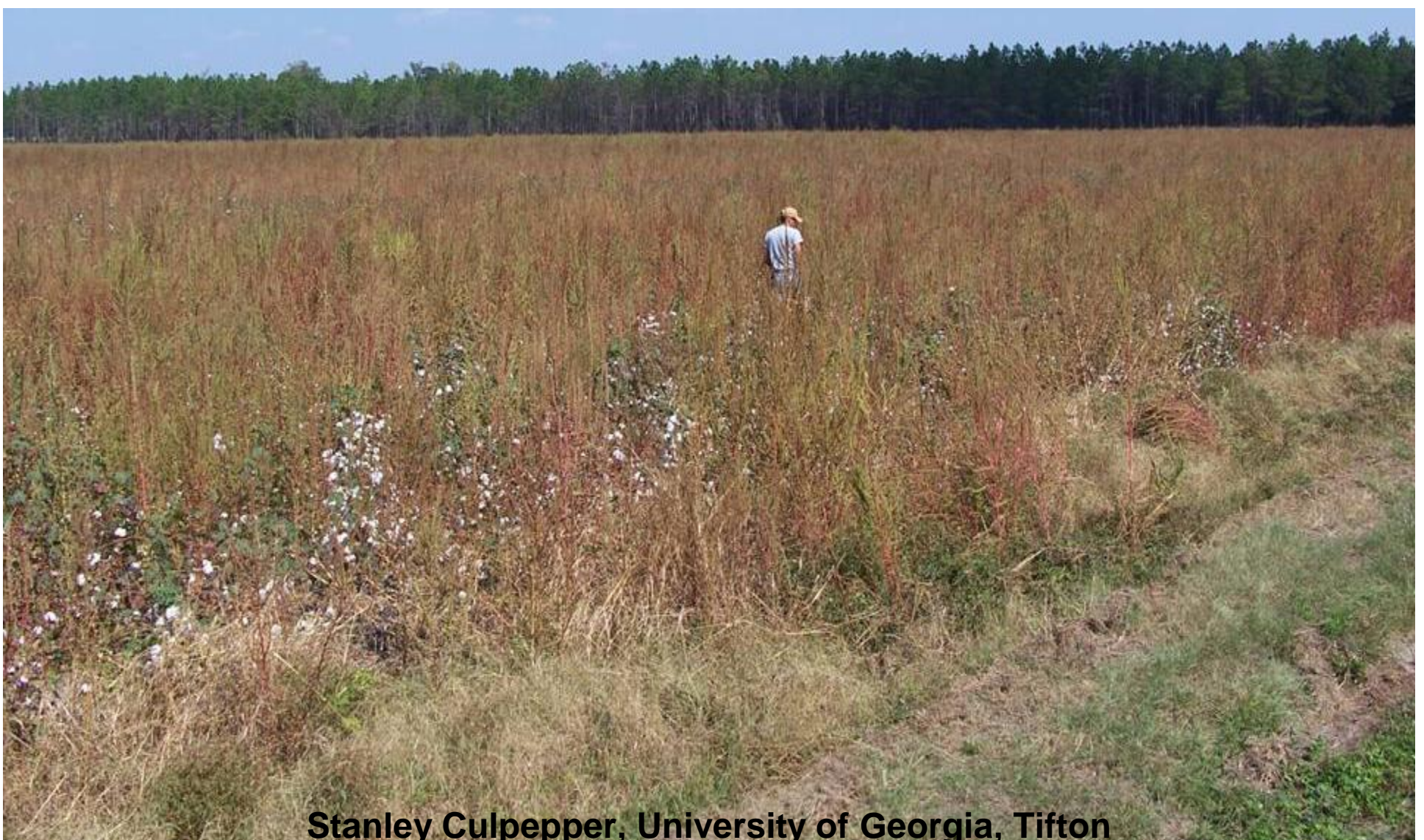


Diversity and Integration: Keys to Surviving in a Palmer World



Stanley Culpepper, University of Georgia, Tifton

Topics of Discussion

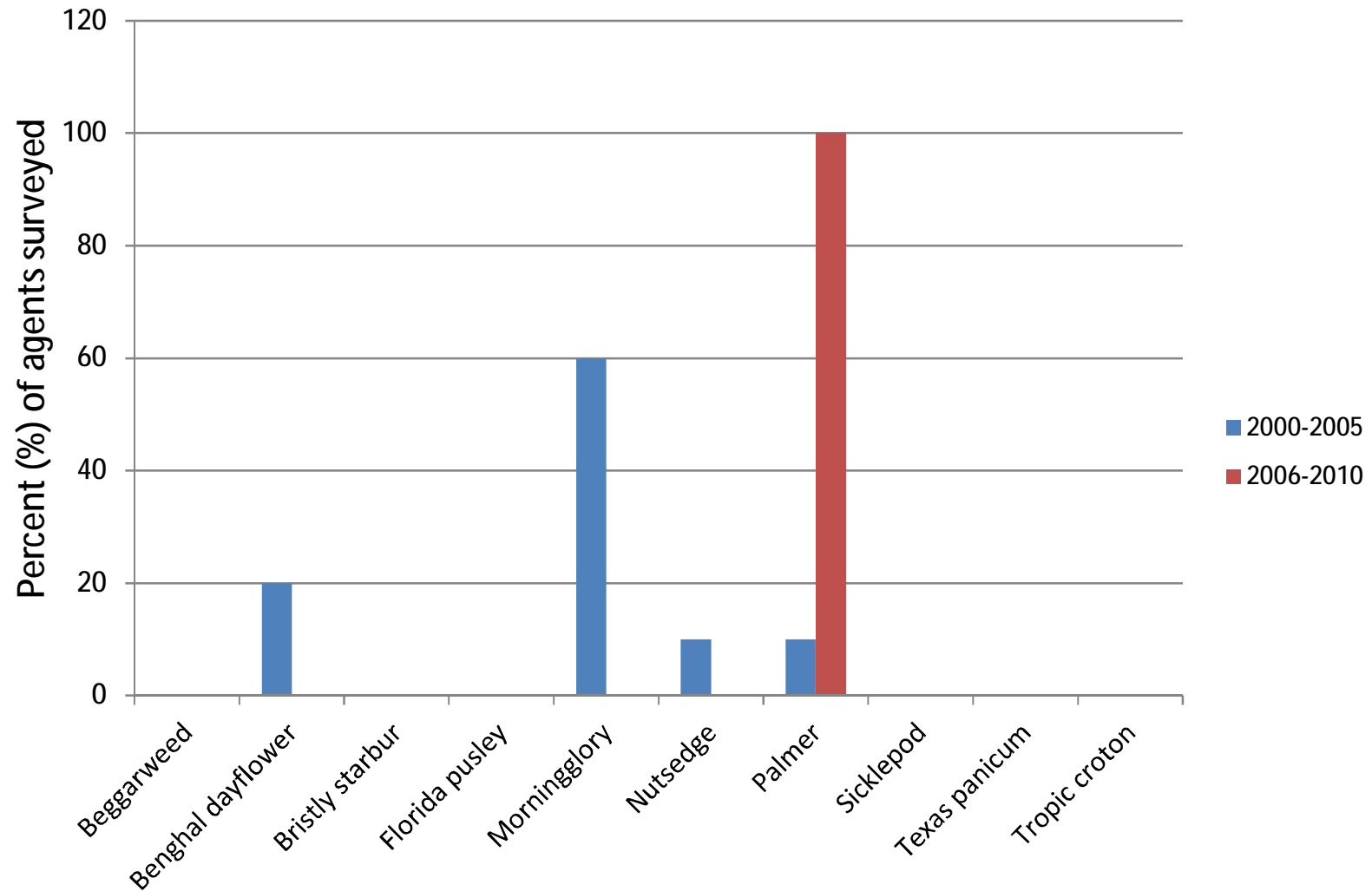
- Ø Changes in cotton production
- Ø Roundup-based programs
- Ø Liberty-based programs
- Ø Integrate the system or grow trees
- Ø PPO and Liberty sustainability

Palmer Changes Agriculture Forever

Total grower (n = 65) acres = 129,615
(12.6% of GA cotton)

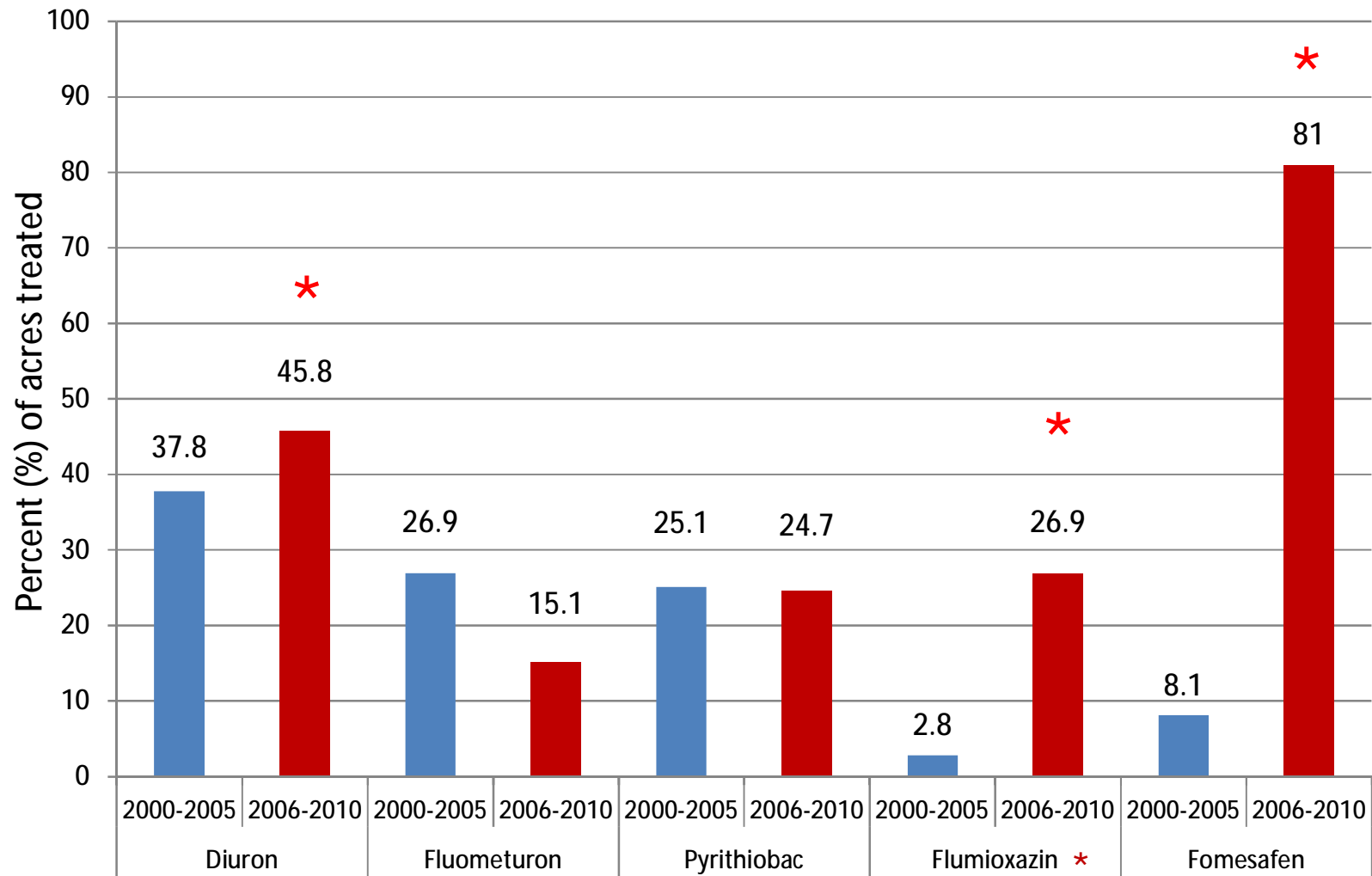
Total agent county (n = 10) acres = 246,034
(24% of GA cotton)

Agents: Most troublesome weed



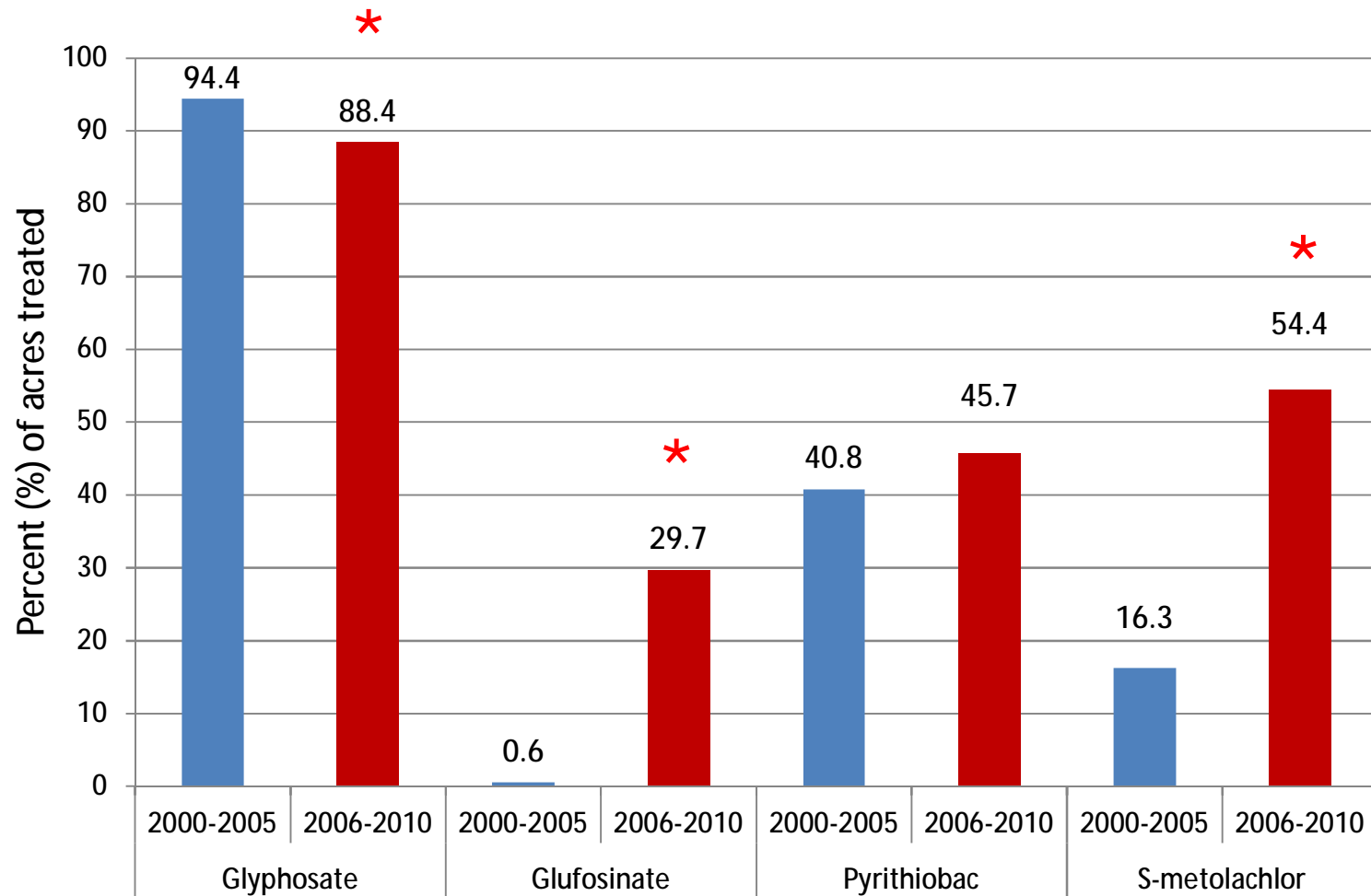
Growers: Pre-plant* /PRE herbicides applied

Percent (%) of acres treated



Growers: POST herbicides applied

Percent (%) of acres treated



Growers

2000-2005: Herbicide costs = \$32.30/A

2006-2010: Herbicide costs = \$62.50/A



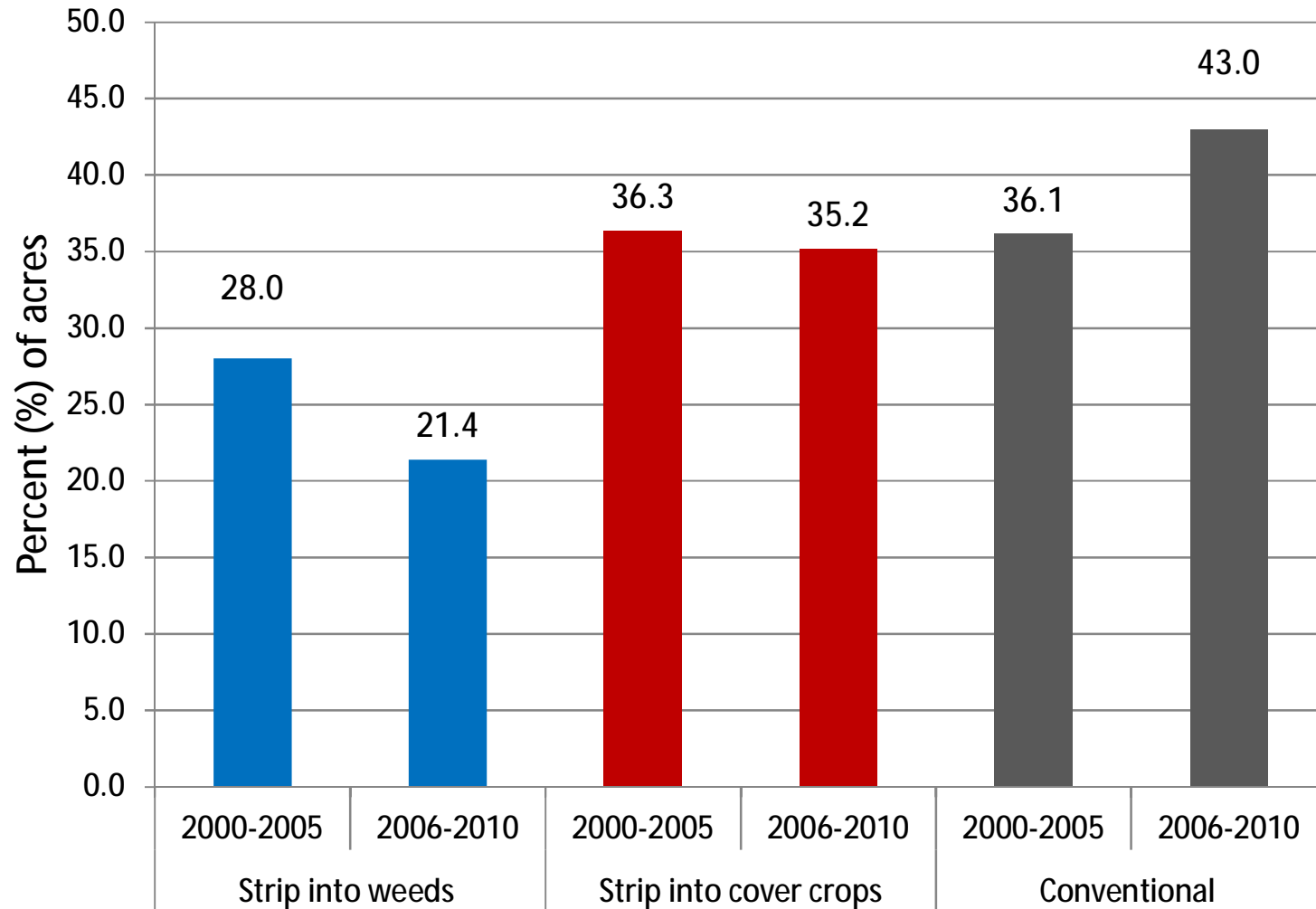
2000-2005: 17% of growers hand-weeded
5% cotton acres at \$2.40/A

2006-2010: 92% of growers hand-weeded
52% cotton acres at \$23.70/A

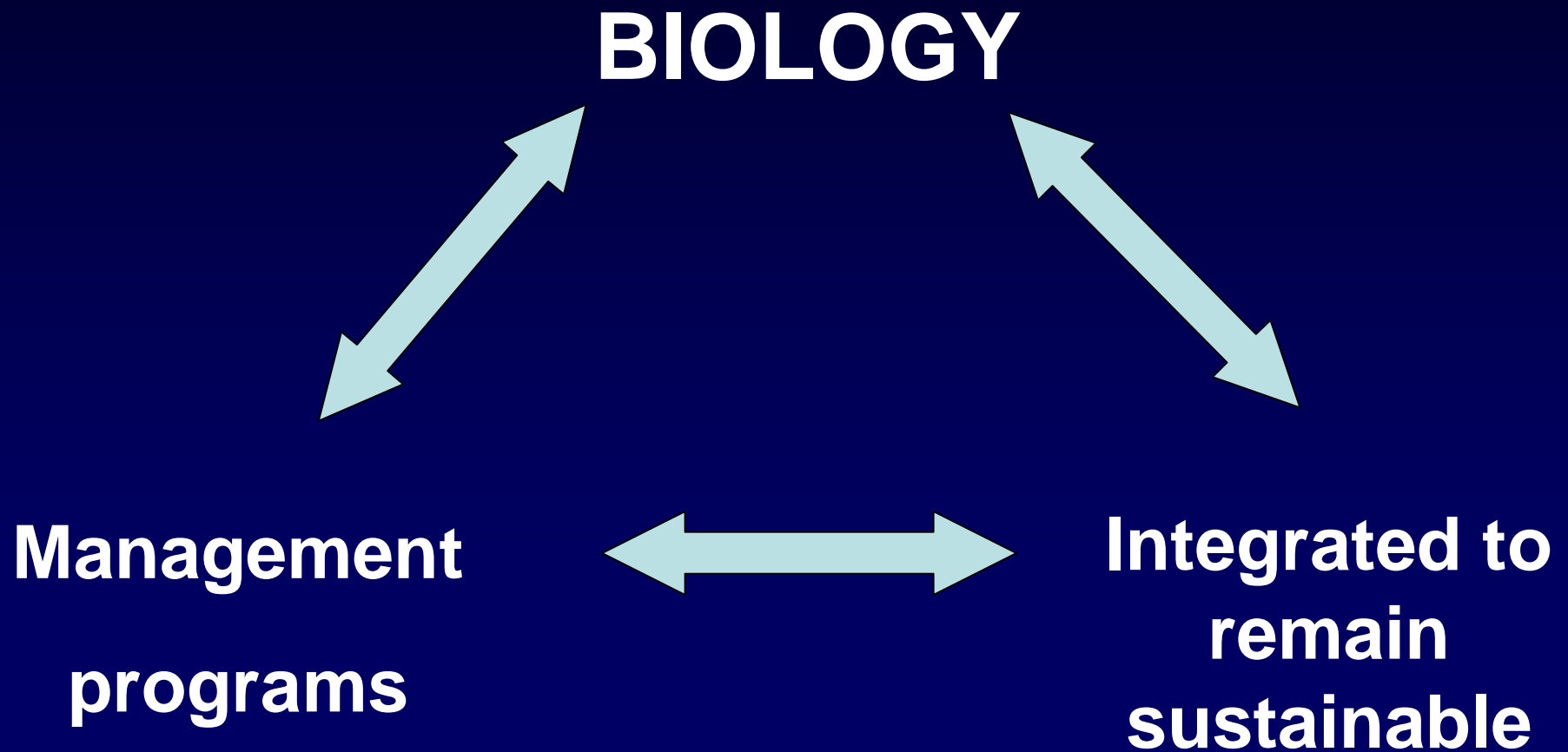


Photo by A.C. York 2010

Growers: Changes in tillage/planting practices from 2000-2005 to 2006-2010



Diversity and Integration: Keys to Surviving in a Palmer World



RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor <i>No Palmer up</i>	Reflex + Direx <i>add paraquat</i>	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx <i>Palmer up, >15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	OR		
Direx <i>Palmer up, <15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	RU + Dual or Warrant		

1. Resistance management; 2) life of residual herbicide on soil; 3) effectiveness on Palmer, 4) Palmer emergence and growth, and 5) cost of product

RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor <i>No Palmer up</i>	Reflex + Direx <i>add paraquat</i>	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx <i>Palmer up, >15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	OR		
Direx <i>Palmer up, <15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	RU + Dual or Warrant		

**APPLY VALOR AND/OR DIREX TO EVERY ACRE;
MUST BE PALMER FREE AT PLANTING!!!**

Valor applied broadcast followed by strip till.



RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor <i>No Palmer up</i>	Reflex + Direx <i>add paraquat</i>	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx <i>Palmer up, >15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	OR		
Direx <i>Palmer up, <15 d to plant</i>	Reflex + Prowl <i>add paraquat</i>	RU + Dual or Warrant		

RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor	Reflex + Direx	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx	Reflex + Prowl	OR		
Direx	Reflex + Prowl	RU + Dual or Warrant		



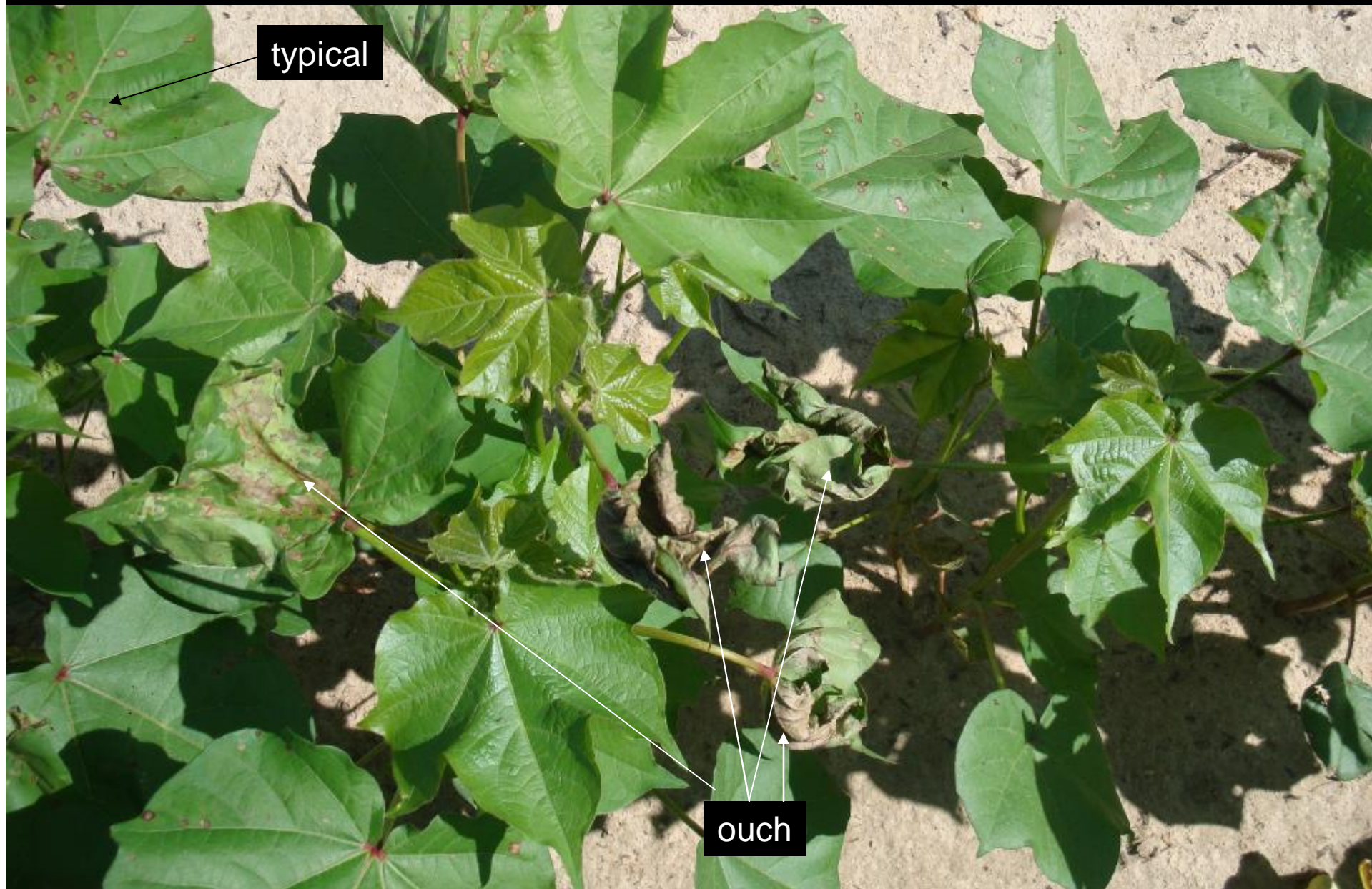
RU + Staple wins 7 out of 10 times!

RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor	Reflex + Direx	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx	Reflex + Prowl	OR		
Direx	Reflex + Prowl	RU + Dual or Warrant		

Consider direct spraying Warrant mixture if more than 6 leaf cotton!

Roundup + Warrant applied over **AGGRESSIVELY**
growing **LARGE** cotton.



RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor	Reflex + Direx	RU + Staple	RU + Dual or Warrant	Direx + MSMA
Valor + Direx	Reflex + Prowl	OR		
Direx	Reflex + Prowl	RU + Dual or Warrant		

No brainer.....Suprend great option as well!



RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor	Reflex + Direx	RU + Staple		
Valor + Direx	Reflex + Prowl	OR	RU + Dual or Warrant	Direx + MSMA
Direx	Reflex + Prowl	RU + Dual or Warrant		
add paraquat if Palmer emerged, follow plantback	48 hr within planting; add paraquat	10 - 12 d after PRE (10 day after May 10)	12 - 14 d after POST1 (12 day after May 10)	15-17 d after POST2

RR Reduced Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST 2	Layby
Valor	Reflex + Direx	RU + Staple	<p>Allows 2 residuals at planting instead of 3 to reduce injury.</p> <p>Perfect timing for thrips application!</p> <p>Allows time for activation before PRE breaks down!</p>	
Valor + Direx	Reflex + Prowl	OR		
Direx	Reflex + Prowl	RU + Dual or Warrant		
add paraquat if Palmer emerged, follow plantback	48 hr within planting; add paraquat	<p>10 - 12 d after PRE</p> <p>(10 day after May 10)</p>	<p>12 - 14 d after POST1</p> <p>(12 day after May 10)</p>	15-17 d after POST2

Tillage is now a common scene



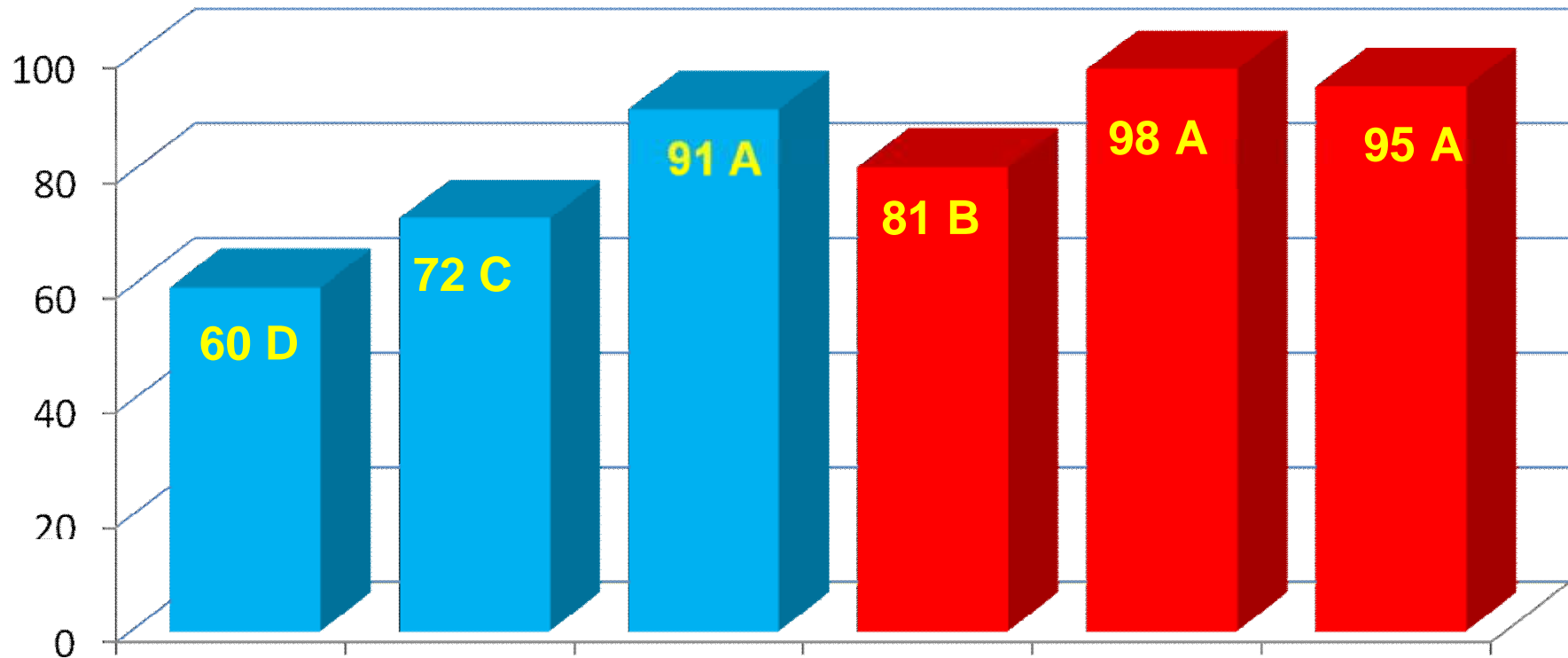
RR Conventional Tillage Cotton Systems. 2012.

Preplant	PRE	POST1	POST2	Layby
Treflan/Prowl + Reflex 12 oz	Reflex 8-12 oz + Direx	RU + Staple <i>(Palmer up)</i> or RU + Dual or Warrant	RU + Dual or Warrant	Direx + MSMA



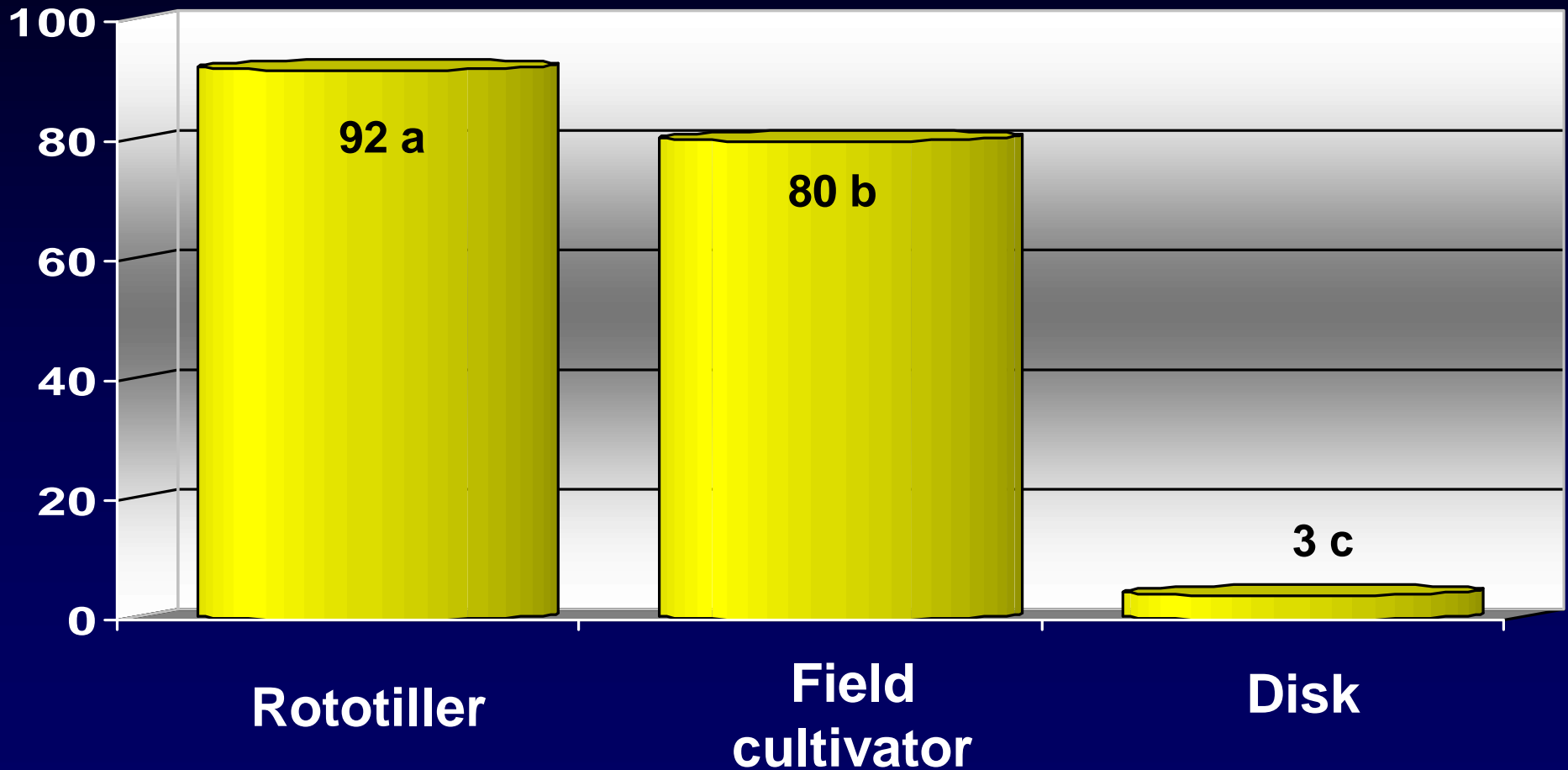
Split Reflex system: 3 types of chemistry

Percent Palmer Amaranth control with Reflex PPI, PRE, or Split Applied at 35 DAT. 2011.



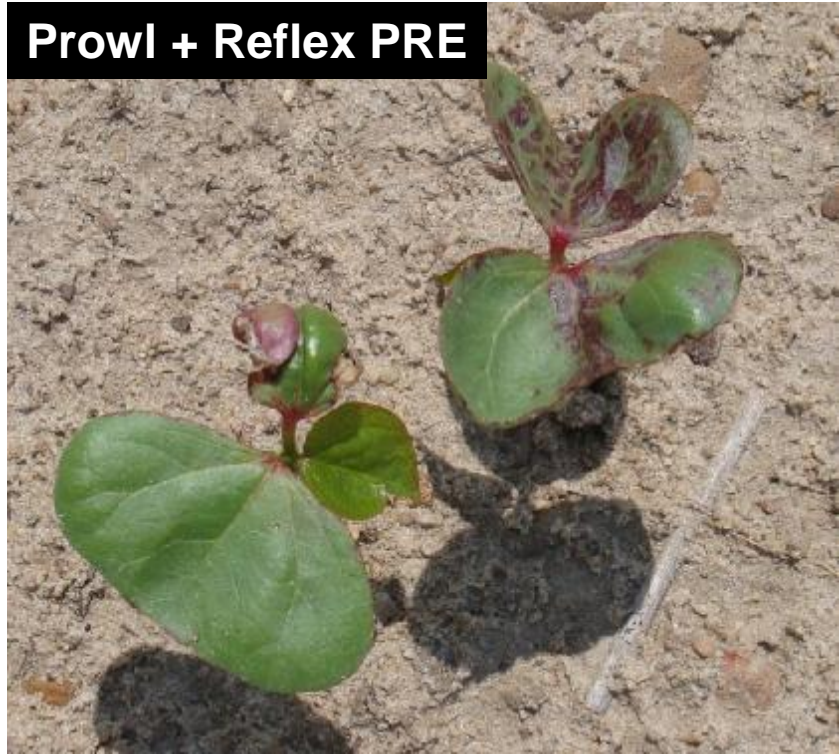
Prowl H2O 2 pts/A included with all treatments.

Percent Palmer Control with Reflex + Prowl PPI, 2010. TyTy, GA. 38 DAT.



Cotton injury is a big concern for growers!!





Irrigated May 13
Planted May 14
Irrigated May 19 during emergence

Roundup Ready PLUS Cotton Incentive (Up to \$22)

Valor AND Reflex = (\$3.00)

Cotoran, Cotton Pro, Direx = (\$3.00)*

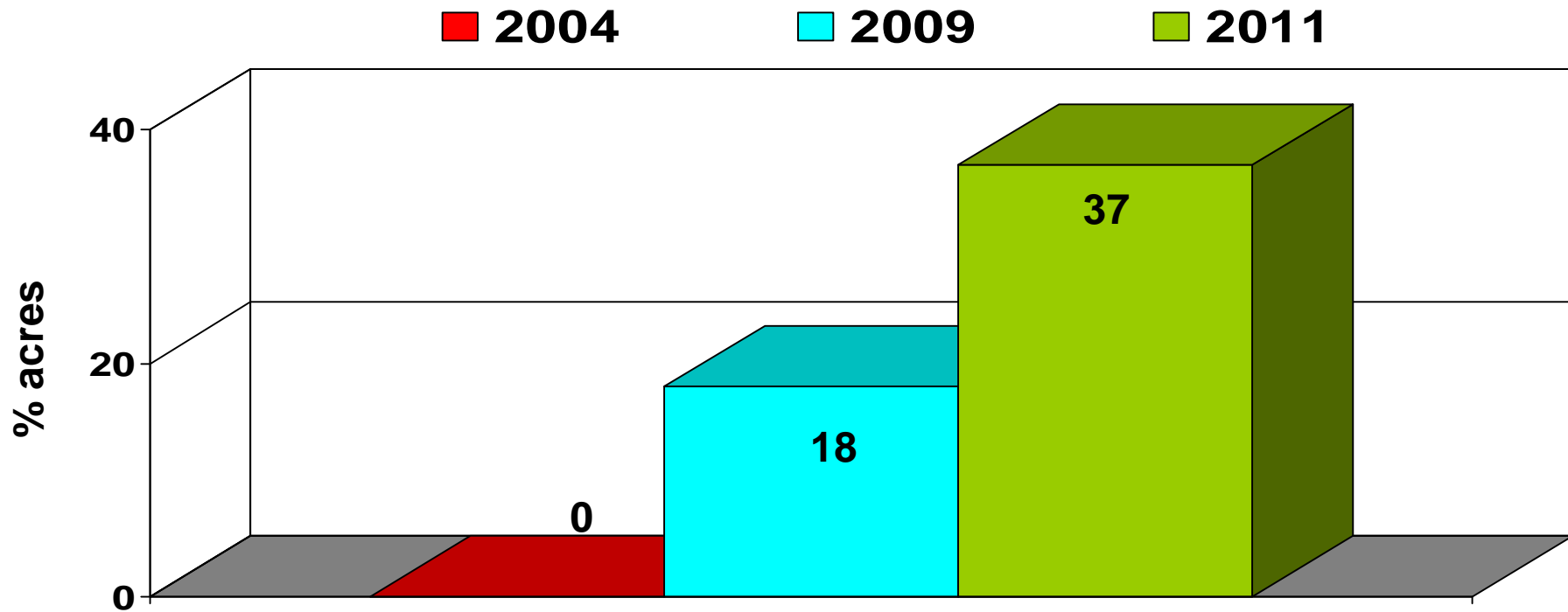
Warrant 3 pt = (\$4.50)*

Dual Magnum 1 pt = (\$3.00)

Gramoxone Inteon 2 pt = (\$1.00)

*Will pay on 2 applications

Impact of GR Palmer amaranth on GA.



Liberty-based Programs

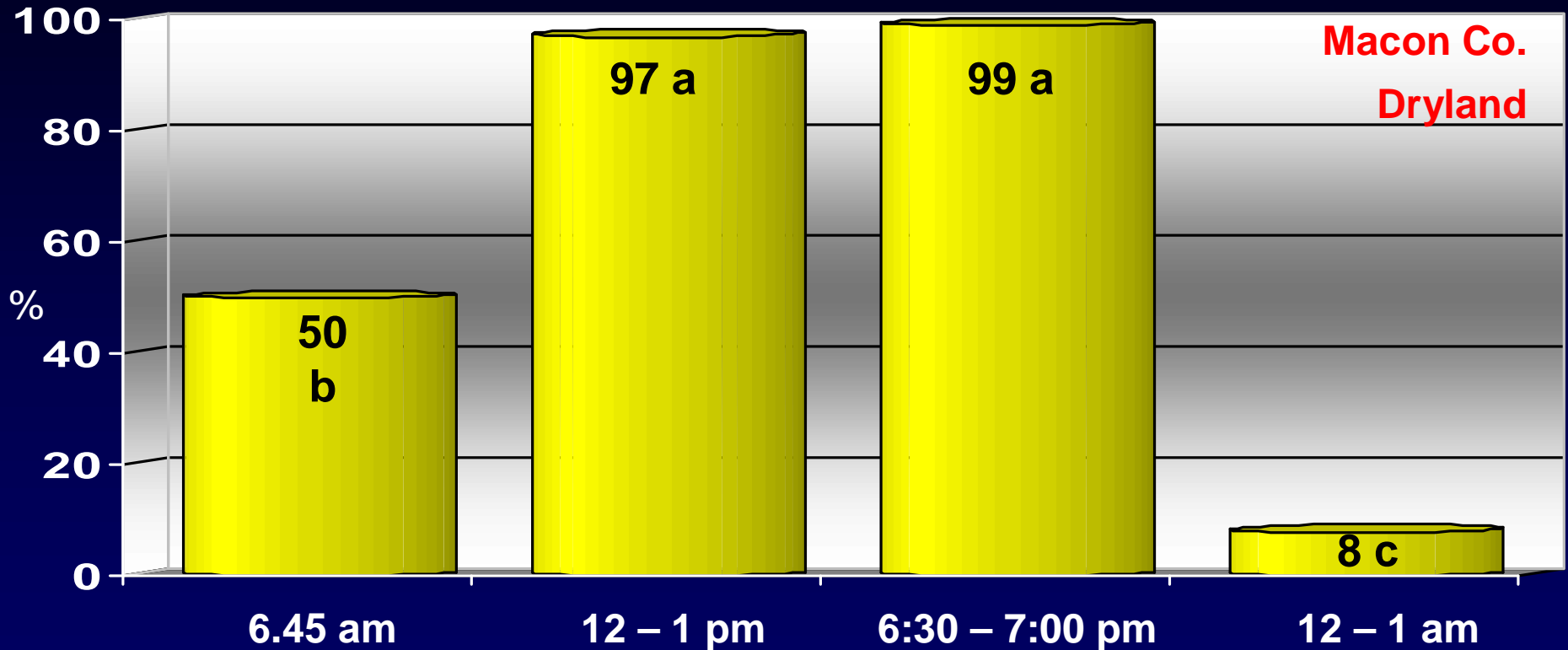
Making the most of your Liberty!

- Ø Water volume
- Ø Spray tip and pressure
- Ø Time of day you spray
- Ø Palmer size



**MOST IMPORTANT IS TO HAVE PRESSURE AND NOZZLES
THAT GENERALTE MEDIUM (300-400 MICRONS)**

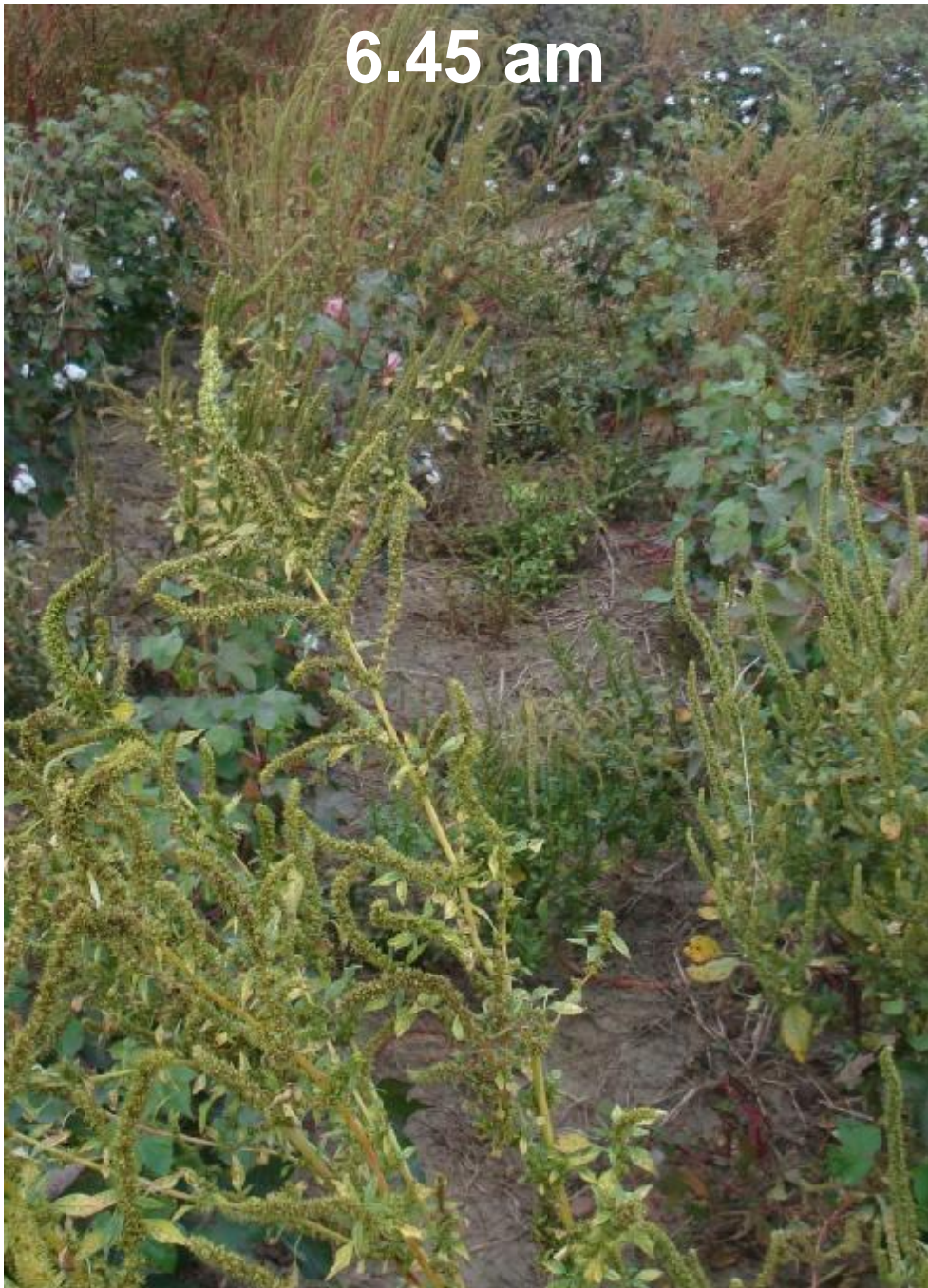
Late-season Palmer control with Liberty as influenced by time of day.



Time of Day for Liberty Applications

Ignite POST 1 (5" Palmer), Ignite POST 2 (18 d later), Diuron + MSMA layby

6.45 am



12:30 pm



Ignite POST (5"Palmer), Ignite POST 2 (18 d later), diuron + MSMA layby

Making the most of your Liberty

GPA

Time

Nozzle

Rate

Making the most of your Ignite

GPA

Time

**Biggest pigweed
in the field is 3
inches!!!!!!!!!!!!!!!!!!!!**

Nozzle

Rate

32 oz/A Gly 4 fb 29 oz/A Ignite on 12" Palmer



Controlling Palmer in **LL** Cotton. 2012.

Pre-plant	PRE	POST1 1-lf cotton	POST 2 5-7 lf cotton	Layby
Valor or	Diuron + Prowl Cotoran + Prowl <i>Add in paraquat</i>	Liberty +	Liberty	Direx +
diuron	Reflex + Prowl Staple + Prowl <i>Add in paraquat</i>	Dual Mag		MSMA

NO IGNITE AT BURNDOWN OR LAYBY!!!!!!!!!!!!!!!!!!!!!!

Heavy Residue



Deep Turn



Georgia growers will not economically survive relying on just herbicides!!!!

Hand weed



Cultivate



Most Palmer amaranth emerges from top inch



Number of Palmer Amaranth Plants During Early Season. Macon Co., Georgia 2008.*



No Deep Tillage



Deep Turn

No Herbicide Treatment

Palmer requires a significant amount of sunlight to emerge!!





**75 to 95%
control in
middle**

Potential Benefits for Georgia Growers



1. Improved Palmer control
2. Protect herbicide chemistry
3. Labor (compared to tillage)
4. Wind and water erosion
5. Prevents GR horseweed
6. Prevents/Lessons GR ryegrass
7. Moisture conservation
8. Reduce herbicide inputs
9. Higher yields on dryland
10. Protection from EPA
11. Reduces thrips damage

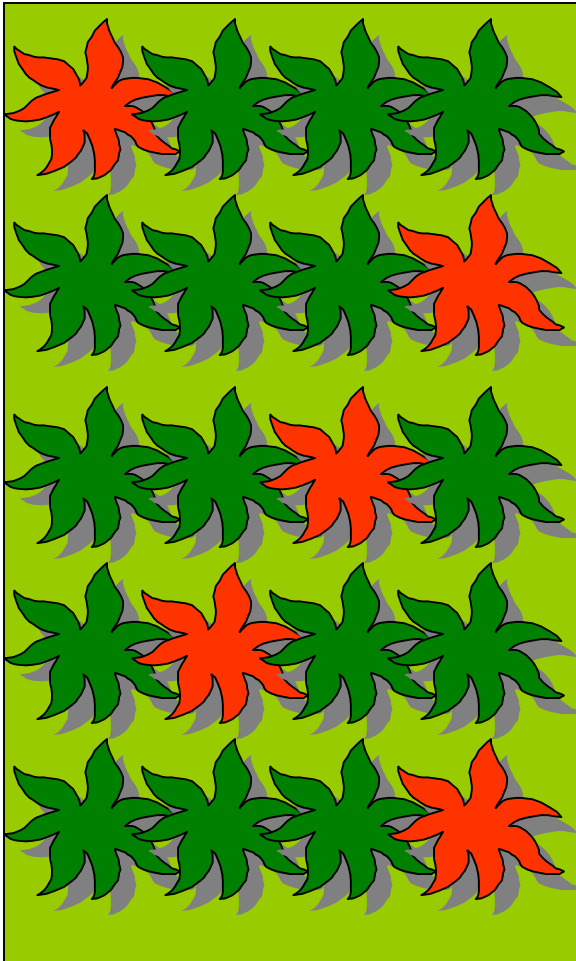
Potential Challenges for Georgia Growers



1. Blowout impacting stand
2. Incorporate herbicides with when strip tilling
3. Spray then roll, roll then spray?
4. Time to get established
5. Increased fertilizer
6. Rubber wheel system
7. Grower comfort



Palmer amaranth seedbank – it is the key!



YEAR 1: 5 Palmer females escape

Produce 2,000,000 seeds in cotton (50% germ)

YEAR 2:

Weed program = 99.9% control

1,000 plants per acre left at harvest

400 female plants/A

160,000,000 seeds produced in cotton (50%)

YEAR 3:

Weed program 99.9% control

80,000 plants per acre left at harvest

32,000 female plants/A = 1.28×10^{10} seed/A

Herbicide Resistance: Will You Survive?

25 plants per
square foot emerge

=

1,089,000 plants
per acre

If resistance is **one in a billion** then you
only need **918 acres** to find that plant.

(historically resistance is 1 plant in population of 1-10 million...9.18 acres)

PPO Herbicides



- *Resistance has already been reported in other areas!!!*
- *Amaranthus quitensis*
 - 2005 (Bolivia)
- *Common waterhemp*
 - 2001 (Kansas)
 - 2002 (Illinois)
 - 2005 (Missouri)
 - 2009 (Iowa)
- *Common ragweed*
 - 2005 (Delaware)
 - 2006 (Ohio)
- *Wild poinsettia*
 - 2004 (Brazil)

Liberty



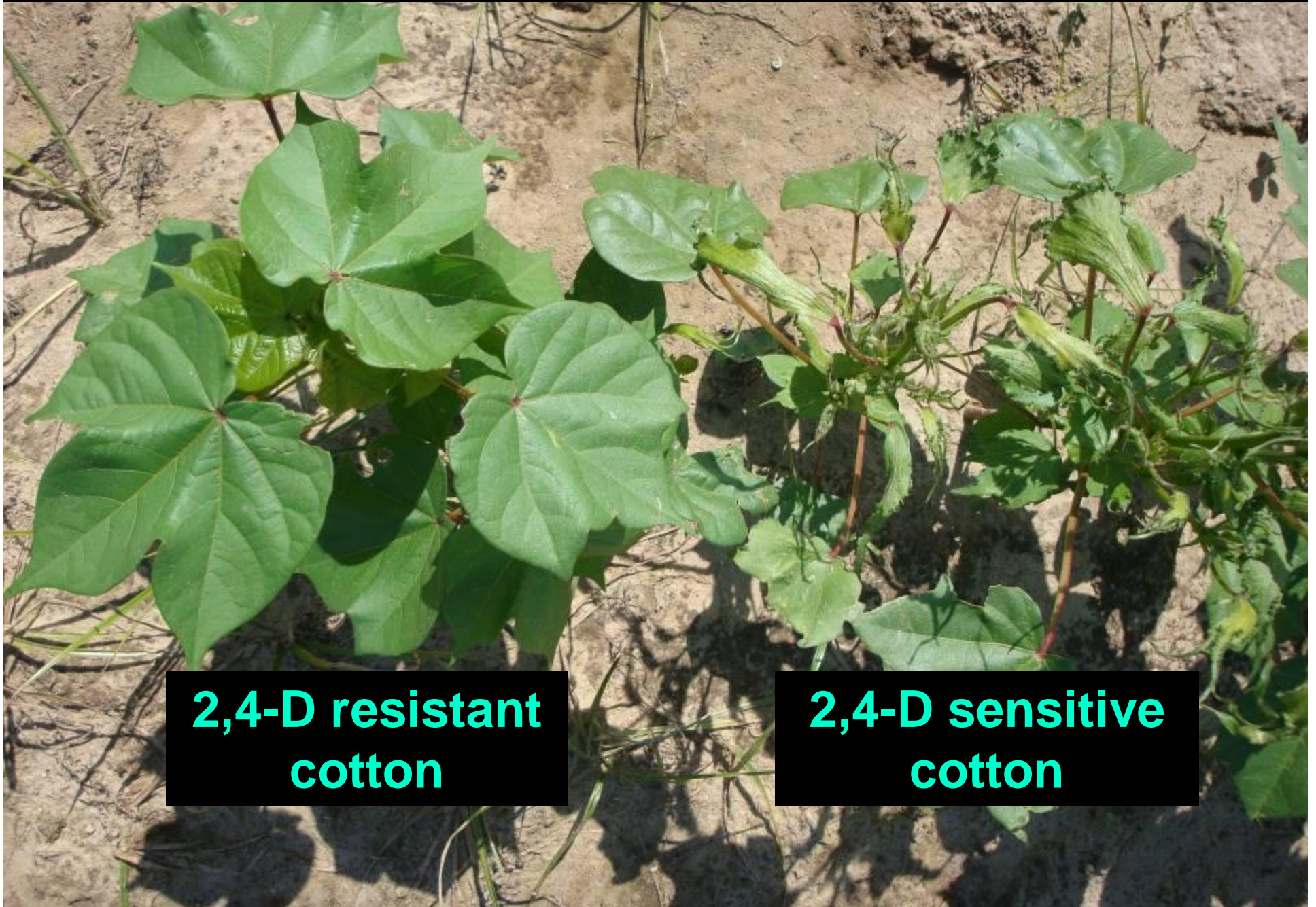
- **Abuse of Liberty**
 - *LL cotton, corn, soybeans*
 - *PHY WRF cotton*
 - *may jeopardize future technologies (DHT, Dicamba)*
- **Current resistances**
 - *Italian ryegrass (Oregon)*
 - *Goosegrass (Malaysia)*



Ignite[®]
FOR ALL **LibertyLink**[®] CROPS

**LIBERTY
LINK**[®] 
IGNITE[®] HERBICIDE TOLERANT

Future Technology: 2,4-D or Dicamba Resistant Cotton



**2,4-D resistant
cotton**

**2,4-D sensitive
cotton**



1.5 pt of 2,4-D



Liberty + 1.5 pt of 2,4-D



Clarity 8 oz



Liberty + Clarity 8 oz



HPPD



Liberty + HPPD

Controlling Palmer in **LL** Cotton. 2012.

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Valor or	Diuron + Prowl Cotoran + Prowl <i>Add in paraquat</i>	Liberty + Dual Mag	Liberty	Direx + MSMA
diuron	Reflex + Prowl Staple + Prowl <i>Add in paraquat</i>			

NO IGNITE AT BURNDOWN OR LAYBY!!!!!!!!!!!!!!!!!!!!!!

How do we save Liberty and the family farm????



- Significant pressure on Bayer.....prevent known repetitive abusers from being able to purchase Liberty??
- Bayer/Monsanto/Dow should unite!!!!
- Growers/Industry/Distributors/Dealers/Extension unite!!
- Regulate????