Agricultural Research Institute

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ABSTRACTS

Deficit irrigation of bermudagrass to conserve water while maintaining plant health

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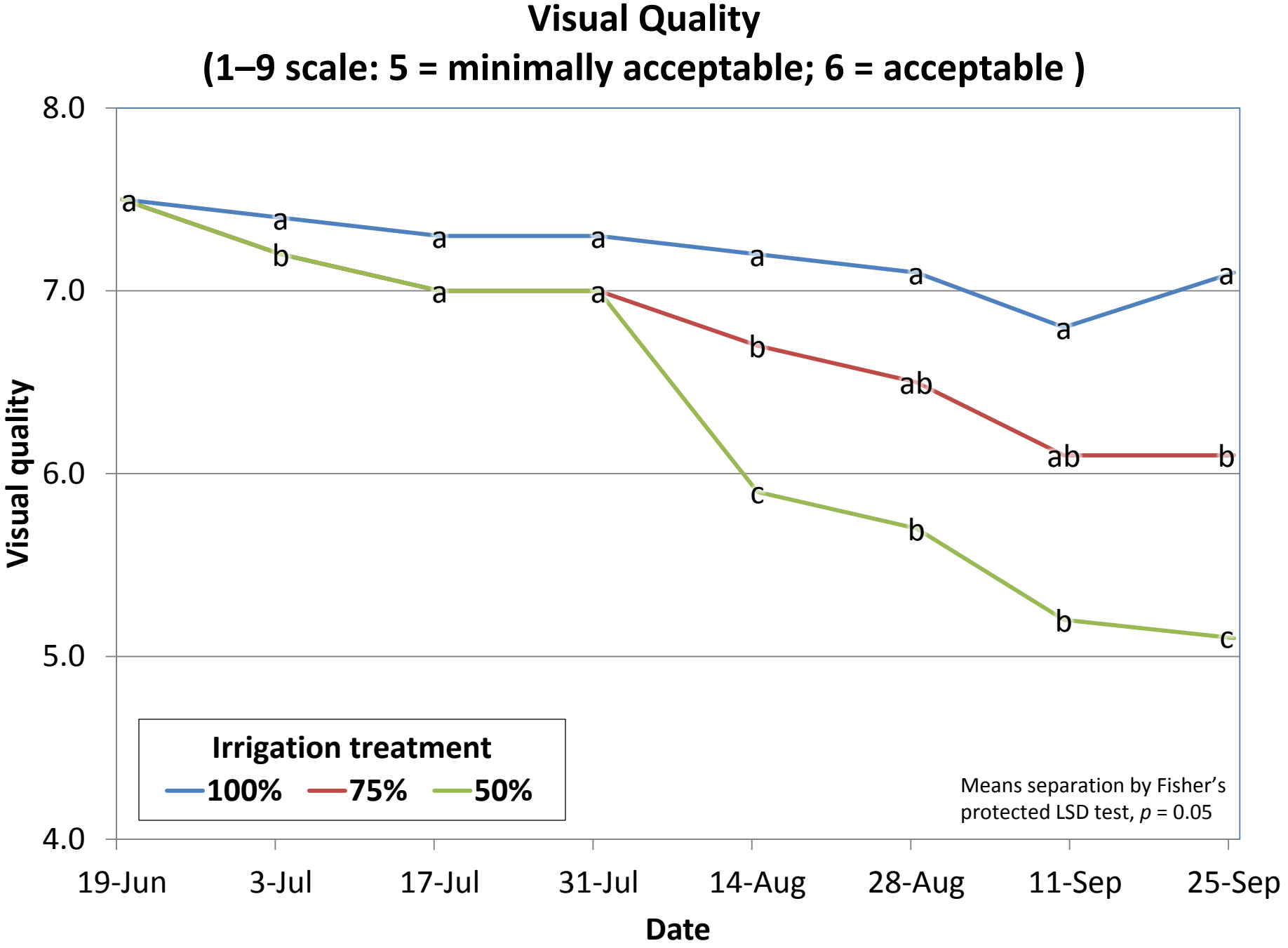
Impact on California Agriculture: Recent legislation sets an overall goal for urban water agencies to reduce per capita water use by 20% by Dec. 31, 2020. Landscape water use has the greatest potential for water conservation of all urban water-use sectors, because it accounts for approximately 30% to 50% of total urban water use. Bermudagrass is commonly used on golf courses, sports fields, lawns, and parks.

Rationale/Introduction: The practice of irrigating below optimal (standard) conditions, referred to as deficit irrigation, allows soil and turfgrass tissue to gradually dry during the summer, because the amount of irrigation is less than the irrigation water requirement. As adoption of this practice continues to increase, it is important to determine how acceptable turfgrass quality can be maintained under deficit conditions. Depending on the degree of deficit, bermudagrass has the potential to provide acceptable turfgrass quality during the entire warm season. The question is what is the minimum irrigation amount needed for bermudagrass to maintain either acceptable turfgrass quality or, if suitable, lower turfgrass quality for various periods of time.

Experimental Approach: This study was conducted on twelve (12) 10.0-by-10.0-foot, well-established GN-1 hybrid bermudagrass plots located at CTILT, Cal Poly Pomona. Three irrigation amounts (treatments) were arranged in a randomized complete block design with four replications. Treatments were calculated so that the irrigation during the summer was 100%, 75% and 50% of optimal. The weekly irrigation amount for each plot was calculated (based on several factors) and programmed into the irrigation controller each Friday. The plots were maintained as representative bermudagrass. Routine measurements during the study included visual turfgrass quality and color ratings using a 1–9 scale (1 = dead, brown; 5 = minimally acceptable; 6 = acceptable; 9 = best); visual ratings of percent brown leaf coverage (percent brown); dried clipping yield; and percent gravimetric soil water content (percent soil moisture) in the 0–6-inch and 6–12-inch root-zone depths.

Results: Treatments were applied from 7 June to 25 Sept. Totals for this duration included CIMIS reference evapotranspiration (ET_o) = 22.66 inches; precipitation = 0.06 inches; and average irrigation applied for 100%, 75%, and 50% = 18.90, 14.27, and 9.44 inches, respectively, or 83%, 63%, and 42% ET_o, respectively. Turfgrass quality and yield were significantly affected by irrigation treatment and week: overall average quality was 7.2 > 6.8 > 6.3 and average quality on 25 Sept. was 7.1 > 6.1> 5.1, for 100%, 75%, and 50%, respectively. Overall average yield (g/m^2per d) was 4.4 > 3.5 > 2.6 and average yield on 16 Sept. was 2.6 > 1.7 = 1.1, for 100%, 75%, and 50%, respectively. Percent soil moisture and percent brown were similarly affected by treatments.

Conclusions: Deficit irrigation is a viable water-conservation method, and a second season of study is needed to continue to test irrigation levels. This study stimulated collaborative work with Drs. Subodh Bhandari, Amar Raheja, Harmit Singh, and their students to work on the methods for measuring quality and color using imaging techniques and other objective methods.


Visual Quality
(1–9 scale: 5 = minimally acceptable; 6 = acceptable)
8.0
7.0
6.0
5.0
4.0
Visual quality
a
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a
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b
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19-Jun
3-Jul
17-Jul
31-Jul
14-Aug
28-Aug
11-Sep
25-Sep
Date
Irrigation treatment
100%
75%
50%
Means separation by Fisher's protected LSD test, p = 0.05