UCRTRAC Accumulative Research Summary
Section A: Irrigation Water Use Efficiency Including Utilization of Effluent Water
Project 3

Title: Water Use Rates Among Bermudagrass and Zoysiagrass Cultivars.

Objective: To determine if significant differences exist among bermudagrass and zoysiagrass cultivars for water-use rates when evaluated under well-watered conditions. Utilization of cultivars possessing a lower water-use rate may result in irrigation water savings.

Location: Fourteen bermudagrass and 11 zoysiagrass cultivars (Table 1) were established in minilysimeter pots (Table 2, growth assembly) for 7 months (Table 3) and placed within a mature stand of bermudagrass (Table 2, in-field lysimeter plot) maintained under well-watered conditions. Between the first and second years of data collection, the minilysimeter pots were moved to a glasshouse and then returned to the field prior to the second year of data collection.

Duration: Four 1-week ET rate trials (Table 4) in each of two consecutive seasons (Table 3).ET rates were measured between 5 Sept. and 6 Oct.1995 and 15 Jul. and 9 Aug. 1996.

Funding Source: Metropolitan Water District of Southern California.

Findings:

- Significant differences among bermudagrass and zoysiagrass cultivars were reported in both years. The average range difference between bermudagrass cultivars was 15% and 21% for 1995 and 1996, respectively. The average range difference between zoysiagrass cultivars was 10% and 11% for 1995 and 1996, respectively.

- The 2-year accumulative ET (24 day ET) differed significantly between the cultivars of bermudagrass and zoysiagrass (table 5).

- Bermudagrass and zoysiagrass ET rates were influenced by environmental conditions in both years. It should be noted that the order by which the cultivars of each species were ranked for ET rate did vary between years.

- There is statistically significant genetic variation between bermudagrass and zoysiagrass cultivars for water use rates.

- However, identification of cultivars that would result in irrigation-water savings, while maintaining good visual appearance, will require evaluation of larger turfgrass samples in precision irrigation plots with unrestricted root zones.

Status: A two-season study was completed. Information associated with this study was reported at a UCR Turfgrass Research Conference and Field Day and in Annual Reports submitted to the Metropolitan Water District of Southern California.

Table 1. Warm-season turfgrass cultivars evaluated for water-use rates under well-watered, field conditions.

Bermudagrass	Zoysiagrass
1. Arizona common	1. Belair
2. Cheyenne	2. DALZ 8502
3. FloraTex	3. DALZ 8507
4. Guymon	4. DALZ 8512
5. Midfield	5. DALZ 8514
6. Midiron	6. DeAnza
7. Midlawn	7. El Toro
8. NuMex Sahara	8. Emerald
9. Santa Ana	9. Korean common
10. Sonesta	10. Meyer
11. Tifgreen	11. Victoria
12. Tifway	
13. Tifway II	
14. Texturf 10	

Table 2. 1995-1996 bermudagrass/zoysiagrass water-use rate study.

Objective	Determine if significant differences in water use rates exist among bermudagrass and zoysiagrass cultivars.
Cultivars	14 bermudagrass cultivars and 11 zoysiagrass cultivars.
Location	Glasshouse 31, Turf Field Laboratory, for establishment. Moved to adjacent field (12E, block 21) for ET- rate assessment.
Growth assembly	Black plastic 'Egg can' pots, 25-cm (10-inch) diameter, 30-cm (12-inch) high. Approximate volume: 14.7 L (0.55 ft^3). Bottom sealed with organdy cloth and pot filled with 8500 g fine fritted clay, packed and settled, and thoroughly rinsed with three to four volumes of water prior to planting. (Fritted clay was also run through a seed-cleaner to remove fine dust which slows infiltration.) Minilysimeters were then planted with six 2-inch plugs (roots removed and all soil washed off) and topdressed with fritted clay until media surface was approximately 1 cm from lip of pot. Plugs were thoroughly watered and allowed to root in the glasshouse. Pots were labeled with colored tape on the side to identify cultivar, genotype, and pot number. *In-field lysimeter plot:* A plot of Arizona common bermudagrass was used to house lysimeters. When a lysimeter was placed within the sunken lysimeter sleeve, the turfgrass canopy of the lysimeter was contiguous with the surrounding turf canopy.
Experimental design	Completely randomized design, 5 replications.
Fertilization	Plugs were fertilized heavily (3 to 4 lb N/1000 ft^2 per month) to accelerate establishment. Prior to ET runs, all pots received a nutrient solution (20 N-20 P_2O_5-20 K_2O plus micronutrients) at a rate of 2.44 g N/m^2 (0.5 lb N/1000 ft^2) per month, applied weekly.
Mowing	Mowed weekly initially, switching to twice-weekly mowing with a glasshouse reel mower (9-blade reel) at a 19-mm (0.75-inch) cutting height 4 weeks prior to ET runs.
Measurements	Daily evapotranspiration rates of bermudagrass and zoysiagrass cultivars. Three-day accumulative ET calculated.
Study duration	2 years data, four 1-week ET runs each year.

Table 3. 1995-1996 MWD bermudagrass/zoysiagrass water-use rate study time frame.

Activity	Date
1994/1995	
Lysimeter plugged	27 Oct. – 30 Nov. 1994
Establishment in glasshouse	Dec. 1994 – June 1995
Lysimeters moved to field for first year ET rate evaluation	July 1995
ET Trial A	5–8 Sept. 1995
ET Trial B	19–22 Sept. 1995
ET Trial C	26–29 Sept. 1995
ET Trial D	3–6 Oct. 1995
1996	
ET Trial A	15–19 July 1996
ET Trial B	22–26 July 1996
ET Trial C	29 July – 2 Aug. 1996
ET Trial D	5–9 Aug. 1996

Table 4. Activity schedule for a typical ET rate trial.

Day	Activity	Data
Sunday	Plot irrigation (AM)	
Monday	Plot irrigation (AM)	
Tuesday	Saturate and fertilize lysimeters, drain, weigh	
Wednesday	Weigh	ET_1
Thursday	Weigh	ET_2
Friday	Weigh, mow, measure leaves	ET_3
Saturday	Plot irrigation (AM)	

Table 5. 1995-1996 warm-season water-use rates: 2-year (24 d) accumulative ET.

Bermudagrass		Zoysiagrass	
Cultivar	ET (mm H_2O/24 d)	Cultivar	ET (mm H_2O/24 d)
Tifway	135	Victoria	145
Tifway II	133	Belair	139
Sonesta	131	DALZ 8502	139
Santa Ana	131	Meyer	139
FB119	130	El Toro	138
Arizona common	125	DALZ 8507	137
Texturf 10	125	Emerald	137
Midlawn	123	De Anza	135
Cheyenne	121	DALZ 8512	134
Guymon	120	DALZ 8514	134
Tifgreen	120	Korean common	131
Midiron	119		
Sahara	118		
Midfield	117		
LSD, P = 0.05	5	LSD, P = 0.05	2