south side of



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the site and redbud trees along the east side to increase the duration of vegetative shade. We attempted to increase the duration of shade at the site in 2008 by planting vines along a hoop structure, but we had limited success. Due to limitation and uneven density of natural shade, a 75% black woven shade cloth was installed above the plots to provide shade in the middle of the day.

The study consists of 45 bermudagrass selections and four standards, 'Celebration', 'Patriot', 'Tifton 4', and 'Tifton 10'. 'Celebration', 'Tifton 4', and 'Tifton 10' were chosen for their potential shade tolerance and 'Patriot' was chosen for its likely poor shade tolerance. The bermudagrass selections were collected primarily from China, Africa, Australia, and other nations. Each bermudagrass was replicated five times on the shade site that is in full sun for about 48% of each day and on an adjacent site that is in full sun for about 90% of each day. Visual turf quality (TQ) and NDVI (normalized difference vegetation index) were assessed every two weeks in 2009 for five rating dates from June 5 to August 13, 2009.

In 2008, shade stress occurred on the shade site for 12% longer each day than on the sun site. This short duration of shade stress caused an average 4.9% decline in TQ and a 3.4% decline in NDVI in 2008. On May 7, 2009, a black woven shade cloth with 75% light reduction (10 ft x 160 ft) was installed on a hoop structure to provide longer and even more uniform shade for the shade site. Consequently, the shade intensity duration increased from 12% in 2008 to 52% in 2009. Also, it increased decline in TQ from 4.9% in 2008 to 12% in 2009 and a decline in NDVI of 3.4% in 2008 to 7.4% in 2009.

The bermudagrass selections differed significantly in TQ and in NDVI both in full sun and in shade in both 2008 and



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2009. Data indicate that there is significant variation among selections in both sun and shade. The best performing cultivar in both full sun and shade was 'Patriot'.

In 2010, photosynthesis will be measured from the 10 best selections, 10 worst selections, and four standards in May, July, and September with a LI-6400 portable gas exchange system.

Summary Points

- Photosynthetically active radiation was measured continuously to determine the amount of shade stress present in the shade site.
- Turfgrass quality ratings were made every two weeks by collecting visual and NDVI ratings.
- In 2009, the shade site received 48% of the solar irradiance received on the sun site.
- Turfgrass visual quality ratings and NDVI indicated significant diversity among selections.
- The mean visual turf quality decline between like selections in full sun to shade was 12%, and the mean decline in NDVI quality was 7.4%.