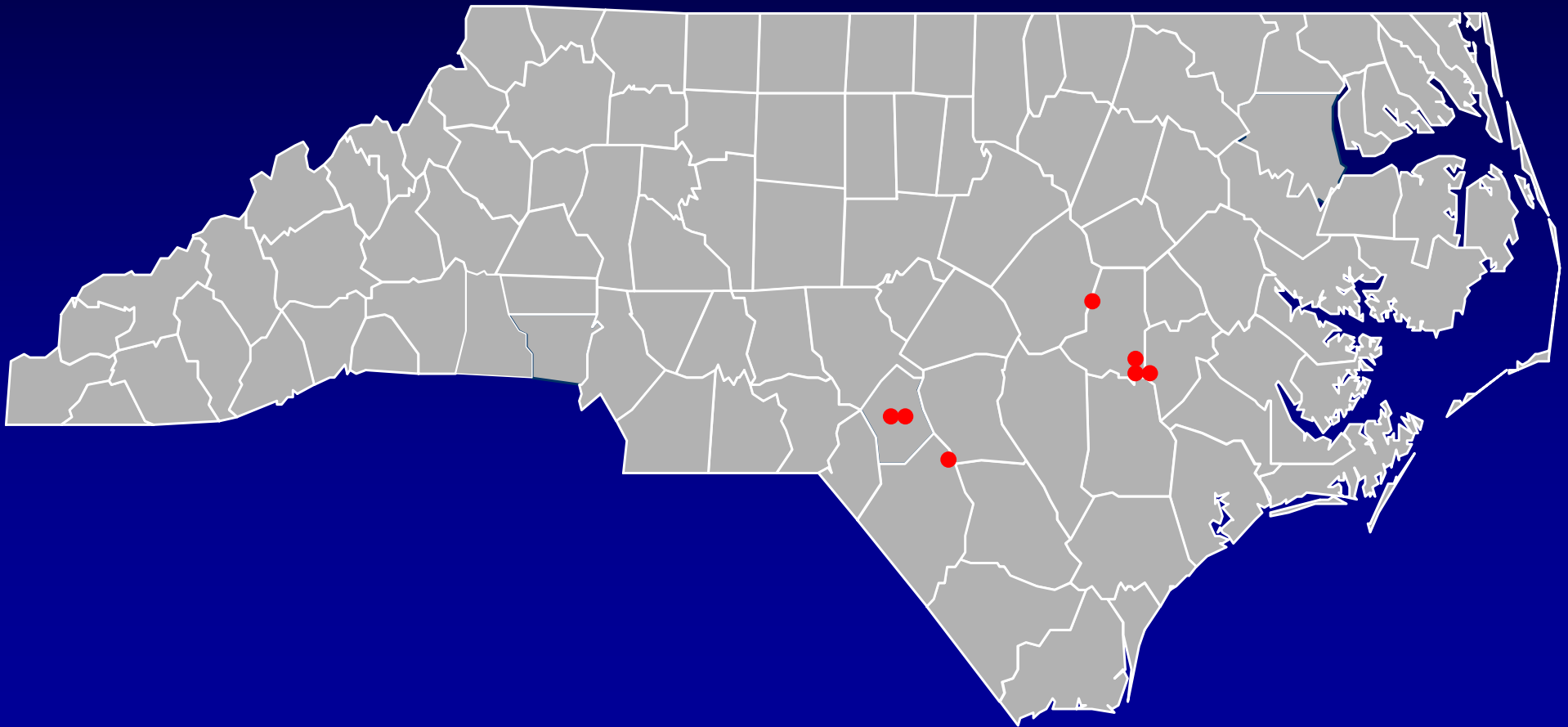






Glyphosate-Resistant Palmer Amaranth

Initial concerns in 2005





Untreated

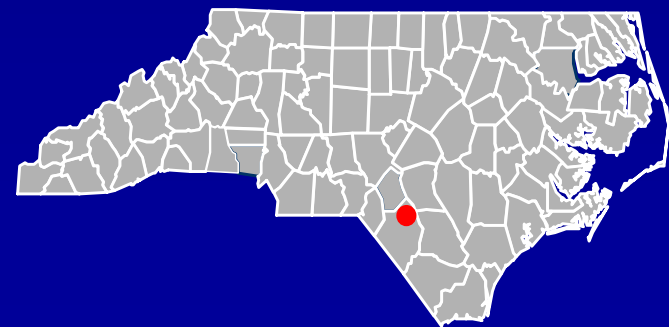


Glyphosate 0.75 lb ae/A

12 inches at treatment

14 DAT

Parkton, NC 2005





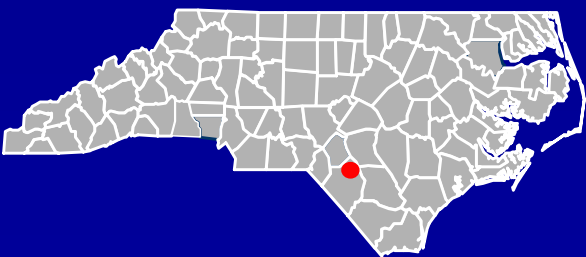
Untreated



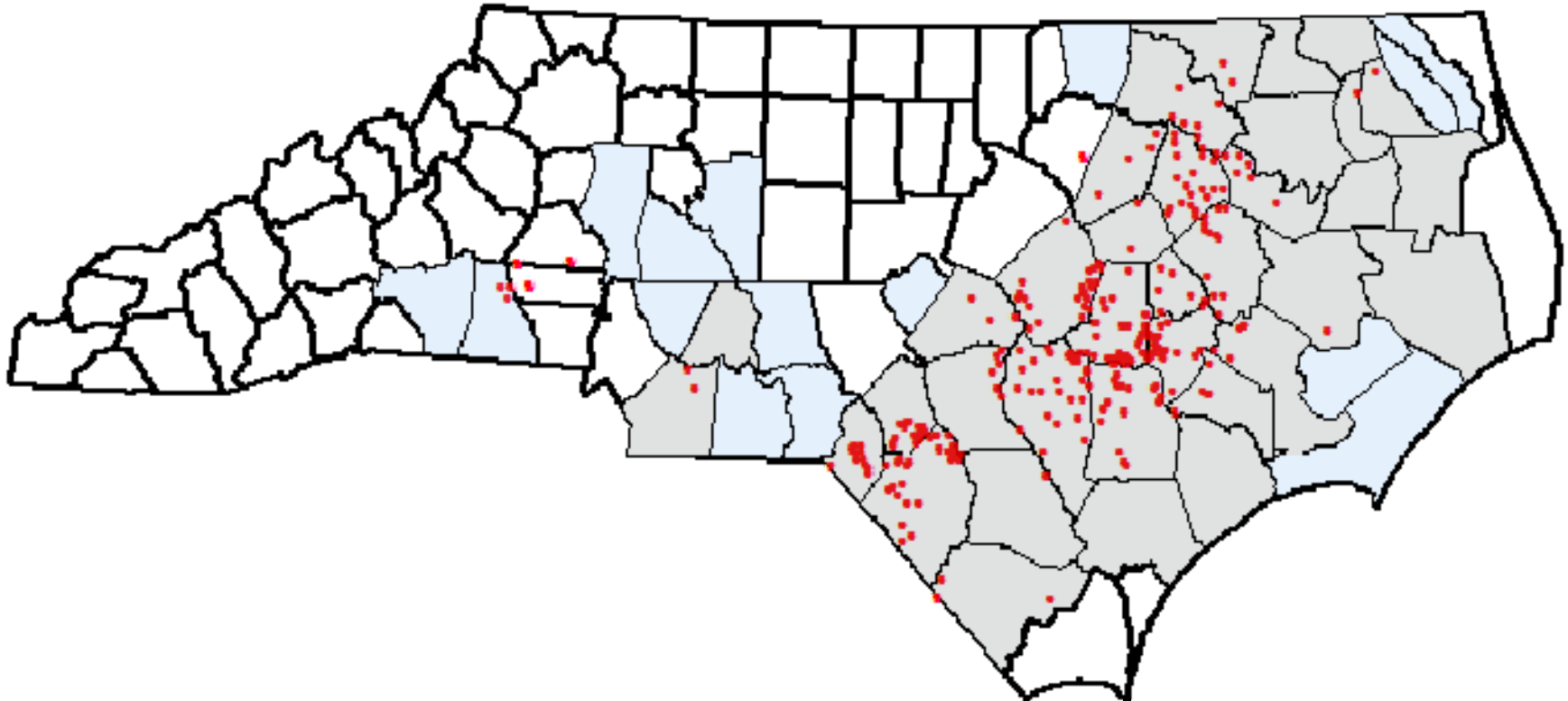
Glyphosate 3.0 lb ae/A

14 DAT

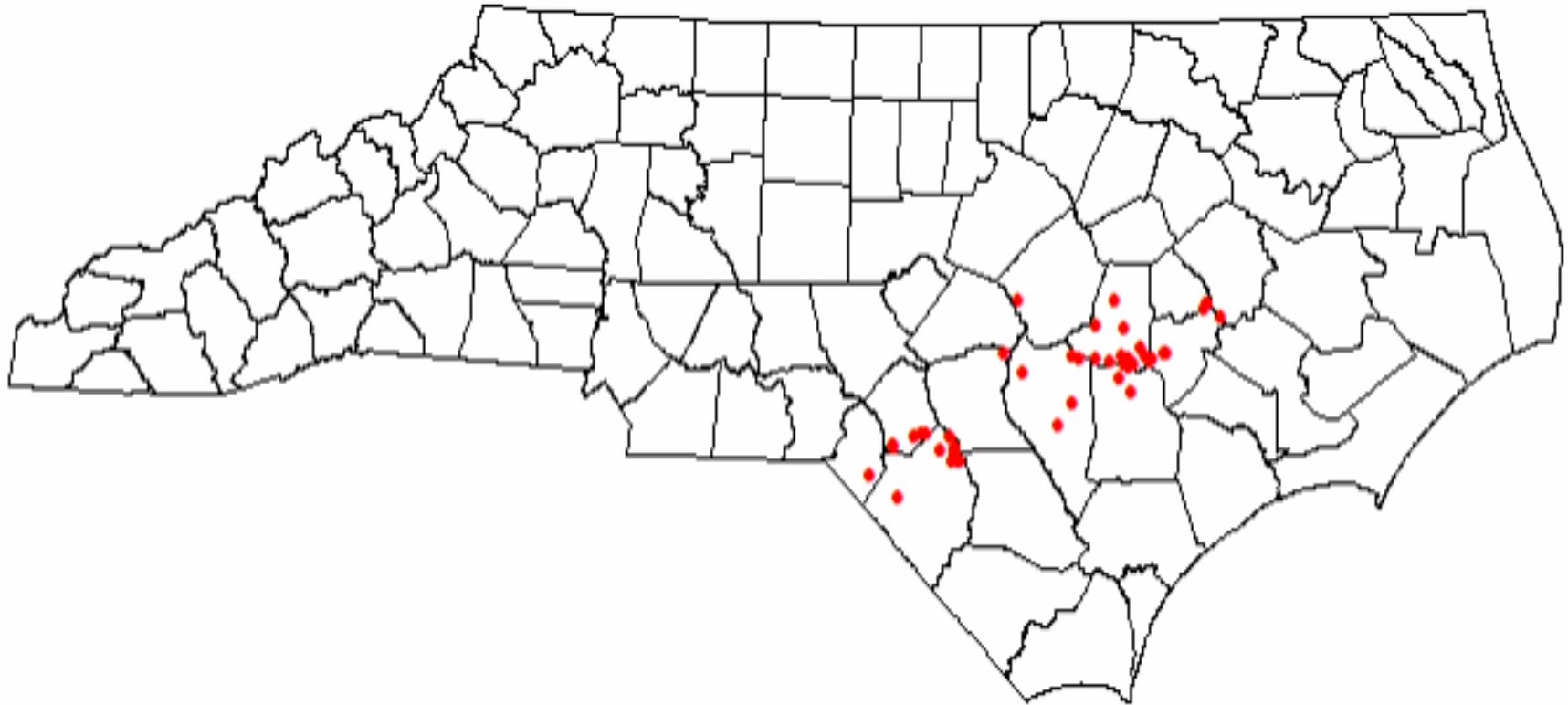
Parkton, NC 2005



290 Fields Sampled in Fall 2005







49 of 290 Fields Resistant
Located in 11 Counties

Known susceptible
population



Untreated ← Treated →

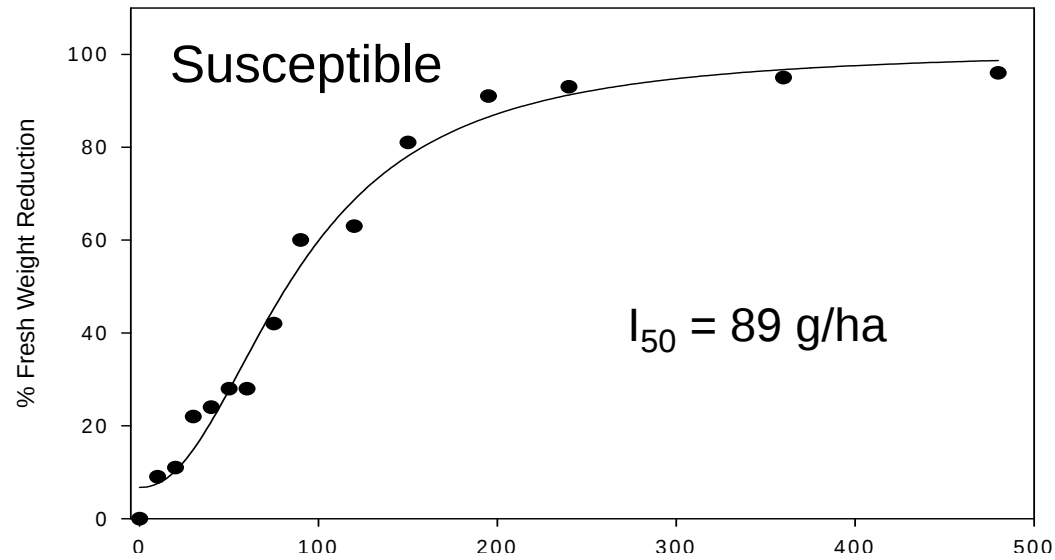


Untreated ← Treated →



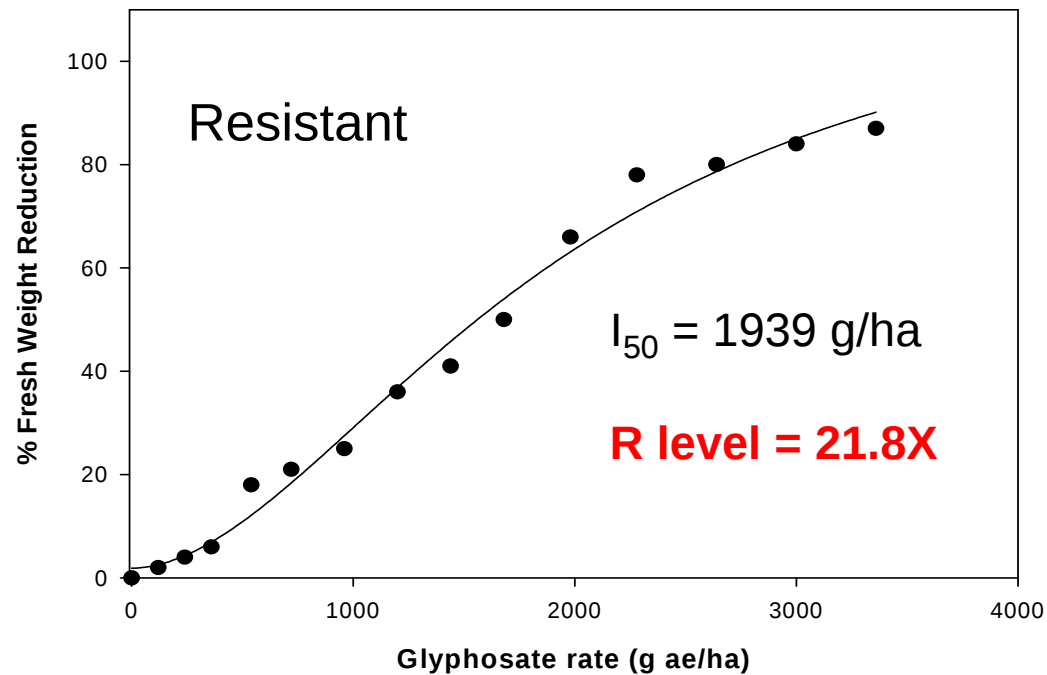
Untreated ← Treated →

Percent fresh weight reduction, greenhouse: North Carolina.



$$y = 6.747 + \frac{101.0643 - 6.7470}{1 + (x/88.9212)^{-2.1698}}$$

$$R^2 = 0.984$$



$$y = 1.8664 + \frac{121.9982 - 1.8644}{1 + (x/1939.2205)^{-1.8546}}$$

$$R^2 = 0.989$$

The background of the slide is a photograph of a field of tall, dry, yellowish-brown grass. In the distance, there is a dense line of green trees under a clear blue sky. The text is overlaid on this image.

Impacts

High level of awareness

Lot of worrying

Some action





Untreated

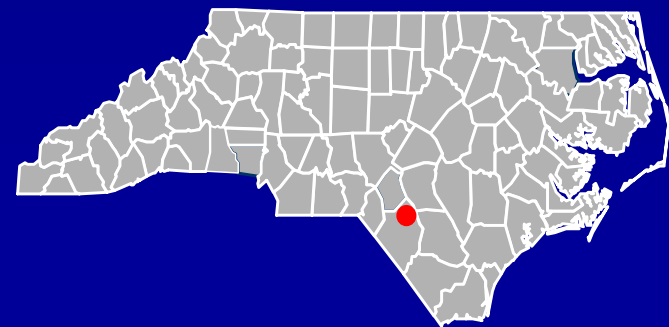


Glyphosate 0.75 lb ae/A

12 inches at treatment

14 DAT

Parkton, NC 2005





What are telling our growers?

- Raising awareness
- Early detection



Detect Resistance Early



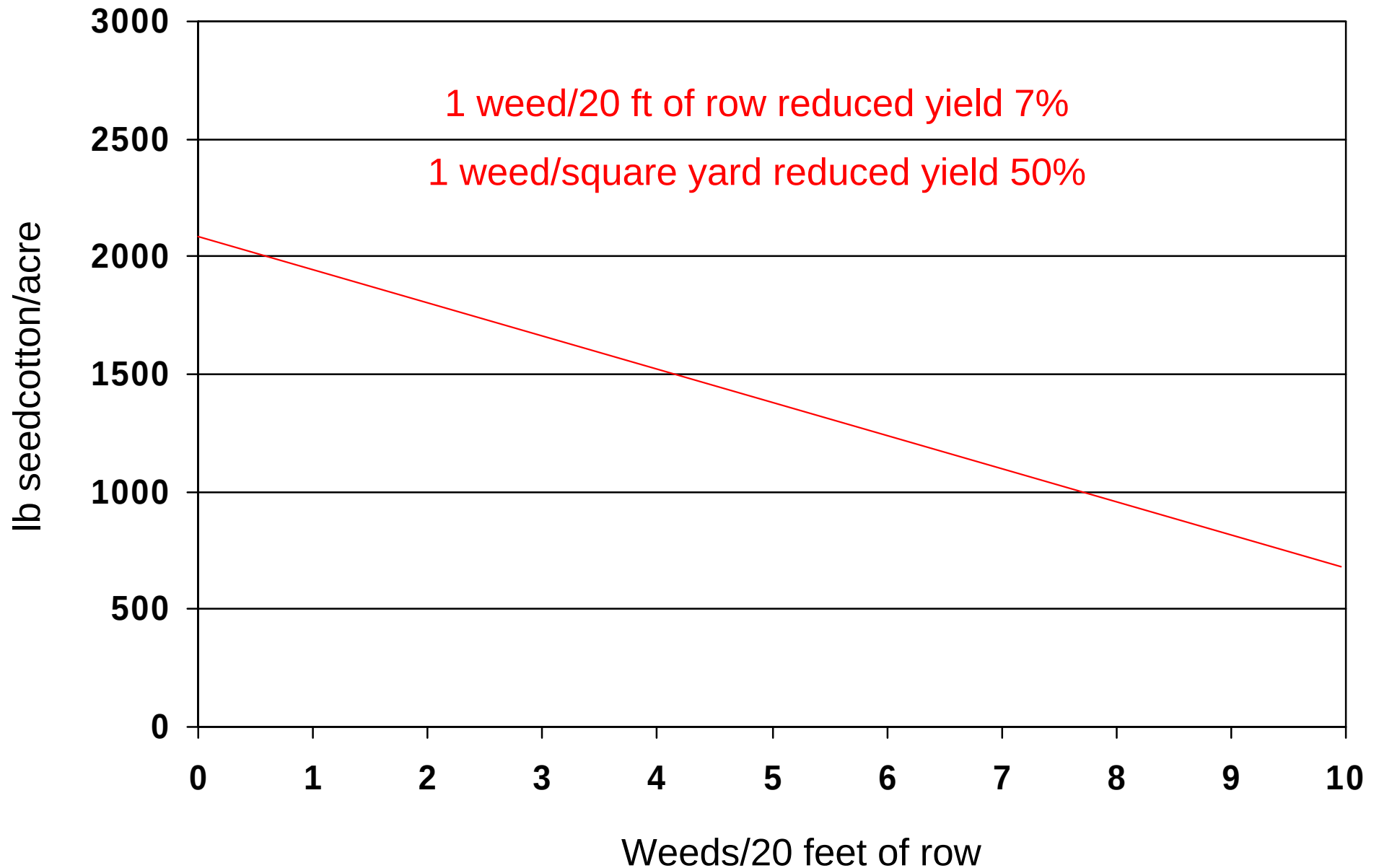
Is this weed resistant?
Wanna risk it?



What are telling our growers?

- Raising awareness
- Early detection
- Rotation; strive for good control in corn or soybeans; try to reduce seed bank

Cotton yield vs Palmer density





What are telling our growers?

- Raising awareness
- Early detection
- Rotation; strive for good control in corn or soybeans; try to reduce seed bank
- Multiple MOA's; strong focus on PRE's and residual control

North Carolina, 2006

Mid-
July



Untreated



Treated – no residual

Mid-
Oct





Glyphosate-resistant Palmer amaranth

Robeson County, 2007

Palmer Amaranth Resistance Management

- Reduce the seedbank
- Residual control is important
- Reduce selection pressure on ALS inhibitors





Weathermax 88 oz

Staple LX 10 oz

Culpepper, Macon Co., GA 2007

Sample near Parkton, NC



Check/Glyphosate



Check/pyrithiobac



Herbicide programs for Palmer amaranth control in RR Soybean

Glyph. resist.	ALS resist.	Preplant or Preemergence	Postemergence
No	Yes or No	Authority MTZ¹, Boundary, Dual Magnum, Envive, Intrro, Outlook, Prefix, Prowl, Sencor, Valor SX, or Valor XLT¹	Lighter infestations: Glyphosate
			Heavy infestations: Glyph. + Dual Mag. or Sequence
Yes	No	Authority MTZ¹, Boundary, Envive, Intrro, Prefix, Valor SX, or Valor XLT¹	Glyphosate + Harmony GT², Glyposate + Flexstar³, or Glyphosate + Reflex³
Yes	Yes	Authority MTZ¹, Boundary, Envive, Intrro, Prefix, Valor SX, or Valor XLT¹	Glyphosate + Flexstar or Glyphosate + Reflex

¹ Do not plant cotton in following year.

² An ALS inhibitor.

³ Do not apply Flexstar or Reflex POST if Prefix used PRE.

Herbicide programs for Palmer amaranth control in **non-RR** Soybean

Sickle-pod	ALS resist.	Palmer infestation	Preplant or Preemergence	Postemergence
No	No	Light	Authority MTZ ^{1,2} , Boundary, Dual Magnum, Envive, Intrro, Outlook, Prefix, Sencor ² , Valor SX ³ , or Valor XLT ^{1,3}	Flexstar ⁴ , Reflex ⁴ , Storm, or Ultra Blazer; can add Harmony GT ⁵ to any of these
		Heavy	Authority MTZ ^{1,2} , Boundary, Envive, Prefix, Sencor ² , Valor SX ³ , or Valor XLT ^{1,3}	
No	Yes	Light or heavy	Authority MTZ ^{1,2} , Boundary, Envive, Prefix, Sencor ² , Valor SX ³ , or Valor XLT ^{1,3}	Flexstar ⁴ , Reflex ⁴ , or Ultra Blazer
Yes	Yes or No	Light or heavy	Authority MTZ ^{1,2} , Boundary, or Sencor ²	Flexstar + Classic or Reflex + Classic

¹ Do not plant cotton in following year.

² Add Dual, Intrro, Outlook, or Prowl for grass control.

³ Add Prowl for grass control.

⁴ Do not apply Flexstar or Reflex POST if Prefix used PRE.

⁵ An ALS inhibitor.



Untreated



PRE only



POST only



PRE + POST

Non-glyphosate programs, 2007

Recommended southeastern US herbicide programs for Palmer amaranth control in RR cotton

Glyph. resist.	ALS resist.	Preplant or Preemergence	Postemergence 1- to 4-leaf	Layby (Palmer < 3")
No	No	Staple*, Reflex**, Valor SX***, Direx, Cotoran, or Prowl	Light infestation: Glyphosate	Valor, Suprend, Direx, or Layby Pro plus MSMA or glyphosate
			Heavy infestation: Glyph. + Dual Mag.	

* Limit to one application per year.

** Caution if Valor preplant.

*** Preplant only.

Recommended southeastern US herbicide programs for Palmer amaranth control in RR cotton

Glyph. resist.	ALS resist.	Preplant or Preemergence	Postemergence 1- to 4-leaf	Layby (Palmer < 3")
Yes	No	Reflex* + Direx, Reflex* + Prowl, Direx + Staple**, or Valor SX***	No Palmer emerged: Glyph. + Dual Mag.	Valor, Suprend, Direx, or Layby Pro plus MSMA or glyphosate
			Palmer < 2 inches: Glyph. + Staple**	

* Caution if Valor preplant.

** Limit to one application per year.

*** Valor preplant only. Can follow with Direx, Cotoran, or Prowl preemergence.

Recommended southeastern US herbicide programs for Palmer amaranth control in RR cotton

Glyph. resist.	ALS resist.	Infestation level	Preplant or Preemergence	Postemergence
Yes	Yes	Reflex* + Direx, Reflex* + Prowl, Cotoran + Prowl, or Valor SX**	No Palmer emerged: Dual Mag.*** ± glyph.	Valor, Direx, or Layby Pro plus MSMA or glyphosate
			Palmer emerged: No options	

* Caution if Valor preplant.

** Valor preplant only. Can follow with Direx, Cotoran, or Prowl preemergence.

*** Shoot for 1-leaf cotton (label specifies minimum 3-inch cotton).



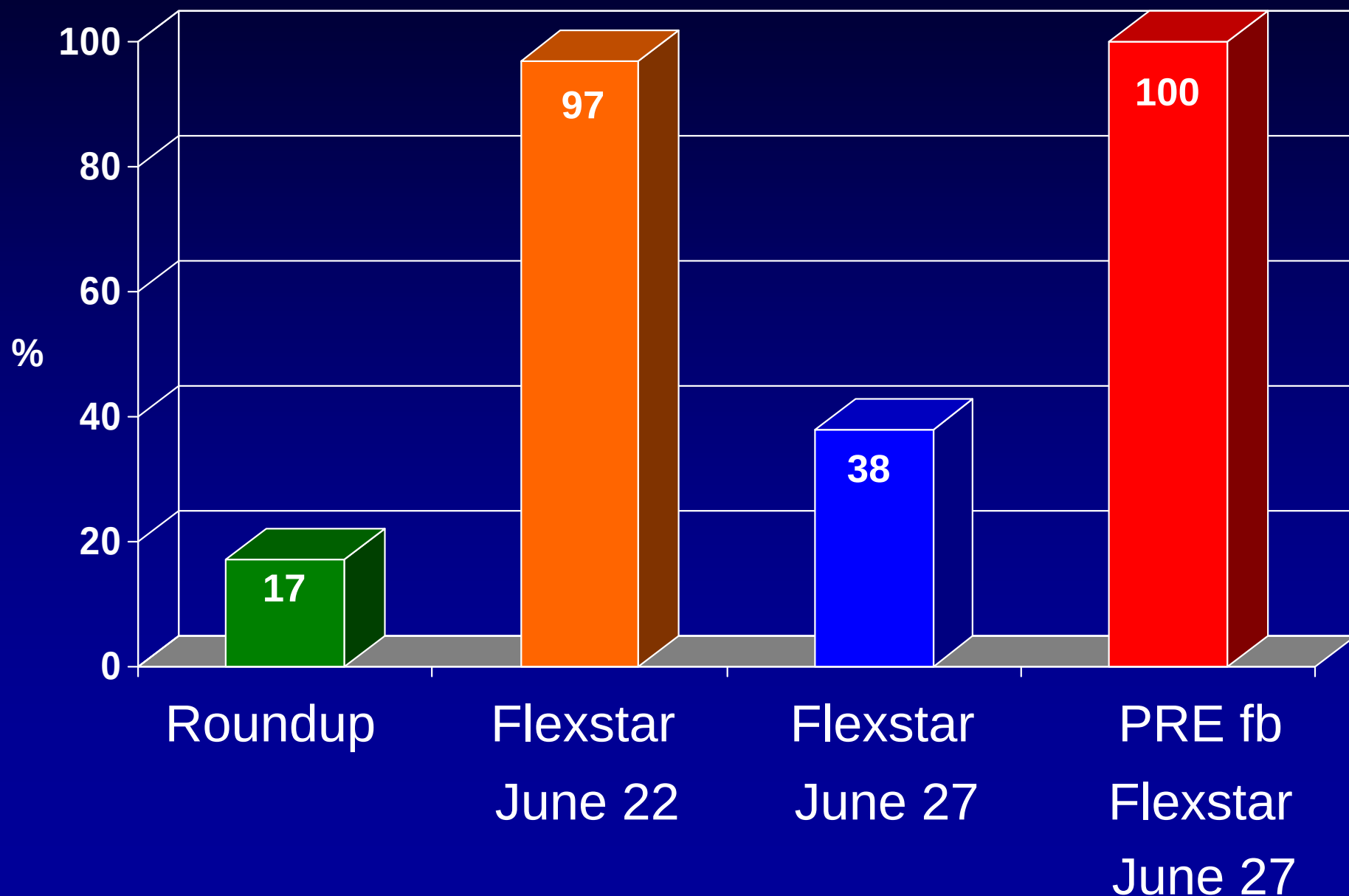
2007

Glyph. + 2,4-D burndown
Gram. + Reflex PRE
Glyph. + Dual first POST
Glyph. Second POST
Direx + MSMA Layby

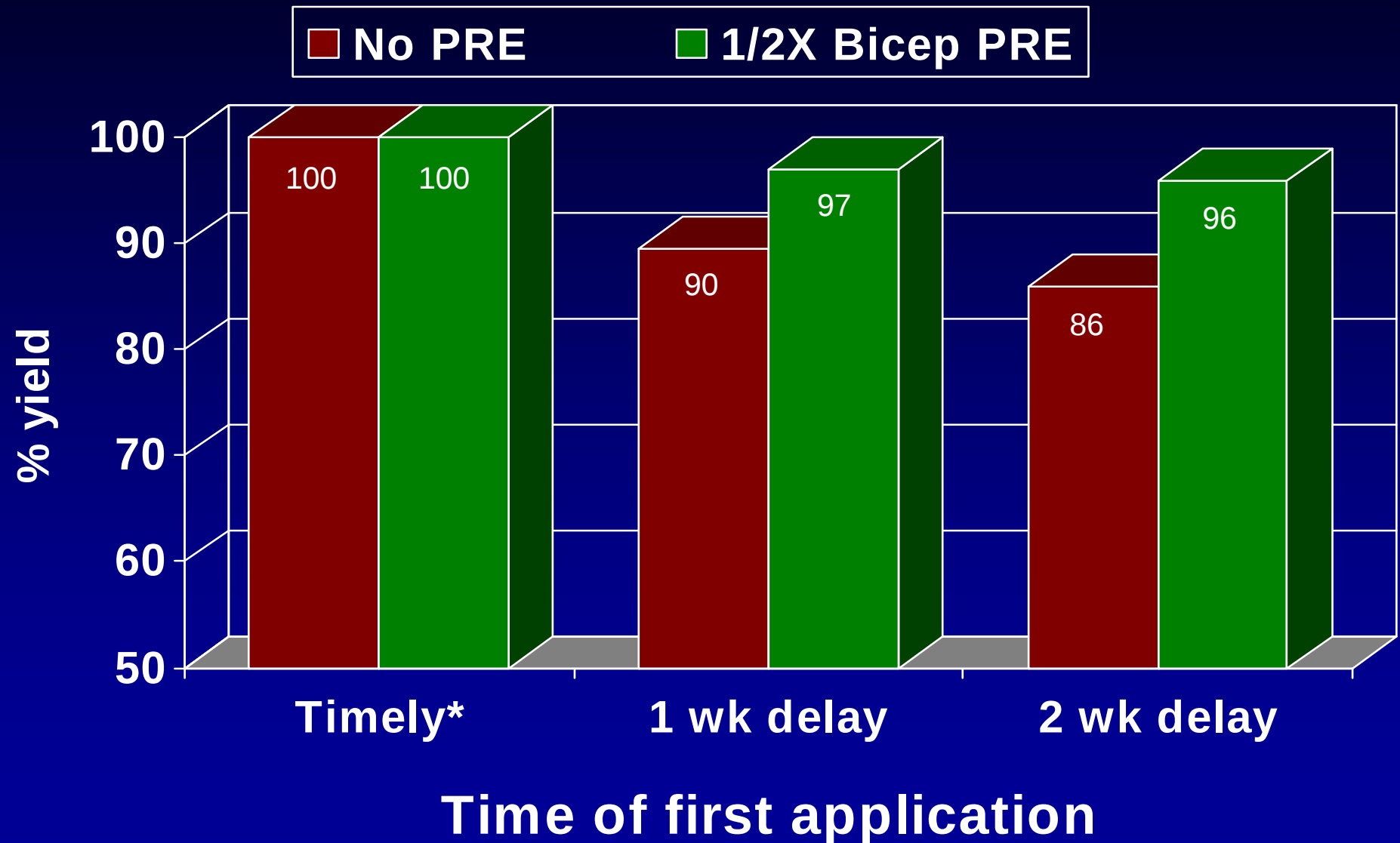
PRE Herbicides

- Strongly recommended in RR systems (cotton, corn, soybean)
- Significant aid in resistance management
- Can offer other benefits

Glyphosate-resistant Palmer amaranth. Soybeans. Robeson Co., 2007.



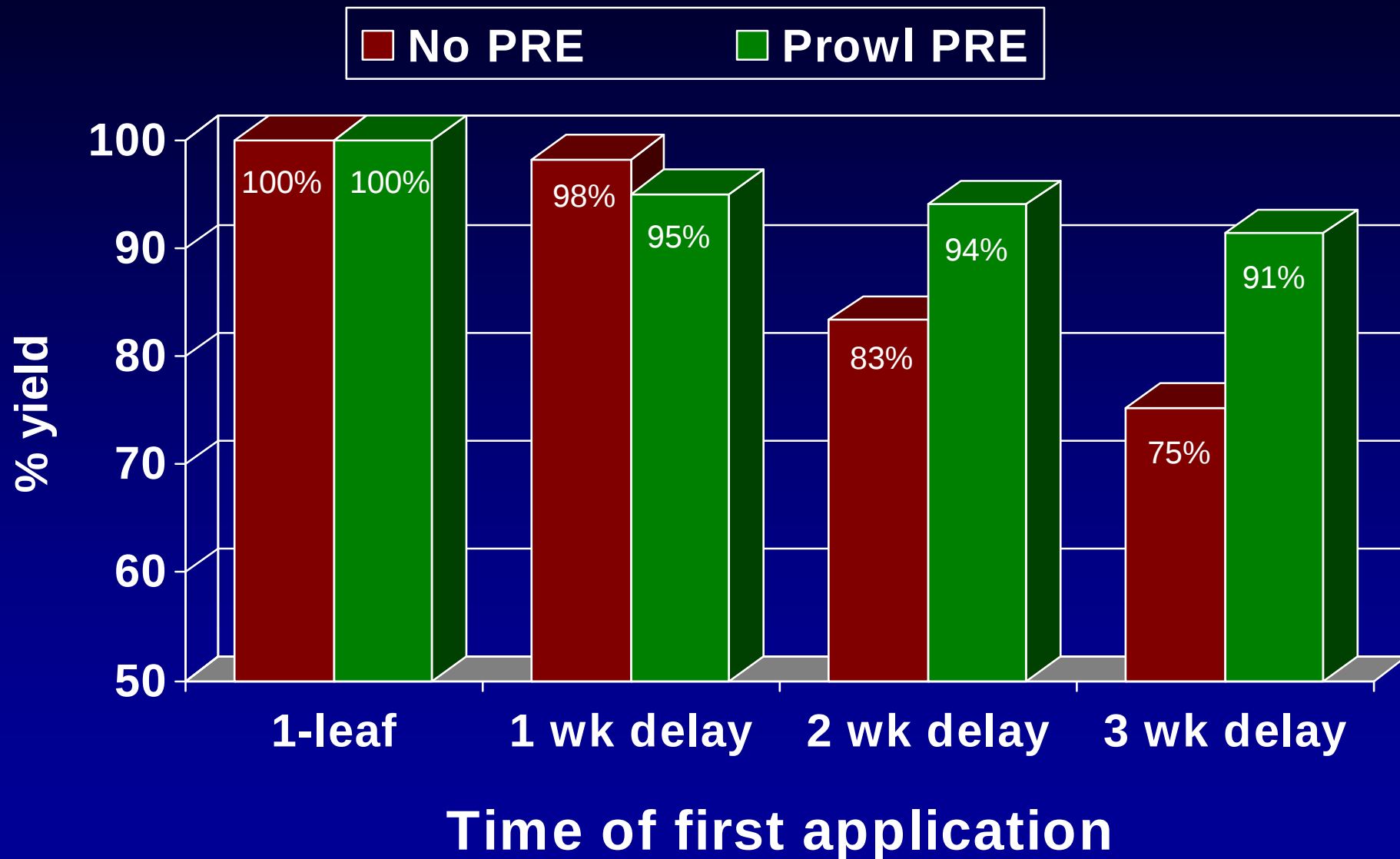
Time of Glyphosate Application on RR Corn. Average of 6 locations, NC.**



* 2- to 3.5-inch weeds.

** Parker, York, and Jordan. 2006. Weed Technol. 20:564-570.

Time of First Glyphosate Application on RR Flex Cotton. Average of 3 locations, NC.





Research Areas

- Salvage treatments
- No-till vs conventional tillage
- Chloroacetamides
- Residuals, especially PRE
- Flex/LL
- Physiology/ecology