

Performance of Cool-season Turfgrasses Irrigated with Varying Evapotranspiration Replacement Rates

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Abstract

A field experiment was conducted at New Mexico State University's Turfgrass Salinity Research Center in Las Cruces (arid, 1265 m elevation; USDA Plant Hardiness Zone 8) from 2013 to Sep. 2015 to investigate the effect of different irrigation amounts on performance of Kentucky bluegrass (KBG) (*Poa pratensis* L.) (eight varieties), tall fescue (TF) (*Festuca arundinacea* Schreb.) (10 varieties), and perennial ryegrass (PR) (*Lolium perenne* L.) (7 varieties). Irrigation treatments included: 115%; 100%; 85%; 70%; 55% of reference evapotranspiration for short grass (ET_{0s}) applied every day. At the end of the research period, grasses performed best were Barserati (KBG); Pennington Smart Seed KBG; Barrari (KBG); BAR Pp 119327 (KBG); and Pennington Smart Seed TF.

Introduction

As much as 50% of total urban water consumption in the southwest being utilized for irrigation of landscapes. As a result, many municipalities have implemented water conservation strategies. There are several options to conserve water and reduce the amount of potable water used for landscape irrigation. However, first and foremost, overwatering must be avoided by using the minimum amount of potable water required to sustain adequate turfgrass quality. Secondly, scheduling irrigation based on turfgrass water requirements, coupled with selecting alternative and potentially drought-tolerant turfgrasses on home lawns and other turf areas can conserve substantial amounts of water. However, information required to initiate these practices in the southwestern United States is lacking.

Objectives

- to determine the best performing cool season species and cultivars irrigated with varying Evapotranspiration Replacement Rates

Material and Methods

- Location:** New Mexico State University's Turfgrass Salinity Research Center in Las Cruces (arid, 1265 m elevation; USDA Plant Hardiness Zone 8)
- Soil:** sandy loam, a sandy skeletal mixed thermic Typic Torriorthent, an entisol typical for arid regions
- Grass species and cultivars:** see Table 1
- Fertilization:** total of 22.5 g N, 7.5 g P₂O₅, and 7.5 g K₂O m⁻² applied monthly
- Mowing:** 5cm height once per week by means of a rotary mower with clippings returned
- Irrigation:** applied at 55%, 70%, 85, and 115% of reference evapotranspiration (ET_{0s})
- Experimental design:** randomized complete block with irrigation amount as whole block (10 m x 10 m) and varieties as subplot (1.5 m by 1.2 m) treatment. All treatment factors were replicated four times. Post hoc comparisons of variety were obtained using the macro by A. Saxton (1998). Data were analyzed using SAS PROC MIXED software version 9.3 (SAS Institute Inc., 2010) and significance was defined at p≤0.05.

Data collection (monthly)

- Visual turf quality ratings (1=dead turf, 9=dark green, uniform turf; 6=lowest acceptable quality)
- Normalized Difference Vegetation Index (NDVI) GreenSeeker Model 505 (NTech, Ukiah, CA)
- Digital Image Analysis (SigmaScan Pro 5 software package (Systat Software Inc., San Jose, CA)
- Data were collected monthly from March to November and averaged for spring (March, April, May), summer (June, July, August), and fall (September, October, November)
- Climate data from nearby weather station (Campbell Scientific)

Table 1. Grasses included in the study

Kentucky bluegrass	Perennial ryegrass	Tall fescue
Barserati	BAR Lp 10769	BAR FA 121092
BAR Pp 112916	BAR Lp 10970	BAR FA 120878
BAR Pp 119327	BAR Lp 10972	BAR FA 121089
Barduke	Pennington Smart Seed PR	BAR FA 121091
Barrari	Pinnacle II	BAR FA 121095
Barvette	Pirouette II	Barrington II
Pennington Smart Seed KBG	RPR blend (Barbeta + Bargamma)	BarRobusto
Thermal Blue		Barvado
		Pennington Smart Seed TF
		RTF blend

Results



Figure 1. Number of entries for which lowest irrigation treatment differs significantly from other ET treatments.

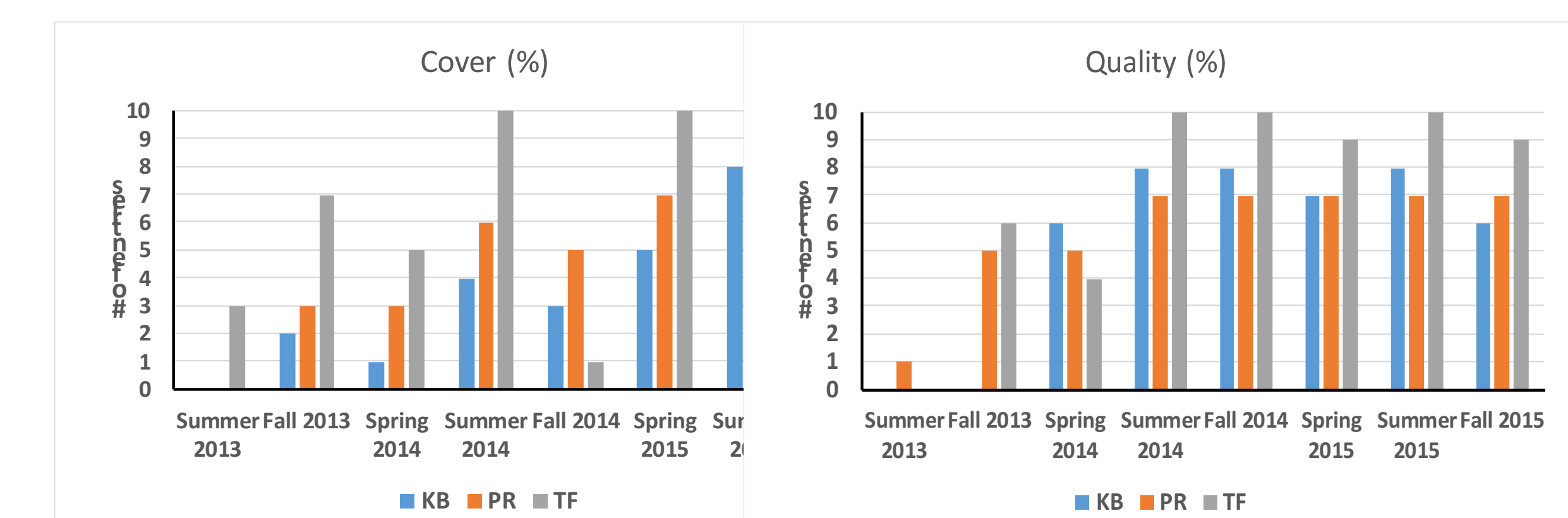


Table 2. Turf quality, Cover, NDVI, and number of top ranking for all sampling dates. Data were collected monthly and are averaged over spring, summer, and fall.

Species	Variety	Quality	Cover	NDVI	Total	Ranking
KB	Barserati	1	7	1	9	1
KB	Pennington Smart Seed KBG	7	4	2	13	2
KB	Barrari	2	8	5	15	3
KB	BAR Pp 119327	10	5	2	17	4
TF	Pennington Smart Seed TF	6	8	5	19	5
TF	BAR FA 121091	7	6	9	22	6
TF	Barvado	3	11	9	23	7
TF	BAR FA 120878	16	2	9	27	8
TF	BarRobusto	10	8	9	27	8
KB	Barduke	14	11	4	29	10
KB	Barvette	22	1	9	32	11
KB	BAR Pp 112916	15	11	8	34	12
TF	BAR FA 121089	5	23	7	35	13
PR	BAR Lp 10972	16	11	9	36	14
KB	Thermal blue	18	3	17	38	15
TF	10-Fa-92 (BAR FA 121092)	18	11	9	38	15
TF	BAR FA 6253 (Barrington II)	13	18	7	38	15
PR	BAR Lp 10769	4	18	17	39	18
PR	Pennington Smart Seed PR	10	18	19	47	19
PR	RPR blend (Barbeta + Bargamma)	18	11	23	52	20
PR	BAR Lp 10970	24	11	19	54	21
TF	RTF blend	9	23	23	55	22
PR	Pinnacle II	18	18	23	59	23
PR	Pirouette II	23	18	19	60	24
TF	BAR FA 121095	25	25	19	69	25

Top 5 performing grasses:

1. Barserati (BAR Pp 110358), KBG
2. Pennington Smart Seed, KBG
3. Barrari, KBG
4. BAR Pp 119327, KBG
5. Pennington Smart Seed, TF

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