Characterization of Water Use Requirements and Gas Exchange of Buffalograss Turf

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Goals:

- *To determine water use requirements of buffalograss.*
- *To examine genotypic variation in water use.*
- *To determine the effect of nitrogen fertilization on water use.*
- *To determine the relationship between photosynthesis and growth of buffalograss under drought stress.*

Buffalograss may be the ideal species for both water savings and aesthetics in the central and southwestern U.S., but water use data are scarce and one can only speculate on water requirements. This two-year study generated crop coefficients for buffalograss and identified intraspecific water use differences among a diverse selection of genotypes.

The field project was installed at the University of Nevada - Reno Valley Road Field Station to determine water use requirements of seventeen buffalograss genotypes representing a diverse genetic background. This project utilized a line source water gradient in which buffalograss varieties were planted in strips along the gradient. Turf performance could be measured at any given irrigation amount, and minimum irrigation requirements were indicated the point in the gradient beyond which the turf goes dormant or cannot survive.

Mini-lysimeters (15 cm diameter, 30 cm depth) were planted, four per genotype, and established in the greenhouse. Cores for the lysimeters were drilled in each plot 2 meters from the main irrigation line. These were used to determine evapotranspiration (ET) gravimetrically under non-limiting conditions.

These lysimeters were used in a previous greenhouse experiment to determine intra-specific differences in water use rates. The results indicate that significant differences do exist in water use between buffalograss varieties, but the differences are relatively small. However, average water use rates are quite low (approximately half) in comparison to a similar experiment with tall fescue.

The line source irrigation gradient was established in July 1994 and June 1995, with the irrigation schedule for both years based on ET (modified Penman) as determined with weather station data. Data on ET under non-limiting conditions, turf quality, canopy temperature, soil moisture, minimum water requirements, and plant water status were collected both years.

The data demonstrate significant differences among genotypes for water use and turf quality. Crop coefficients ranged from 0.76 to 1.02 in 1994 and from 0.60 to 0.92 in 1995. For both years, canopy temperatures were relatively unaffected by drought until the end of the experiment, and then only increased at the very outer edge of the plots.

Over the course of the 31 day experiment in 1994, the point demarcating the minimum irrigation required to prevent total dormancy corresponded to approximately 10 to 20% of ET. During the 70 day experiment in 1995, the point demarcating the minimum irrigation required to prevent dormancy was approximately 40% of ET.

It is apparent from the two-year study that some genotypes of buffalograss can produce an acceptable turf with deficit irrigation of 50 to 60% of ET. Compared to a cool-season turfgrass species, one of the better performing genotypes of buffalograss used on golf course roughs could significantly reduce the irrigation needs of a golf course.

Evapotranspiration and associated crop coefficients for July 12 through August 18, 1994 and July, August, and July 1 through September 8, 1995 for seventeen buffalograss genotypes. Values are means of four replicates. Values in a column followed by the same letter are not significantly different (P = 0.05).

Genotype	Total 1994			July 1995			August 1995			Total 1995		
	- ET, cm -	-- K_c --		- ET, cm -		-- K_c --	- ET, cm -		-- K_c --	- ET, cm -		-- K_c --
Plains	27.2	1.00	ab	21.2	a	0.94	20.7	a	0.86	46.5	a	0.92
Guymon 6	23.7	0.86	c-g	18.6	b	0.83	16.8	b	0.70	39.2	b	0.77
Prairie	24.7	0.90	c-e	17.5	bc	0.78	16.3	bc	0.68	37.5	bc	0.74
Kenemer	25.2	0.92	b-d	18.3	b	0.81	15.5	b-d	0.64	37.1	b-d	0.73
Hilight 15	23.8	0.87	c-g	16.8	b-e	0.75	16.2	bc	0.67	36.6	b-d	0.72
Nebraska 315	24.3	0.88	c-g	17.5	b-d	0.78	15.5	b-e	0.64	36.5	b-d	0.72
Hilight 912	27.9	1.02	a	17.4	b-d	0.77	15.6	b-d	0.65	36.3	b-e	0.72
Guymon 1	24.3	0.89	c-g	18.3	b	0.81	14.9	b-e	0.62	36.2	b-e	0.71
Nebraska 609	24.3	0.88	c-g	18.2	b	0.81	14.5	b-f	0.60	35.6	b-e	0.70
Diploid 2-7	22.5	0.82	e-h	17.1	b-d	0.76	15.2	b-e	0.63	35.5	b-e	0.70
Guymon 2	24.3	0.88	c-g	17.5	b-d	0.78	14.3	b-f	0.59	34.9	b-f	0.69
Washoe	22.3	0.81	f-h	17.0	b-d	0.75	14.3	b-f	0.59	34.4	c-f	0.68
Tetraploid 1-14	22.2	0.81	gh	16.3	c-e	0.72	14.6	b-f	0.61	34.0	c-f	0.67
Tetraploid 2-5	23.3	0.85	d-h	15.8	c-e	0.70	13.6	c-f	0.57	32.5	d-f	0.64
Tetraploid 2-2	21.0	0.76	h	16.1	c-e	0.72	12.7	ef	0.53	31.6	ef	0.62
Topgun	24.7	0.90	c-f	14.9	e	0.66	12.9	d-f	0.54	30.7	f	0.61
Diploid 3-5	26.0	0.95	a-c	15.6	de	0.69	12.1	f	0.50	30.5	f	0.60