

# Avoiding and Managing Glyphosate-Resistant Weeds

University of Tennessee

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# Glyphosate-Resistant Weeds

## Southern United States

- *Conyza canadensis* (horseweed)
- *Amaranthus palmeri* (Palmer amaranth)
- *Ambrosia trifida* (giant ragweed)
- *Ambrosia artemisiifolia* (common ragweed)
- *Amaranthus tuberculatus* (common waterhemp)
- *Lolium multiflorum* (Italian ryegrass)
- *Sorghum halepense* (Johnsongrass)
- *Eleusine indica* (Goosegrass)

# Horseweed Burndown for Soybean

**February**

**March**

**April**

**Glyphosate/Gramoxone + Clarity 8 ozs**

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**21 DBP**

**Gramoxone Inteon 48 ozs or Ignite 29 ozs + Sencor 4ozs**

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**Newly emerged to rosette (Feb to late-March)**



**Bolting up to 6" horseweed  
(Early-April to Soybean Emergence)**



# New Herbicide

## ➤ Verdict

- Old Integrity (Sharpen + Outlook)
- Rate 5 oz/A (Soybean)
- Rate 10 oz/A (Corn)
- Pre plant to Pre emergence
- Was more consistent controlling horseweed than Sharpen

# 2 GR Weeds in the Same Field

14 DAA of 32 oz/A Roundup PowerMax



22 fb 22 ozs/A Roundup PM on 1-3" then 6-8" Palmer





**Taproot of  
*A. Palmeri***



**Glyphosate,  
Glufosinate,  
Chopped and then  
dug up  
*A. Palmeri***

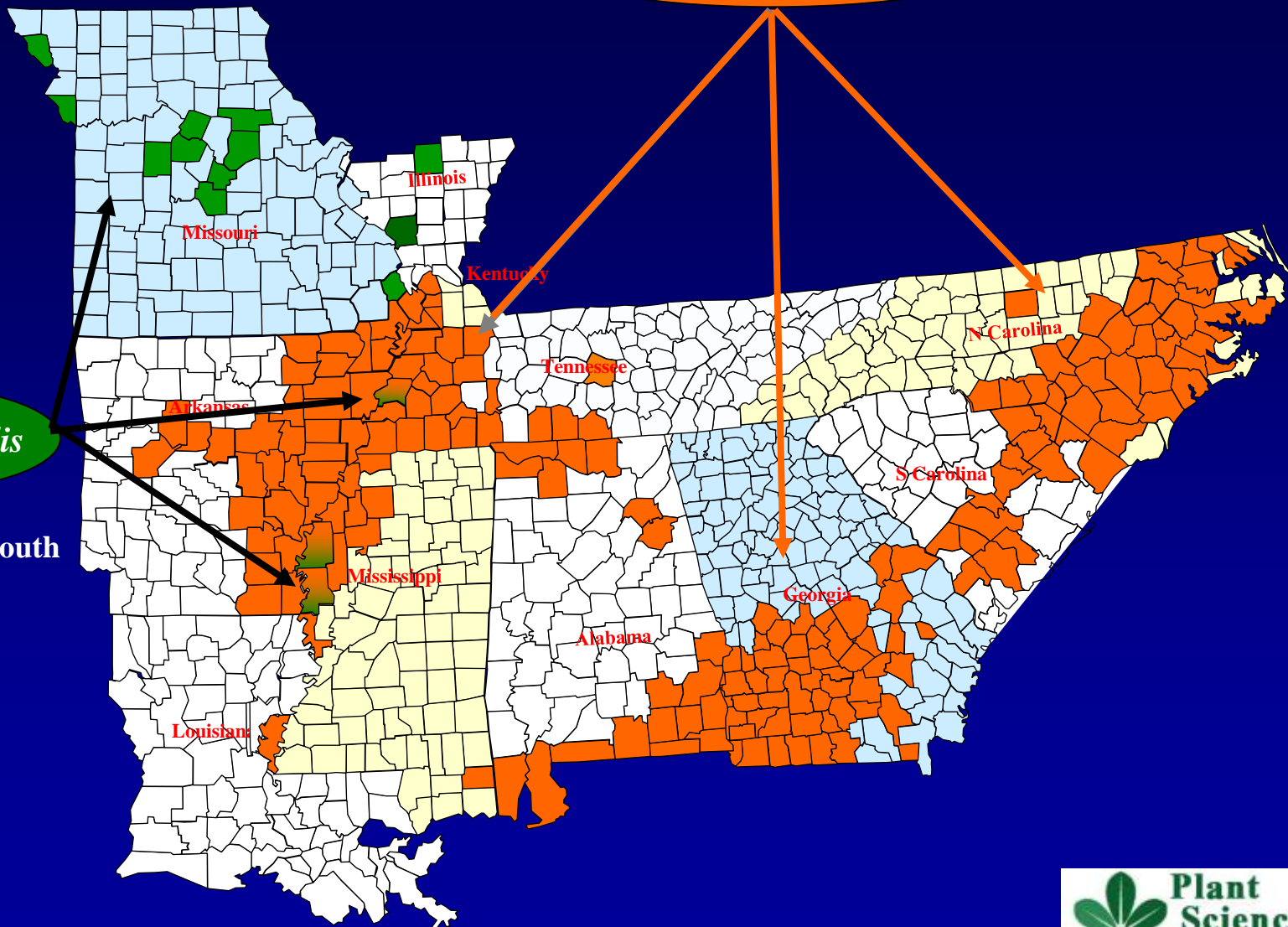
**Buntin 2009**

# Glyphosate-Resistant Pigweed Species

*Amaranthus palmeri*

*Amaranthus rudis*

4 Counties in Mid-South

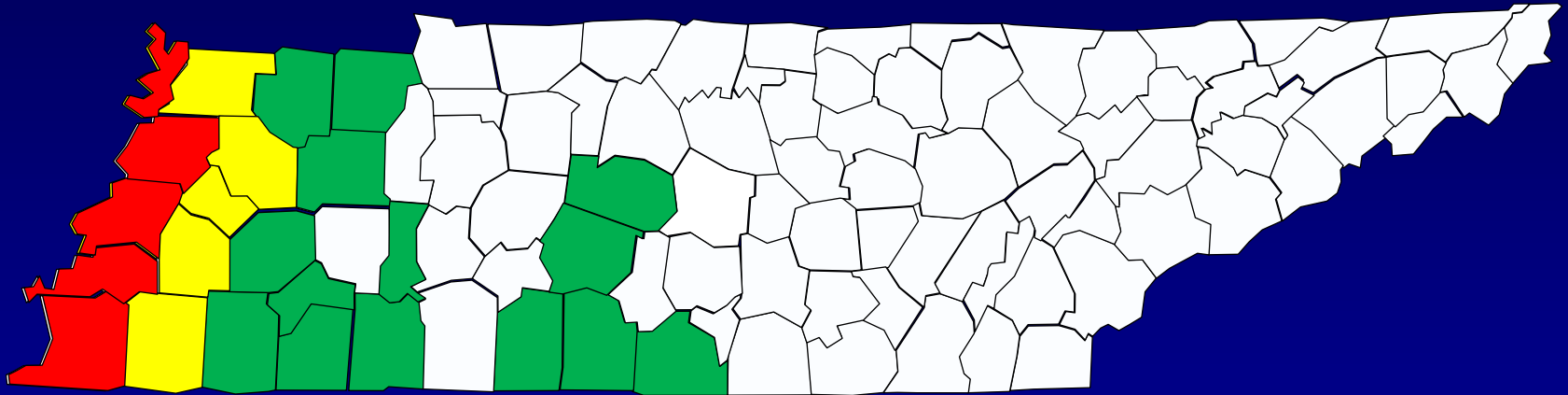


# Glyphosate-Resistant Palmer Amaranth Infested Counties

90% Infestation

50% Infestation

<25% Infestation



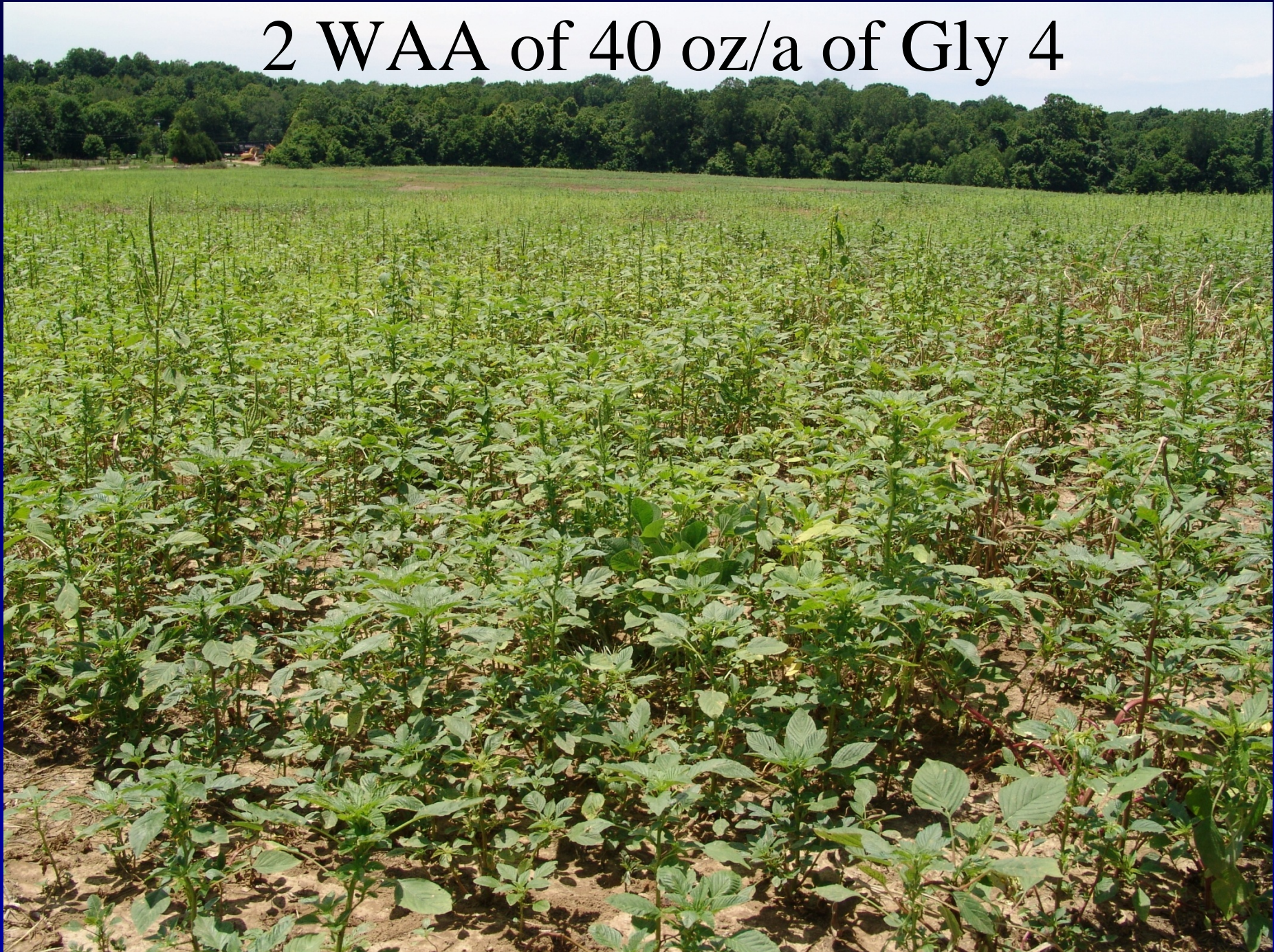
# GR Palmer Now In Force in Middle TN



21 DAA 40 oz/A Gly 4



2 WAA of 40 oz/a of Gly 4



# Treatments That Worked

Envive 2.5 oz Pre /fb 1 pt Flexstar on 1 to 3" Palmer



# Envive 3.5 oz fb Flexstar GT 3 Pt on 3" Palmer



1.5 pts Boundary Pre fb 48 ozs/A Flexstar GT 1-3''



# GR Pigweed Summary

## ➤ Pre Emergence Options

- Boundary (1.5 pts)
- Envive (2.5 ozs)
- Prefix (2 qts)
- Valor (2 ozs)
- Authority MTZ (18 ozs)
  - Cotton Recrop 12 month
- Valor XLT ( 3 ozs)
  - Cotton Recrop 18 month

# Residual Palmer Control on Silt loam

Millington TN 2010

<b>Treatment</b>	<b>20 DAA</b>	<b>30 DAA</b>
<b>Authority First 2oz</b>	<b>65b</b>	<b>63b</b>
<b>Fierce 3 oz</b>	<b>96a</b>	<b>95a</b>
<b>Prefix 32 oz</b>	<b>96a</b>	<b>92a</b>
<b>Optill 2 oz</b>	<b>58b</b>	<b>53b</b>
<b>Prowl H20 40 oz</b>	<b>20c</b>	<b>20c</b>
<b>Valor XLT 3 oz</b>	<b>96a</b>	<b>68b</b>
<b>Valor SX 2 oz</b>	<b>96a</b>	<b>77b</b>

# Residual Palmer Control on Sandy loam

Ridgley 2010

<b>Treatment</b>	<b>20 DAA</b>	<b>30 DAA</b>
<b>Authority First 2oz</b>	<b>60b</b>	<b>48b</b>
<b>Fierce 3 oz</b>	<b>86a</b>	<b>90a</b>
<b>Prefix 32 oz</b>	<b>97a</b>	<b>88a</b>
<b>Optill 2 oz</b>	<b>65b</b>	<b>40b</b>
<b>Prowl H20 40 oz</b>	<b>35c</b>	<b>10c</b>
<b>Valor XLT 3 oz</b>	<b>76a</b>	<b>58b</b>
<b>Valor SX 2 oz</b>	<b>88a</b>	<b>60b</b>

# GR Pigweed Summary

## ➤ Post Options:

➤ 1 to 4' Palmer amaranth

Flexstar (1.5 pts)

Cobra (10 ozs)

Blazer (1.5 pts)

1qt Prefix Pre fb 22 ozs/A Ignite 1-3"



2.5 ozs/A of Envive Pre fb 22 ozs/A Ignite 1-3”



16 ozs/A of Dual Pre fb 22 ozs/A Ignite 8''



# New Herbicide

## ➤ Warrant

- Encapsulated acetachlor
- Rate 48 oz/A
- Soybeans post up to R3
- Cotton post cotyledon to 1<sup>st</sup> flower
- Very comparable to Dual Mag at 16 oz/A

# Warrant Injury

Causes heart shaped leaves



# Post Applied Injury

1.3 pt Dual Mag +  
22 oz RPM →



←  
3 pt Warrant +  
22 oz RPM

# Over-Lap Residuals

- Soybeans or Cotton Follow Pre with:
  - Dual Magnum
  - Warrant
- Soybeans only Follow Pre with:
  - Prefix
  - Flexstar

# Palmer Amaranth Facts

- Most competitive of the Amaranth sp.
- Growth rate 0.21 to 0.18 cm/gdd (Horak and Loughin 2000)
- If we assume 96/70 Mid June growing period a 2” Palmer will grow 2.5” per day
- So a 2” Palmer amaranth will be 4.5” in 24 hours and too large for a PPO herbicide to control!

# The Difference of 2 Days!

Flexstar on 6" Palmer

Flexstar on 3" Palmer



# Pre Not Activated and Post a Few Days Late



# GR Weed Management in Soybean

## Burndown

30 to 14 DBP

Near Planting

**Kixor products (Verdict) +  
glyphosate or Gramoxone Inteon**

**Dicamba +  
glyphosate or  
Gramoxone Inteon**

Pre Emergence

**Valor products (Valor, Valor XLT,  
Gangster, Equip, etc.) or**

**Dual Magnum products (PreFix,  
Boundary etc.)**

**Prowl**

**Authority products (Authority  
MTZ, Sonic)**

# GR Palmer Amaranth Management in Soybean

Pre Emergence	<u>AND</u> Up to V3	<u>AND/OR</u> Post
<p>Valor products (Valor, Valor XLT, Gangster, Equip, etc.) or</p> <p>Dual Magnum products (PreFix, Boundary etc.)</p> <p>Prowl products</p> <p>Intrro</p> <p>Authority products (Authority First, Authority MTZ, Sonic) <b>Recrop concerns with cotton!</b></p>	<p>16 oz Dual Magnum or</p> <p>32 oz Prefix or 48 oz Warrant</p> <p>+/- glyphosate</p>	<p><b>Up to 6" Palmer Reflex or</b></p> <p>Flexstar (mixed with glyphosate)</p> <hr/> <p><b>Non Residual Options</b></p> <p>Ultra Blazer</p> <p>Cobra</p> <p>+/- glyphosate</p>



# Corn Weed Control



# Halex GT

- **Premix of Dual (20.5%) + Touchdown (20.5%) + Callisto (2.05%)**
- **Rate 3.6 to 4 pts/A**
- **Apply Preplant, Pre or Post up to 30" tall corn**
- **Performed well in 2007 trials (Pigweeds, crabgrass, Broadleaf signalgrass and Johnsongrass)**
- **Good resistance management premix**

# Bleacher Herbicides

- Premixes
- Halex GT = Callisto + S-metalochlor + glyphosate
  - ❑ Apply POST up to V8 or 30"
  - ❑ 3.6 to 4 pt/A
  - ❑ Do not tankmix with foliar fertilizer
- Capreno = Laudis + thiencazone methyl
  - ❑ Apply POST up to V7
  - ❑ 5.6 oz/A
- Corvus = Balance + thiencazone methyl
  - ❑ Apply PRE 5.6 oz/A

# Crop Rotation for GR Palmer Control



# Crop Rotation for GR Palmer



# Horseweed Burndown for Cotton

**February**

**March**

**April**

**Glyphosate/Gramoxone + Clarity 8 ozs**

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**21 DBP**

**Gramoxone Inteon 48 ozs or Ignite 29 ozs + Cotoran or Caparol 32 ozs**

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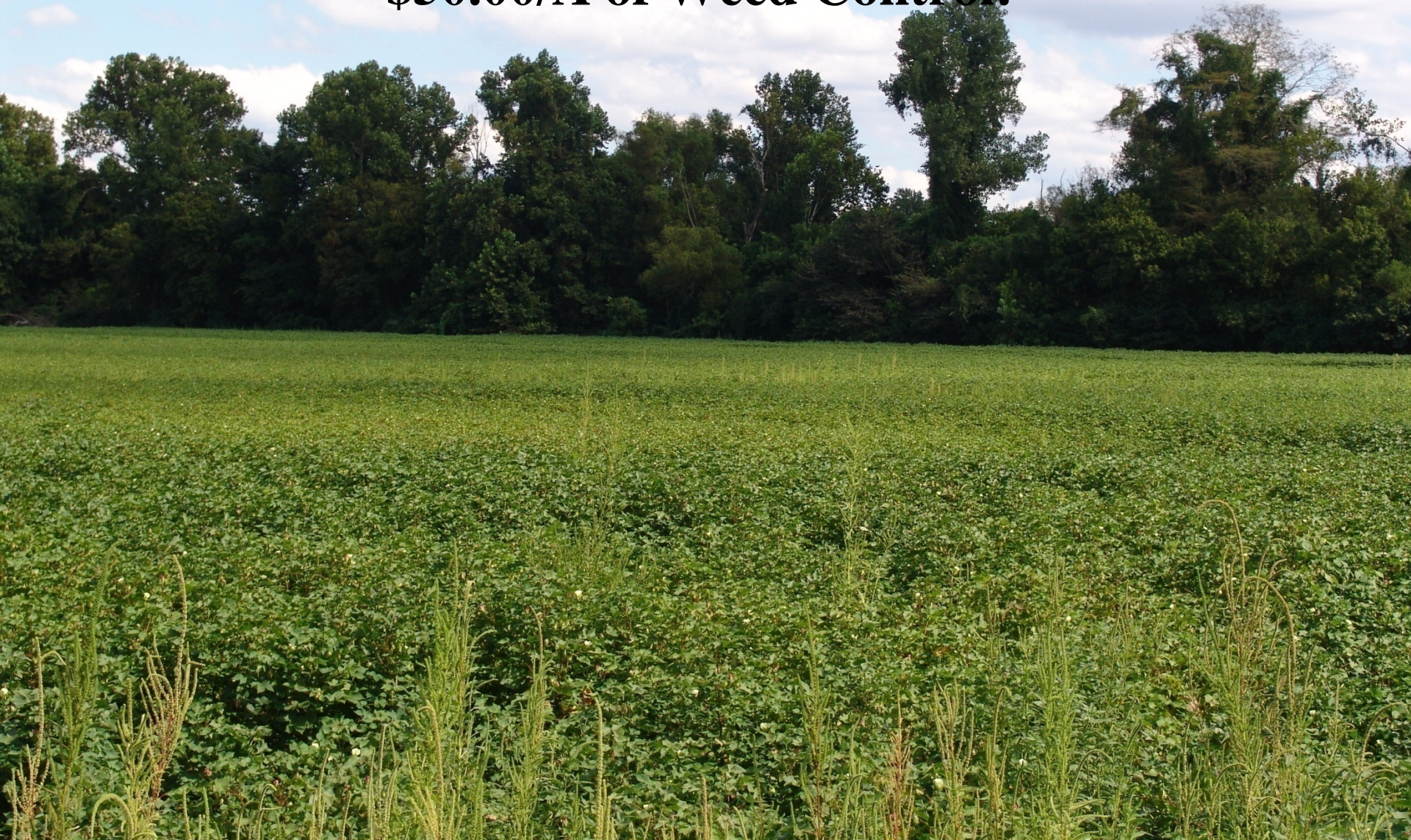
# GR Palmer pigweed management in cotton



**2008-Shelby County 66 oz/A Roundup PM fb/ 0.15  
oz/A Envoke fb/16 oz/A Direx + 32 oz/A MSMA + 1  
oz/A Valor  
\$60.90/A of Weed Control!**



**2009-32 oz/A Cotoran Pre/ 60 oz/A Ignite fb/16  
oz/A Direx + 32 oz/A MSMA + 1 oz/A Valor  
\$50.00/A of Weed Control!**



# 2010 Story of Ignite on WideStrike Cotton

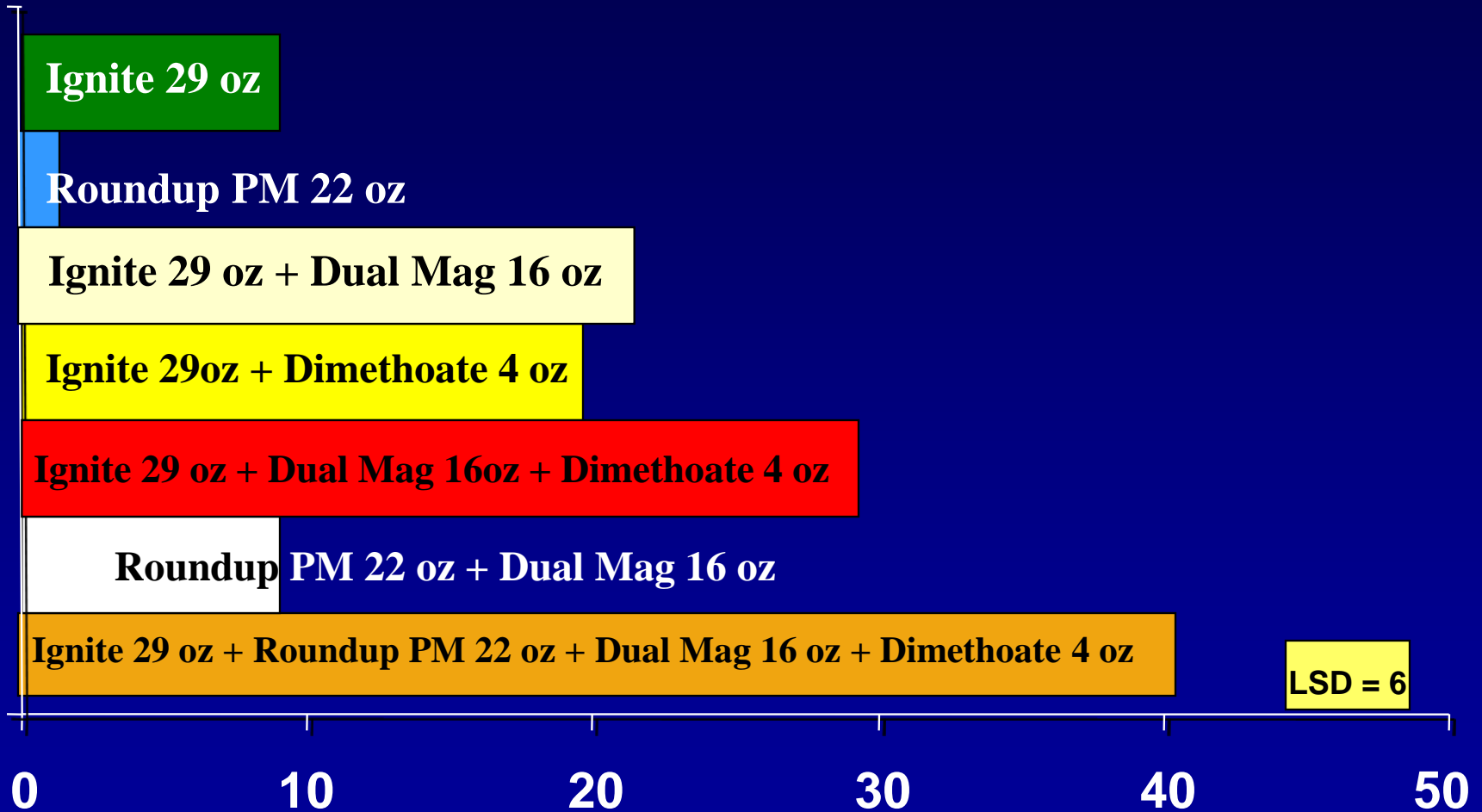
- WideStrike cotton varieties were planted on 65% of acres in TN
  - Many acres were treated with at least 1 application of Ignite
  - Of the 250,000 acres only a few had extreme injury >35%
  - ❑ Cotton on those acres was already stressed: thrips, sand blasting ect.
  - ❑ Tankmixes with Dual Mag

# Ignite Injury on WideStrike Cotton

Picture taken 10 DA sand blasting and 7 DAA 29 oz/A Ignite + 16 oz/A Dual Mag



# 375 WideStrike Cotton Tolerance to Ignite Tankmixes

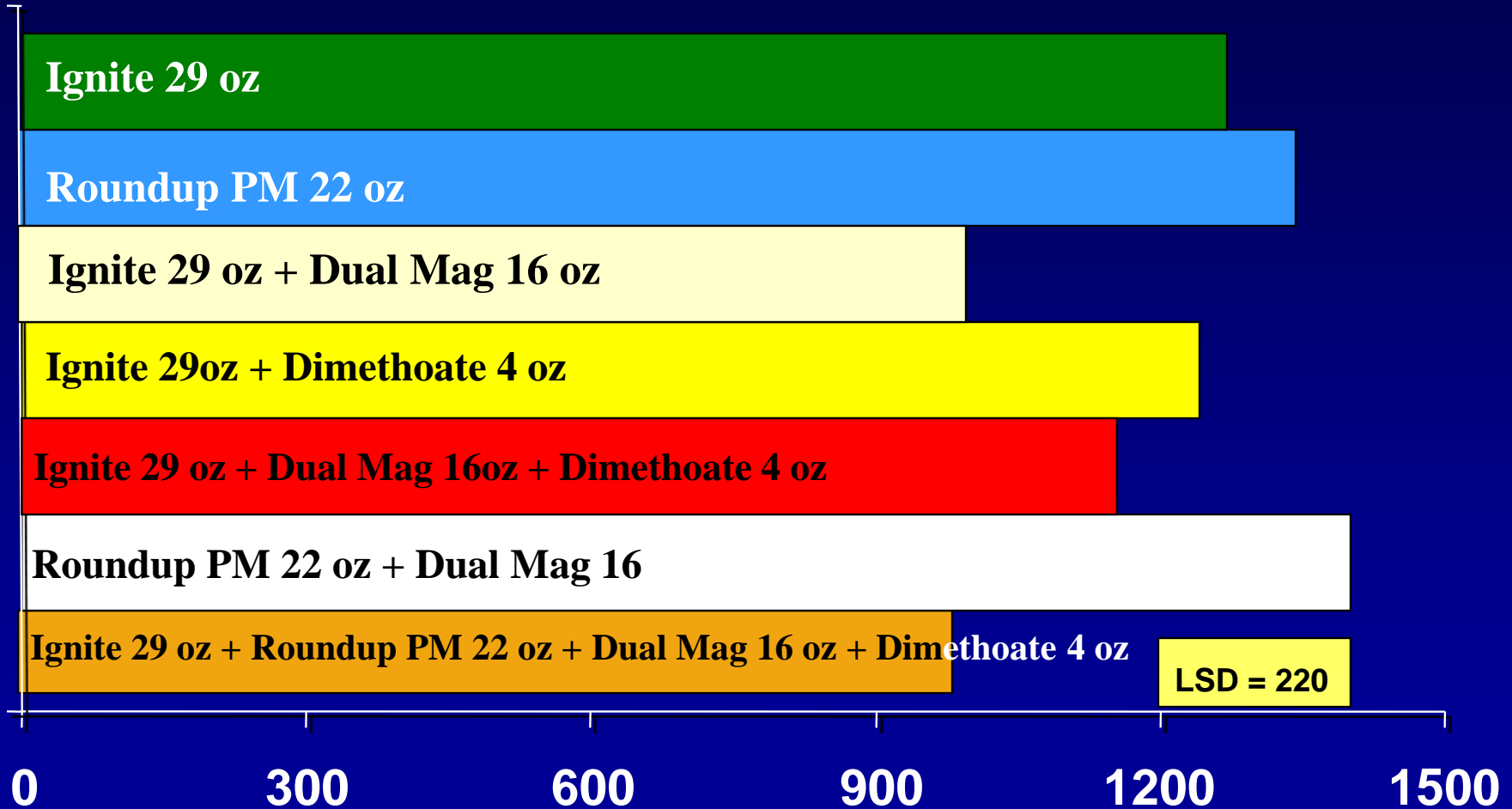


Steckel, Bond and Stephenson

% Injury 5 DAA

# 375 WideStrike Cotton Tolerance to Ignite Tankmixes

2 If Application At Jackson, TN 2010

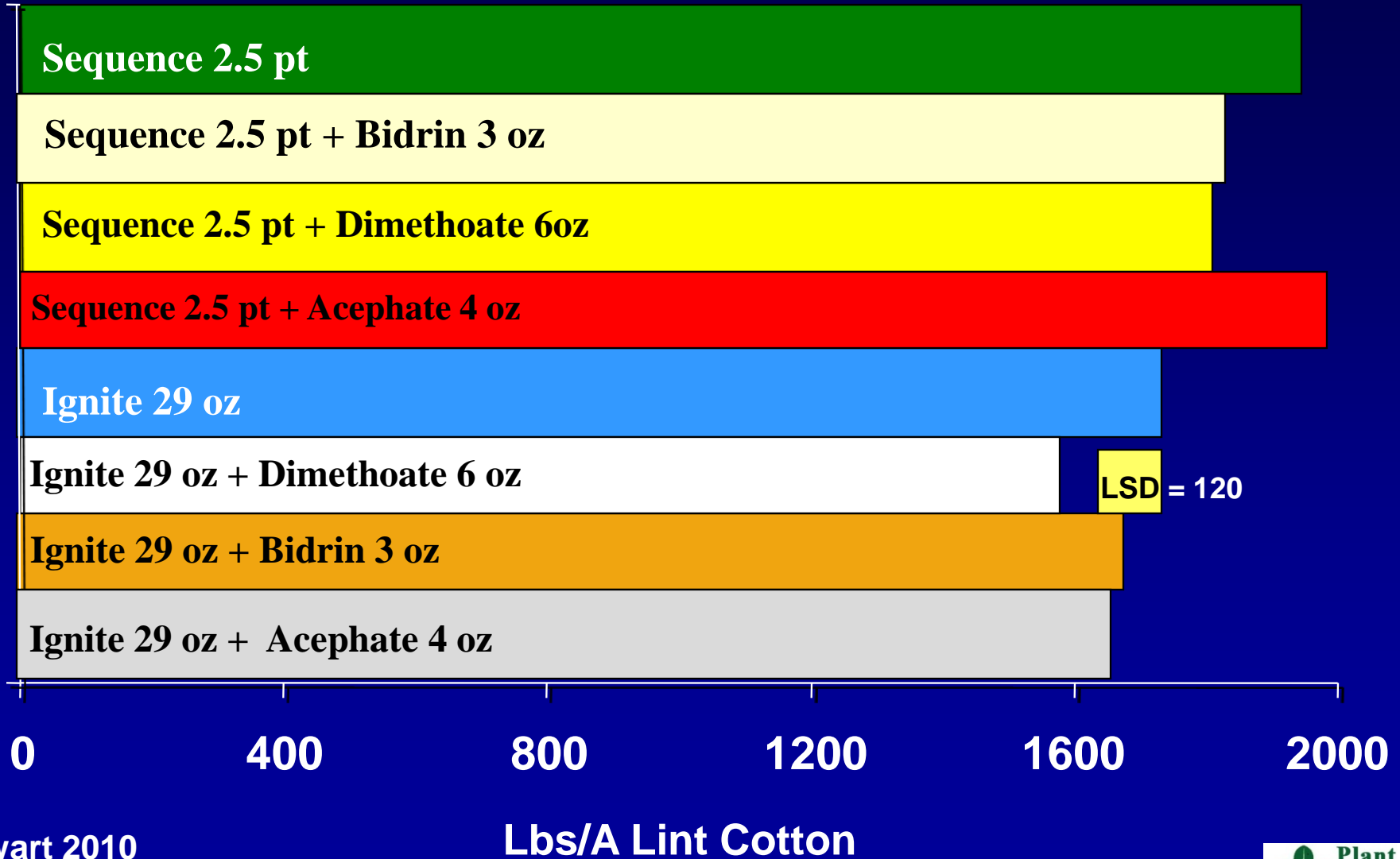


# Ignite Injury on WideStrike Cotton

**14 DAA 29 oz/A Ignite + 16 oz/A Dual Mag**



# Thrips Stressed 375 WideStrike Cotton Tolerance to Ignite Insecticide Tankmixes



# GR Weed Management Considerations:

- **When making the decisions:**
  - How has RR flex, WideStrike and LL cotton varieties yield on your farm?
  - Can you irrigate the field?
  - Typical GR Palmer infestation in heavily infested fields will reduce yield 100%
  - 1 GR Palmer/sq yard emerging with cotton reduces yield 50% (Culpepper et. al 2009)
  - 2 GR Palmer/20' of row emerging at 3lf cotton reduces yield 16% (MacRae et. al 2007)

# GR Weed Management in Cotton

## Burndown

30 to 21 DBP

Near Planting

Pre Emergence

Dicamba +  
glyphosate or  
Gramoxone Inteon  
+/- Valor

After Reflex  
application a  
1/2" of rain  
plant cotton

Cotoran/Caparol or  
Reflex on coarse soils

# GR Palmer Amaranth Management in Cotton

<b>Pre Emergence</b>	<b><u>AND</u> 1 to 2 lf</b>	<b><u>AND/OR</u> 5 to 7 lf</b>	<b><u>P.Direct</u></b>
<p>Cotoran/Caparol on any soil or Reflex on coarse soils</p>	<p>16 oz Dual Magnum or or 48 oz Warrant + glyphosate or  Palmer up Ignite alone or with Dual Magnum?</p>	<p>Glyphosate +/- Dual Magnum or Warrant</p>	<p>Direx + MSMA</p> <hr/> <p><b><u>Hooded</u></b></p> <p>On larger Palmer or cotton</p> <p>Gramoxone Inteon + Direx + Valor</p>

# Questions?