What's New?

Research Impacting Florida's Green Industry

J. Bryan Unruh, Ph.D.

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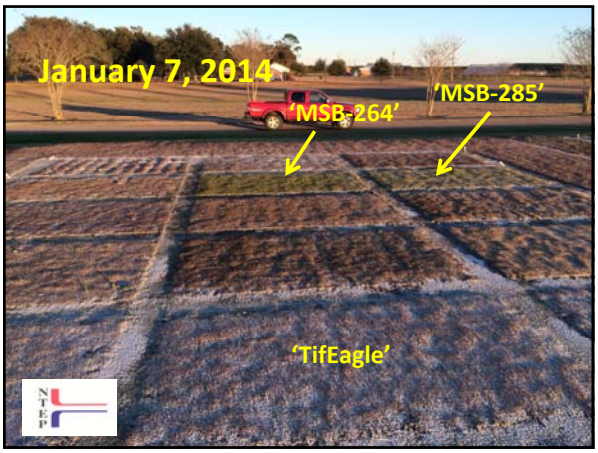
Turfgrass Science

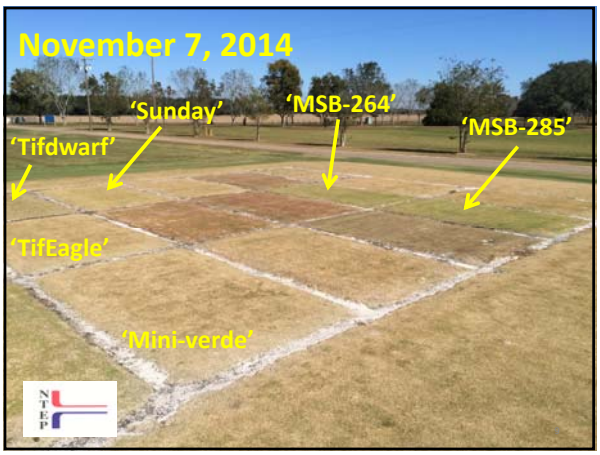
Cultivar Development and Evaluation


Bahiagrass Development
Funded by:
USGA


January 7, 2014
'MSB-264'
'MSB-285'
'TifEagle'


Bermudagrass Putting Green


2013 NTEP Bermudagrass Trial


November 7, 2014
'Sunday'
'MSB-264'
'MSB-285'
'Tifdwarf'
'TifEagle'
'Mini-verde'


2013 SCRI Bermudagrass Trial

A better phrase may be: *Drought Response*

- Grasses undergo many changes in *response* to drought.
  - Many of these responses go unnoticed but have a profound effect on the plant's ability to withstand drought.
    - Some are often very difficult to quantify.
  - Others are readily observed and easily quantified.

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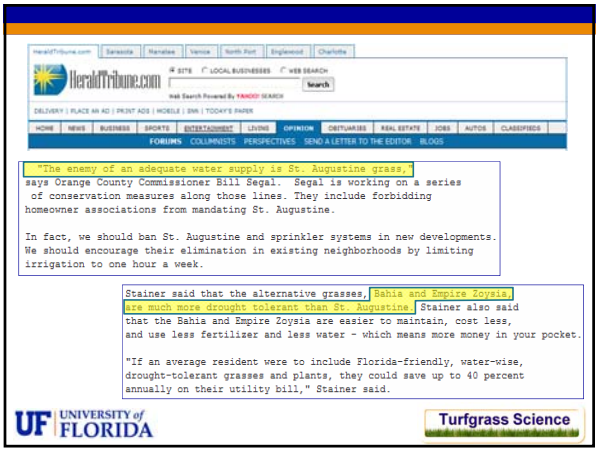

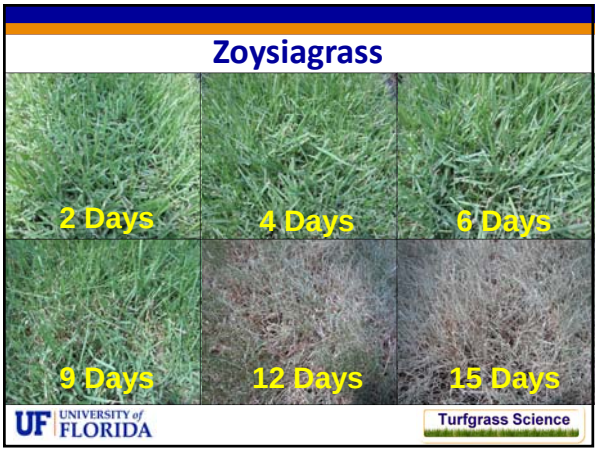

Drought Tolerance vs. Drought Resistance

- Drought Resistance = the ability of a plant to survive prolonged drought stress through various mechanisms:
  - Drought Tolerance
    - Escape
    - Hardiness
  - Drought Avoidance
    - Limiting factors influencing soil water uptake
      - deep rooting
      - root viability
      - resistance to soil stresses
    - Limiting evapotranspiration (ET)

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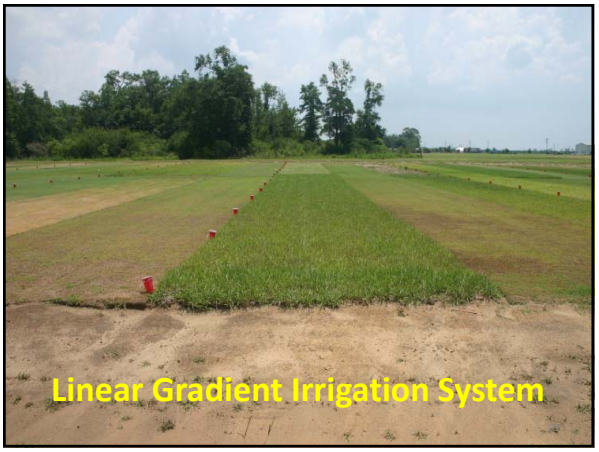
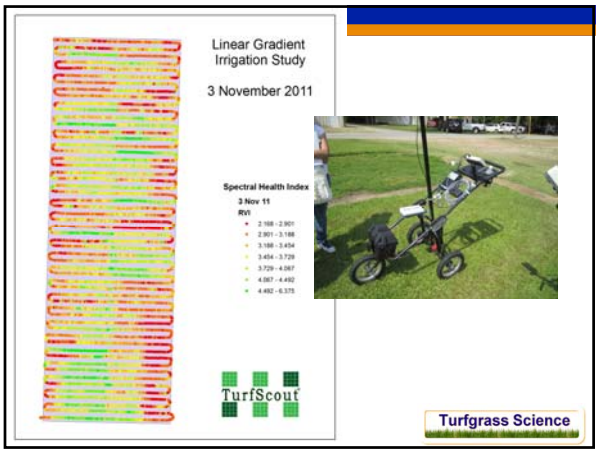
Linear Gradient Irrigation System
22


Linear Gradient Irrigation System


Linear Gradient Irrigation System
Kevin Kenworthy's Breeding Material



Plant Genetics and Genomics to Improve Drought and Salinity Tolerance in Turfgrass Species for the Southern United States

Texas AgriLife Research, Texas A&M System
University of Florida
University of Georgia
North Carolina State University
Oklahoma State University

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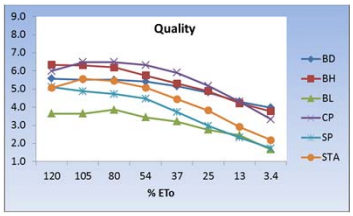
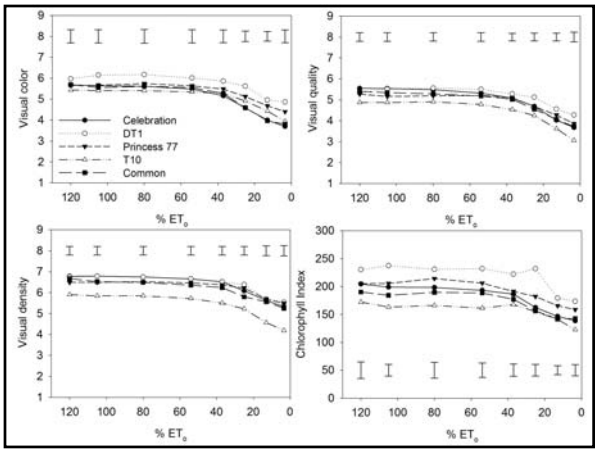
Turfgrass Science

Species comparison

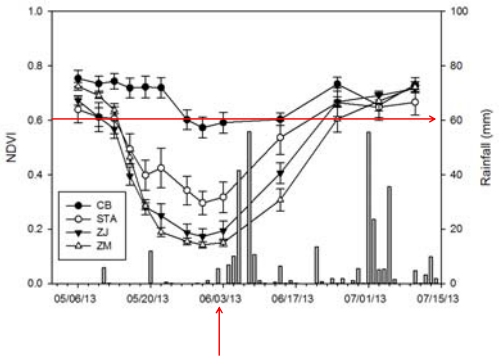


	120%	105%	80%	54%	37%	25%	13%	3%
BD†	5.6 b	5.5 b	5.5 b	5.4 b	5.2 b	4.8 a	4.3 a	4.0 a
BH	6.3 a	6.3 a	6.2 a	5.7 ab	5.3 ab	4.9 a	4.2 a	3.8 ab
BL	3.6 d	3.6 d	3.9 d	3.4 e	3.2 d	2.8 c	2.4 bc	1.7 c
CP	6.0 a	6.5 a	6.5 a	6.3 a	5.9 a	5.2 a	4.3 a	3.3 b
SP	5.1 c	4.9 c	4.7 c	4.5 d	3.7 d	3.0 c	2.3 c	1.7 c
STA	5.1 c	5.6 b	5.4 b	5.1 c	4.4 c	3.8 b	2.9 b	2.2 c

†BD: bermudagrass; BH: bahiagrass; BL: bufflograss; CP: centipedegrass; SP: seashore paspalum; STA: St. Augustinegrass



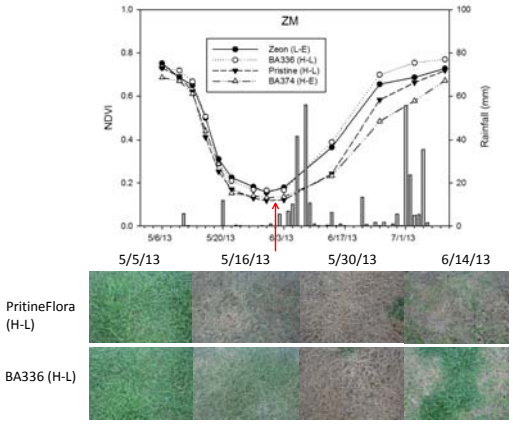
Species comparison



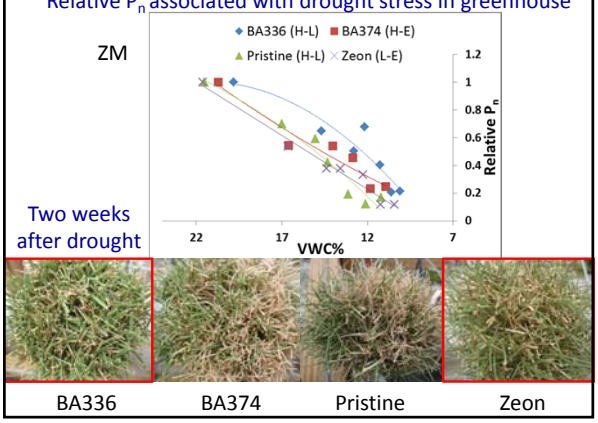
After 30 days of drought

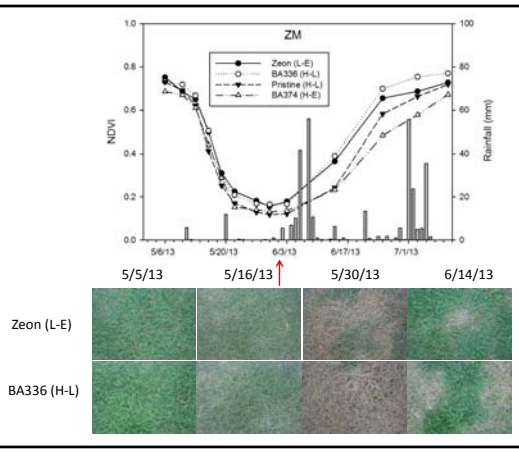
Above-ground

- Physiological measurements
  - Photosynthetic rate (P_n) (Li-6200)
    - Stomatal closure (early stage of drought stress)
    - functionality limitation (later stage of drought stress and recovery)
  - Canopy transpiration rate (Li-6200)

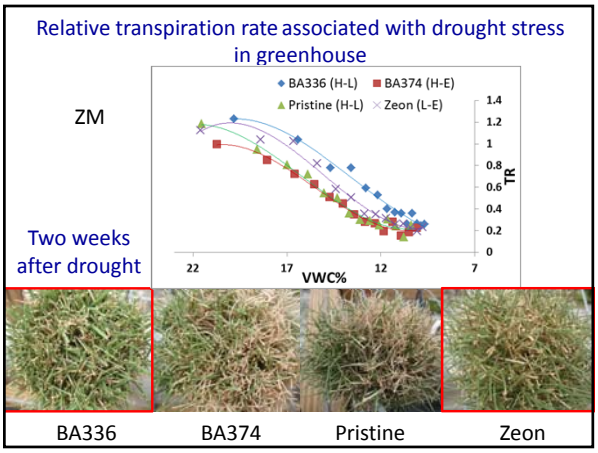


Relative P_n associated with drought stress in greenhouse



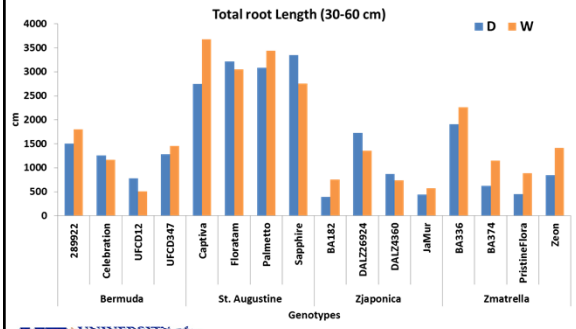


Relative transpiration rate associated with drought stress in greenhouse



Greenhouse study

Total root Length (Genotypes)



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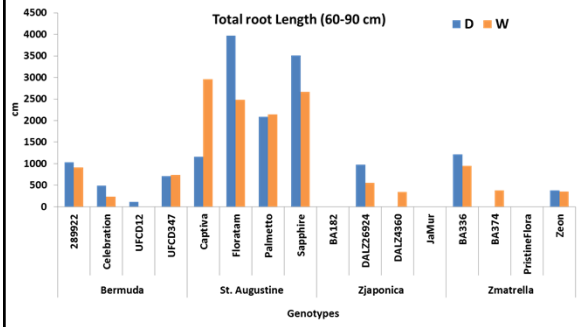
Greenhouse Root Study (Dry tubes)

Total root Length (Genotypes)



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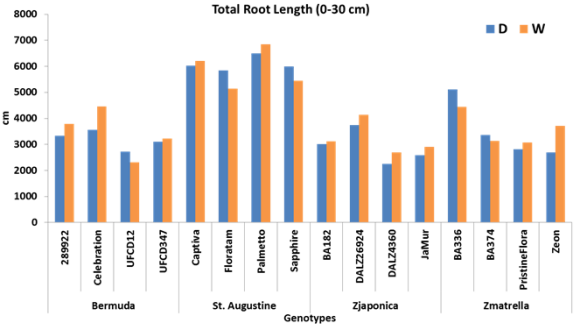
Total root Length (Genotypes)



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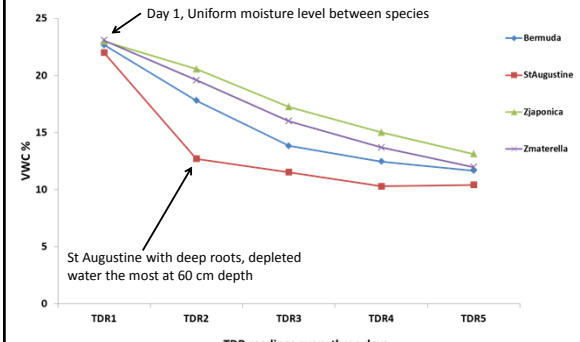
Moisture Reading TDR at 60 cm (Dry tubes)



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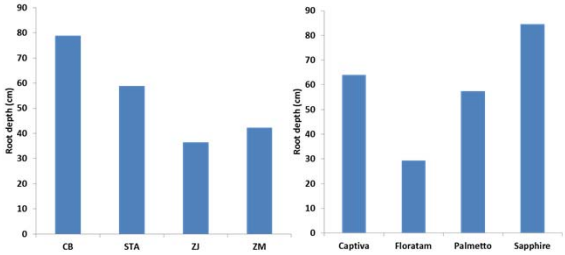
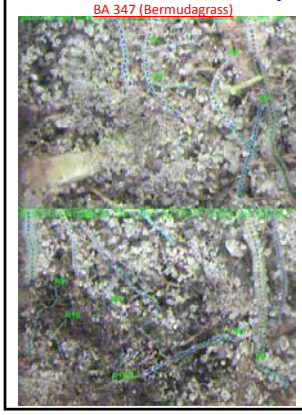
Field Study Root Depth

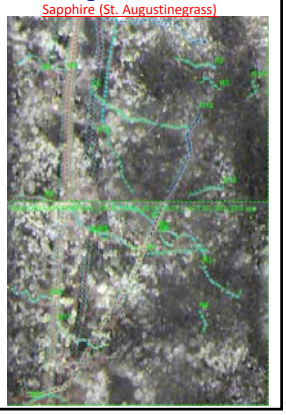


Field Study Root Images

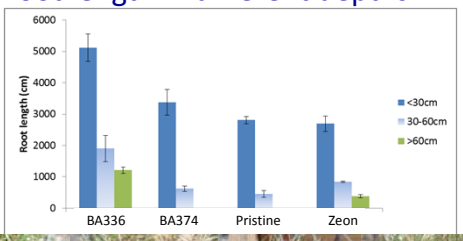
BA 347 (Bermudagrass)



Sapphire (St. Augustinegrass)



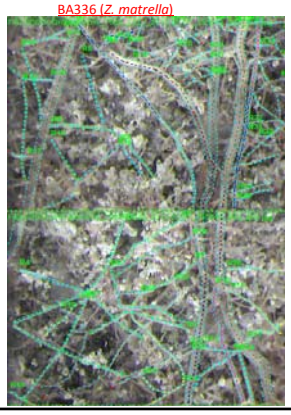
Root length in different depths



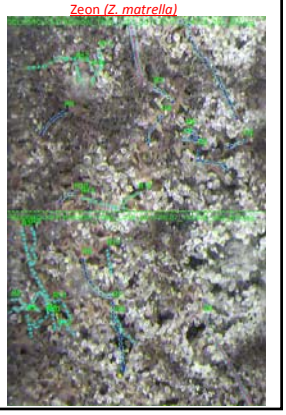
BA336 BA374 Pristine Zeon

Field Study Root Images

BA336 (*Z. matrella*)



Zeon (*Z. matrella*)

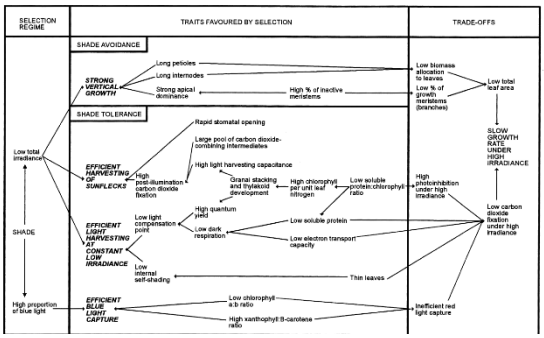


BA336 vs. Zeon

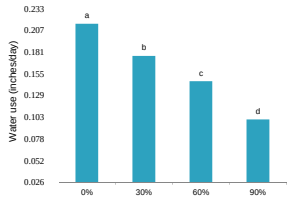
- High transpiration
- High photosynthetic rate
- Extensive and deep root system
- Drought avoidance
- Advantageous under short period of drought

- low transpiration
- low photosynthetic rate
- Moderate root system
- Drought tolerance
- Advantageous under long period of drought

Shade Avoidance vs. Shade Tolerance



Henry and Aarssen 1997



- 30% Shade → 19.8% reduction in water use
- 60% Shade → 35.8% reduction in water use
- 90% Shade → 60.5% reduction in water use

Why DLI?

- Greenhouse light transmittance
  - 30-75% (Both and Faust, 2004)
- Ease of measurement
- Changes in light intensity
  - Seasonal
  - Regional
  - Latitudinal

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DLI Requirements – Summer Avgs.

Turfgrass Cultivar	DLI requirement (mol m^{-2} d^{-1})
Tifway bermudagrass	22.4
Celebration bermudagrass	19.5
TifGrand hybrid bermudagrass	18.6
Argentine bahiagrass	15.3
Tifblair centipedegrass	13.5
SeaDwarf seashore paspalum	13.2
Floratam St. Augustinegrass	11.8
Palisades zoysiagrass (japonica)	11.3
Diamond zoysiagrass (matrella)	11.3
Captiva St. Augustinegrass	10.9
Pristine zoysiagrass (matrella)	10.9
JaMur zoysiagrass (japonica)	10.0

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Cultivars

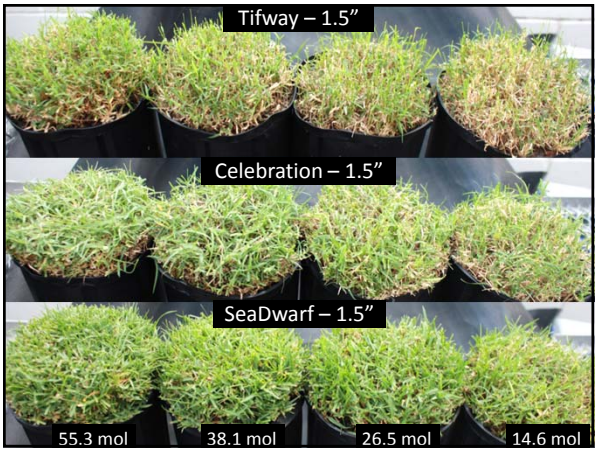
Species	Cultivar	Mowing Height (mm) Low	High
Hybrid bermudagrass - *Cynodon spp.*	TifEagle	3.2	4.8
	Champion	3.2	4.8
	Jones Dwarf	3.2	4.8
	Tifway	12.7	38.1
Common bermudagrass - *Cynodon dactylon*	Celebration	12.7	38.1
Seashore paspalum - *Paspalum vaginatum*	SeaDwarf	12.7	38.1

Experimental Design

- Supplemental lighting
  - HPS with 1000 W bulbs, 0.9 m above canopy
  - Photoperiod of 12 h d^{-1}
  - Temperature reduced by 13% under 70% shade

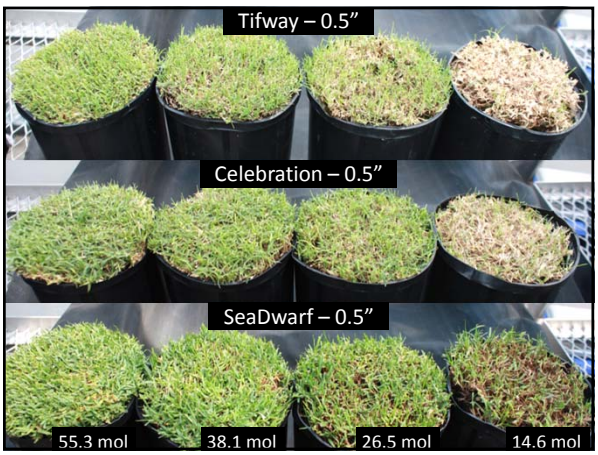
Experimental Design

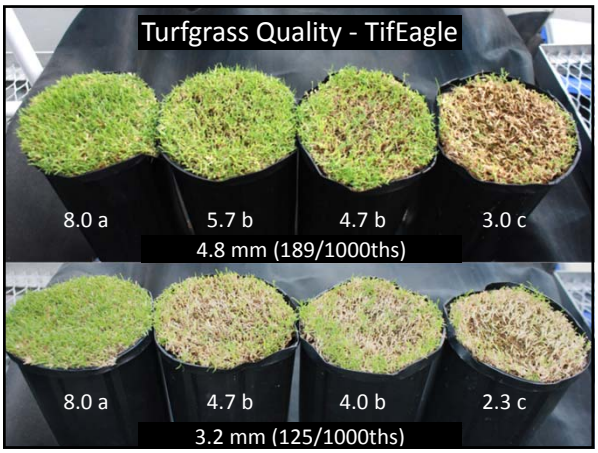
- Isolation house at Turfgrass Envirotron
  - Gainesville, FL
- Two month duration
  - May-June 2014
- 27 - 21˚C day-night temperature

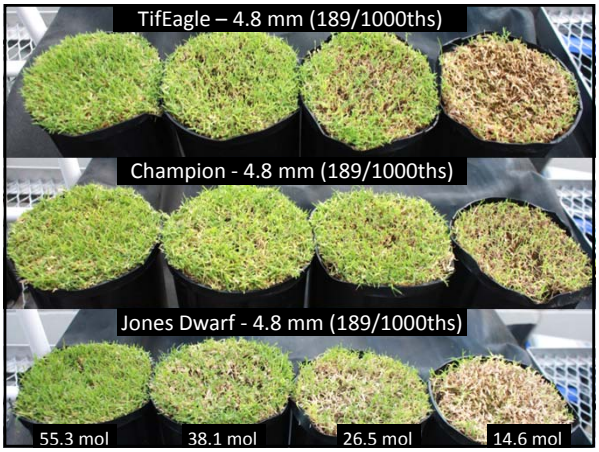


Experimental Design

- Split-plot design
  - Main plot - shade
- Four shade regimes
  - 0, 30, 50, 70% shade







DLI Requirements

Turfgrass Cultivar	DLI requirement (mol m^{-2} d^{-1})* Mowing Height: High	Low	% Change
Jones Dwarf bermudagrass	39.8	47.3	+ 19
TifEagle bermudagrass	33.7	38.5	+ 14
Champion bermudagrass	30.6	31.9	+ 1
Tifway bermudagrass	23.3	32.6	+ 40
Celebration bermudagrass	18.5	26.4	+ 43
SeaDwarf seashore paspalum	15.6	27.0	+ 73

*Reduced to 93% observed DLI

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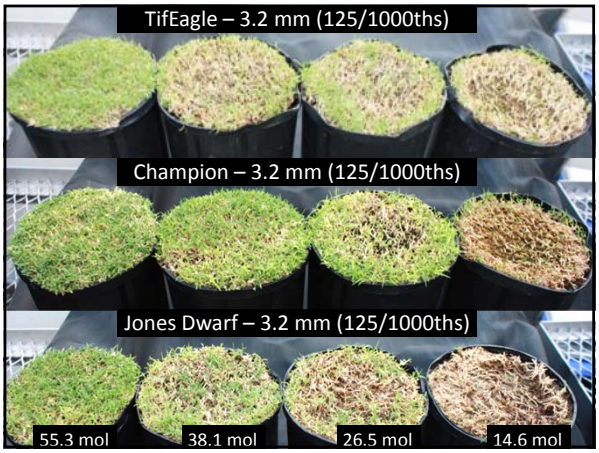
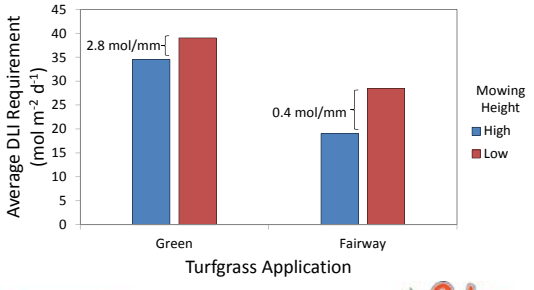


Summary



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Zoysiagrass Management

- *Zoysia japonica*
  - Jamur, Ultimate, Empire
  - Verticutting
    - None, Once/year
  - Topdressing
    - None, Onec/year
  - N Fertility
    - 2.0, 2.5, 3.0, 3.5, and 4.0 lbs/yr
- *Zoysia matrella*
  - Zeon, Pristine, Emerald
  - Verticutting
    - None, monthly, bimonthly
  - Topdressing
    - None, monthly, bimonthly
  - N Fertility
    - 2.0, 2.5, 3.0, and 3.5 lbs/yr

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Sheet Steaming as a Methyl Bromide Alternative

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Materials and Methods

- Plot Size: 20 ft by 20 ft.
- Treatments:
  - Methyl Bromide @ 400 lbs/acre (hot gas application)
  - Dazomet @ 265 lbs/acre
  - Steam
  - Steam + KOH

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Volk Thatch Meter

- Developed and testing for putting greens.
- We have modified the instrument and are testing on fairway and lawn grass height turf.

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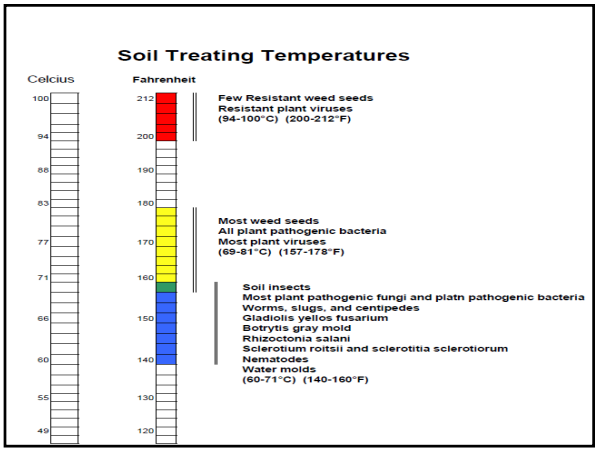
STEAM


Soil Treating Temperatures
Celcius
Fahrenheit
100
94
88
83
77
71
66
60
55
49
212
200
190
180
170
160
150
140
130
120
Few Resistant weed seeds
Resistant plant viruses
(94-100°C) (200-212°F)
Most weed seeds
All plant pathogenic bacteria
Most plant viruses
(69-81°C) (157-178°F)
Soil insects
Most plant pathogenic fungi and platn pathogenic bacteria
Worms, slugs, and centipedes
Gladiolis yellos fusarium
Botrytis gray mold
Rhizoctonia salani
Sclerotium roitsii and sclerotitia sclerotiorum
Nematodes
Water molds
(60-71°C) (140-160°F)


BASAMID (DAZOMET)


Untreated Control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On the horizon. . .

- Downhole steam generator
  - Oil field technology
  - The advantage to this technology is that it does not use a steam boiler and is not affected by water hardness.

Evaluation of Drip-Applied Fumigants for Bermudagrass Control

SMR Farms
Bradenton, FL

Drip Applied Fumigants

	Fumigant Treatment	Rate / Acre
1	PIC EC	150 lbs
2	Telone EC	20 gal
3	Vapam	75 gal
4	Kapam	60 gal
5	Trifecta (DMDS + PIC EC + Telone EC)	500 lbs
6	Telone EC + Vapam	20 gal + 75 gal
7	Telone EC + PIC EC + Vapam	20 gal + 150 lbs + 75 gal
8	Inline + Kapam	25 gal + 60 gal
9	MBA #400	40 gal
10	Methyl Bromide (98:2)	408 lbs
11	Untreated Control	

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Results

- At 6 weeks after treatment, ALL fumigants provided 98 – 100% control.
- Fumigant rates, application volumes, and drip-tape spacing needs additional testing.
- Economics of this methodology have not been calculated.

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On the horizon. . .

- Allyl isothiocyanate (AITC) (Dominus™)
  - When Basamid and Vapam react with water, they form MITC (methyl isothiocyanate) which is the biocide.
    - AITC is analogous to MITC and was a central constituent in Vorlex – a very old fumigant.

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On the horizon. . .

- In my original GCSAA funded project, I tested a fumigant that I called MBA #300.
  - I recently disclosed that MBA #300 was Vorlex.
  - Vorlex was a mixture of AITC, 1,3-dichloropropene (Curfew/Telone), and chloropicrin.

Pike Creek Turf Trial – July 2014

On the horizon. . .

- AITC is considered "organic" and has a food crop label.
  - AITC does not require Fumigant Management Plans to be in place – but, they will be required if 1,3-D or PIC is added.
- We plan to continue evaluation of this material.

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SMR Trial – November, 2014

On the horizon. . .

Georgia GCSA	$2,500
United States Golf Association	$10,000
Everglades GCSA	$2,500
Central New York GCSA	$200
Intermountain GCSA	$500
Calusa GCSA	$1,000
Florida GCSA	$5,000
Northern Ohio GCSA	$500
Heart of America GCSA	$2,500
Palm Beach GCSA	$5,000
GCSAA	$10,000
Total	$39,700

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