Zoysiagrass – How to Manage the New Kid on the Block

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Empire Zoysiagrass
Older Zoysias

- Slow growing, lengthy establishment
- Nematode issues
- Disease more prevalent than some other species
- Coarse leaf texture
- Prone to thatch
Newer Zoysias

• Slow growing, but much faster than older varieties
• Nematode issues – generally not as damaging as on older varieties
• Disease more prevalent than some other species
• Coarse leaf texture
• Prone to thatch
Japonicas vs. Matrellas
(“coarse” vs. “fine”)

**Japonicas**
- Higher mowing height (2-2.5”)
- Rotary mower
- Medium shade tolerance
- Medium traffic tolerance
- Low N users
- Disease susceptibility

**Matrellas**
- Lower mowing height
- Rotary or reel
- Better shade tolerance
- Better traffic tolerance
- May need higher N, use dependent
- Disease susceptibility
Empire Zoysiagrass

- Very responsive to nitrogen
- Low-growing, dense
- Hunting billbug pests
- Susceptible to brown patch
- Tends to get thatchy
- Nematode tolerance?
- Shade tolerance similar to Floratam
- The big myth - water
Empire Zoysiagrass

- Goes into dormancy throughout winter in central and northern Florida
- Greens up slowly in spring (zoysia patch issues can compound this)
- Do not give in to applying extra N fertilizer to speed this up!
- We are going to have to become more familiar with disease management
### Fertilization

<table>
<thead>
<tr>
<th>Zoysia Species</th>
<th>Empire</th>
</tr>
</thead>
<tbody>
<tr>
<td>(lbs. N 1,000 ft(^{-2}) annually)</td>
<td>(lbs. N 1,000 ft-2 annually)</td>
</tr>
<tr>
<td>North FL: 2-4</td>
<td>North FL: 2-3</td>
</tr>
<tr>
<td>Central FL: 2-5</td>
<td>Central FL: 3</td>
</tr>
<tr>
<td>South FL: 3-6</td>
<td>South FL: 3-4</td>
</tr>
</tbody>
</table>
Responses to Nitrogen

- Little or no increased quality or color due to N rate
- Increased zoysia patch
- Increased thatch
Insert pix of current research showing check plots vs. treated
Historical N Recommendations

Zoysiagrass Lawns

- 1944: Ample fertilization is necessary (Anonymous)
- 1950: Less than bermudagrass (Musser)
- 1969: 7-8 lbs N/1000 ft²/year (Holt in Hanson and Juska, Agron. Mono. No. 14)
- 1973: 0.4-1.0 lbs N/1000 ft²/growing month (Beard)
- 1996: 2 lbs N/1000 ft²/year (Duble)
- 2003: 1-5 lbs N/1000 ft²/year depending upon location in SE (McCarty)
- 2007: 0.5 lbs N/1000 ft²/growing month (Snyder et al. in Pessarakli)
Empire Quality in Response to N

Trenholm et al., 2006
Empire Quality Scores

Average Turf Quality vs. Annual N (lbs 1,000 ft$^{-2}$)

- 2006
- 2007
- Spring 2007

Trenholm et al., 2007
Empire Zoysiagrass Visual Scores 2001

Trenholm and Unruh, 2009
Empire Zoysiagrass Visual Scores 2002

Trenholm and Unruh, 2009
Lysimeters buried in center of each plot
As nitrate percolates downward through the column, it collects in reservoir filled with gravel. At bottom of lysimeter is a portal for tubing that runs to collection device aboveground. To collect leachate, a vacuum pump is attached to the tubing and water evacuated from base. A sub-sample is collected for analysis.
Nitrate Leaching Due to N Rate

- 3-yr study 2005-2007
- Established Floratam and Empire
- N applied in 4 applications throughout the year at rates of 1, 4, 7, or 10 lbs N 1,000 ft$^{-2}$
- N applied as quick-release urea dissolved in water and applied through sprayer
- 2 irrigation regimes (1” @ 1x wkly, 0.5” @ 2x wkly)
Nitrogen Rate Study- Nitrate-N Leaching from Empire

Nitrogen applied as 100% soluble urea

Trenholm et al. 2010
Nitrogen Rate Study - Percent of Applied N Leached from Empire

Nitrogen applied as 100% soluble urea

*Trenholm et al. 2010*
Fertilizing the New Zoysias

• Watch N – too much will increase disease and thatch and delay spring green-up
• Not responsive to increased N rates for quality – why apply more inputs if no benefit?
• Holds green color regardless of N source in many environments (less frequent applications needed)
• K can improve stress tolerance (winter, drought, others)
• Consider equal N:K ratio
• Apply P in accord with Urban Turf Fertilizing Labeling Rule (no more than 0.25 lbs/1,000 ft\(^{-2}\) at any one time and no more than 0.5 lbs/1,000 ft\(^{-2}\) annually
• Apply micronutrients as need is indicated by a soil test (high pH = iron, manganese)


**Study 1: Zoysiagrass management**

- Experimental areas were sprigged in 2001 at the Arkansas Agricultural Research and Extension Center, Fayetteville, AR with *El Toro, Meyer*, and *Cavalier* zoysiagrass.
- Plots were maintained from 2002-2007 using 1-2 lb N/1000ft²/year.
- The soil is a Captina silt loam with pH=6.2.
- Fertilization treatments were initiated in May 2008 using sulfur-coated urea at 0, 2, 4, and 6 lbs N/1000 ft²/year applied on May 15, June 15, July 15, August 15, and September 15.
  - Monthly applications were 0, 0.4, 0.8, or 1.2 lbs N/1000 ft²

*From Dr. Aaron Patton, Purdue University*
Turf Quality

Mowing and Nitrogen influenced turf quality in the spring (15-May)

From Dr. Aaron Patton, Purdue University
Mowing and Nitrogen influenced turf quality in summer (26-Aug)

From Dr. Aaron Patton, Purdue University
Turf Quality

Nitrogen influenced turf quality in summer (25-Sept)

From Dr. Aaron Patton, Purdue University
Turf Quality

Mowing and Nitrogen influenced turf quality in fall (16-Oct)

From Dr. Aaron Patton, Purdue University
Summary - Zoysiagrass Fertility

• All cultivars had a similar response in most cases.
• Results after two years of the zoysiagrass management study (Study 1) indicate that turf density is improved through cultivar selection and N fertility. Increasing annual nitrogen applications ≥2 lbs N/1000 ft² also improved turf density.
• In the spring of 2009 (after one year of fertility treatments) N rates ≥4 lbs N/1000 ft²/year were observed to cause a delay in spring green-up and a decline in turf quality at the 1.5-inch mowing height.
• There was little scalping in our study, but on one collection date mowing at 0.5-inch and fertilizing with 6 lbs N/1000 ft²/year resulted in increased scalping (primarily on Cavalier).
• Turf quality was generally highest for Meyer and Cavalier. Turf quality was highest in the summer for plots receiving ≥2 lbs N/1000 ft²/year, but turf quality was never unacceptable (<6) for the unfertilized check plots in either year.
• Different results would be expected on different soil types.

From Dr. Aaron Patton, Purdue University
Empire Response to N Source

Treatments:
- Control
- Ammonium nitrate
- Urea
- 30% SRN
- 50% SRN
- 30% PCU every 60 days
- 30% PCU every 120 days at 2 lbs N
- Milorganite

Trenholm et al., 2009
### Empire Response to N Source – Yr 2

<table>
<thead>
<tr>
<th></th>
<th>FC 1</th>
<th>FC 2</th>
<th>FC 3</th>
<th>FC 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.0 b</td>
<td>5.3 a</td>
<td>6.3 a</td>
<td>4.9 b</td>
</tr>
<tr>
<td>AN</td>
<td>3.5 ab</td>
<td>6.0 a</td>
<td>7.4 a</td>
<td>6.5 a</td>
</tr>
<tr>
<td>Urea</td>
<td>4.1 a</td>
<td>5.6 a</td>
<td>7.0 a</td>
<td>6.1 a</td>
</tr>
<tr>
<td>30% SRN</td>
<td>3.5 ab</td>
<td>5.6 a</td>
<td>7.0 a</td>
<td>6.1 a</td>
</tr>
<tr>
<td>50% SRN</td>
<td>4.0 ab</td>
<td>5.8 a</td>
<td>6.9 a</td>
<td>6.1 a</td>
</tr>
<tr>
<td>30% PCU</td>
<td>3.5 ab</td>
<td>5.6 a</td>
<td>7.0 a</td>
<td>6.0 a</td>
</tr>
<tr>
<td>30% PCU @ 2 lbs</td>
<td>3.9 ab</td>
<td>5.5 a</td>
<td>6.8 a</td>
<td>5.6 ab</td>
</tr>
<tr>
<td>Milorganite</td>
<td>3.3 ab</td>
<td>5.6 a</td>
<td>6.8 a</td>
<td>5.9 a</td>
</tr>
</tbody>
</table>

*Trenholm et al., 2009*
Study 2: Zoysiagrass N source

• Separate areas of established Meyer and Cavalier zoysiagrass were used at the same location.
• Three nitrogen sources
  – Urea
  – Ammonium nitrate
  – Calcium nitrate
• Two rates
  – 2.0 lbs N/1000ft²/year with each source
  – 4.0 lbs N/1000ft²/year with each source
• Application timings were the same as study 1.

From Dr. Aaron Patton, Purdue University
Summary - Zoysiagrass N Source

• Field
  – After two years: N source did not significantly affect color, density, or turf quality of Cavalier or Meyer zoysiagrass

From Dr. Aaron Patton, Purdue University
Drought Stress
Average Maximum Root Depth

Adapted from Marcum et al. 1995
Irrigation Requirement

Adapted from White et al. 1993
Drought tolerance

• Excellent
  – Crowne, El Toro

• Very good
  – Carrizo, Cavalier, Empire, Jamur, Palisades, Zeon, Zorro

• Good
  – Cashmere, Diamond, Emerald, Marquis, Matrella, Meyer, Royal

Adapted from White et al., 1993, Marcus et al., 1995, and Chalmers et al., 2008
The Big Myth With the New Zoysias – Water Use!

[Image of a sprinkler system spraying water on a lawn]
Empire Research – Deficit Irrigation

• Glasshouse research, Ph D student project
• Objective to look at different grasses under deficit irrigation rates over time
• Maintained grasses at 100, 80, 60, or 40% ET
• Floratam, Palmetto, Sea Isle 1, Empire, Argentine bahiagrass
• Wide range of physiological measurements as well as visual ratings
Average Quality

Deficit Irrigation as % ET

- Argentine
- Empire
- Floratam
- Palmetto
- Sea Isle 1
Photosynthesis Rates

Deficit Irrigation as % ET

- Argentine
- Empire
- Floratam
- Palmetto
- Sea Isle 1
Root Growth 0-6 inches

Deficit Irrigation as % ET

- Argentine
- Empire
- Floratam
- Palmetto
- Sea Isle 1
Drought and Rooting Research

• MS Student working with Dr. Kevin Kenworthy
• Empire root system similar to SA in top few inches of soil
• Empire root system significantly reduced at lower soil depths
• Empire exhibited one of longest times to reach drought endpoint
• Empire in grouping of grasses taking shortest time to go into leaf wilt
Rooting of Empire at Various Soil Depths

From Fuentealba et al., 2010
Turfgrass Water Use Rates

• Dr. Michael Dukes and team
• Compared water use (ET) of 4 warm-season grasses
• Final report not available yet, but synopsis:
• Water use ranking under well watered conditions (high to low):
  – Bahiagrass
  – Empire and Floratam were about the same and LESS than bahiagrass
Irrigating The New Zoysias for Best Maintenance

• Similar to SA needs
• Varies by season, soil type, etc.
• Adjust frequency seasonally
• Apply ½-3/4” each application – do NOT adjust application amounts
• Follow all watering restrictions
Salinity Tolerance

• Excellent
  – Diamond

• Very good
  – Crowne, El Toro, Jamur, Palisades, Victoria

• Good
  – Belair, Cavalier, DeAnza, Emerald, Meyer, Zeon

• Largely unknown
  – All other cultivars

Adapted from Marcum et al., 1998 and Qian et al., 2000
Shade Tolerance Rankings

**TEXAS**

1. Diamond
2. Zorro
T3. Royal
T3. Palisades
T3. Marquis
T3. Emerald
T3. Crowne
8. Cavalier
9. El Toro
10. Sunburst
T11. Belair
T11. Meyer

**ARKANSAS**

Good
Cavalier, Diamond,
El Toro, Palisades, Zorro

Fair
Meyer

Poor
Zenith

Adapted from Riffel et al., 1995

Adapted from Trappe et al., 2009
Empire Shade Tolerance

• Observations suggest that shade tolerance is less than that of most St. Augustine grass cultivars, but about the same as Floratam (worst of the SAs)
• 6-8 hours of sunlight for best growth, can be filtered to about 30%
• Mow higher, reduce N and irrigation if maintaining in shade
Mowing Basics

• Mow at the correct height for the species
• Empire: 2-2.5” with rotary mower
  – Mowing too low stresses the grass and forces it to use up all saved reserves for shoot growth
  – Mowing high increases root depth
Mowing

• Only remove 1/3 of the leaf blade at any one time
• Make sure mower blades are sharp
• Do not mow wet grass
• Mowers may move disease, weeds between properties
• Rotary mower is fine, too coarse for reel
Thatch Management

- Thatch is dead and decaying organic matter above soil line and below green grass
- What increases thatch?
  - Excess nitrogen
  - Excess water
- Why is Thatch Bad?
  - Too much is unhealthy - roots in air
  - Water, fertilizer, pesticides can’t get through
  - Insect hotel
  - Disease Safe Place
- Can thatch be good?
Verticutting
Verticutting

• Encourages regrowth and lets in air, water, light
• This really makes the lawn look dead for a week or two
• Keep the lawn spritzed (like it was first being established) for the first 7-10 days
• After 7-10 days, apply a nitrogen fertilizer (no more than 1 lb N 1,000 ft⁻²)
• This MUST ONLY BE DONE in spring or early summer!
• Follow up with light topdressing
Why Do We Aerate?

- Compacted soils
- Improves roots (increases air)
- Do Florida soils get compacted?
- Does aeration improve thatch?
Bottom Line on the New Zoysias

- Management differs slightly from SA
- No magic to keep it healthy
- Watch N rates – less is better
- Keep lookout for disease – be prepared to use fungicides at intervals
- Remember, it needs the same amount of water as other species to look good
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