Turfgrass & Landscape Research

Field Day

September 16, 2010

Turfgrass Research Facility

University of California, Riverside

University of California Agriculture and Natural Resources

Cooperative Extension

Agricultural Experiment Station

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Welcome to Field Day!

On behalf of the entire UCR Turfgrass and Landscape Team, welcome (or hopefully, welcome back) to the 2010 UCR Turfgrass and Landscape Research Field Day. This is the third consecutive event after a five-year hiatus of Field Day. We're glad you can join us and encourage you to attend and bring others to future Field Days that will be held on September 15, 2011 and September 13, 2012. Our goal is to reach or surpass the 500-attendee mark by 2012. With your continued support, we can make that happen!

By the end of the day, I think you will agree that our programs are headed in the right direction in terms of striving to meet both the short- and long-term challenges facing the turfgrass and landscape industries. Our program is second to none, especially in the areas of water, salinity, and pest management. I am most proud of the teamwork and trans-disciplinary approach to Turfgrass and Landscape Management exhibited by UCR and UC faculty, advisors, staff, and students. Scientists who are leaders in their respective fields are coming together to lend their expertise toward the advancement of scientific knowledge in our arenas.

As we come together as a Green Industry to see and hear about the latest research, let's be mindful of the importance of strengthening and consolidating industry resources for continued support at the University of California. With your help, the best is yet to come!

As you enjoy today's tours, please take a moment to thank those folks, mostly wearing shirts with our Turfgrass Science logo, who assisted with preparation for this event. Special thanks go to my fellow Field Day planning committee members including Steve Cockerham, Sue Lee, Steve Ries, Frank Wong, Sherry Cooper, and Heidi O'Guinn. Production of this booklet would not have been possible without Camaron Cabrera. Staff and students from Agricultural Operations, Frank Wong's Lab, and my Lab have worked tirelessly to make this event possible and are deserved of your appreciation. Last but not least, very special thanks to all of our industry partners for their generous donations to our turf and landscape programs throughout the year, and especially for the today's delicious barbeque lunch under the shade of a tent!

Enjoy Field Day!

Sincerely,

James H. Baird, Ph.D.

Assistant Specialist in Cooperative Extension and Turfgrass Science

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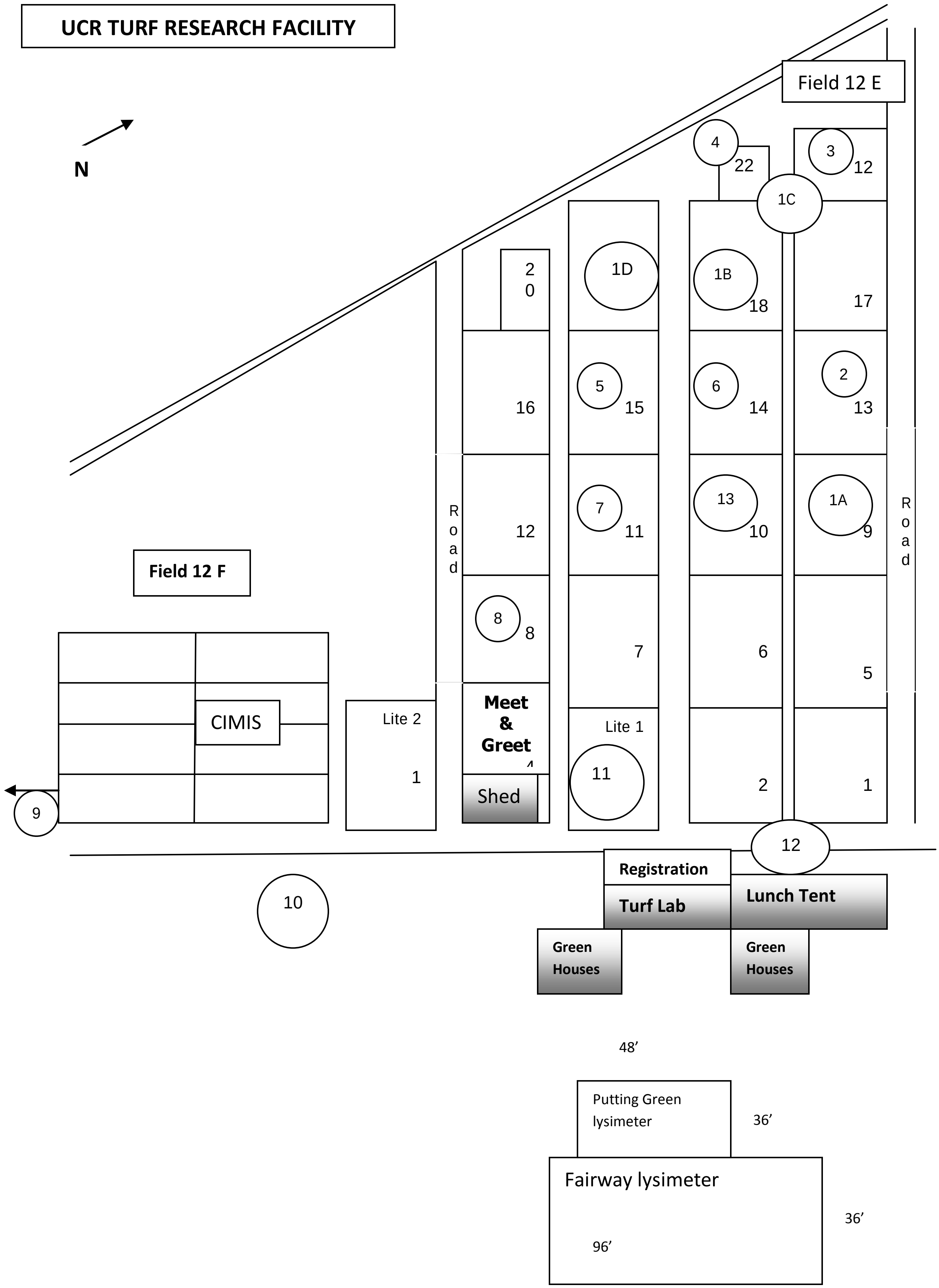


Turfgrass and Landscape Research Field Day
FIELD DAY SCHEDULE AND TABLE OF CONTENTS

CIMIS Data Sep. 2009- Aug. 2010

Month Year	Tot ETo (in)	Tot Precip (in)	Avg Sol Rad (Ly/Day)	Avg Vap Pres (mBars)	Avg Max Air Tmp (F)	Avg Min Air Tmp (F)	Avg Air Tmp (F)	Avg Max Rel Hum (%)	Avg Min Rel Hum (%)	Avg Rel Hum (%)	Avg Dew Point (F)	Avg Wind Speed (mph)	Avg Soil Temp (F)
Sep 2009	5.89	0.00	455	12.7	92.7	62.8	76.4	68	22	43	50.2	3.8	73.2
Oct 2009	4.40	0.00	355	8.9	78.4	53.6	65.2	66	25	43	39.5	4.5	64.3
Nov 2009	3.18	0.12	287	6.8	75.3	48.2	60.7	64	20	39	32.7	3.7	57.6
Dec 2009	2.08	1.78	207	6.6	63.1	43.5	52.5	70	33	50	32.8	3.6	50.9
Jan 2010	2.35	5.32	219	6.7	66.8	44.8	54.9	66	32	49	33.4	3.8	51.0
Feb 2010	2.44	2.03	285	8.4	65.4	45.4	54.6	77	38	59	39.5	3.6	54.3
Mar 2010	4.67	0.31	420	7.4	70.4	46.7	58.1	72	27	47	36.1	4.2	57.2
Apr 2010	5.11	0.94	494	8.7	70.1	47.1	57.8	77	33	54	40.3	4.6	60.8
May 2010	6.18	0.07	543	10.0	75.8	51.6	62.8	74	32	52	44.1	4.8	65.6
Jun 2010	6.25	0.00	570	13.7	82.6	57.3	68.3	81	36	58	52.9	4.5	71.7
Jul 2010	6.57	0.00	540	14.5	87.3	61.0	72.4	77	33	55	54.5	4.4	74.8
Aug 2010	6.99	0.00	538	12.3	90.7	60.8	74.7	69	23	43	49.8	4.0	73.6
Totals/Avgs	56.11	10.57	409	9.7	76.5	51.9	63.2	72	30	49	42.1	4.1	62.9

The National Turfgrass Evaluation Program at UCR

S.T. Cockerham and S.B. Ries, Agricultural Operations University of California, Riverside

The National Turfgrass Evaluation Program (NTEP), a cooperative effort between the non-profit National Turfgrass Federation, Inc., and the United States Department of Agriculture (USDA), is designed to coordinate evaluation trials of turfgrass varieties and promising selections in the United States and Canada. Information such as turfgrass quality, color, density, resistance to diseases and insects, tolerance to heat, cold, and drought can be used by seed and sod distributors and plant breeders to determine the broad picture of the adaptation of a cultivar. Results can also be used by sports turf managers, golf course superintendents, landscape architects, landscape contractors, ground managers and consultants to determine if a cultivar is well adapted to a local area.

Local and state government entities, such as parks and highway departments, use NTEP for locating resource-efficient varieties. Most important, growers and consumers use NTEP extensively to purchase drought tolerant, pest resistant, attractive and durable seed or sod. It is the acceptance by the end-user that has made NTEP the standard for turfgrass evaluation in the U.S.A. and other countries worldwide.

Four NTEP studies are currently underway at UCR. Plot maps and mean visual quality results for the 2009 calendar year are presented for tall fescue (Table 1), bermudagrass (Table 2), zoysiagrass (Table 3) and Seashore Paspalum (Table 4). Results for leaf texture, color, density, and winter color (warm-season grasses), as well as annual progress and final reports, can be found at http://www.ntep.org/.

NTEP Tall Fescue Trial (north replicate)

100	109	40	31	61	103	91	50	11	32
4	65	86	24	25	95	96	111	73	38
93	70	57	9	89	27	64	53	112	43
20	30	21	10	74	19	26	22	56	108
49	52	84	60	72	8	78	62	80	42
14	77	5	6	68	37	82	39	113	28
2	44	17	16	1	79	36	35	66	18
90	63	13	34	88	98	106	23	45	46
97	54	101	105	76	87	15	59	7	3
110	47	58	71	92	48	51	69	41	67
99	107	83	75	94	12	102	29	81	33
104	55	85							

NTEP Tall Fescue Trial (middle replicate)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113							

NTEP Tall Fescue Trial (south replicate)

42	66	111	23	65	13	69	95	99	43
103	50	8	49	110	109	45	88	52	48
72	101	68	19	100	44	78	75	113	73
25	105	92	41	7	67	59	24	79	96
85	77	70	83	57	35	76	9	61	97
62	33	106	46	74	30	51	34	98	28
39	5	36	102	54	56	112	2	90	94
84	26	15	10	107	86	47	14	27	87
16	32	53	22	37	4	12	38	93	104
82	6	58	60	80	18	108	89	29	55
17	71	21	63	11	1	3	64	91	20
31	81	40							

2007 NTEP Tall Fescue Entries

1	KY-31	31	Toccoa	61	BAR Fa 6253	91	Darlington
2	Spyder	32	Terrier	62	Talladega	92	KZ-1
3	Bravheart	33	Raptor II	63	Tahoe II	93	Renovate
4	Umbrella	34	Aggressor	64	06-WALK	94	Compete
5	Cannavaro	35	Essential	65	Escalade	95	Hudson
6	Greenbrooks	36	Fat Cat	66	06-DUST	96	Reunion
7	Plato	37	IS-TF-161	67	Honky Tonk	97	GWTF
8	Lindbergh	38	MVS-341	68	PSG-85QR	98	KZ-2
9	Aristotle	39	MVS-1107	69	STR-8GRQR	99	AST9002
10	Einstein	40	Titanium	70	PSG-82BR	100	AST9001
11	Silverado	41	Firecracker LS	71	Faith	101	RNP
12	Monet	42	M4	72	GO-1BFD	102	AST-4
13	Cezanne Rz	43	0312	73	SR 8650	103	AST 7003
14	Van Gogh	44	PSG-TTST	74	STR-8BB5	104	AST9003
15	Ninja 3	45	Col-1	75	Tulsa Time	105	J-140
16	Cochise IV	46	J-130	76	PSG-RNDR	106	ATF-1199
17	RK 4	47	Corona	77	PSG-TTRH	107	Justice
18	RK 5	48	Crossfire 3	78	Speedway	108	Rebel IV
19	GE-1	49	Hunter	79	Rembrandt	109	3rd
20	SC-1	50	Biltmore	80	JT-41	110	Traverse SPR
21	ATF 1328	51	Padre	81	JT-36	111	Rhambler SPR
22	Skyline	52	Magellan	82	JT-45	112	Firenza
23	Hemi	53	Catelyst	83	JT-42	113	Falcon IV
24	Turbo RZ	54	Stetson II	84	JT-33		
25	Turbo	55	Finelawn Xpress	85	BGR-TF1		
26	Bullseye	56	Falcon NG	86	BGR-TF2		
27	Trio	57	Shenandoah Elite	87	Gazelle II		
28	Sidewinder	58	Falcon V	88	Wolfpack II		
29	Rocket	59	Shenandoah III	89	AST 7002		
30	Jamboree	60	BAR Fa 6363	90	AST 7001		

Table 1. NTEP tall fescue mean visual quality ratings for 2009 at UC Riverside (9-best). Quality among entries are significantly different if they differ by the LSD value or greater.

	mean		mean		mean
ESSENTIAL	6.8	CEZANNE RZ	5.8	UMBRELLA	5.4
FALCON V	6.8	GAZELLE II	5.8	DARLINGTON	5.3
CATELYST	6.7	J-130	5.8	JT-33	5.3
BULLSEYE	6.6	JAMBOREE	5.8	JT-41	5.3
SHENANDOAH ELITE	6.6	JUSTICE	5.8	PSG-TTST	5.3
FIRENZA	6.4	PADRE	5.8	SIDEWINDER	5.3
HEMI	6.4	SPYDER LS	5.8	AST9002	5.2
MONET	6.4	TERRIER	5.8	BGR-TF2	5.2
RK 5	6.4	TRAVERSE SRP	5.8	HUNTER	5.2
3RD MILLENNIUM SRP	6.3	TURBO	5.8	LINDBERGH	5.2
GARRISON	6.3	ESCALADE	5.7	PSG-RNDR	5.2
BRAVEHEART	6.3	J-140	5.7	PSG-TTRH	5.2
COCHISE IV	6.3	JT-36	5.7	AST7003	5.1
FIRECRACKER LS	6.3	REMBRANDT	5.7	AST9001	5.1
RHAMBLER SRP	6.3	ROCKET	5.7	GWTF	5.1
SHENANDOAH III	6.3	AST9003	5.6	KZ-2	5.1
SPEEDWAY	6.3	COL-1	5.6	MAGELLAN	5.1
CANNAVARO	6.2	CORONA	5.6	PLATO	5.1
FAITH	6.2	FAT CAT	5.6	TULSA TIME	5.1
FINELAWN XPRESS	6.2	GO-1BFD	5.6	ATF 1328	5.0
PSG-85QR	6.2	HONKY TONK	5.6	COMPETE	5.0
FALCON IV	6.1	JT-42	5.6	EINSTEIN	5.0
GREENBROOKS	6.1	JT-45	5.6	TURBO RZ	5.0
MUSTANG 4	6.1	RAPTOR II	5.6	RNP	4.9
RK 4	6.1	REBEL IV	5.6	SILVERADO	4.9
LS 1200	6.1	STR-8BB5	5.6	AST1001	4.8
FALCON NG	6.0	HUDSON	5.5	CROSSFIRE 3	4.8
SR 8650	6.0	IS-TF-159	5.5	STETSON II	4.8
STR-8GRQR	6.0	KZ-1	5.5	TOCCOA	4.8
TALLADEGA	6.0	MVS-341	5.5	BAR FA 6363	4.7
WOLFPACK II	6.0	SKYLINE	5.5	AST 7001	4.6
BAR FA 6253	5.9	312	5.4	BILTMORE	4.6
GE-1	5.9	06-WALK	5.4	TAHOE II	4.5
MVS-1107	5.9	AST 7002	5.4	ARISTOTLE	4.3
PEDIGREE	5.9	BGR-TF1	5.4	KY-31	3.9
PSG-82BR	5.9	NINJA 3	5.4		
TITANIUM LS	5.9	RENOVATE	5.4	**LSD**	**0.7**
VAN GOGH	5.9	REUNION	5.4		
06-DUST	5.8	TRIO	5.4		

2007 NTEP Bermudagrass Trial

8	5	16	13	23	24	7	28
11	27	17	15	6	18	14	1
4	9	3	30	12	20	21	10
2	25	29	19	31	22	26	13
23	8	30	19	22	16	1	27
12	17	14	10	28	25	24	15
3	11	20	2	5	31	29	9
26	6	4	21	7	18	15	24
21	18	12	17	10	11	6	20
22	23	27	28	2	5	16	8
25	19	29	7	30	31	26	4
13	9	14	1	3			

NTEP Bermudagrass Entries

1. Riviera
2. Princess 77
3. NuMex-Sahara
4. SWI-1070
5. SWI-1081
6. SWI-1083
7. SWI-1113
8. SWI-1117
9. SWI-1122
10. Midlawn
11. Tifway
12. Premier
13. SWI-1057
14. BAR 7CD5
15. Gold Glove
16. Sunsport
17. Patriot
18. OKC 1119
19. OKC 1134
20. RAD-CD1
21. OKS 2004-2
22. PSG 91215
23. PSG 94524
24. IS-01-201
25. Pyramid 2
26. Hollywood
27. Yukon
28. Veracruz
29. PSG 9BAN
30. PSG PROK
31. PSG 9Y2OK

Table 2. NTEP bermudagrass mean visual quality ratings for 2009 at UC Riverside (9-best).

	mean
PSG 9Y2OK	5.9
OKC 1119	5.8
BAR 7CD5	5.5
OKC 1134	5.5
PREMIER	5.5
PSG PROK	5.4
SWI-1081	5.4
TIFWAY	5.4
SWI-1070	5.3
IS-01-201	5.2
PRINCESS 77	5.2
SWI-1113	5.2
SWI-1122	5.2
VERACRUZ	5.2
HOLLYWOOD	5.1
RAD-CD1	5.0

	mean
SWI-1083	5.0
OKS 2004-2	4.9
PATRIOT	4.8
PSG 94524	4.8
PSG 9BAN	4.8
RIVIERA	4.8
PSG 91215	4.7
GOLD GLOVE	4.7
SWI-1057	4.7
SUNSPORT	4.6
YUKON	4.6
NUMEX-SAHARA	4.5
PYRAMID 2	4.4
MIDLAWN	4.3
SWI-1117	4.1
LSD	**1.2**

2007 NTEP Zoysiagrass Trial

5	3	6	1	10	9	4
2	7	8	11	7	2	1
5	6	10	8	3	9	4
11	3	4	8	10	7	6
2	11	5	1	9		

NTEP Zoysiagrass Entries

1	Zenith	5	DALZ 0701	9	29-2
2	Meyer	6	DALZ 0702	10	240
3	Zorro	7	Shadowturf	11	380-1
4	DALZ 0501	8	L1F		

Table 3. NTEP zoysiagrass mean visual quality ratings for 2009 at UC Riverside (9-best).

	mean
ZORRO	7.3
DALZ 0701	6.6
DALZ 0501	6.2
DALZ 0702	6.2
L1F	6.2
SHADOWTURF	5.7
29-2	5.4
ZENITH	5.0
380-1	4.4
240	3.8
MEYER	3.7
LSD	**0.9**

2007 NTEP Seashore Paspalum Trial

5	6	2	4	3	1	3
6	1	5	2	4	5	4
6	1	3	2			

Seashore Paspalum Entries

1 Salam
2 Sea Isle 1
3 SRX 9 HSCP
4 UGA 7
5 UGA 22
6 UGA 31

Table 4. NTEP Seashore paspalum mean visual quality ratings for 2009 at UC Riverside (9-best).

	mean
SRX 9HSCP	7.2
UGA 22	7.0
SEA ISLE 1	6.8
UGA 7	6.7
SALAM	6.6
UGA 31	6.1
LSD	**0.6**

Can Certain Fungicides and PGRs Improve Turfgrass Water Use Efficiency?

Jim Baird, Brent Barnes, and Alea Miehls
Department of Botany and Plant Sciences
University of California, Riverside

Objectives:

It is well known that several fungicides, insecticides, and growth regulators can increase plant vigor and tolerance to abiotic stresses in addition to their primary function. The purpose of this study was to determine if these products can improve turfgrass tolerance to drought imposed by deficit irrigation. Other products, purported to reduce water use, appear likely to contain elevated amounts of nutrients (e.g., nitrogen) that can mask drought symptoms. The purpose of adding a nitrogen (N) treatment in this experiment was to determine the effects of excessive nitrogen on turfgrass stress tolerance, water use efficiency, and rooting.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized split block with 3 replications; main plots are chemical treatments and sub-plots are irrigation treatments

Plot Size: 6' by 6'

Species/Cultivars: Bermudagrass „Princess 77'

Fertility: 1 lb N/1000 ft^2 6 times annually

Application Information: CO_2 Bicycle sprayer
TeeJet 8003VS nozzles
19" nozzle spacing
22" boom height
Speed 1 mph
Output: 80 GPA
Pressure: 42 psi @ tank
Calibration: 946 ml/nozzle/minute

Application Timing: Initial application of all chemicals and fertilizer was made on August 18th, 2010

Irrigation Regimes: Prior to initiation of the study, the plot area was irrigated at 60% ETo/DU. Following initial application of chemicals and fertilizer, plots were then hand watered at either 50 or 70% ET_o three times weekly (MWF) according to the CIMIS ETo from the previous week.

Data Collection: Baseline and every two or four weeks: turf quality; percent soil volumetric water content using TDR probe; "greenness" measured by NDVI; photosynthesis and respiration using

LiCor 7500 infrared gas analyzer; ET; Water Use Efficiency (WUE); clipping yield; rooting at conclusion of experiment.

Treatments:

Trt	Product(s)	Rate	Frequency
1.	Untreated Control		
2.	Revolution	6 oz/1000 ft^2	Two monthly
3.	Insignia Revolution	0.9 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
4.	Heritage TL Revolution	2 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
5.	Honor Revolution	0.7 oz/1000 ft^2 6 oz/1000 ft^2	Two monthly
6.	Signature	8 oz/1000 ft^2	Four bi-weekly
7.	Primo Maxx	0.25 oz/1000 ft^2	Four bi-weekly
8.	Methylene Urea (40-0-0)	4 lbs N/1000 ft^2	Once

Preliminary Results:

- ✓ There were no statistically significant differences among treatments to date (Figs. 1-4), due in part to natural variation within the plot area.

- ✓ There was greater soil water retention in treatments containing Revolution surfactant (Fig. 3).

- ✓ Nitrogen increased clipping yield (Fig. 4), but excess growth appears to be depleting soil water in deficit irrigation treatment (Fig. 3).

Acknowledgments: Special thanks to BASF, Bayer, Syngenta, and Aquatrols for their support of this study.

Plot Map:

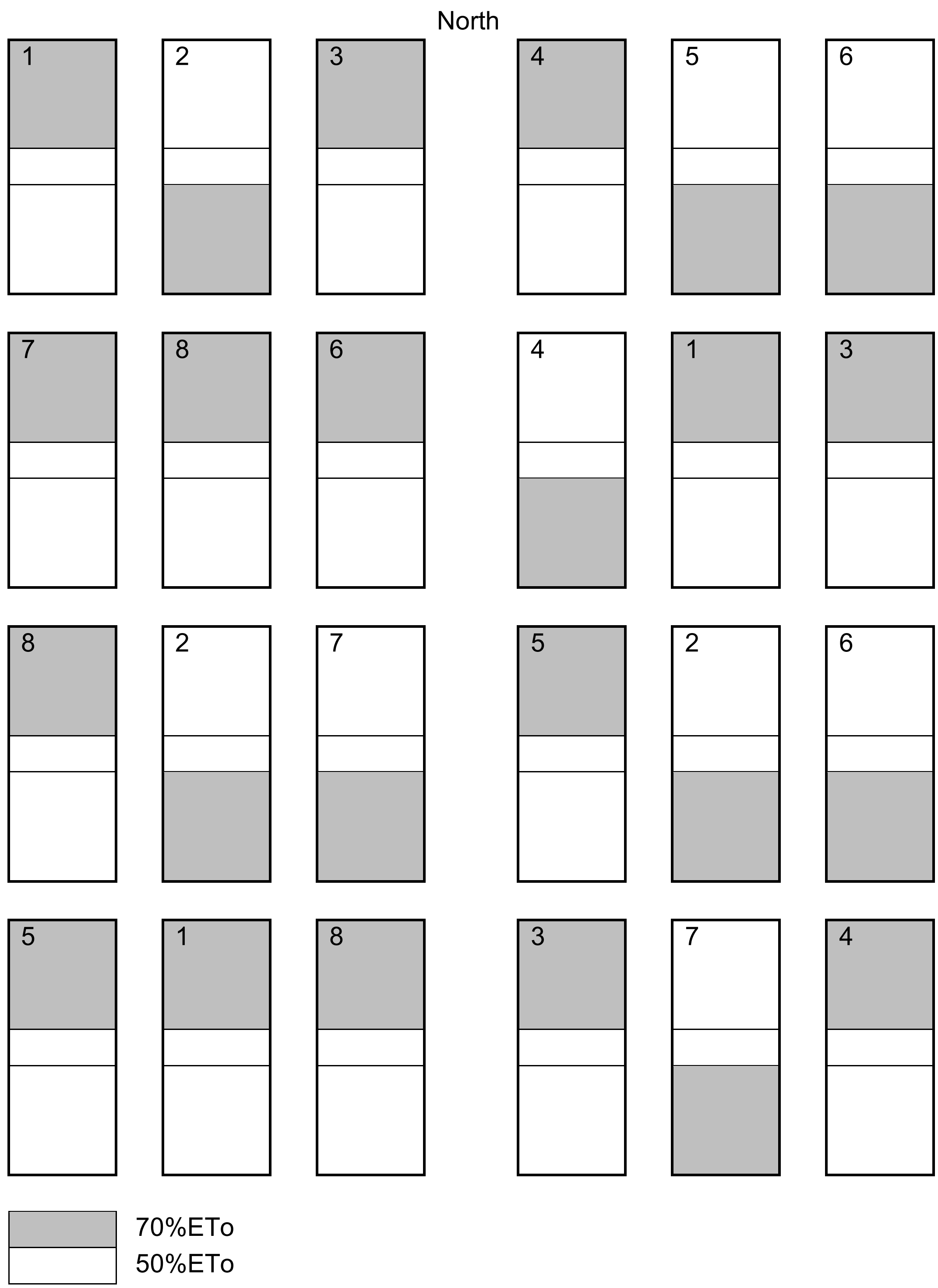


Figure 1. Bermudagrass turf quality (1-9, 9 = best) following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

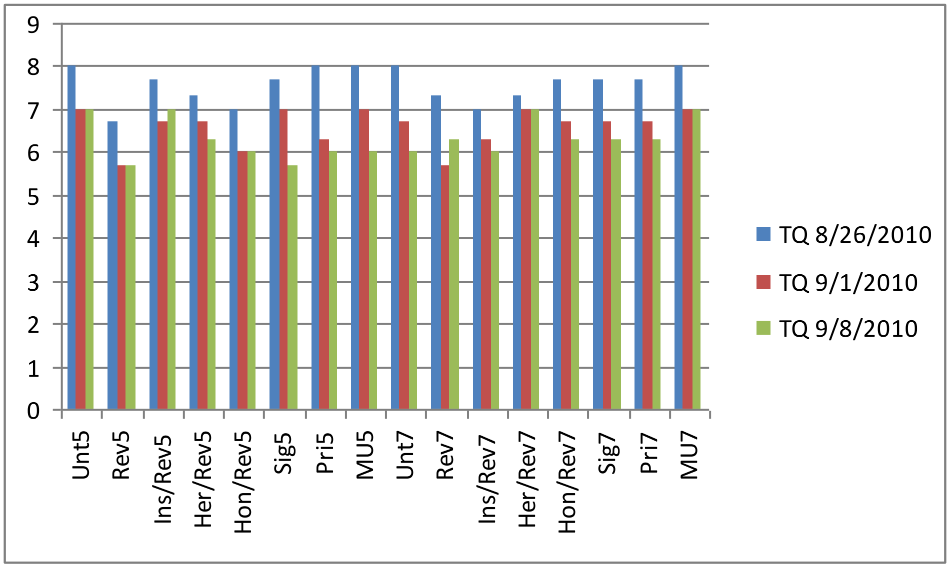


Figure 2. Normalized Difference Vegetative Index (NDVI) measurements prior to and following chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

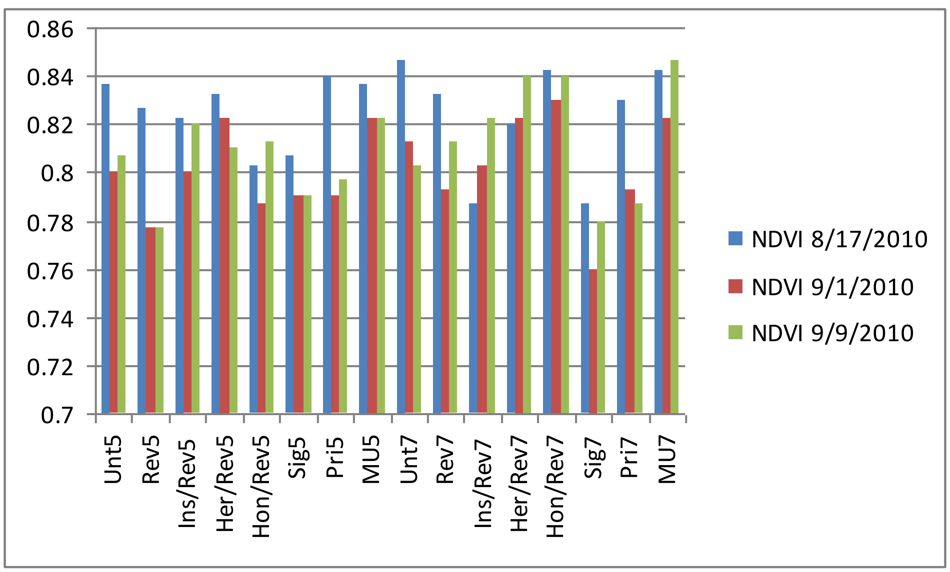


Figure 3. Percent soil volumetric water content measured by time domain reflectometry (TDR) prior to and following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.

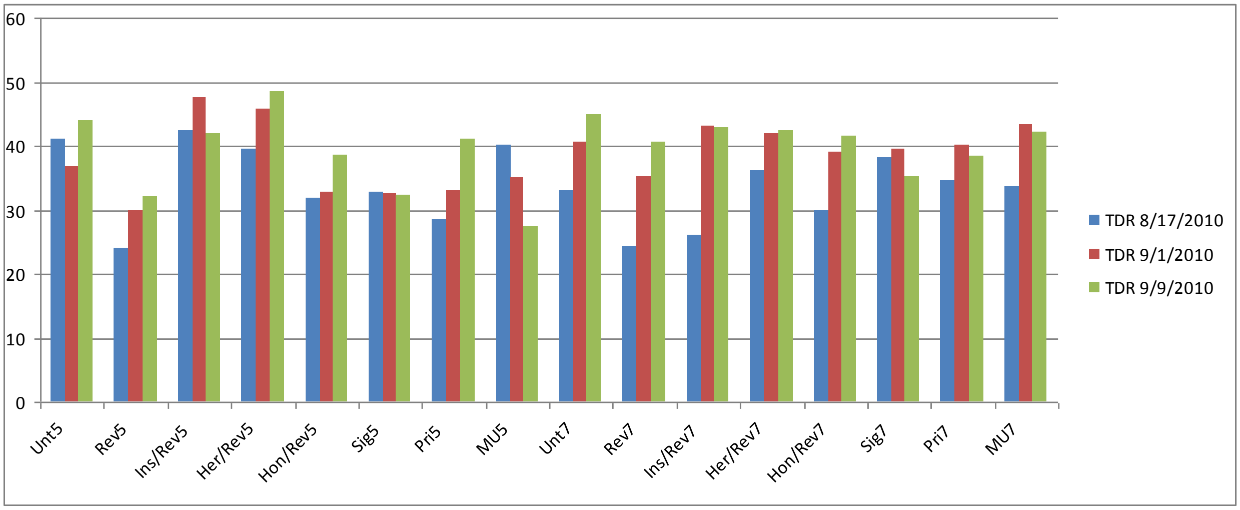
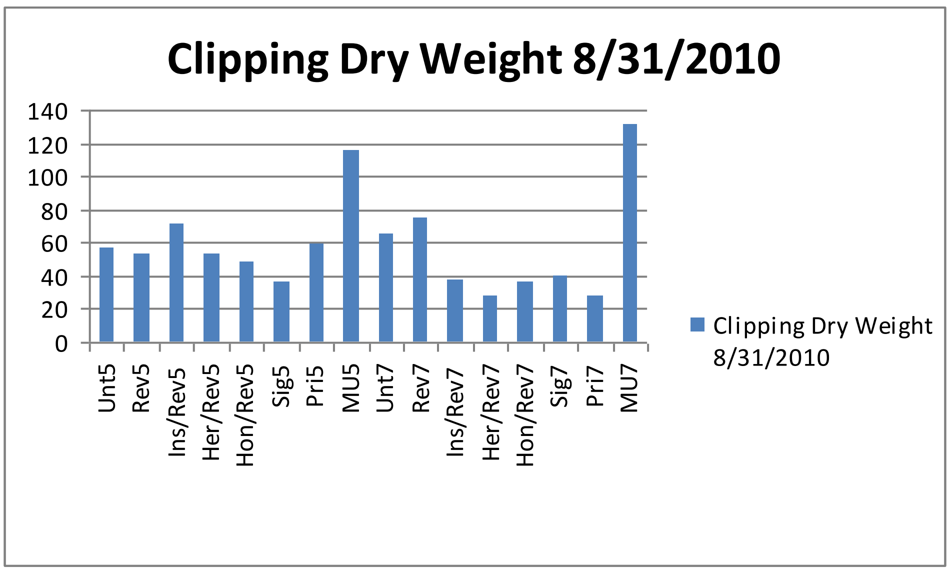


Figure 4. Bermudagrass clipping dry weight harvested on 8/31/2010 following initial chemical applications made on 8/18/2010 and irrigation based on 50% or 70%ETo. Riverside, CA.



Groundcovers for Water Conserving Landscapes

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Landscape groundcovers are a diverse group of trailing or spreading plants that naturally form a continuous soil covering. They can range in height from about six inches to nearly three feet tall, and may be woody, herbaceous, or succulent. Groundcovers are often looked upon as turfgrass substitutes in irrigated landscapes of the southwestern United States based on the presumption they require less water and other inputs to maintain high aesthetic quality. There is limited research-based information quantifying water requirements and climatic adaptability of the many plants that are potential landscape groundcovers. Unlike turfgrass, much of the information describing groundcover irrigation needs is anecdotal and non-quantitative. Thus, it can be impossible to accurately compare water needs of many groundcovers to those of turfgrass.

In a previous study, we looked at six groundcovers representing a range of growth habits and potential adaptations to drought to compare their minimum water needs. We found they varied widely and unpredictably in their minimum water needs and drought responses. We concluded that many groundcover species (in our study *Vinca major*, *Baccharis pilularis*, *Drosanthemum hispidum*, and *Hedera helix*) are able to maintain acceptable landscape performance when presented with significant drought and have minimum water needs around 30-40% of ETo, which is similar to that of warm-season turfgrass. Other species (exemplified in our study by *Potentilla tabernaemontanii* and *Gazania* hybrid) are not able to withstand any drought and have minimum water needs similar to cool-season turfgrasses. Thus, the idea is not true that groundcovers in general require less water than turfgrass to remain aesthetically appealing in the landscape.

This new study of 18 groundcover plant materials is designed to evaluate adaptation to the inland valley climate and performance at a reduced level of irrigation. After these plants become established, we plan to challenge them with decreasing levels of irrigation beginning with 60% of real-time ETo. The plants represent a mix of native, so-called California-Friendly, and non-native as well as woody and herbaceous plant materials.

<u>Study Design:</u>

- 18 species
- 1 irrigation treatment; 3 replications of each species
- 54 sub-plots 10 ft. × 10 ft. each
- Sprinkler irrigation
- Plants transplanted from #1 containers or from flats as rooted cuttings
- No soil amendment

GROUNDCOVER RESPONSE TO LIMITED IRRIGATION STUDY – U.C. RIVERSIDE				
Specific Epithet	**Common Name**	**Source Size**^{z}	**Date Planted**	**Notes**
1. Drosanthemum speciosum, Delosperma, Mesembryanthemum??	Vygie, ice plant	Altman Plants #1 container	4-2-10	Vygies (Afrikaans for mesembs, fam. Aizoaceae), So. Africa native, spring flowering, re-flowers in summer
2. Rosmarinus officianalis „Irene'	prostrate rosemary	Native Sons 4-in. pot	11-4-09	Reportedly very low-growing
3. Convolvulus sabatius (Convolvulus sabatius ssp. Mauritanicus)	ground morning glory	Native Sons 4-in. pot	11-4-09 repltd 4-2-10	Reportedly drought resistant, 1-2 ft. H × 2-3 ft. W, lavender flowers, Italy-Yugos-NoAf native, hardy to 25°F
4. Achillea millefolium „Sonoma Coast'	common yarrow	Native Sons #1 container	11-4-09	California native plant, white flowers
5. Thymus pracox arcticus (T. praecox subsp. Arcticus; T. serpyllum) „Pink Chintz'	creeping thyme	Native Sons 4-in. pot	11-4-09	Reportedly grows 1-in. ht., pink flowers, attract bees
6. Atriplex cinerea	coastal salt bush	Native Sons #1 container	11-4-09	Silver foliage, reportedly low-spreading, Australian native
7. Correa X unk. „Dusky Bells' („Carmine Bells')	Australian fuchsia	Native Sons #1 container	11-4-09	Reportedly low wide-spreading, deep red flowers, Australian native
8. Geranium X cantabrigiense „Biokova'	cranesbill	Native Sons #1 container	11-4-09	Reportedly very low and spreading, flowers winter/spring
9. Juniperus horizontalis „Wiltonii'	blue rug juniper	Monrovia #1 container	12-2-09	Very flat dense growing, trailing branches, silver blue foliage
10. Hypericum calycinum L.	creeping St. Johnswort, Aaron's beard	Expertise Growers cuttings in flats	10-29-09	
11. Salvia sonomensis „Gracias' (S. sonomensis X S. clevelandii)	creeping sage	Las Palitas #1 container	9-11-09	Calif. Native, reported low growing, wide spreading, lavender-blue flowers, possibly a hybrid of S. sonomensis X S. clevelandii, flowers winter/spring
12. Aptenia cordifolia (L.f.) N.E. Br. (A. cordifolia X A. haeckeliana??)	Red apple	Expertise Growers cuttings in flats	10-29-09 add plt 4-2-10	Ice plant relative
13. Lantana montevidensis	trailing purple lantana	Expertise Growers cuttings in flats	10-29-09 add plt 4-8-10	Common landscape lantana, flowers spring
14. Trachelospermum jasminoides	star jasmine	Expertise Growers cuttings in flats	10-29-09	
15. Sedum spp.	Mixed sedums	Altman Plants 8 ft. × 8 ft. mats	3-31-10	Sod-like product with cuttings of 4 sedum spp. Rooted in jute mat under laden with plastic netting
16. Buchloe dactyloides „U.C. Verde'	Buffalograss	Todd Valley Farms plugs	4-8-09	Performance standard under limited irrigation
17. Corethrogyne filaginifolia „Silver Carpet'	California aster, common corethrogyne	Las Palitas #1 container	9-11-09	California native plant
18. Lonicera japonica „Halliana'	Hall's honeysuckle, Japanese honeysuckle	Expertise Growers cuttings in flats	10-29-09	Reportedly tolerates drought well

Title:	**Selective Control of Annual Bluegrass (*Poa annua* L.) in Creeping Bentgrass Putting Greens**
Investigators:	Jim Baird, Brent Barnes, Alea Miehls, and Vanessa Ferrel Department of Botany and Plant Sciences University of California, Riverside
Sponsors:	Golf Course Superintendents Association of Northern California Northern California Golf Association San Diego Golf Course Superintendents Association Sierra Nevada Golf Course Superintendents Association Southern California Golf Association Southern California Golf Course Superintendents Association Southern California Section, Professional Golfers Association
Cooperators:	Todd Bunnell, SePro Gary Custis, PBI Gordon Doug Houseworth, Arysta LifeScience Suk-Jin Koo, Moghu Research Center Bob Mack, Helena Chemical Todd Mayhew, Valent Dean Mosdell, Syngenta Chris Olsen, Bayer Environmental Science
Objectives:	Evaluate existing and experimental herbicides and PGRs for selective removal of annual bluegrass that persists in creeping bentgrass putting green turf. Evaluate herbicides and herbicide combinations for potential bentgrass injury prior to inclusion in experiments on golf courses throughout the State.
Location:	UCR Turfgrass Research Facility, Riverside CA
Soil:	Loamy sand amended with sand topdressing
Experimental Design:	Randomized complete block; three replications
Plot Size:	3 ft x 6 ft
Species/Cultivars:	Creeping Bentgrass (*Agrostis stolonifera* L.) „Cobra'
Mowing Height:	0.180 inches; 3 days/wk
Irrigation:	80% ETo (historical from previous week)/DU
Cultivation:	alternate bi-monthly verticutting/solid-tine aeration; topdressing monthly

Sprayer: Bicycle with two 8003VS nozzles
20-inch spacing
35 psi
1 mph
510 ml/nozzle/30 sec = 80 GPA

Application Dates: A = May 13 and June 10, 2010
B = May 13, 20, 28 and June 4, 2010
C = Bi-weekly beginning May 13, 2010
D = June 10, 2010
E = July 23 and August 13, 2010
F = September 3, 2010

Data Collected: *Poa annua* control (0-100%) based on initial *Poa* cover in each plot
Bentgrass quality (1-9, 1 = dead; 6 = minimally acceptable)

Results:

- ✓ More than one application of amicarbazone applied at 2.0 oz/A or greater caused severe and sustained injury or death to bentgrass turf that remained (Table 1). Preliminary results from studies in Northern California indicate that these rates can be safely applied in cooler climates or during cooler periods of the year, but they are too high for late spring/early summer in Riverside.
- ✓ Onset of higher air temperatures occurred between July 6 and July 14 rating dates. Furthermore, the green was vertical mowed on July 7. The combination of both stresses exacerbated injury from herbicide treatments, and plots treated with higher rates of HM 0814 began showing significant turf injury relative to the control.
- ✓ Beyond July 14, it was difficult to identify and rate *Poa annua* cover in the study, even in the untreated control (Table 2).
- ✓ MRC-01 provided the best combination of *Poa* control and bentgrass safety during this phase of the experiment; however, there appeared to a minimum total dosage required to achieve optimal control. Subsequently, higher and more frequent applications of MRC-01 were applied which increased bentgrass injury, especially as summer stress increased. Thus far, MRC-01 has demonstrated to be a promising new herbicide for selective *Poa* control in bentgrass greens both in Riverside and Northern California, but there is a rate limit for maintaining bentgrass safety.
- ✓ The Riverside study will continue along with ongoing studies on golf courses Northern California, and new studies are soon to be initiated on golf courses in Southern California. Focus will be on refining application rates and frequencies of MRC-01 and amicarbazone, evaluation of tank-mix partners with MRC-01 and with amicarbazone, and evaluation of various rates and/or more frequent applications of other herbicides or PGRs included in this study to achieve maximum *Poa* control with minimal bentgrass injury.

Selective Control of *Poa annua* in Creeping Bentgrass Putting Greens.
UCR Turf Research Facility; Plot 12E-22; Plot size: 3 ft x 6 ft with 5 ft alleys between replications.

North

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

16	17	7	28	25	22	2	26	24	13	8	14	3	19	11
29	27	5	21	1	20	30	4	18	10	6	12	23	9	15

11	16	9	30	2	24	13	26	27	20	7	25	21	29	3
1	6	5	19	10	23	14	12	22	18	28	17	15	4	8

Table 1. Creeping bentgrass quality (1-9, 1=dead, 6=minimally acceptable) following application of herbicides. Riverside, CA. 2010.

Trt	Product(s)	Rate(s)	Timing	5/20	5/28	6/4	6/6	6/19	6/25	7/6	7/14	7/29	8/8	8/25	9/3
1	Velocity	4 oz/A	A	7.0	7.7	8.0	7.7	8.0	9.0	9.0	8.0	8.7	7.7	8.0	7.3
2	Velocity + Trimmit	2 oz/A +8 oz/A	A	7.0	8.0	8.0	8.0	8.0	9.0	9.0	8.0	8.0	7.7	7.7	8.0
3	Amicarbazone	1 oz/A	A	8.0	8.0	8.0	8.0	8.0	8.0	9.0	7.3	8.0	7.7	7.7	8.0
4	Amicarbazone	2 oz/A	A	7.7	7.7	7.7	8.0	6.7	6.0	8.3	8.0	8.3	7.7	7.7	7.3
5	Amicarbazone	4 oz/A	A	7.0	6.0	6.3	6.3	2.7	2.3	2.7	3.0	4.3	5.3	5.7	6.0
6	Amicarbazone + Trimmit	2 oz/A + 8 oz/A	A	7.0	6.7	7.0	7.3	5.0	4.7	6.0	7.7	8.0	7.3	6.7	7.0
7	MRC-01	1.25 $oz/1,000ft^2$	A, E	8.0	8.0	8.0	8.0	9.0	9.0	8.7	7.0	7.3	7.3	7.3	6.3
8	Prograss	8 oz/A	A	8.0	8.0	8.0	7.7	8.7	9.0	9.0	7.7	8.0	7.3	7.7	7.0
9	Prograss + Amicarbazone	6 oz/A + 2 oz/A	A	8.0	8.0	8.0	8.0	7.7	7.0	8.7	7.7	8.3	8.0	7.7	8.7
10	HM 0814	3 $oz/1,000ft^2$	A	8.0	8.0	8.0	8.0	8.3	8.7	8.0	6.7	6.3	6.7	7.0	7.3
11	HM 0814	6 $oz/1,000ft^2$	A	8.0	8.0	8.0	8.0	8.3	8.0	8.0	6.7	6.3	6.0	6.7	6.0
12	HM 0814 + Trimmit	2 $oz/1000ft^2$ + 8 oz/A	A	8.0	8.0	8.0	8.0	8.3	8.3	8.0	7.3	7.3	7.3	6.7	7.3
13	Trimmit	10 oz/A	A, E	8.0	8.0	8.0	8.0	8.0	8.3	9.0	8.3	8.7	8.0	8.0	9.0
14	Trimmit	16 oz/A	A, E	8.0	8.0	8.0	8.3	9.0	8.3	9.0	8.7	8.3	8.0	8.0	9.0
15	Bensumec 4 LF	9.4 $oz/1000ft^2$	F	8.0	8.0	8.0	8.0	8.7	9.0	9.0	7.0	9.0	7.3	7.3	7.3
16	SP 5114[2]	14.5 oz/A	E	8.0	8.0	8.0	8.0	9.0	9.0	9.0	7.7	8.0	7.7	8.0	9.0
17	SureGuard	6 oz/A	F	8.0	8.0	8.0	8.0	9.0	9.0	9.0	7.7	9.0	8.0	8.0	8.0
18	Untreated Control	-	-	8.0	8.0	8.0	8.0	9.0	9.0	9.0	8.0	8.7	8.0	7.7	8.0
19	Amicarbazone	1 oz/A	B	7.7	7.7	6.7	6.0	6.7	6.7	8.3	8.0	8.7	8.0	8.0	8.7
20	Amicarbazone	2 oz/A	B	7.3	6.0	4.0	2.0	1.7	1.3	2.7	3.7	4.7	5.0	5.0	5.3
21	Amicarbazone + Trimmit	1 oz/A + 2 oz/A	B	8.0	7.7	6.0	5.0	6.3	6.7	8.0	8.0	8.7	7.7	7.7	7.7
22	$FeSO_4$	16 $oz/1000ft^2$	C	9.0	8.0	9.0	8.0	9.0	9.0	9.0	9.0	8.7	9.0	9.0	9.0
23	MRC-01	0.75 $oz/1000ft^2$	B, E	8.0	8.0	8.0	7.7	9.0	9.0	8.7	7.7	8.3	7.7	7.7	8.0
24	MRC-01	$3oz/1000ft^2$	D	8.0	8.0	8.0	8.0	8.7	8.7	9.0	7.3	8.3	7.7	8.0	8.0
25	MRC-01[2]	3 $oz/1000ft^2$	D	8.0	8.0	8.0	8.0	8.3	9.0	9.0	7.7	7.3	7.0	7.7	6.7
26	SP 5114[2]	29.0 oz/A	E	8.0	8.0	8.0	8.0	9.0	9.0	9.0	7.7	7.0	7.3	8.0	9.0
27	SP 5412[2]	24.6 oz/A	E	8.0	8.0	8.0	8.0	9.0	9.0	9.0	7.7	7.7	7.7	7.7	8.7
28	SP 5412[2]	49.2 oz/A	E	8.0	8.0	8.0	8.0	9.0	9.0	9.0	8.0	8.0	7.7	8.0	9.0
29	SP 5410[2]	20.5 oz/A	E	8.0	8.0	8.0	8.0	8.7	9.0	9.0	7.7	7.7	7.7	8.0	9.0
30	SP 5410[2]	41.0 oz/A	E	8.0	8.0	8.0	8.0	9.0	9.0	9.0	8.0	7.3	7.3	8.0	9.0
	LSD (0.05)*			0.3	0.4	0.3	0.6	0.8	1.0	1.0	1.1	1.4	1.1	1.5	1.7

*Treatment mean differences in columns greater than or equal to LSD are significantly different, Fisher's Protected LSD, *P*=0.05.

[1]$FeSO_4$ applied in 320 GPA of water; all other treatments applied in 80 GPA. [2]No surfactant added; all other treatments applied with 0.25% non-ionic surfactant.

Table 2. Annual bluegrass control (0-100%) following application of herbicides. Riverside, CA. 2010.

Trt	Product(s)	Rate(s)	Timing	5/28	6/4	6/6	6/19	6/25	7/6	7/14
1	Velocity	4 oz/A	A	28	47	33	48	57	70	65
2	Velocity + Trimmit	2 oz/A +8 oz/A	A	31	36	25	40	34	73	48
3	Amicarbazone	1 oz/A	A	29	29	44	57	60	47	64
4	Amicarbazone	2 oz/A	A	37	35	52	96	99	80	92
5	Amicarbazone	4 oz/A	A	70	66	87	100	100	100	100
6	Amicarbazone + Trimmit	2 oz/A + 8 oz/A	A	40	56	71	100	100	94	89
7	MRC-01	1.25 oz/1,000ft^2	A, E	20	30	61	84	75	82	87
8	Prograss	8 oz/A	A	12	25	32	52	44	36	37
9	Prograss + Amicarbazone	6 oz/A + 2 oz/A	A	38	26	45	90	88	78	68
10	HM 0814	3 oz/1,000ft^2	A	10	5	20	25	21	23	30
11	HM 0814	6 oz/1,000ft^2	A	21	23	18	54	48	51	54
12	HM 0814 + Trimmit	2 oz/1000ft^2 + 8 oz/A	A	19	7	9	31	22	52	63
13	Trimmit	10 oz/A	A, E	10	5	14	24	19	47	33
14	Trimmit	16 oz/A	A, E	18	16	24	32	28	51	62
15	Bensumec 4 LF	9.4 oz/1000ft^2	F	4	10	18	51	30	39	54
16	SP 5114[2]	14.5 oz/A	E	13	15	19	33	19	13	26
17	SureGuard	6 oz/A	F	17	14	10	34	27	21	17
18	Untreated Control	-	-	17	11	11	22	19	11	30
19	Amicarbazone	1 oz/A	B	32	61	84	87	78	61	74
20	Amicarbazone	2 oz/A	B	69	83	98	100	100	100	100
21	Amicarbazone + Trimmit	1 oz/A + 2 oz/A	B	21	57	82	100	97	87	76
22	$FeSO_4$	16 oz/1000ft^2	C	20	22	23	26	28	49	40
23	MRC-01	0.75 oz/1000ft^2	B, E	32	64	86	97	98	76	74
24	MRC-01	3oz/1000ft^2	D	10	10	20	50	45	56	98
25	MRC-01[2]	3 oz/1000ft^2	D	23	7	25	34	27	62	91
26	SP 5114[2]	29.0 oz/A	E	12	12	12	30	7	30	22
27	SP 5412[2]	24.6 oz/A	E	6	6	17	11	6	17	28
28	SP 5412[2]	49.2 oz/A	E	15	4	24	24	8	14	32
29	SP 5410[2]	20.5 oz/A	E	16	12	12	27	11	28	52
30	SP 5410[2]	41.0 oz/A	E	14	18	18	19	14	19	36
	LSD (0.05)[*]			**21**	**23**	**23**	**21**	**24**	**29**	**29**

[*]Treatment mean differences in columns greater than or equal to LSD are significantly different, Fisher's Protected LSD, *P*=0.05.

[1]$FeSO_4$ applied in 320 GPA of water; all other treatments applied in 80 GPA. [2]No surfactant added; all other treatments applied with 0.25% non-ionic surfactant.

A background of Kikuyugrass (*Pennisetum clandestinum*) and its future improvement

Tyler J Mock

Kikuyugrass is a warm season grass that originates from the Kenyan highlands. It is named after the Kikuyu tribesmen who live in the area from which it originates. In Kenya, Kikuyugrass is generally found on the edges of forests but can also quickly spread into cleared areas. It was taken from Kenya and established in South Africa and Australia in the late 1800's. In Australia it has been used as a forage grass for many years. Kikuyugrass is now found in many other mild climates such as New Zealand, Mexico, Spain, Central America, South America as well as portions of the United States. It was introduced originally into California in the 1920's to lower the amount of soil erosion on hillsides.

From its original roles as a forage grass and erosion controller, Kikuyugrass began to invade other areas, most notably of which is turf. Kikuyugrass' aggressive growing habits aid it in taking over other turf-grasses. Due to this aggressiveness, when it takes over a turf area it is simply managed thereafter as the main turf species.

Kikuyugrass is a C4 grass, but is able to photosynthesize at colder temperatures than other C4 grasses. This translates into longer growth and greener color going into winter. This is one of the benefits to Kikuyugrass when compared to other similar grasses. Active growth takes place between 60 and 90 F, but it can survive in temperatures above 100 F. One of the reasons why Kikuyugrass does well in California and has the potential to replace other less drought tolerant C3 cool season grasses is its ability to survive in relatively colder climates. Kikuyugrass can continue to grow and retain its color in temperatures below 60 F. Kikuyugrass both does and does not enter dormancy in California depending on how cold the winters are and its proximity to the ocean which moderates temperature. Usually it retains its winter color best of all of the warm season grasses. It has even been –recorded to tolerate light frost without loss of color.

Kikuyugrass is spread by rhizomes, stolons, and seed. The seed have a rounded shape and are dark brown in color. They are roughly 1/8" long. Kikuyugrass has a course to medium texture and is often compared or confused with Japanese lawngrass (*Zoysia japonica*) and St. Augustinegrass (*Stenotaphrum secdundatum*). The leaf color is a medium to lime green, while the leaves are flat and pointy, growing from 1-10 inches long. Another distinguishing characteristic of the species is the male flower (white anther and filament) that can be seen above the surface on low cut grass. When seen over larger areas, the filaments give the grass a silver look. When mowed the filaments will usually come back in one day. This silver look can generally be seen in the spring and fall.

Kikuyugrass has a thick mat and has issues with thatching. The thatching can cause spongy turf and uneven surfaces. Scalping and lower quality can also occur. One method to counteract this and other undesirable traits in Kikuyugrass is to mow it at heights below 5/8". Due to its aggressive nature, Kikuyugrass will grow up fences and poles if not checked by mowing. Edging and hand picking are often needed to prevent it from invading other areas. The mat layer and aggressive growth of Kikuyugrass allow it to have a high traffic tolerance as well as recover quickly from injuries such as divots on a golf course. The species requires only 2-3 lbs. of nitrogen per 1000 square feet per year. Sometimes the nitrogen in the water is enough to sustain growth.

Future research

-One aspect of Kikuyugrass research that is in the beginning stages is to measure the size of its genome. This will provide necessary background information to help us understand how Kikuyugrass can best be improved in the future.

-Early research will also concentrate on measuring the genetic variation of samples of Kikuyugrass from all over the world. Studying genetic variation will help to isolate traits that are desirable for breeding such as disease resistance and color retention. This is necessary before breeding efforts can begin.

-Androgenesis, or reduction in ploidy level, will be attempted to hopefully produce a less vigorous growth habit while retaining desirable qualities.

-Long term goals are to eventually breed Kikuyugrass for improved turf quality, disease resistance, and color retention as well as other industry needs like stronger sod strength.

Seeded vs. Vegetative Buffalograss for Southern California

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With decreasing fresh water resources and increasing water use restrictions on landscapes, the turf industry and general public are increasingly seeking after alternative and low maintenance turfgrasses. Recently, there has been a lot of interest in using buffalograss [*Buchloe dactyloides* (Nutt.) Engelm.] on lawns and landscapes in Southern California. Buffalograss is a warm-season, stoloniferous turfgrass species native to North America. Of particular importance in areas where water availability is an issue, buffalograsses have a comparatively low water use rate. As importantly, buffalograsses exhibit a drought induced dormancy survival characteristic, with certain cultivars (e.g., „UC Verde') demonstrating a very quick recovery once water is available. Buffalograsses also perform very well with little or no mowing.

Although buffalograss does have a place in the Southern California landscape, it is important to understand its weaknesses as well as its strengths. Like other warm-season turfgrasses with lower water use requirements, buffalograss will go dormant or turn straw brown color during the colder periods of winter except perhaps in coastal environments where temperatures are moderated by the ocean. In general, buffalograss also exhibits weak sod strength, and poor tolerance to shaded conditions and traffic.

UC Verde is a vegetatively propagated buffalograss cultivar that resulted from a turfgrass improvement program at the University of California Davis and Riverside campuses. It was found that the new diploid female buffalograss cultivar exhibited superior drought tolerance, stolons of fine texture, and a competitive growth habit. Also, relative to other buffalograsses, it had shorter winter dormancy with superior color retention, and high turf density with a rapid stolon spreading rate and short plant height that provided a low maintenance turf of good quality. Although UC Verde is well adapted to our region, it is vegetatively propagated by plugs only. This can be both expensive and time-consuming to establish a stand of turf.

In this experiment, we sought to compare establishment rates, traffic tolerance, and other turf quality characteristics of UC Verde and three experimental seed-propagated lines of buffalograss from the University of Nebraska. These experimental lines were developed from parental materials that exhibited improved turfgrass performance and greater seed yield. All three lines are hexaploid. They have exhibited excellent heat tolerance and drought resistance characteristics. The lines will be named and limited seed of these releases will be available in 2011.

Location: UCR Turf Facility

Soil: Hanford fine sandy loam

Experimental Design: Randomized complete block with 3 replications

Plot Size: 12' by 12'

Plugs and Seed Established: 7/9/2010

Seeding Rate: 2 lbs/1000 ft^2

Spacing: 18-inch spacing of UC Verde plugs

Fertility: 0.5 lb N/1000 ft^2 approximately monthly

Mowing Height: 2.25 inches

Irrigation Regimes: Established for 8 weeks at 160% ET_o replacement, then irrigation was lowered to (60% ET_o*K_c)/DU

Data Collection: turf quality, percent brown canopy tissue cover, color quality, percent cover, winter color retention, spring green up, response to simulated traffic (following establishment)

Acknowledgments: Special thanks to Florasource, LTD. for UC Verde plugs and the University of Nebraska for the experimental seed lines.

Treatments:

1. NE BFG 07-4E seed
2. „UC VERDE' plugs
3. NE BFG 07-03 seed
4. NE BFG 07-01 seed

Plot Map:

North

4E	UC Verde	03	01
03	01	UC Verde	4E
UC Verde	4E	01	03

Drought Tolerance of Fescues, Ryegrasses, and Their Hybrids

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In California and much of the United States, tall fescue (*Festuca arundinacea* Shreb.) is the most widely used lawn grass because of its adaptation to cooler climates, shade, and ability to maintain lush color year-round in warmer climates with supplemental irrigation. Similarly, perennial ryegrass (*Lolium perenne* L.) is widely used on golf courses, athletic fields, and other areas because of its rapid germination and establishment; wear tolerance; and dark green color. However, maintaining a reasonable visual quality of these cool-season turfgrasses requires approximately 80% reference evapotranspiration (Eto) in coastal climates and 90% to 100% ETo in transition climates. The Model Ordinance developed by the California Urban Water Conservation Council and supported by vast majority of water agencies has now reduced landscape irrigation to 70% Eto, and increasing water use restrictions in certain regions of the State mandate even lower water use on landscapes and golf courses in response to drought. Thus, how are homeowners and professional turf managers going to maintain lush cool-season turf in arid conditions or in climates subjected to severe drought? Obviously, a more drought resistant cool-season turfgrass species is needed to maintain desired color with limited water resources.

By intercrossing with meadow fescue (*Festuca pratensis* Huds.) and recurrent selection for drought and heat tolerance, we have developed a population of perennial ryegrass with a marked increase in drought tolerance. This increase was associated with a dramatic increase in the frequency of introgression of *F. pratensis* chromatin on the short arm of chromosome 3. In studies in the United Kingdom on forage-type interspecific hybrids of fescues and ryegrasses or Festulolium, this specific segment of *F. pratensis* chromatin was associated with deep rooting, drought, heat, freezing, and flood tolerance (Humphreys et al., 2003). We believe that extreme selection applied to our materials favored the specific genome regions from *F. pratensis* responsible for drought and heat tolerance under Southern California conditions.

The primary objectives of my M.S. thesis research are to:

1. Quantify the level of drought tolerance in Festulolium versus the parents (*F. pratensis* and „SR4220' perennial ryegrass) and commercially available tall fescue and perennial ryegrass cultivars with demonstrated drought tolerance.
2. Determine rooting characteristics of the aforementioned germplasm as a possible mechanism of drought tolerance.

In this field study, grasses were established to maturity under non-limiting irrigation, and then subjected to deficit irrigation (70% ET_o) for an extended time period. Preliminary results will be discussed and shown at Field Day.

Location:	UCR Turf Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	5' by 5'
Seeding Date:	1/14/2010
Fertility:	0.5 lb N/1000 ft^2 approximately monthly
Mowing Height:	2 inches

Irrigation: Maintained at (150% ET_o*K_c)/DU until start of study, then 70% ET_o replacement based on CIMIS data from previous week (divided into three irrigation events/wk by hand watering plots

Deficit irrigation: Initiated on 8/19/2010

Data Collection: Turf quality (1-9, 6 minimally acceptable); color quality (1-9, 6 minimally acceptable); percent cover brown tissue, gravimetric soil water content; clippings taken monthly; Time Domain Reflectometry (TDR) probe for soil water content; and Normalized Difference Vegetation Index (NDVI) for measure of greenness or vigor

Acknowledgments: Special thanks to Seed Research of Oregon for providing the tall fescue and perennial ryegrass cultivars, and Blue Moon Farm, LLC of Oregon for providing the *Festuca pratensis* seed.

Treatments:

1. „Grande 2' Tall Fescue
2. „Tulsa Time' Tall Fescue
3. „Speedway' Tall Fescue
4. „SR4220' Perennial Ryegrass
5. „Zoom' Perennial Ryegrass
6. VL-001 Festulolium
7. AL-001 Festulolium
8. VL-002 Festulolium
9. „PASJA' Festuca pratensis Huds.
10. VL-003 Festulolium

Plot Map:

North

1	2	3	4	5	6	7	8	9	10
6	1	4	8	7	9	3	5	10	2
3	5	7	1	10	8	2	9	6	4

References:

Humphreys, M.W., P.J. Canter, and H.M. Thomas. 2003. Advances in introgression technologies for precision breeding within the *Lolium-Festuca* complex. Ann. Appl. Biol. 143:1-10.

Weed Control During Conversion from Tall Fescue to Buffalograss for Water Conservation

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Water use restrictions for irrigation of landscapes are likely to continue to increase throughout much of California. As a result, it is becoming increasingly difficult to maintain turf quality and desirable green color of cool-season turfgrasses like tall fescue. One strategy for decreasing water use on turf is to convert to warm-season turfgrass species that require at least 20% less water. Removing the existing sod and replacing sod of a warm-season species would be the ideal remedy, but this may be cost prohibitive for many homeowners. An alternative approach would be to seed or plug the warm-season species directly into the existing lawn. Results from a study conducted last year demonstrated that tall fescue must be eradicated to allow successful establishment of warm-season turf. In addition, we found that weed competition can adversely affect stand establishment unless managed properly.

Objectives:

1. Determine efficacy of tall fescue eradication, weed control, and safety to buffalograss established from seed or by plugs.
2. Determine herbicide (combinations) that can be used to transition eradication of tall fescue to minimize turf discoloration while not compromising establishment rate of buffalograss.
3. Evaluate new herbicides that are soon to be registered on turfgrass in California.

Location:	UCR Turfgrass Research Facility
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block with 3 replications
Plot Size:	7' by 7'
Species/Cultivars:	West Coaster' tall fescue turf; „UC Verde' buffalograss (plugs) and (33:33:33) mixture of University of Nebraska NE BFG07-03, NE BFG 07-01, and NE BFG 07-4E experimental seed
Application Information:	CO_2 Bicycle sprayer TeeJet 8002DG nozzles 19" nozzle spacing 22" boom height Speed: 2 mph Output: 30GPA Pressure: 42 psi @ Tank Calibration: 732 ml/nozzle/minute

Roundup QuikPro applied at 1.5 oz product per gallon in backpack sprayer (spray to wet)

Application Timing: A: 7/27/2010
B: 9/2/2010

Plugs and Seed: Established on 8/4/2010; plugs on 15-inch spacing; 2 lbs/1000 ft^2 seed

Fertility: 0.5 lb N/1000 ft^2 approximately monthly

Mowing Height: 2.25 inches; 3 times weekly

Irrigation Regimes: Established for 8 weeks at 160% ET_o replacement, then irrigation was lowered to (60% ET_o*K_c)/DU

Data Collection: Total plot turf quality, percent weed cover by species, and percent cover buffalograss using 18” by 18” 1” grid pattern counting grass at intersection.

Acknowledgments: Special thanks to DuPont, West Coast Turf, Florasource, Ltd., University of Nebraska, Crop Production Services, Bayer, and Syngenta for donating the plant materials and herbicides used for this study.

Preliminary Results:

- ✓ Thus far, none of the herbicide treatments have resulted in injury to buffalograss seedlings or plugs.
- ✓ Although Tenacity, applied before planting at 5 oz/A (trts 19-20, 23-24) was helpful in transitioning tall fescue from green toward dead turf, it appeared that the Tenacity-treated tall fescue turf was still vigorous enough to reduce buffalograss stand establishment (Table 1).
- ✓ Celsius, applied at 2.9 or 4.5 oz/A, was effective in transitioning tall fescue turf while not impeding buffalograss establishment (Table 1).
- ✓ Weed competition in the plots was mounting and will be discussed at Field Day.

Table 1. Buffalograss and green tall fescue cover (0-100%) on September 1, 2010. Riverside, CA.

Trt	Method	Herbicide(s)	Rate(s)	Timing	Buffalo Cover	Tall Fescue Color
1	Seed	Roundup QuikPro	1.5 oz/gal	A	2.0 c	0 d
2	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
3	Seed	Roundup QuikPro	1.5 oz/gal	A	2.7 c	0 d
		Imprelis	1.5 oz/A	B		
4	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
		Imprelis	1.5 oz/A	B		
5	Seed	Roundup QuikPro	1.5 oz/gal	A	1.3 c	0 d
		Imprelis	3.0 oz/A	B		
6	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
		Imprelis	3.0 oz/A	B		
7	Seed	Roundup QuikPro	1.5 oz/gal	A	1.7 c	0 d
		Imprelis	4.5 oz/A	B		
8	Plugs	Roundup QuikPro	1.5 oz/gal	A	11.7 a	0 d
		Imprelis	4.5 oz/A	B		
9	Seed	Roundup QuikPro	1.5 oz/gal	A	2.0 c	0 d
		Speedzone Southern	4.0 pt/A	B		
10	Plugs	Roundup QuikPro	1.5 oz/gal	A	11.7 a	0 d
		Speedzone Southern	4.0 pt/A	B		
11	Seed	Roundup QuikPro	1.5 oz/gal	A	1.3 c	0 d
		Celsius	2.45 oz/A	B		
		Revolver	4.5 oz/A	B		
12	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
		Celsius	2.45 oz/A	B		
		Revolver	4.5 oz/A	B		
13	Seed	Roundup QuikPro	1.5 oz/gal	A	1.3 c	0 d
		Tenacity	5 oz/A	B		
		Monument	10 g/A	B		
14	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
		Tenacity	5 oz/A	B		
		Monument	10 g/A	B		
15	Seed	Roundup QuikPro	1.5 oz/gal	A	2.0 a	0 d
		Tenacity	5 oz/A	A		
		Monument	10 g/A	B		
16	Plugs	Roundup QuikPro	1.5 oz/gal	A	10.0 a	0 d
		Tenacity	5 oz/A	A		
		Monument	10 g/A	B		
17	Seed	Celsius	2.5 oz/A	A	1.3 c	43.3 b
		Celsius	4.0 oz/A	B		
18	Plugs	Celsius	2.5 oz/A	A	10.0 a	30.0 c
		Celsius	4.0 oz/A	B		
19	Seed	Tenacity	5.0 oz/A	A	0.3 c	84.7 a
		Tenacity	5.0 oz/A	B		
		Monument	10.0 g/A	B		
20	Plugs	Tenacity	5.0 oz/A	A	5.7 b	88.3 a
		Tenacity	5.0 oz/A	B		
		Monument	10g/A	B		
21	Seed	Celsius	4.9 oz/A	A	1.7 c	10.0 d
		Revolver	9.0 oz/A	A		
22	Plugs	Celsius	4.9 oz/A	A	10.0 a	21.7 c
		Revolver	9.0 oz/A	A		
23	Seed	Tenacity	5.0 oz/A	A	0.0 c	89.7 a
		Monument	15.0 g/A	B		
24	Plugs	Tenacity	5.0 oz/A	A	7.0 b	76.7 a
		Monument	15.0 g/A	B		

Means followed by same letter do not significantly differ (P =0.05, Fisher's Protected LSD).

Weed Control During Conversion from Tall Fescue to Buffalograss for Water Conservation

Plot Plan

North

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

11	4	5	3	12	6	13	10
16	14	22	7	19	20	1	21
18	24	8	15	23	9	17	2

7	21	10	14	12	1	18	3
16	11	15	24	23	4	6	17
5	8	12	20	2	19	22	9

2010 Turf Disease Trials
Juanita Rios and Frank Wong
UCR Department of Plant Pathology & Microbiology

Materials Tested in 2010

Fungicide	Manufacturer	Fungicide(s)	Notes
Affirm 11.3WDG	Cleary Chemical	polyoxin-D	A new formulation of polyoxin-D similar to Endorse.
Concert 4.3SC	Syngenta	chlorothalonil + propiconazole	A premix of the active ingredients in Daconil and Banner MAXX
Disarm C	Arysta	chlorothalonil + fluoxastrobin	A premix of Disarm plus chlorothalonil for broad spectrum disease activity
Disarm M	Arysta	fluoxastrobin + myclobutanil	A premix of Disarm plus myclobutanil for broad spectrum disease activity
Headway 1.4ME	Syngenta	azoxystrobin + propiconazole	A premix of the active ingredients in Heritage and Banner MAXX
Interface 2.27SC	Bayer	iprodione + trifloxystrobin	A premix of the active ingredients in 26GT and Compass with StressGard pigment.
Iprodione Pro 2SE	BASF	iprodione	A post-patent formulation of iprodione similar to 26GT.
Primo MAXX 1MEC	Syngenta	trinexapac-ethyl	Not a fungicide, but a plant growth regulator that helps to reduce anthracnose severity.
Renown 5SC	Syngenta	azoxystrobin + chlorothalonil	A premix of the active ingredients in Daconil and Heritage
Reserve 4.8SC	Bayer	chlorothalonil + triticonazole	A premix of the active ingredients in Daconil and Triton FLO with StressGard pigment.
Signature 80WG	Bayer	fosetyl-Al	A phosphonate fungicide with StressGard pigment.
Tartan 2.4SC	Bayer	triadimefon + trifloxystrobin	A premix of the active ingredients in Compass and Bayleton with StressGard pigment.
Torque 3.8SE	ClearyChemical	tebuconazole	A new DMI fungicide.
Tourney 50WG	Valent	metconazole	A new DMI fungicide.
Triton FLO 3.1SC	Bayer	triticonazole	A new DMI fungicide with StressGard pigment..
Velista 50WDG	DuPont	penthiopyrad	A new SDHI fungicide in the same class as Emerald and ProStar with a different disease spectrum.

2010 Summer Anthracnose Trials

Forty fungicide treatments were evaluated for their ability to control anthracnose on annual bluegrass. Plots were inoculated on 1 Jun with anthracnose spores grown in the laboratory. The green was a 'Peterson's Creeping' annual bluegrass, established in 2007 from seed. Turf was mowed 3 days a week at a height of 0.25-in. and irrigated daily according to ET needs. Fungicide applications were initiated on 15 Jun.

In addditon to fungicides registered in California and those in late stages of development, evaluated treatments included a number of experimental compounds from Syngenta and Valent. Eight Bayer Programs and one Syngenta Program was

Disease pressure during the trial was good, with check plots reaching a maximum of 82.5% disease by 10 Aug. Generally, curative applications slowed the rate of disease progress after the first applications but it was not until the 3rd application that significant differences were observed between treatments (27 Jul evaluation date).

Plot Map

EAST

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
40	11	34	2	35	3	36	4	37	6	38	5	39
13	33	12	32	1	31	10	30	9	29	8	28	7
21	14	22	15	23	16	24	17	25	18	26	19	27
40	20	19	20	1	29	21	2	30	22	3	23	31
9	28	8	27	7	33	26	6	32	25	5	24	4
18	10	34	11	35	12	36	13	37	14	38	16	15
24	7	35	8	33	9	32	10	31	11	39	40	17
6	16	5	15	4	14	3	38	2	39	12	1	13
25	17	34	18	x	19	27	20	28	21	29	22	30
x	x	36	40	37	23	26						

Table 2. Fungicide effectiveness vs anthracnose

#	Treatment and rate per 1,000 sq ft	Interval	% Disease									
			15-Jun		29-Jun		13-Jul		27-Jul		10-Aug	
			Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD
1	Check	14	45.0	31.1	45.0	30.0	55.0	25.2	75.0	12.9	82.5	12.6
2	Syngenta EXP1 0.37 fl oz	14	36.3	24.3	32.5	25.0	30.0	25.8	25.0	25.2	20.0	27.1
3	Syngenta EXP1 0.49 fl oz	14	25.0	12.9	12.5	9.6	5.0	10.0	0.0	0.0	0.0	0.0
4	Syngenta EXP2 1.20 fl oz plus Daconil Ultrex 82.5 WG 3.20 oz	14	30.0	16.3	27.5	9.6	15.0	10.0	2.5	5.0	0.0	0.0
5	Syngenta EXP2 1.61 fl oz plus Daconil Ultrez 82.5 WG 3.20 oz	14	26.3	22.1	17.5	17.1	7.5	9.6	0.0	0.0	0.0	0.0
6	Syngenta EXP3 0.47 fl oz plus Daconil Ultrex 82.5 WG 3.20 oz	14	35.0	30.0	27.5	31.0	12.5	15.0	0.0	0.0	0.0	0.0
7	Syngenta EXP3 0.63 fl oz plus Daconil Ulrex 82.5 WG 3.20 oz	14	30.0	29.4	30.0	34.6	10.0	14.1	2.5	5.0	0.0	0.0
8	Syngenta EXP1 0.37 fl oz plus EXP6 1.00 fl oz	14	17.5	9.6	12.5	9.6	8.8	8.5	0.0	0.0	0.0	0.0
9	Syngenta EXP4 0.37 oz	14	31.3	23.9	32.5	12.6	17.5	15.0	0.0	0.0	0.0	0.0
10	Syngenta EXP1 0.37 fl oz plus Daconil Ultrex 82.5 WG 2.40 oz	14	23.8	27.5	12.5	15.0	7.5	9.6	0.0	0.0	0.0	0.0
11	Syngenta EXP1 0.49 fl oz plus Daconil Ultrex 82.5 WG 3.20 oz	14	25.0	23.8	13.8	7.5	11.3	6.3	0.0	0.0	0.0	0.0
12		14	17.5	15.0	20.0	14.1	20.0	14.1	35.0	12.9	22.5	28.7
13		21	13.8	13.8	25.0	26.5	25.0	26.5	27.5	25.0	20.0	27.1
14	Renown 5SC 2.50 fl oz	14	13.8	31.1	25.0	22.5	25.0	23.6	7.5	15.0	20.0	5.0
15	Renown 5SC 4.50 fl oz	21	25.0	26.5	11.3	13.1	7.5	9.6	0.0	0.0	0.0	0.0
16	Syngenta EXP5 0.38 oz	14	20.0	23.1	15.0	17.3	17.5	20.6	15.0	19.1	10.0	14.1
17	Syngenta Summer Program	14	22.5	26.3	25.0	17.3	22.5	17.1	5.0	10.0	0.0	0.0
18	Bayer Program 1	14	35.0	30.0	25.0	20.8	20.0	24.5	0.0	0.0	0.0	0.0
19	Bayer Program 2	14	17.5	22.2	10.0	14.1	10.0	14.1	0.0	0.0	0.0	0.0
20	Bayer Program 3	14	22.5	28.7	17.5	20.6	10.0	11.5	2.5	5.0	0.0	0.0
21	Bayer Program 4	14	27.5	20.6	21.3	23.2	18.8	22.5	0.0	0.0	0.0	0.0
22	Bayer Program 5	14	25.0	23.8	20.0	24.5	12.5	15.0	0.0	0.0	0.0	0.0
23	Bayer Program 6	14	40.0	24.5	27.5	17.1	10.0	8.2	2.5	5.0	0.0	0.0
24	Bayer Program 7	14	35.0	35.1	21.3	21.7	16.3	18.0	15.0	19.1	10.0	14.1

Table 2. Fungicide effectiveness vs anthracnose (continued)

			% Disease									
			15-Jun		29-Jun		13-Jul		27-Jul		10-Aug	
#	Treatment and rate per 1,000 sq ft	Interval	Avg	SD	Avg	SD	Avg	SD	Avg	SD	Avg	SD
25	Bayer Program 8	14	45.0	19.1	22.5	15.0	20.0	11.5	1.3	2.5	0.0	0.0
26	Reserve 4.8 SC 3.20 fl oz	14	37.5	33.0	30.0	29.4	17.5	15.0	7.5	15.0	5.0	10.0
27	Reserve 4.8 SC 3.50 fl oz	14	35.0	30.0	32.5	27.5	25.0	20.8	10.0	11.5	0.0	0.0
28	Reserve 4.8 SC 4.50 fl oz	14	17.5	22.2	12.5	18.9	7.5	9.6	0.0	0.0	0.0	0.0
29	Concert 4.3SC 5.50 fl oz	14	32.5	25.0	27.5	20.6	27.5	20.6	15.0	30.0	17.5	35.0
30	Disarm C 5.90 fl oz	14	32.5	25.0	20.0	18.3	15.0	19.1	2.5	5.0	0.0	0.0
31	Disarm M 1.0 fl oz	14	30.0	24.5	20.0	11.5	17.5	15.0	5.0	10.0	0.0	0.0
32	Tourney 50WG 0.27 oz	14	35.0	26.5	42.5	9.6	22.5	17.1	1.3	2.5	0.0	0.0
33	Tourney 50WG 0.37 oz	14	45.0	25.2	37.5	12.6	30.0	14.1	2.5	5.0	0.0	0.0
34	Valent EXP1 2.50 oz	14	21.3	16.5	16.3	11.1	16.3	11.1	11.3	13.1	5.0	10.0
35	Velista 50WDG 0.30 oz	14	48.8	29.5	36.3	24.3	28.8	18.4	28.8	16.5	25.0	20.8
36	Velista 50WDG 0.50 oz	14	52.5	22.2	45.0	12.9	32.5	9.6	25.0	12.9	20.0	14.1
37	Velista 50WDG 0.70 oz	14	32.5	17.1	28.8	20.2	16.3	16.0	11.3	10.3	2.5	5.0
38	Velista plus Chlorothalonil Premix 2.10 fl oz	14	32.5	37.7	17.5	20.6	12.5	15.0	12.5	15.0	7.5	9.6
39	Torque 3.8SE 0.60 fl oz	14	27.5	32.0	22.5	26.3	25.0	23.8	15.0	17.3	5.0	10.0
40	Torque 3.8SE 0.60 fl oz alt Affirm 11.3WDG 0.90 oz alt Spectro 90WDG 3.00 oz	14	25.0	37.9	22.5	26.3	17.5	28.7	7.5	15.0	2.5	5.0

Syngneta Summer Program is as follows (All applied at 14-day intervals):

#	15-Jun	29-Jun	13-Jul	27-Jul	10-Aug	24-Aug	7-Sep
17	Headway 1.4ME 1.5 fl oz + Primo MAXX 1MEC 0.1 fl oz	Concert 4.3SC 5 fl oz + Primo MAXX 1MEC 0.1 fl oz	Renown 5SC 2.5 fl oz + Primo MAXX 1MEC 0.1 fl oz	Daconil WS 6SC 3.6 fl oz + Medallion 50WP 0.25 oz + Primo MAXX 1MEC 0.1 fl oz	Daconil WS 6SC 3.6 fl oz + Medallion 50WP 0.25 oz + Primo MAXX 1MEC 0.1 fl oz	Renown 5SC 2.5 fl oz + Primo MAXX 1MEC 0.1 fl oz	Concert 4.3SC 5 fl oz + Primo MAXX 1MEC 0.1 fl oz

Bayer Programs are as follows (All applied at 14-day intervals):

#	15-Jun	29-Jun	13-Jul	27-Jul	10-Aug	24-Aug	7-Sep
18	Triton FLO 3.1SC 0.75 fl oz	Triton FLO 3.1SC 0.75 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
19	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
20	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
21	Reserve 4.8 SC 3.6 fl oz	Reserve 4.8 SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
22	Signature 80WG 4.0 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Triton FLO 3.1SC 0.75 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Triton FLO 3.1SC 0.75 fl oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Triton FLO 3.1 SC 0.75 fl oz
23	Reserve 4.8 SC 3.6 fl oz	Reserve 4.8 SC 3.6 fl oz	Insignia 20WG 0.90 oz+ Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Insignia 20WG 0.90 oz+ Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Reserve 4.8SC 3.6 fl oz
24	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz	Signature 80WG 4.0 oz + Daconil Ultrex 82.5WG 3.2 oz
25	Triton FLO 3.1SC 0.75 fl oz	Triton FLO 3.1SC 0.75 fl oz	Insignia 20WG 0.90 oz+ Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Insignia 20WG 0.90 oz+ Daconil Ultrex 82.5WG 3.2 oz	Reserve 4.8SC 3.6 fl oz	Triton FLO 3.1SC 0.75 fl oz

2010 Dollar Spot Trials

Twenty three fungicide treatments were evaluated for their effectiveness in controlling dollar spot (*Sclerotinia homoeocarpa*) on creeping bentgrass at UCR. The effectiveness of 19 of these is presented here. Plots were inoculated mid-May with dollar spot infested grain. The green was a 90/10 mix of creeping bentgrass and annual bluegrass, established in 2005 from sod. Turf was mowed 3 days a week at a height of 0.25-in. and irrigated daily according to ET needs. Fungicide applications were initiated on 8 Jun at 14-, 21- or 28-day intervals. Disease severity (% plot area affected) was evaluated every 14 days.

Disease pressure was good with disease reaching 52% by 20 Jul in untreated plots. Most fungicides gave an immediate response 14 days after the first application (22 Jun); by 6 Jul, almost all fungicide treatments were significantly different from the check plots.

Plot Map

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	1	20	18	4
11	5	14	10	6	15	19	12	16	3	21	2	17
7	13	8	22	9	1	14	10	2	19	9	15	20
13	4	18	11	12	3	6	17	22	7	21	16	8
5	12	4	11	3	16	2	10	1	17	8	18	9
13	15	22	5	14	21	6	20	7	19	23	23	23

Table 3. Control of dollar spot with fungicides

			% Dollar Spot							
			8-Jun		22-Jun		6-Jul		20-Jul	
#	Treatment and rate per 1,000 sq ft	Interval	Avg	SD	Avg	SD	Avg	SD	Avg	SD
1	Check	14	20.0	8.2	27.5	5.0	32.5	9.6	52.5	15.0
2	Interface SC 3.00 fl oz	14	16.3	7.5	0.0	0.0	0.0	0.0	0.0	0.0
3	Interface SC 4.00 fl oz	14	11.3	7.5	12.5	9.6	0.0	0.0	0.0	0.0
4	Interface SC 5.00 fl oz	14	16.3	4.8	2.5	5.0	0.0	0.0	0.0	0.0
5	Iprodione Pro 2 SE 5.00 fl oz	14	15.0	12.2	6.3	9.5	1.3	2.5	0.0	0.0
6	Tartan SC 1.50 fl oz	14	20.0	10.8	10.0	11.5	0.0	0.0	0.0	0.0
7	BASF EXP1 1.93 fl oz	14	17.5	9.6	7.5	5.0	2.5	5.0	0.0	0.0
8	BASF EXP1 2.89 fl oz	14	13.8	11.1	7.5	9.6	0.0	0.0	0.0	0.0
9	BASF EXP2 0.16 fl oz	14	16.3	11.1	5.0	5.8	1.3	2.5	0.0	0.0
10	BASF EXP2 0.16 fl oz	21	20.0	11.5	5.0	5.8	0.0	0.0	0.0	0.0
11	BASF EXP2 0.21 fl oz	21	21.3	6.3	7.5	9.6	1.3	2.5	0.0	0.0
12	BASF EXP2 0.21 fl oz	28	12.5	5.0	5.0	10.0	0.0	0.0	0.0	0.0
13	BASF EXP2 0.34 fl oz	21	5.0	4.1	7.5	9.6	2.5	2.9	0.0	0.0
14	BASF EXP2 0.46 fl oz	28	18.8	7.1	7.5	5.8	3.8	0.0	0.0	0.0
15	Velista 50WDG 0.30 oz	14	18.8	6.3	7.5	9.6	3.8	4.8	2.5	5.0
16	Velista 50WDG 0.50 oz	14	13.8	6.3	5.0	5.8	2.5	2.9	0.0	0.0
17	Valent EXP2 0.40 fl oz	14	18.8	11.1	6.3	9.5	2.5	5.0	0.0	0.0
18	Valent EXP2 0.50 fl oz	14	17.5	2.9	10.0	8.2	5.0	4.1	0.0	0.0
19	Valent EXP2 0.60 fl oz	14	17.5	6.5	12.5	9.6	1.3	2.5	0.0	0.0
20	Valent EXP2 0.70 fl oz	14	17.5	5.0	5.0	5.8	1.3	2.5	0.0	0.0
21	Tourney 50 WG 0.37 oz	14	11.3	10.3	17.5	5.0	11.3	5.0	3.8	7.5
22	Tourney 50 WG 0.37 oz plus Valent EXP2 0.50 fl oz	14	20.0	7.1	7.5	9.6	3.8	4.8	0.0	0.0
23	Torque 3.8SC 0.60 fl oz alt Spectro 90WDG 4.00 fl oz	14	25.0	10.0	25.0	10.0	16.3	7.5	1.3	2.5

Biology and Potential Hosts of a Novel Root-Knot Nematode in Southern California Turf

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Plant parasitic nematodes are tiny roundworms that typically live in soil or in plant tissues. They feed on living plant cells and cause plant diseases that are often difficult to identify or mistaken for other biotic or abiotic causes. Major problems with plant parasitic nematodes in California turf grasses typically have been confined to relatively few golf courses in the Bay area and in the Coachella Valley with either the stem gall nematode, *Anguina pacificae* or the Sting nematode, *Belonolaimus longicaudatus*, respectively. The recent discovery of high population densities of root-knot nematodes (*Meloidogyne* spp.) and their devastating symptoms in bentgrass putting greens of two Coachella Valley golf courses have raised new concerns for golf course managers.

We are currently investigating the identity of the root-knot nematode species with morphological keys and molecular tools. While it is certainly not one of the widely distributed root-knot nematode species that occur in agronomic fields of this region, identification has proven so far quite difficult. Consequently we are uncertain if it is a new species, a recent strain introduction with limited distribution, or an established pathogen flourishing under particularly disease-conducive conditions. If it is a new species or an exotic species, this may trigger regulatory actions.

Of particular interest is the host range of this root-knot nematode as selection of appropriate resistant or tolerant turfgrass varieties may provide an opportunity to mitigate the problem. Cool-season grasses, such as bentgrass, are more prone to show root-knot nematode disease symptoms than warm season grasses when parasitism of the roots adds another burden to the overall stress caused by the extreme environmental conditions in California's inland deserts. Additionally, microorganisms that take advantage of a root-knot nematode-diseased root system might further enhance root disease and decay.

Galling of bentgrass roots caused by root-knot nematodes

Carbon Fixation and Water Use Efficiency of Warm and Cool-Season Turfgrasses

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Turfgrass is a key component of urban landscapes. In Southern California, recent estimates have suggested 41% of urbanized lands are covered with turfgrass, and throughout the United States, turfgrass is the predominant irrigated crop species. Climate change resulting in increasing temperature and drought coupled with diminishing water resources offer the greatest potential for severely impacting turfgrass and landscape use. Understanding that carbon sequestration (and denitrification) are dependent upon inputs of water and nutrients, our research strives to determine ways in which water and nutrient use can be minimized while at the same time maximizing carbon sequestration of turfgrasses and groundcovers.

As a means of launching a long-term research program in turfgrass ecology, commonly used cultivars of five cool-season (C3) and eleven warm-season (C4) turfgrass species and cultivars in mono- or polystands were monitored for 12 months beginning in March 2009 through March 2010. Whole plot CO_2 and H_2O exchange was measured every two weeks under non-limiting conditions for irrigation, fertility, and mowing height. Gross ecosystem photosynthesis (GEP), or the amount of carbon dioxide exchanged between the turf and the atmosphere (μmole CO_2-C/m^2/sec) was evaluated. Water use efficiency (WUE), or the amount of CO_2 fixated by the turf per unit of water lost by evapotranspiration (ET) was also determined for each plot as GEP/ET. These data will serve as a baseline for future experiments.

2009-2010 Research Objectives
Determine association between water use efficiency and carbon dynamics among different turfgrass species and cultivars under non-limiting cultural practices.
Expand knowledge base about ecological role of turf in the landscape.

Location: UCR Turfgrass Research Facility

Soil: Hanford fine sandy loam

Mowing Heights: 2.5'' for cool-season grasses except fine fescues (no mow), 2.0'' warm-season grasses, except St. Augustinegrass and buffalograss (3'')

Experimental Design: Randomized complete block with 3 replications

Plot Size: 6' by 10'

Establishment: Sod and plugs were established in July and August 2008

Fertility: 1 lb N/1000 ft2 at planting; 0.5 lb N/1000 ft2/wk during establishment and approximately once/month thereafter

Irrigation Regimes: Once it was established, turfgrasses were subjected to warm-season irrigation regimes (approximately 60% ETo/DU). Supplemental irrigation is applied to the cool-season turf as necessary by hand watering.

Data Collection: A LI-COR 7500 open path infrared carbon dioxide and water analyzer was used to measure carbon flux and evapotranspiration (ET) within each plot on a bi-weekly basis throughout the experiment (March 2009 to April 2010). The LI-COR was attached to a tripod and placed on each turfgrass plot. A transparent chamber was used to cover the LI-COR during gas exchange measurements. Attached to the tri-pod was a small fan that helped mix the air within the chamber. Data were logged on a computer using the LI-COR software.

For each turfgrass plot, two measurements were taken. The first is net ecosystem exchange (NEE), which is gas exchange during photosynthesis and respiration. Placing the tripod on the center of the plot and covering it with the transparent chamber logged carbon dioxide and evapotranspiration measurements logged on the computer for approximately one minute. After the measurement was taken, the chamber was removed and vented. The second measurement was ecosystem respiration. The chamber was placed back over the tri-pod, which was covered by a shade cloth, allowing no light to penetrate the chamber. Data were logged for another minute while the chamber was covered. Additional measurements taken were canopy temperature using an infrared thermometer, soil temperature using a fluke thermometer with probe, as well as soil moisture content using a Hydrosense™. Turfgrass samples were collected in each plot and analyzed for leaf area, carbon and nitrogen isotope analyses. Measurements of NEE and respiration per plot determined gross ecosystem productivity (GEP) or how much carbon dioxide is being exchanged between the plant and the atmosphere/m^2/second. Water use efficiency or the amount of carbon dioxide taken up by a plant per unit of water lost was also determined for each plot using the LI-COR. A plant with high WUE takes up more carbon dioxide and transpires less water, which helps increase its ability to withstand drought.

Results:

- ✓ Carbon fixation potential and water use efficiency of all species/cultivars during one year are presented in Figures 1 and 2, respectively.
- ✓ The warm-season species Tifgreen 328 bermudagrass demonstrated the greatest carbon fixation potential under the parameters of this study (Fig. 1). Of the cool-season species, the highest carbon fixation potential was detected in Bayside Blend (80% Kentucky bluegrass/20% perennial ryegrass). It appeared that shoot density might play an important role in carbon fixation potential of turfgrasses.
- ✓ Data from Fig. 2 substantiates the greater water use efficiency (WUE) of warm-season turfgrasses compared to cool-season turfgrasses.
- ✓ Highest WUE was determined for common St. Augustinegrass for the warm-season turfgrass species and, once again, Bayside Blend Kentucky bluegrass and perennial ryegrass for the cool-season turf.
- ✓ These data are "preliminary" in the sense of statistical evaluation and interpretation and thus should not be used for demonstrating superiority of one species/cultivar over another.

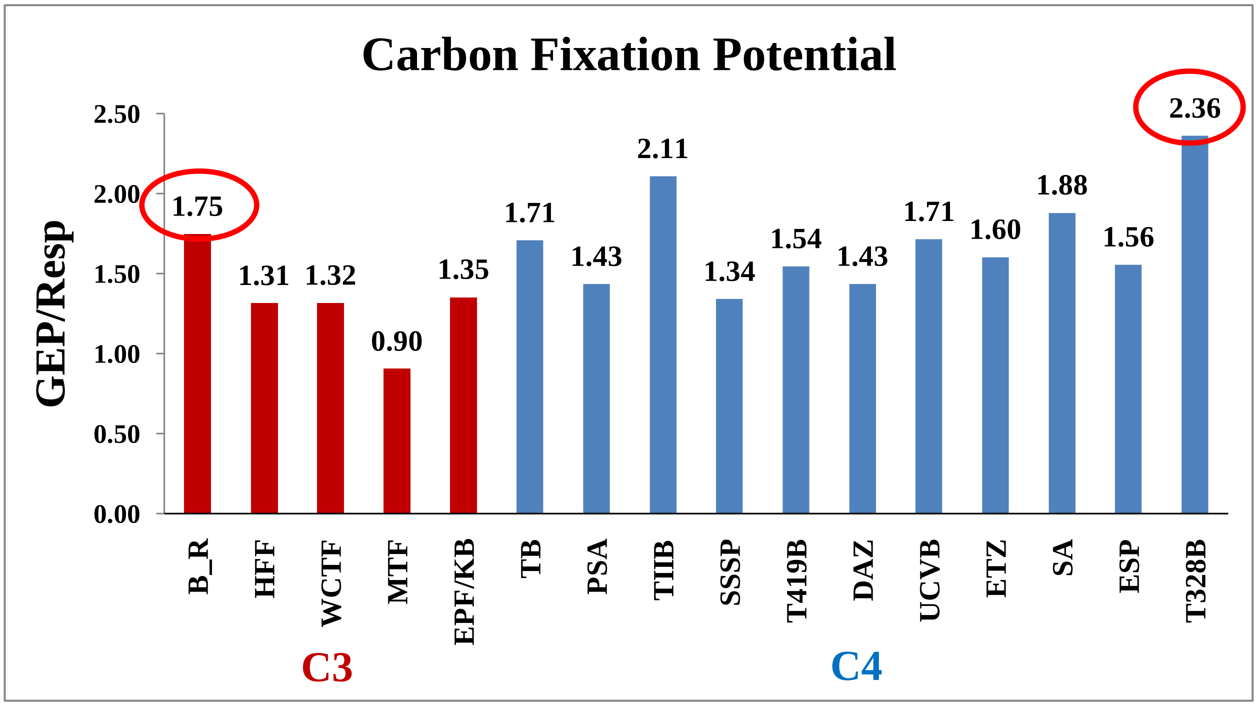

Figure 1: Carbon fixation potential (GEP/R) of all cultivars during March 2009-April 2010. Values greater than 1 indicate a cultivar that acts as a carbon "sink" storing carbon dioxide. Values less than 1 indicate a cultivar that acts as a carbon "source" releasing carbon dioxide. B_R = Bayside Blend (80%KB/20%PR); HFF=Hillside Fine Fescue (Strong/Slender/Chewings); WCTF = West Coaster Tall Fescue; MTF= Medallion Tall Fescue; EPF/KB=Elite Plus (TF/KB); TB=Tifsport Hybrid Bermuda; PSA= Palmetto St. Aug; TIIB = Tifway II HB; SSSP=Sea Spry Seashore Paspalum; T419=Tifway 419 HB; DAZ=De Anza Zoysia; UCVB=UC Verde Buffalo; ETZ= El Toro Zoysia; SA=St. Aug; ESP= Excalibre Seashore Paspalum; T328B=Tifgreen 328 HB.

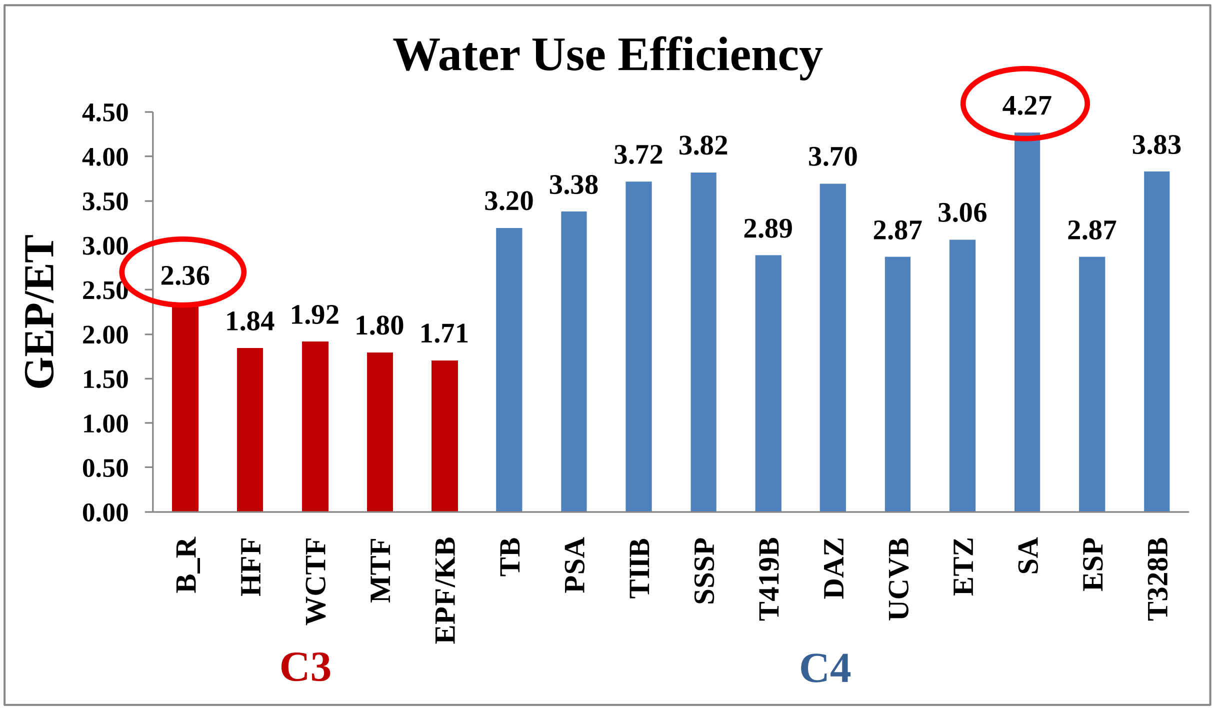

Figure 2: Water use efficiency (GEP/ET) of all cultivars during March 2009-April 2010. Values greater than 1 indicate a cultivar that is water use efficient. Values less than 1 indicate a cultivar that is not water use efficient. B_R = Bayside Blend (80%KB/20%PR); HFF=Hillside Fine Fescue (Strong/Slender/Chewings); WCTF = West Coaster Tall Fescue; MTF= Medallion Tall Fescue; EPF/KB=Elite Plus (TF/KB); TB=Tifsport Hybrid Bermuda; PSA= Palmetto St. Aug; TIIB=Tifway II HB; SSSP=Sea Spry Seashore Paspalum; T419=Tifway 419 HB; DAZ=De Anza Zoysia; UCVB=UC Verde Buffalo; ETZ= El Toro Zoysia; SA=St. Aug; ESP= Excalibre Seashore Paspalum; T328B=Tifgreen 328 HB.

2010-11 Plot Plan

North

4	12	3	14	7
17	2	9	5	16
19	8	20	18	15
10	1	13	11	6
10	20	8	12	5
19	3	17	1	14
9	15	11	16	6
18	2	4	7	13
20	19	18	17	16
15	14	13	12	11
10	9	8	7	6
5	4	3	2	1

Treatments:

1. Tifsport Bermudagrass	**11. West Coaster Tall Fescue**
2. Chaparral Perennial Ryegrass	**12. UC Verde Buffalograss**
3. Palmetto St. Augustinegrass	**13. El Toro Zoysiagrass**
4. Whittet Kikuyugrass	**14. A-4 Creeping Bentgrass**
5. Sea Spray Seashore Paspalum	**15. Common St. Augustinegrass**
6. Tifway 419 Bermudagrass	**16. Tifdwarf Bermuda**
7. De Anza Zoysiagrass	**17. Excalibre Seashore Paspalum**
8. Tifgreen 328 Bermudagrass	**18. Medallion Tall Fescue**
9. Bayside Blend Kentucky Bluegrass/Perennial Ryegrass	**19. Kurapia (Lippia nodiflora L.)**
10. Hillside Fine Fescue	**20. Elite Plus Tall Fescue/Kentucky Bluegrass**

Commercial Variety/Species	Variety/Composition	Origin/Producer	Mowing Height
Hillside Fine Fescue	„Florentine GT' Strong Creeping Red Fescue, „Seabreeze GT' Slender Creeping Red Fescue, and „Tiffany' Chewings Fescue.	Sod from West Coast Turf	Mow once/yr
Chaparral Perennial Ryegrass	Unstated varietal blend	Sod from West Coast Turf	1.25" reel
Creeping Bentgrass	A-4	Sod from West Coast Turf	0.75" reel
Bayside Blend Kentucky Bluegrass and Perennial Ryegrass	Unstated varietal mixture; 80% KB/20% PR	Sod from West Coast Turf	2.25" rotary
West Coaster Tall Fescue	Unstated varietal blend	Sod from West Coast Turf	2.25" rotary
Medallion Tall Fescue	Unstated varietal blend	Sod from Pacific Sod	2.25" rotary
Elite Plus Tall Fescue and Kentucky Bluegrass	Unstated varietal mixture	Sod from A-G Sod	2.25" rotary
Tifway 419 Hybrid Bermuda	Tifway 419	Sod from West Coast Turf	1.25" reel
Tifsport Hybrid Bermuda	Tifsport	Sod from West Coast Turf	1.25" reel
Tifdwarf Hybrid Bermuda	Tifdwarf	Sod from West Coast Turf	0.75" reel
Tifgreen 328 Hybrid Bermuda	Tifgreen 328	Sod from A-G Sod	0.75" reel
El Toro Zoysiagrass	El Toro	Sod from Southland Sod	1.25" reel
DeAnza Zoysiagrass	DeAnza	Sod from West Coast Turf	1.25" reel
Palmetto St. Augustinegrass	Palmetto	Sod from West Coast Turf	2.25" rotary
Common St. Augustinegrass	Variety unknown	Sod from Southland Sod	2.25" rotary
UC Verde Buffalograss	UC Verde	Plugs from Florasource	2.25" rotary
Excalibre Seashore Paspalum	Excalibre	Sod from Pacific Sod	1.25" reel
Sea Spray Seashore Paspalum	Sea Spray	Sod from West Coast Turf	1.25" reel
Kurapia	*Lippia nodiflora* L.	Green Geo Co., Japan	No mowing
Kikuyugrass	Whittet	Sod from Emerald Sod	0.75" reel

2011 Research Objectives

1. Determine association between water use efficiency and carbon dynamics among different turfgrass systems and Kurapia.
2. Determine how turfgrass species/cultivars affect the magnitude, seasonal patterns, and annual emissions of N_2O.
3. Examine aforementioned objectives under reduced water and, in the future, reduced nutrient and light conditions.

Building upon our preliminary research in 2009-2010, beginning in 2011 we will commence bi-weekly measurements on the following species and cultivars under deficit irrigation according to physiology (C3 vs. C4). Baseline measurements of gas exchange and soil properties will be taken under non-limiting irrigation. Then, warm-season turfgrasses will be hand watered to replace 50% ETo (based on CIMIS data from previous week) and cool-season turfgrasses will receive 70% ETo. Experimental design is a randomized complete block with three replications of 6-ft by 10-ft plots. All measurements will continue through 2011, and into 2012 if necessary. Nitrogen fertility will be applied according the "average" requirements of the warm-season turfgrasses and the same for the cool-season turfgrasses. This research will provide improved understanding of how turfgrass functions with ever increasing water restrictions, and will use measurement tools and new models recently developed to identify pulse dynamics in turfgrass.

Since the research area where the plots reside already contains scaffolding for attachment of shade cloth (from previous shade research), future research on this experimental area will involve similar measurements under reduced light conditions. Evaluation of gas exchange and WUE under varying soil fertility levels is another long-term goal of our research.

In conjunction with the aforementioned study, we will also estimate photosynthesis and water use efficiencies in commonly managed turf landscapes around Riverside, CA. This analysis will survey 10 distinct owner plots of golf course, institutional, urban park, and residential in both the winter and summer of 2010. This analysis will provide information on ranges of turf growth rates compared to expectations from our field plot research.

In subsequent years, we will conduct a similar survey study, however here we will survey turf along the strong climate gradient associated with the coastal to inland transect in Southern California. Here we will pick representative turf from the Pacific Ocean through the Coachella Valley for surveys. This research will extend our research database by examining the effect of climate on turfgrass function.

To examine the long-term consequences of turfgrass management, we will estimate carbon pools in the turfgrass in all aforementioned studies. We have extensive experience conducting carbon pool analyses in both wild land and urban environments and will use standard methods for calculating individual pools and expected turnover times.

Acknowledgments: Special thanks to West Coast Turf, Southland Sod Farms, Pacific Sod, A-G Sod Farms, Emerald Sod Farms, Florasource, Ltd, Green Produce Co., Ltd., Intelligent Choice, Inc. for donating the plant materials for this study.

Emerging Contaminant Issues in Recycled Water for Turf and Landscapes

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The scarcity of water, worsened by urbanization and/or climate changes, places an enormous pressure on water supply in arid and semi-arid regions. This scarcity, when combined with the need for disposing of large volumes of treated wastewater (also intensified by urbanization), makes the reuse of municipal treated wastewater an economically and environmentally critical option. At present, the majority of treated wastewater flows into surface streams or oceans without any economic or environmental benefit.

The reuse of treated wastewater, or “recycled water”, is expected to play an increasingly important part in American Southwest. California presently recycles about 650,000 acre-feet of water per year. Future reuse activity in California is estimated to reach 2 million acre-feet per year by 2020 and 3 million acre-feet per year by 2030. The use of recycled water may take several forms, including surface spreading and subsurface injection to recharge groundwater storage, and irrigation of landscapes, golf courses and agricultural crops. Currently 18% of the reuse in California is for landscape and golf course irrigation. Many economical, technological, and societal factors contribute to the slow adoption of recycled water for irrigation. In addition to the need for managing salinity and nutrients, a new limiting factor is the widespread public perception and concern about so-called “chemicals of emerging concern” (CECs) in the recycled water. CECs encompass many classes of chemicals, including especially pharmaceuticals and personal care products (PPCPs).

Human PPCPs contains thousands of active ingredients within tens of thousands of products. The occurrence and effects of PPCPs in the environment has attracted worldwide attention in the research community and hence there is a fairly good understanding about the levels of PPCPs in recycled water. Many pharmaceuticals used in human medical care are not completely absorbed in the human body, and are instead excreted, often unchanged from their original forms. On the other hand, current wastewater treatment plants were not specifically designed to remove PPCPs from the waste stream. Consequently, many PPCPs are found to be present in recycled water at concentrations from ng/L (ppt) to low µg/L (ppb). Therefore, when recycled water is used for irrigation, the plant-soil system is adminstered with PPCPs at trace levels. For golf courses and lawns, a question begging for answers is: Would the PPCPs contaminate groundwater when recycled water is used for irrigation?

Researchers at UC Riverside concluded a study last summer using the lysimetered plots at UCR’s Turf Research Facility. Sandy loam and loamy sand plots were irrigated solely with recycled water for 6 months at 100% or 130% ETo. The leachate was collected and analyzed for the appearance of 15 PPCPs. Up to 5 compounds were detected in the leachate. After correcting for the leaching fraction, only less than 5% of the input PPCPs traveled below the 90-cm depth and accumulated in the leachate. These results suggested that turfgrass acted as an effective “biofilter” and efficiently removed most of PPCPs entering the system.

Title:	**Preemergence Control of Summer Annual Weeds in Bermudagrass Turf**
Investigators:	Jim Baird, Alea Miehls, Brent Barnes and Vanessa Ferrel Department of Botany and Plant Sciences University of California, Riverside
Cooperators:	Glenn Feenstra and Dennis Borene, Crop Production Services Todd Burkdoll, BASF Gary Custis, PBI Gordon Mike Lees, Dow AgroSciences Todd Mayhew, Valent Dean Mosdell, Syngenta Chris Olsen, Bayer Environmental Science
Objectives:	Evaluate new and existing herbicides and formulations for preemergence control of summer annual weeds in bermudagrass turf.
Location:	UCR Turfgrass Research Facility, Riverside CA
Soil:	Hanford fine sandy loam
Experimental Design:	Randomized complete block; three replications
Plot Size:	6 ft x 10 ft
Species/Cultivars:	Tifgreen 328 Bermudagrass
Mowing Height:	1.25 inches; 2 days/wk
Irrigation:	60% ETo (historical from previous week)/DU
Cultivation:	Verticutting twice annually
Sprayer:	Bicycle 8003VS nozzles 19-inch spacing 45 psi 1.6 mph 60 GPA
Application Dates:	A = February 25, 2010 B = April 23, 2010 C = September 2010
Data Collected:	Weed cover by species (0-100%) based on initial cover in each plot (if present); Bermudagrass quality (1-9, 1 = dead; 6 = minimally acceptable).

Table 1. Weed cover (0-100%) on August 24, 2010 following spring application of herbicides. Riverside, CA.

Trt	Product(s)	Rate(s)	Timing	Crab grass	Wild Parsley	Spurge	Cudweed
1	Barricade 65WG	1 lb/A	A	1	1	7	1
2	Barricade 65WG	1 lb/A	AB	0	2	2	4
3	Barricade 65 WG + Tenacity	0.77 lb/A 5 oz/A	AB AB	0	1	2	0
4	Pendulum Aqua Cap	64 oz/A	A	1	1	7	2
5	Pendulum Aqua Cap	64 oz/A	AB	0	4	6	1
6	Tower	32 oz/A	A	6	3	17	1
7	Tower	32 oz/A	AB	2	1	7	0
8	Pendulum Aqua Cap + Tower	64 oz/A 32 oz/A	AB AB	0	1	5	3
9	Ronstar G	4.5lb/1000ft^2	A	5	2	7	1
10	Ronstar G	2.5lb/1000ft^2 2.0lb/1000ft^2	A B	6	6	8	3
11	Specticle 20WP	2.5 oz/A	AC	2	3	7	1
12	Specticle 20WP	3.75 oz/A 2.5 oz/A	A C	1	8	2	1
13	Specticle 20WP	3.75 oz/A 1.2 oz/A	A C	1	6	2	1
14	Specticle 20WP	5 oz/A	A	0	22	3	3
15	Barricade 65WG Specticle 20 WP	1.15 lb/A 2.5 oz/A	A C	0	17	3	4
16	Dimension 2EW	0.38 lb/A	A	0	0	8	1
17	Dimension 2EW	0.25 lb/A	AB	0	3	7	1
18	Gallery 75DF	0.66 lb/A	A	5	3	1	0
19	Dimension 2EW + Gallery 75DF Dimension 2EW	0.25 lb/A 0.66 lb/A 0.25 lb/A	A A B	0	5	5	1
20	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.18 lb/A 0.22 lb/A 0.25 lb/A 0.44 lb/A	A A B B	1	2	6	0
21	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.18 lb/A 0.33 lb/A 0.25 lb/A 0.33 lb/A	A A B B	1	6	7	1
22	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.18 lb/A 0.44 lb/A 0.25 lb/A 0.22 lb/A	A A B B	0	2	10	1

Table 1. (cont.)

Trt	Product(s)	Rate(s)	Timing	Crab grass	Wild Parsley	Spurge	Cudweed
23	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.25 lb/A 0.22 lb/A 0.18 lb/A 0.44 lb/A	A A B B	0	1	6	1
24	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.25 lb/A 0.33 lb/A 0.18 lb/A 0.33 lb/A	A A B B	1	0	4	2
25	Dimension 2EW + Gallery 75DF Dimension 2EW + Gallery 75DF	0.25 lb/A 0.44 lb/A 0.18 lb/A 0.22 lb/A	A A B B	1	1	7	1
26	Gallery 75DF	0.44 lb/A 0.22 lb/A	A B	6	5	3	1
27	Bensumec 4LF	12.5 lb/A	A	1	1	7	1
28	Bensumec 4LF	10 lb/A	AB	0	6	7	1
29	Dimension 270G	4.2lb/1000ft^2	A	1	7	4	1
30	Untreated Control	--	--	10	7	5	1
	LSD (0.05)			5	11	NS	2

Results:

- ✓ There was no phytotoxicity observed following application of herbicide treatments.
- ✓ Summer annual weed pressure was lighter and more variable than desired; subsequently it was difficult to substantive conclusions about herbicide efficacy.
- ✓ In general, better control was achieved with tank-mixes and sequential applications using higher rate(s) first.
- ✓ Specticle provided postemergence *Poa annua* control that persisted from winter and good control of summer annuals with a single application. However, it appeared to be weaker on control of wild parsley.
- ✓ Barricade and Tenacity, Pendulum and Tower, and Dimension and Gallery all appeared to provide effective broad-spectrum control of most all summer annual weeds.

PLOT PLAN - Preemergence Summer Annual Weed Control Study

NORTH

1	16	26	16	5	19
2	17	3	9	12	23
3	18	30	8	18	25
4	19	1	25	22	30
5	20	10	29	13	27
6	21	21	20	4	8
7	22	17	24	20	10
8	23	4	5	2	24
9	24	27	23	14	16
10	25	2	13	29	6
11	26	11	15	28	7
12	27	19	6	3	1
13	28	7	12	15	9
14	29	28	22	17	11
15	30	18	14	26	21

Save The Date

For Future Turfgrass & Landscape Research Field Day

Thursday, September 15, 2011

Thursday, September 13, 2012

See You Then!