UCRTRAC Accumulative Research Summary
Section A: Irrigation Water Use Efficiency Including Utilization of Effluent Water
Project 11

Revised 12-24-04

Title: Heat Tolerant Bluegrass, Kentucky Bluegrass, and Tall Fescue Visual Ratings During Short-term Drought and Recovery.

Objective: To compare the short-term (≈ 2 weeks) drought and heat tolerance and recovery of recently-developed heat tolerant bluegrass cultivars with Kentucky bluegrass and tall fescue cultivars.

- Heat tolerant bluegrasses (HT bluegrasses) are a cross between Kentucky bluegrass (*Poa pratensis*) and Texas bluegrass (*Poa arachnifera*). Historically, the latter has been found in prairies and plains, southern Kansas to Texas and Arkansas.

  Heat tolerant bluegrasses have been developed for low water use, heat, and drought tolerance. The prime growing regions targeted for HT bluegrasses are the tall fescue belt or the transition region.

- Two cultivars each of HT bluegrass, Kentucky bluegrass, and tall fescue were established in 6.7- x 10.0-ft subplots on 23 Oct. 2001 (Fig. 1 and Table 1). Twelve 20.0- x 20.0-ft main plots (irrigation cells) each contained the six cultivars.

- There were three and two drought/recovery tests during the summer of 2003 and 2004, respectively. During each drought/recovery test the following occurred: entire plot irrigated to field capacity; drought phase: irrigation turned off for 13 d for six irrigation cells while the other six cells were well-watered; recovery phase: all irrigation cells well-watered until next drought/recovery test.

- On two to three dates during each 13-d drought phase (dates ranging from 3 to 13 d of drought) and on two to three dates during each recovery phase (dates raning from 2 to 20 d of recovery), visual ratings of the following were taken from each subplot: turfgrass quality; percentage of canopy that was wilted and rolled; and percentage of canopy that was fired.

Location: Established precision irrigation plot located at the UCR Turfgrass Field Research Facility

Duration: Two summer seasons during 2003 and 2004

Funding Source: Scotts Company
Please note that this is a cooperative project with CSU Pomona. Appreciation is given to Mr. Russell Plumb.

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Findings: Preliminary analyses of data were conducted on the average turfgrass quality for the last rating date of both drought and recovery phases.

	2003 Last Rating Dates	
	Date (d of drought)	Date (d of recovery)
Test 1	27 June (10)	18 July (17)
Test 2	4 Aug. (13)	22 Aug. (17)
Test 3	5 Sept. (13)	26 Sept. (20)
	Avg. Quality	Avg. Quality

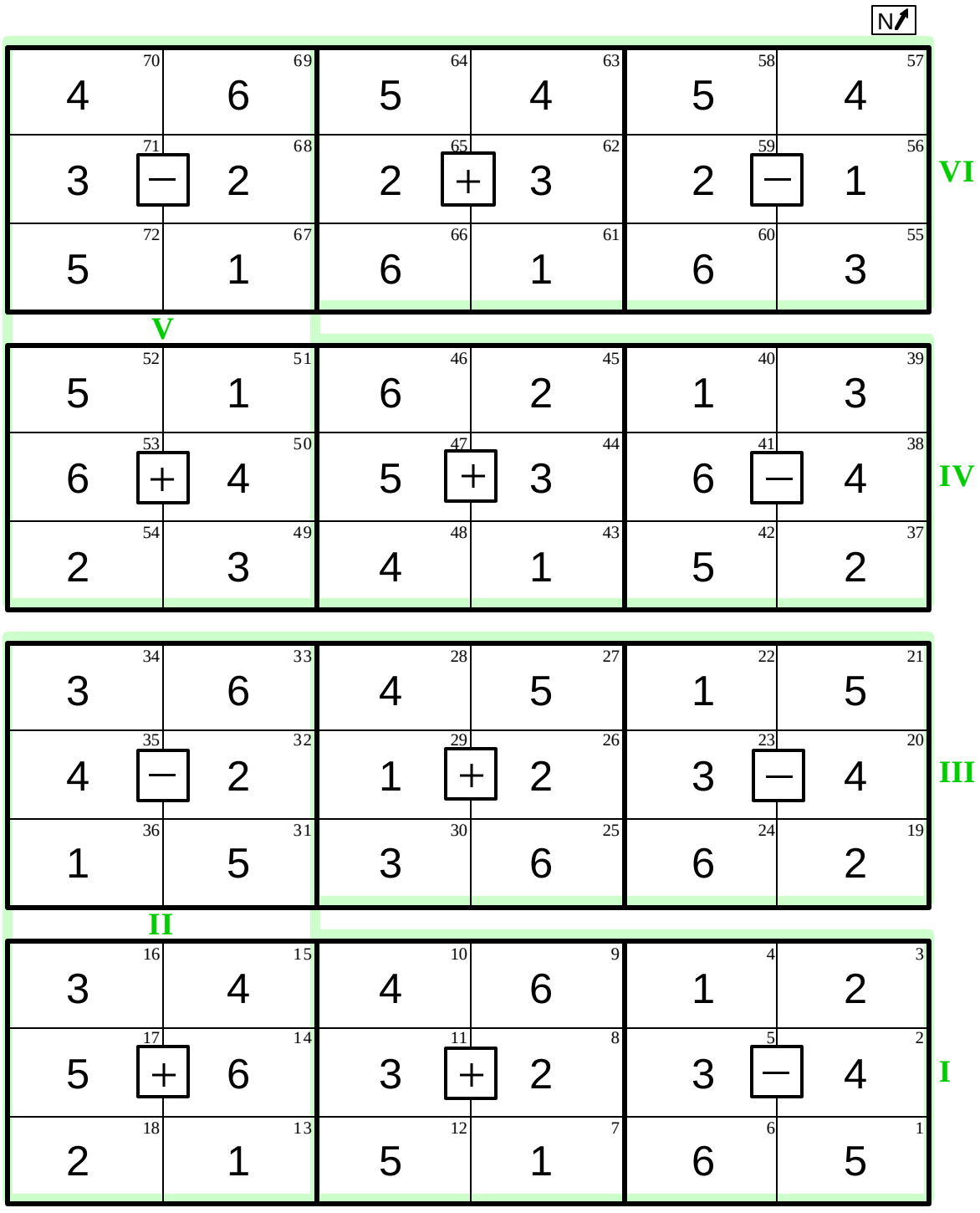
	2004 Last Rating Dates	
	Date (d of drought)	Date (d of recovery)
Test 1	9 July (13)	30 July (20)
Test 2	27 Aug. (13)	17 Sept. (20)
	Avg. Quality	Avg. Quality

The data are shown in Table 2.

1. In terms of drought and heat tolerance under the conditions of this study: tall fescue > Kentucky bluegrass ≈ heat tolerant bluegrass.
2. All species made an almost complete recovery.

Status: The field phase of this study was recently completed in September 2004. We are now in the phase of completing data analyses, development, and summary. In the future, there will be presentations and reporting concerning this study.

Figure 1. 2004 Scotts bluegrass irrigation study.



1=Heat tolerant bluegrass HT-129 (Thermal Blue), 2=Heat tolerant bluegrass HT-329 (Dura Blue), 3=Apollo Kentucky bluegrass, 4=Envicta Kentucky bluegrass, 5=Dynasty tall fescue, 6=K-31 tall fescue

I –VI = Blocks (replications)

[+] = 110% ET_o, [−] = Water off, other times 110% ET_o

Table 1. Scotts irrigation study outline.

Turfgrass Cultivar Treatments

(seeded to 6.7- × 10.0-ft subplots on 23 Oct. 2001)

1. Heat tolerant bluegrass HT-129 (Thermal Blue)
2. Heat tolerant bluegrass HT-329 (Dura Blue)
3. Apollo Kentucky bluegrass (top performer)
4. Envicta Kentucky bluegrass (low performer)
5. Dynasty tall fescue (top performer)
6. Kentucky-31 tall Fescue (low performer)

Drought/Recovery Tests

1. Three drought/recovery tests during summer 2003
   Two drought/recovery tests during summer 2004

2. During each drought/recovery test (in order):
   a. All twelve 20.0- x 20.0-ft main plots (irrigation cells) irrigated to field capacity.

   b. Drought phase: Six irrigation cells not irrigated for 13 d while the other six irrigation cells were well-watered (irrigated at 110% ET_o based on previous 7 d accumulative ET_o, obtained from an on-site CIMIS station and applied in three irrigation events per week; irrigation events cycled three to four times to prevent any runoff from each irrigation cell).

   c. Recovery phase: All twelve irrigation cells well-watered as above until next drought/recovery test.

Visual Ratings

1. On two to three dates during each 13-d drought phase (dates ranging from 3 to 13 d of drought) and on two to three dates during each recovery phase (dates ranging from 2 to 20 d of recovery), the following visual ratings were taken from each subplot.
   a. Turfgrass quality (1 to 9 scale, with 1 = worst, 5 = minimally acceptable, and 9 = best turfgrass)

   b. Percentage of canopy that was wilted and rolled (0% to 100%)

   c. Percentage of canopy that was fired (0% to 100%)

   d. Turfgrass damage due to probable summer patch activity at the end of the summer (22 Sept. 2003)

Plot Maintenance

1. Mowed weekly with a rotary mower set at 2.0-inch mowing height
2. Annual N rate of 5.0 lb/1000 ft^2 divided in five equal annual applications
3. Pest control to maintain viable turfgrass and prevent thinning

Table 2. Average turfgrass quality for the last rating date of both drought and recovery phases during three and two drought/recovery tests conducted during summer 2003 and 2004, respectively.

	2003[z]		2004[y]	
Cultivar	(–) irrigation	(+) irrigation	(–) irrigation	(+) irrigation
		Drought phase		
Heat tolerant bluegrass				
Thermal Blue	3.0	5.7	3.2	7.8
Dura Blue	3.2	6.2	3.7	7.8
Kentucky bluegrass				
Apollo	3.7	6.2	3.7	8.1
Envicta	3.7	6.1	3.7	8.0
Tall fescue				
Dynasty	4.5	6.4	4.7	8.0
K-31	4.1	6.0	4.7	7.2
LSD, $P = 0.05$[x]	0.5	0.3	0.5	0.3
		Recovery phase		
Heat tolerant bluegrass				
Thermal Blue	5.8	5.9	7.5	7.7
Dura Blue	6.1	6.2	7.5	7.6
Kentucky bluegrass				
Apollo	6.1	6.2	7.5	7.8
Envicta	6.1	6.4	7.6	7.7
Tall fescue				
Dynasty	6.2	6.4	7.6	7.9
K-31	5.8	6.1	7.2	7.4
LSD, $P = 0.05$[x]	NS	0.3	0.2	0.2

[z] Last rating date, drought phase, test 1, 2, and 3 = 10, 13, and 13 d of drought, respectively. Last rating date, recovery phase, test 1, 2, and 3 = 17, 17, and 20 d of recovery, respectively.

[y] Last rating date, drought phase, test 1 and 2 = 13 and 13 d of drought, respectively. Last rating date, recovery phase, test 1 and 2 = 20 and 20 d of recovery, respectively.

[x] Mean separation within columns and phase by Fisher's protected LSD test, $P = 0.05$; NS = nonsignificant.