UCRTRAC Accumulative Research Summary
Section A: Irrigation Water Use Efficiency Including Utilization of Effluent Water
Project 2

Title: Water Use Rates Among Tall Fescue Cultivars.

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

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

Duration: Four 1-week ET rate trials (Table 4) in each of two consecutive summer seasons (Table 3). ET rates were measured between 23 Aug. and 23 Sept. 1994 and between 20 June and 25 Aug. 1995 (Table 3).

Funding Source: Metropolitan Water District of Southern California.

Findings:

- Significant differences among tall fescue cultivars for ET rate were reported in1994 with a mean 13% difference between the highest and lowest cultivars.
- 1995 ET rates from the same turf lysimeters were basically not significant.
- There was no consistency between 1994 and 1995 data in terms of cultivars possessing a high or a low ET rate.
- Irrigation water savings probably is possible by tall fescue cultivar selection because there is considerable genetic variation within the species.
- However, identification of cultivars that would result in irrigation-water savings, while maintaining good visual appearance, will probably require evaluation of larger turfgrass samples in precision irrigation plots.

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 to the Metropolitan Water District of Southern California.

Table 1. Tall fescue varieities used in the 1994-1995 MWD ET study.

Variety	Seed company	Pedigree or experimental no.	Comment
1. Amigo	Medalist America	PST-5HF	
2. Apache	Turf-Seed & Pure Seed Testing	5M4	
3. Arid	Jacklin Seed Co.	HMR	
4. ATF007	Advanta Seeds West, Inc.	Dwarf turf-type	Endophyte: 0%
5. ATF136	Advanta Seeds West, Inc.	Dry area in Texas	Endophyte: 100%
6. ATF141	Advanta Seeds West, Inc.	ATF007 X ATF136	Endophyte: 100%
7. Bonsai	Turf Merchants		
8. Crewcut	Stover Seed Co.		
9. Emperor	Zajac Performance Seeds	PICK.SLD	
10. Encore	Stover Seed Co.		
11. Falcon	E.F. Burlingham	NJ-78	
12. JC12	Southland Sod Farm		
13. KY-31	Advanta Seeds West, Inc.		Endophyte free
14. Mojave	Mid-Valley Ag. Products		
15. Monarch	Turf-Seed & Pure Seed Testing	5BB	
16. Murietta	Turf-Seed & Pure Seed Testing	PST-5D7	
17. Pixie	Jacklin Seed Co.	J-89	
18. RF1	Southland Sod Farm		
19. Rebel Jr.	Loft's Seed, Inc.	NJED-87	
20. Tomahawk	Turf-Seed & Pure Seed Testing	5DX	
21. Trailblazer	Lesco, Inc.		
22. Twilight	Turf Merchants	KWS-BG-6	

Table 2. 1994-1995 MWD tall fescue water use rate study.

Objective	Determine if significant differences among tall fescue cultivars exist for water use rates.
Cultivars	22 tall fescue varieties.
Location	Glasshouse 30, Turf Field Laboratory for establishment; moved to field (12E, block 7) for ET rate measurements.
Growth assembly	Black plastic 'Egg can' pots, 25-cm (10-inch) diameter, 30-cm (12-inch) deep. Approximate volume: 14.7 L (0.55 ft^3). Bottom sealed with organdy cloth and pots filled with 8500 g fine fritted clay, packed and settled, and thoroughly rinsed with three to four volumes of water prior to planting. Lysimeters seeded at a rate of 8 lb seed/1000 ft^2 (2 g seed per pot). Seed was mixed with 200 ml (approximately 725 g) fine fritted clay and spread evenly over pot surface. Seed was covered with an additional 200 ml fritted clay. Pots were labeled with colored tape on the side to identify variety, pot number, and replication. *In-field lysimeter plot*: A plot of 'MIC-18' dwarf tall fescue 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	Randomized complete block design, 5 replications.
Fertilization	All turfs fertilized weekly with a nutrient solution (20 N-20 P_2O_5-20 K_2O plus micronutrients) at 2.44 g N/m^2 (0.5 lb $N/1000ft^2$) per month. (Lysimeters were established at 1 lb N/1000 ft^2 per month.) Pots were leached weekly prior to fertilization with RO water to prevent salt buildup.
Mowing	Mowed weekly with a glasshouse reel mower (7-blade reel) at a 50-mm (2-inch) cutting height. Mower had the ability to collect clippings for yield.
Measurements	Evapotranspiration rates of 22 tall fescue cultivars. ET was measured as an accumulative (3-day) weight loss (grams) from pot surface (Table 4). Grams water multiplied by a constant (0.0197) to obtain millimeters of water lost from the pot surface. Visual turfgrass quality and color ratings (1=poorest, 9=best) measured on 4 Aug. A subset of seven cultivar (35 pots) was evaluated for: • clipping yields (grams/pot; clippings removed during weekly 2-inch mowing, dried, weighed); • leaf density (counted from a 5- x 10-cm grid and multiplied by 2 to obtain number leaves per dm^2); • vertical leaf extension rates [height of 20 leaves was measured after a mowing event and just prior to the next mowing 7 days later; the change in the average leaf length was divided by the number of days (7) to obtain a leaf extension rate in mm/day]; • leaf length (30 leaves measured from each lysimeter); • leaf width (30 leaves measured from each lysimeter).
Study duration	2 years data; four, 1-week ET runs each year.

Table 3. 1994-1995 MWD tall fescue ET rate study time frame.

Activity	Date
1994	
Lysimeter seeding	3 Jan. – 14 Feb. 1994
Establishment in glasshouse	14 Feb. – 22 Aug. 1994
Field plot seeding and establishment	16 Feb. – 22 Aug. 1994
Weekly fertilizer regime (0.5 lb N/ month) initiated	3 Aug. 1994
Move lysimeters to field plot for acclimation	5 Aug. 1994
ET Trial A	23–26 Aug. 1994
ET Trial B	30 Aug. – 2 Sept. 1994
ET Trial C	6–9 Sept. 1994
ET Trial D	20–23 Sept. 1994
1995	
Minilysimeter pots moved to glasshouse for rejuvenation	10 Jan. 1995
Pots moved from glasshouse to field for acclimation	22 Feb. 1995
Holes ‘adjusted’ so lysimeter turf surface contiguous with surrounding plot	31 Mar. 1995
ET Trial A	20–23 June 1995
ET Trial B	27–30 June 1995
ET Trial C	11–14 July 1995
ET Trial D	8–11 Aug. 1995
Morphological measurements finalized, study conclusion	25 Aug. 1995

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

Day	Activity	Data[z]
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, yield, leaf extension rate
Saturday	Plot irrigation (AM)	

[z] Note that yields, leaf extension rates, and other measurements were collected from seven varieties representing the morphological diversity within the entire collection. These data were collected to help us understand the association between key morphological traits and the ET-rate under well-watered conditions.