USGA
Green Section
RESEARCH YOU SHOULD KNOW
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Scientists are quantifying the minimum daily light integrals of commonly used bermudagrass and zoysiagrass cultivars at fairway and rough cutting heights. (Dr. Benjamin Wherley)

MINIMUM DAILY LIGHT INTEGRALS:

DO CULTIVARS, CUTTING HEIGHTS AND PGRS MATTER?

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- Texas A&M University scientists are determining minimum daily light integral (DLI) thresholds for nine commonly used bermudagrass and zoysiagrass cultivars at fairway and rough cutting heights.
- Minimum DLI thresholds for bermudagrass cultivars were generally higher than for zoysiagrass cultivars.
- All bermudagrass cultivars had similar minimum DLI thresholds at fairway height in summer, but minimum DLI thresholds increased significantly at rough height for 'Tifway' and 'TifGrand' hybrid bermudagrass.
- All zoysiagrass cultivars had lower minimum DLI thresholds at rough height than fairway heights in summer.
- Trinexapac-ethyl reduced minimum DLI thresholds for all zoysiagrass cultivars at fairway height in summer.

Shade is a major barrier to achieving quality playing surfaces on golf courses with many trees. In general, this is because grasses – especially warm-season grasses – perform best when growing at or near full sun. Many factors influence turf performance in shade and, aside from turf selection, superintendents also are interested in how cutting heights and plant growth regulators affect light requirements of turfgrass cultivars.

Accurately defining the sunlight needed for a quality playing surface was more challenging before the advent of commercially available daily light integral (DLI) meters, which estimate the amount of photosynthetically active radiation (PAR) that accumulates on turfgrass from sunlight each day. In addition to informing shade management research, these meters now can help superintendents assess the suitability of a site for different grasses – provided that the DLI requirements of grasses are readily available. To inform this process, Texas A&M University scientists are conducting research to determine minimum DLI thresholds for commonly used bermudagrass and zoysiagrass cultivars.

Field experiments were conducted at fairway (0.75 inch) and rough (2 inch) cutting heights in 2016 and 2017. Four bermudagrass cultivars ('Tifway', 'TifGrand', 'Celebration' and 'Latitude 36') and five zoysiagrass cultivars ('Zeon', 'Zorro', 'Geo', 'Palisades' and 'JaMur') were established in full sun then evaluated under structures that provided 0%, 30%, 50%, 70%, 80% or 90% shade. To best simulate real-world conditions, the shade structures were in place for the duration of these experiments, even during winter months. Turfgrass quality evaluations under this spectrum of shade levels allowed the scientists to use statistics to determine the shade level corresponding to minimum acceptable turfgrass quality – i.e., the minimum DLI threshold for acceptable turf quality. Minimum DLI thresholds were calculated for cultivars at each cutting height in spring, summer and fall. Additionally, the team evaluated the effect of a plant growth regulator on minimum DLI thresholds by treating half of the fairway plots of each cultivar and shade level combination with trinexapac-ethyl monthly during the growing season.

Preliminary results show that minimum DLI thresholds varied by season and were greatest in summer. Minimum DLI thresholds for bermudagrass cultivars were generally higher than for zoysiagrass cultivars, and cultivars of each species responded differently to cutting heights and applications of trinexapac-ethyl. Bermudagrass cultivars had similar minimum DLI thresholds at a fairway cutting height in summer, requiring 24 to 26 moles of PAR per square meter per day. The range for zoysiagrass cultivars was 18 to 26 moles per square meter per day at fairway height, and 'Zeon' and 'Zorro' were at the lower end of the range. Trinexapac-ethyl had no effect on minimum DLI thresholds for bermudagrass cultivars at fairway height in summer, but reduced minimum DLI thresholds for zoysiagrass cultivars to 15 to 20 moles of PAR per square meter per day in summer.

Minimum DLI threshold differences were more pronounced at rough height. Minimum DLI thresholds for rough height 'Latitude 36' and 'Celebration' bermudagrass in summer were similar to those at fairway cutting heights. Conversely, 'Tifway' and 'TifGrand' bermudagrass required more PAR at rough height in summer. The minimum DLI thresholds for all zoysiagrass cultivars decreased at rough height, requiring only 9 to 14 moles of PAR per square meter per day.

These preliminary results demonstrate the importance of not only species, but also cultivar selection when considering shade tolerance, and provide metrics to consider during selection. Similarly, it's important not to overlook management differences as some of the most pronounced differences in this study occurred from fairway to rough cutting heights.

References

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