IDEAL IRRIGATION MANAGEMENT FOR ESTABLISHING COOL-SEASON GRASSES

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Introduction

Limited information is available regarding irrigation requirements for establishing cool-season grasses. Recently published studies reported the use of 100% ETo to establish seashore paspalum (*Paspalum vaginatum* Sw.), bermudagrass (*Cynodon dactylon* L.), tall fescue (*Festuca arundinacea* Schreb.) and Kentuky bluegrass (*Poa pratensis* L.) (Serena et al., 2014; 2012; Schiavon et al., 2013). However, smaller plants, such as turfgrasses that have just germinated may require less water than mature plants. Leinauer et al. (2010) successfully established several cool-season grasses from coated seed using 50% of ETo.

General recommendations state that for turfgrass establishment several irrigation events per day should be applied. Such advice is based on the belief that during germination and emergence of smaller size seeds, such as turfgrasses, only a soil surface that is constantly moist will guarantee successful establishment. However, to our knowledge no published field studies are available to corroborate such recommendations.

Objectives

To investigate if:

- different irrigation quantities and
- differring irrigation frequencies

affect establishment of cool-season turfgrasses

Material and Methods

A field experiment was conducted at New Mexico State University (arid, 1265 m elevation; USDA Plant Hardiness Zone 8) from Sep. 2012 to Apr. 2013. The experimental design was a randomized complete block with irrigation treatments as the whole block and turfgrasses as the plot treatment (Figure 1). Each individual plot measured 1.5 m by 1.2 m and all treatment factors were replicated four times. Grass species included were Kentucky bluegrass, tall fescue, and perennial ryegrass (*Lolium perenne* L.). Irrigation was applied by means of a sprinkler system comprising of T5 Rotors (The Toro Company, Riverside, CA) installed in each corner of a 10 m x 10 m block and operated at 275 kPa. Irrigation treatments were as follow:

1) 60% ET_o; irrigation applied every day,
2) 60% ET_o; irrigation (2x trt1) applied every other day,
3) 120% ET_o; irrigation applied every day,
4) 120% ET_o; irrigation (2x trt3) applied every other day,
5) 180% ET_o applied every day

Each irrigation, when needed, was applied twice per day, 12 hours apart. In case of a rain event exceeding 3 mm, irrigation was withheld on the following day (Figure 2). Irrigation amounts were calculated every Monday morning based on the previous week's cumulative ET_0 rate (Allen et al., 2005). Grasses were seeded on 25 Sept. 2012. Turfgrass establishment was assessed by digital image analysis. Turf coverage was determined from digital images using SigmaScan® Pro 5 (Systat software Inc., San Jose, CA). Sigmoidal models were used to calculate Days After Seeding (DAS) needed to reach 50 and 95% of green cover for each replicate separately. Percent green coverage were analyzed using ANOVA procedures and mean separation tests were conducted using Fisher's Protected LSD (P=0.05) in SAS Proc Mixed (SAS Institute, Inc. 2009).

Figure 1. Study area at the end of the establishment period.

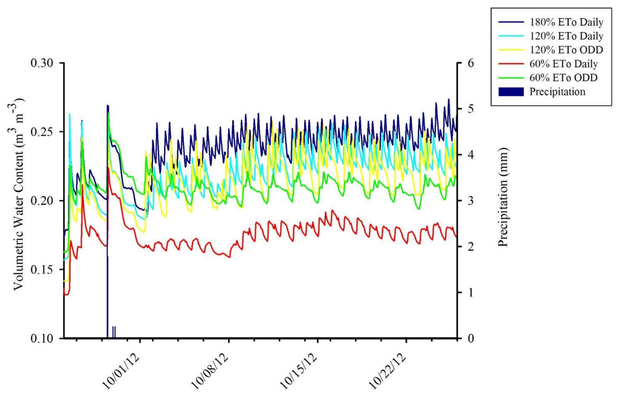

Figure 2. Hourly Volumetric Water Content (m^3 m^{-3}) and precipitation (mm) from September 25th to October 25th.

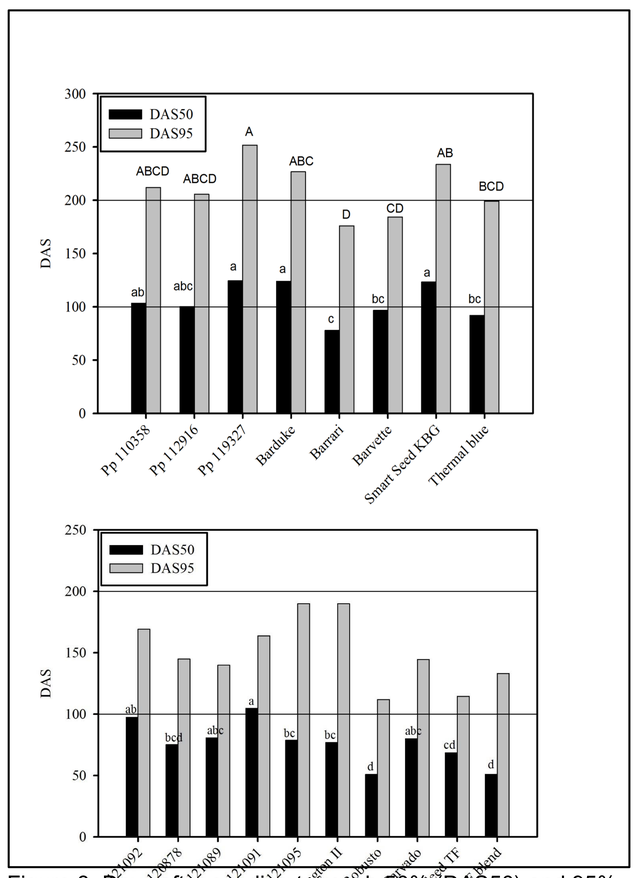

Figure 3. Days after seeding to reach 50% (DAS50) and 95% (DAS95) green cover of different Kentucky bluegrass (top) and tall fescue (bottom) varieties. Values are averaged over five irrigation treatments and 4 replications. Bars followed by the same letters [separately for DAS50 (lower case letters) and DAS95 (upper case letters)] are not significantly different from one another.

Results

Perennial ryegrass:

- There was no significant irrigation effect on the establishment of perennial ryegrass for both DAS50 and DAS95.
- Establishment was not affected by the different varieties.

Tall fescue:

- Irrigation amount and frequency had a significant effect on tall fescue for both DAS50 and DAS95 (Table 1).
- The 60% ODD treatment resulted in the slowest establishment and plots did not reach full coverage by the end of the study (Table 1).
- The 120% ODD treatment resulted in poorer establishment compared to 120% ETo applied daily (Table 1).
- Varieties affected DAS50 but not DAS95 (Figure 3).

Kentucky bluegrass:

- DAS50 was affected by irrigation treatment and variety (Table 1).
- Days to reach 95% coverage was affected only by variety but not irrigation (Table 1, Figure 3).

Table 1. Days to reach 50% (DAS50) and 95% coverage (DAS95) for several turfgrasses irrigated at different amounts and frequencies.

Irrigation	Kentucky bluegrass		Perennial Ryegrass		Tall Fescue	
	DAS50	DAS95	DAS50	DAS95	DAS50	DAS95
180% ETo daily	95 [y] bc [z]	216	36 [x]	86	41 [w] c	104 c
120% ETo daily	68 c	166	31	78	52 c	108 c
120% ETo ODD	85 c	215	49	116	60 c	129 b
60% ETo daily	124 ab	203	51	71	98 b	188 a
60% ETo ODD	155 a	213	44	84	130 a	DNR [t]

[y] average of 8 Kentucky bluegrass, [x]7 perennial ryegrass, [w]10 tall fescue varieties and 4 replications
[z] Values followed by the same letter (separately for each species) are not significantly different from one another (Fisher's protected least significant difference at α = 0.05).
[t] DNR=Did not reach 95% coverage by the end of the study

Summary

- Irrigation frequency and quantity affect cool-season turfgrasses differently.
- Perennial ryegrass established equally fast under all treatments.
- Kentucky bluegrass was only affected during the early stages of establishment but irrigation did not influence number of days to reach complete coverage.
- Tall fescue established fastest at the highest irrigation amount.
- More research is needed to also investigate establishment from mixtures.

References

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