Efficacy of Bt Toxins Against Bollworm in LA Cotton

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MSEWG
Mid-South Entomologist Working Group

LSU AgCenter
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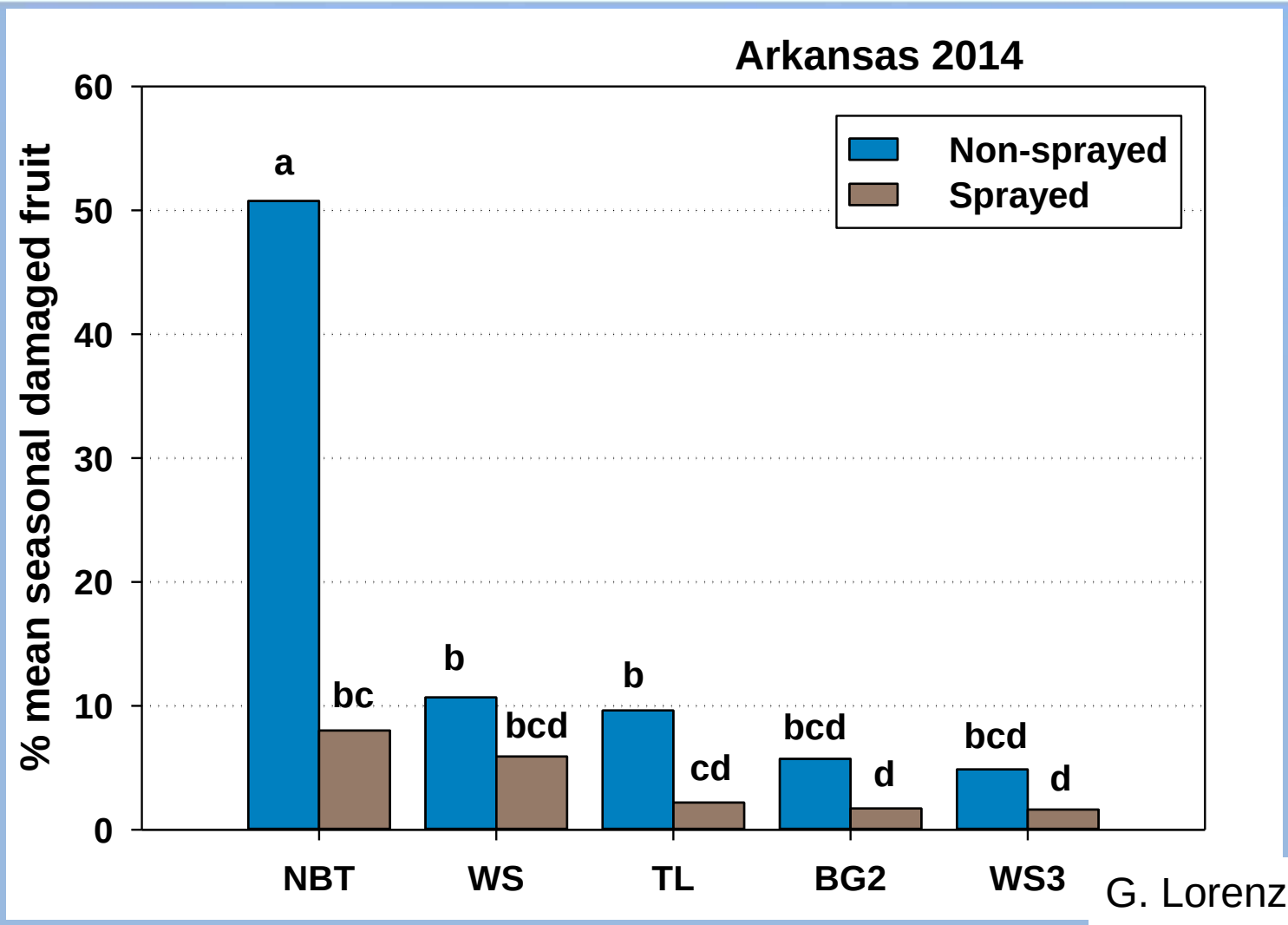
Bollworms surviving dual-gene cotton varieties

Experimental Design

- Small plot tests
- 5 x 2 factorial with 4 replicates
  - Cotton technologies
    - Non-Bt
    - Widestrike
    - Bollgard 2
    - Twinlink
    - Widestrike 3
  - Insecticide
    - Non-sprayed
    - Prevathon 20 fl-oz/ac

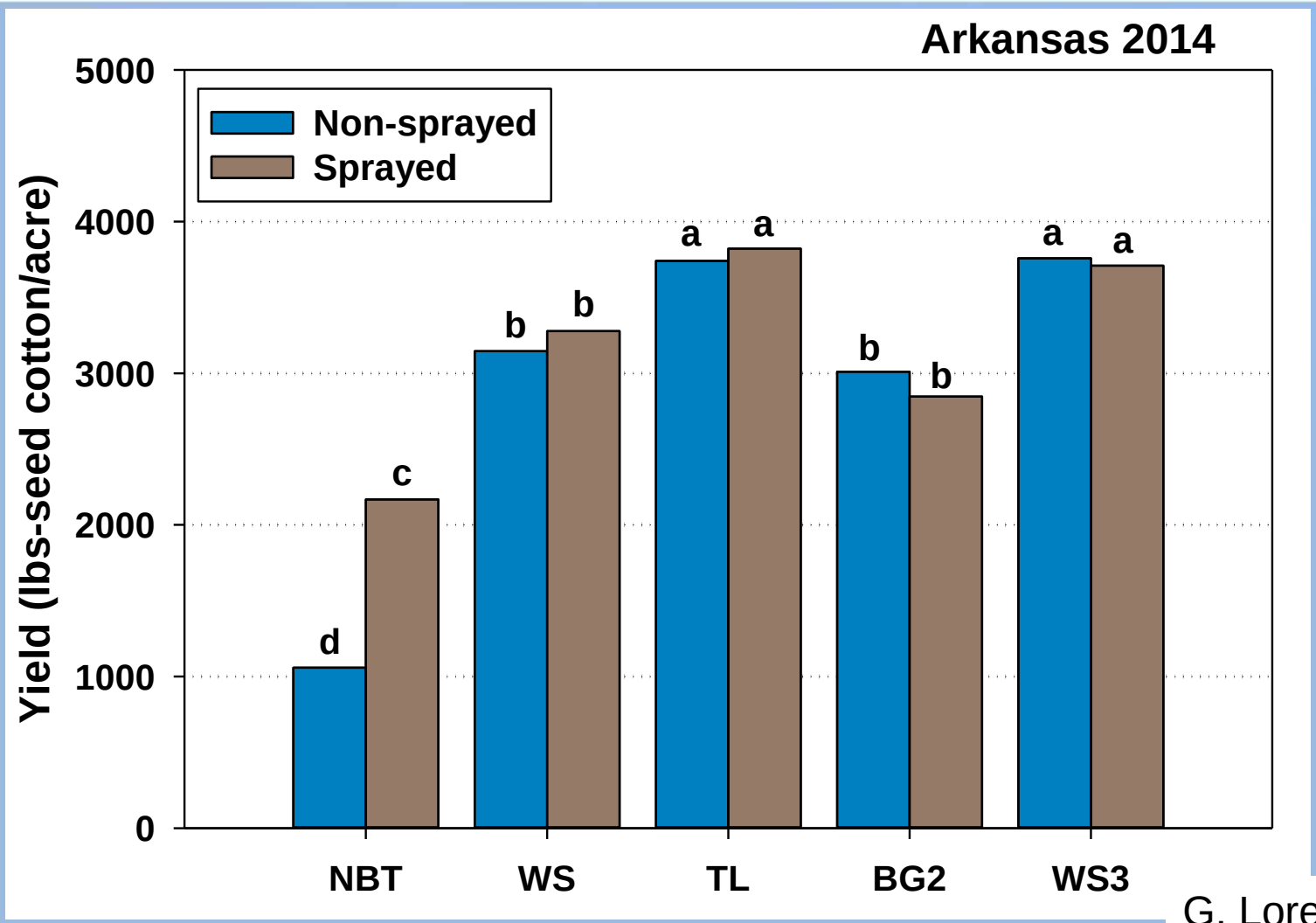
- Widestrike
  - Cry1Ac + Cry1F
- Bollgard II
  - Cry1Ac + Cry2Ab
- Twinlink
  - Cry1Ab + Cry2Ae
- Widestrike 3
  - Cry1Ac + Cry1F + Vip3A

Damaged fruit - Arkansas



G. Lorenz, Univ. AR

Yield - Arkansas



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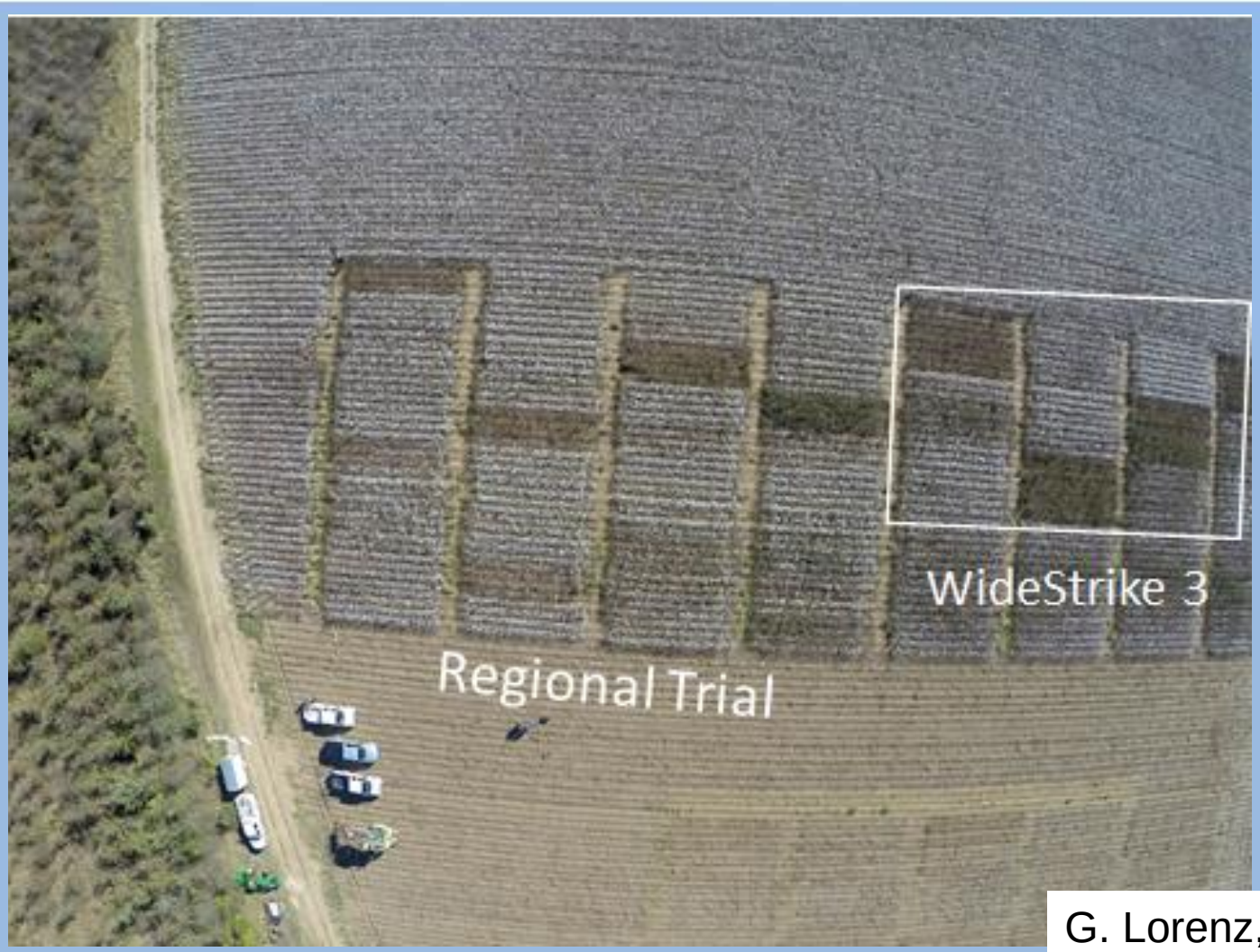
Arkansas Location



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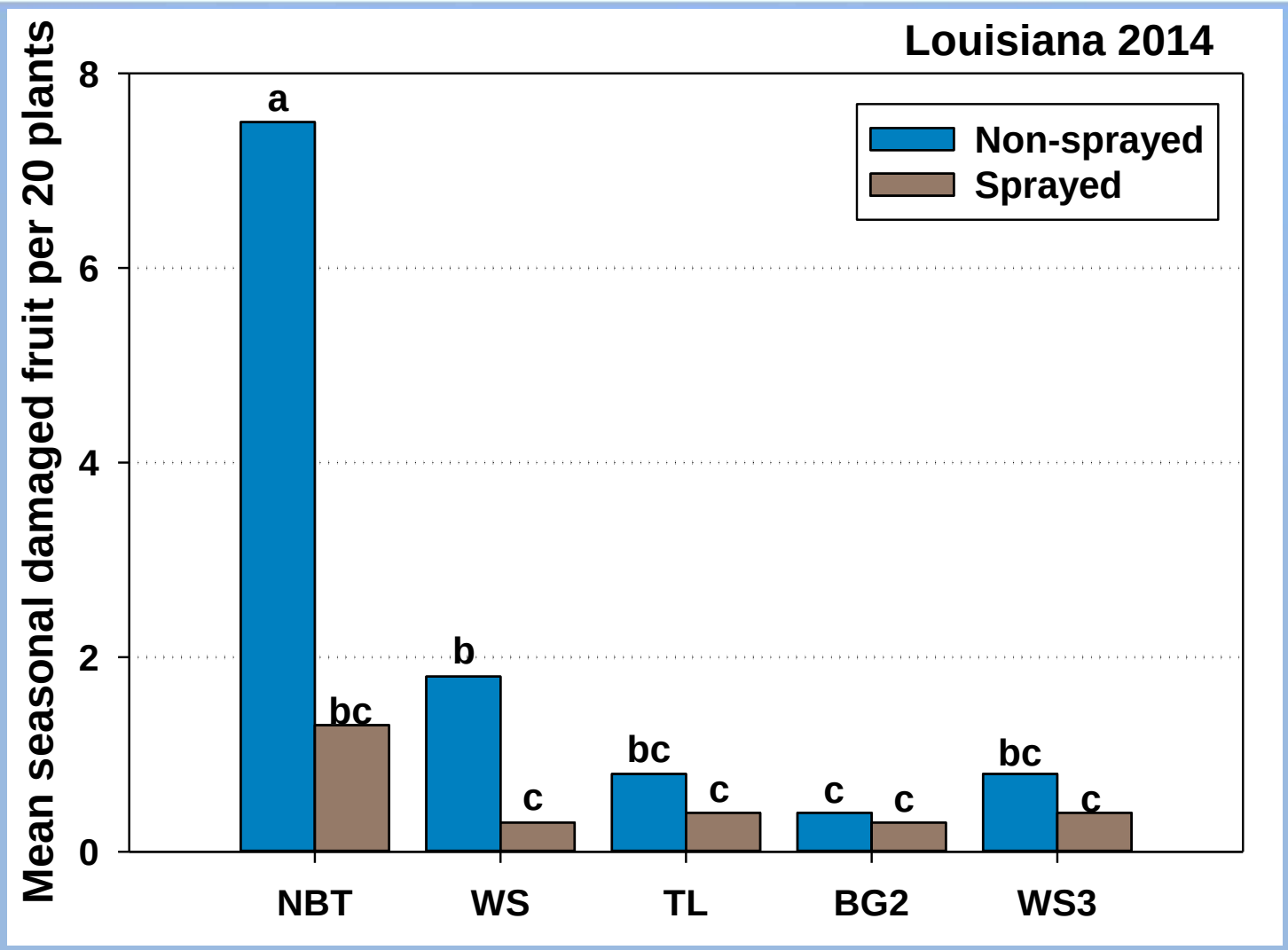
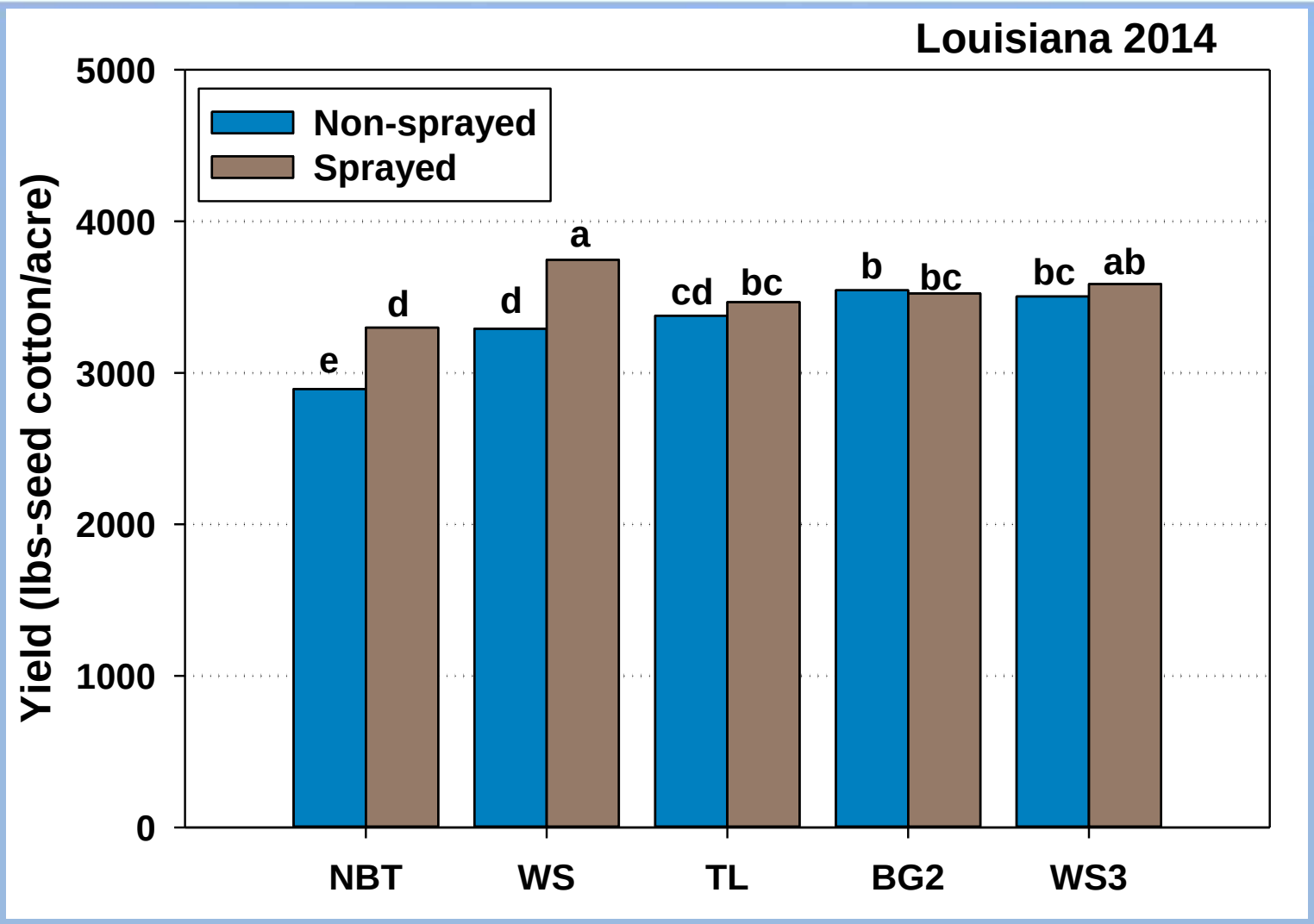
Damaged fruit - Louisiana

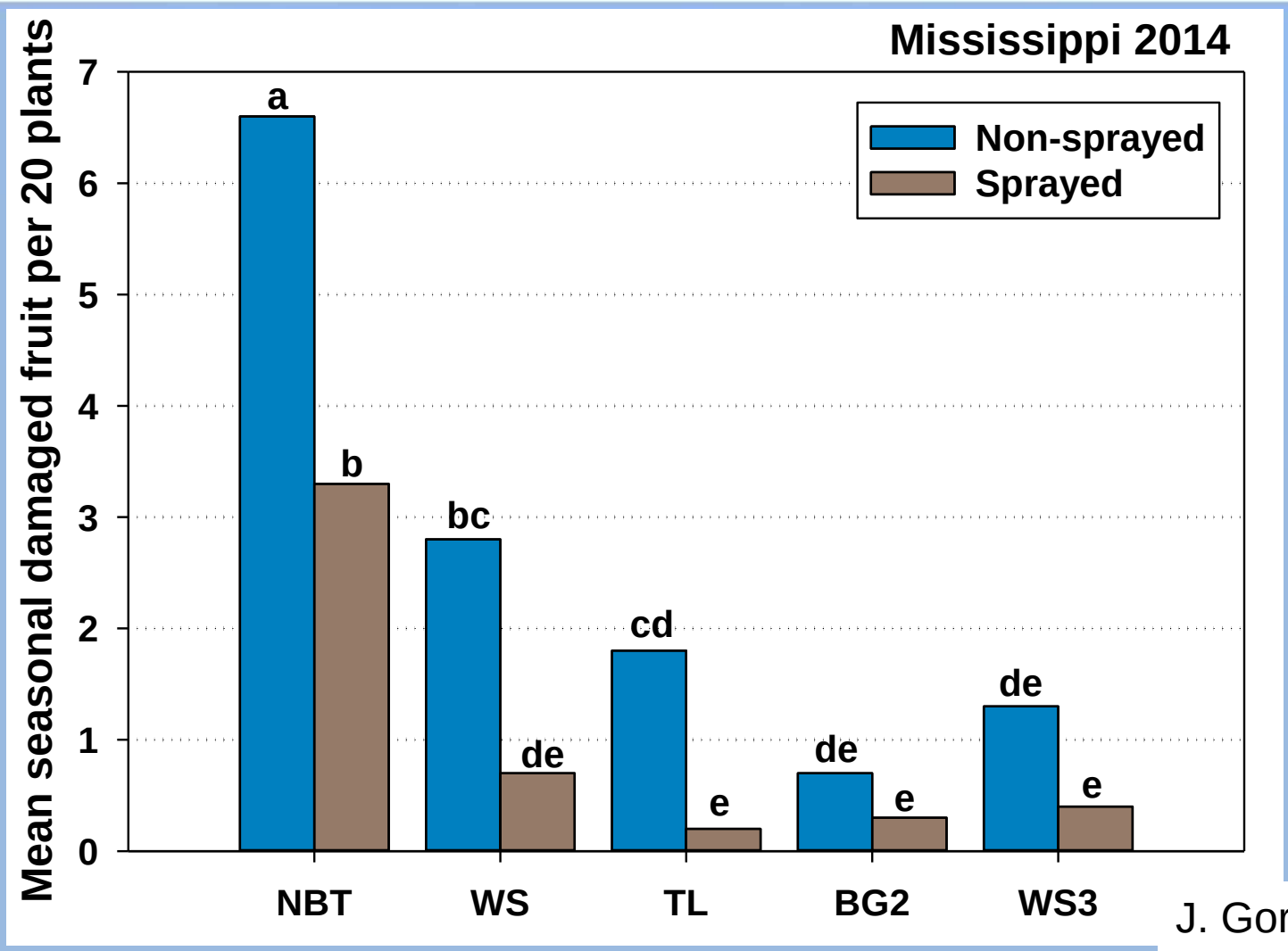


Yield - Louisiana



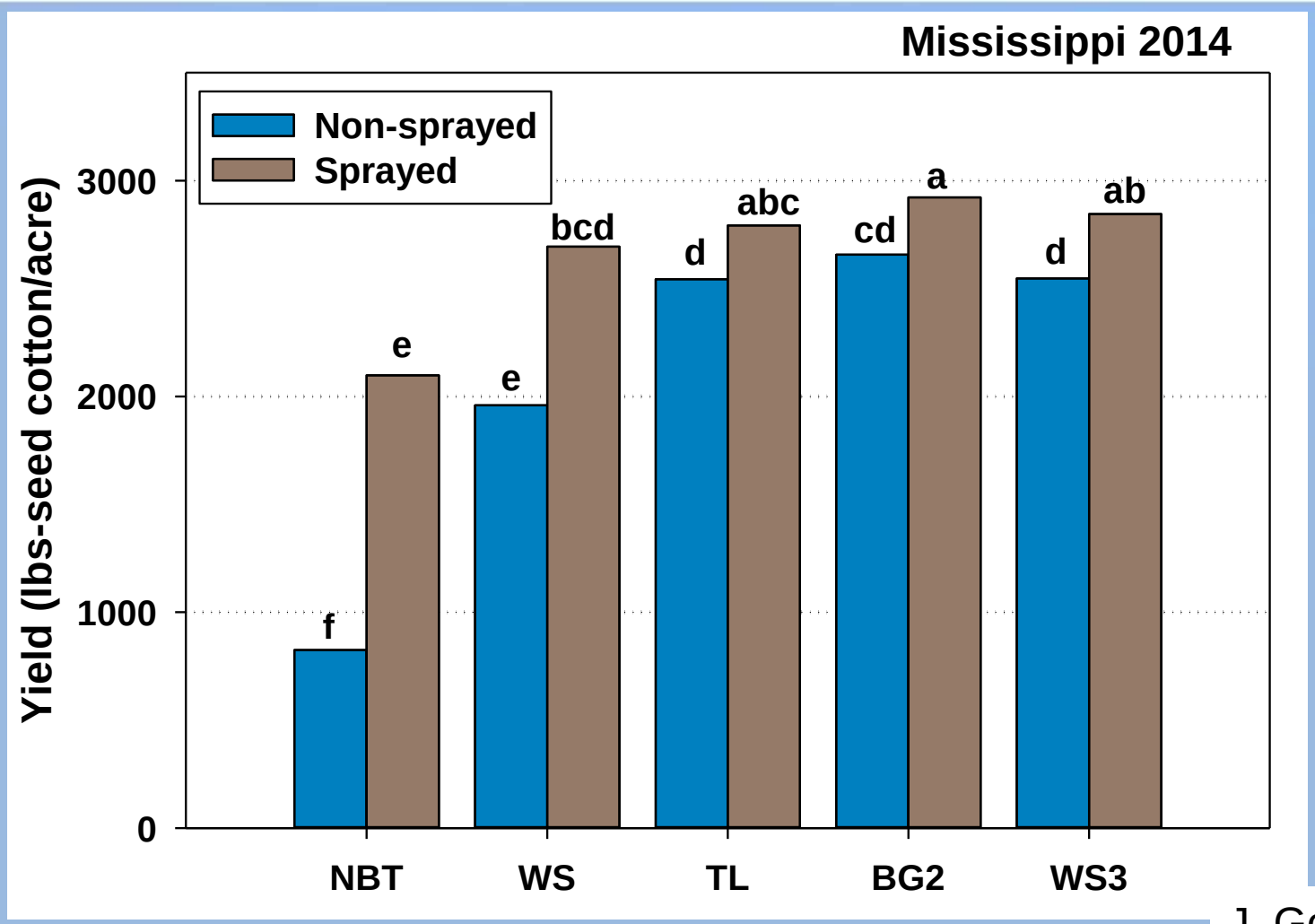
Louisiana Location

Damaged fruit - Mississippi



J. Gore, MSU

Yield – Mississippi



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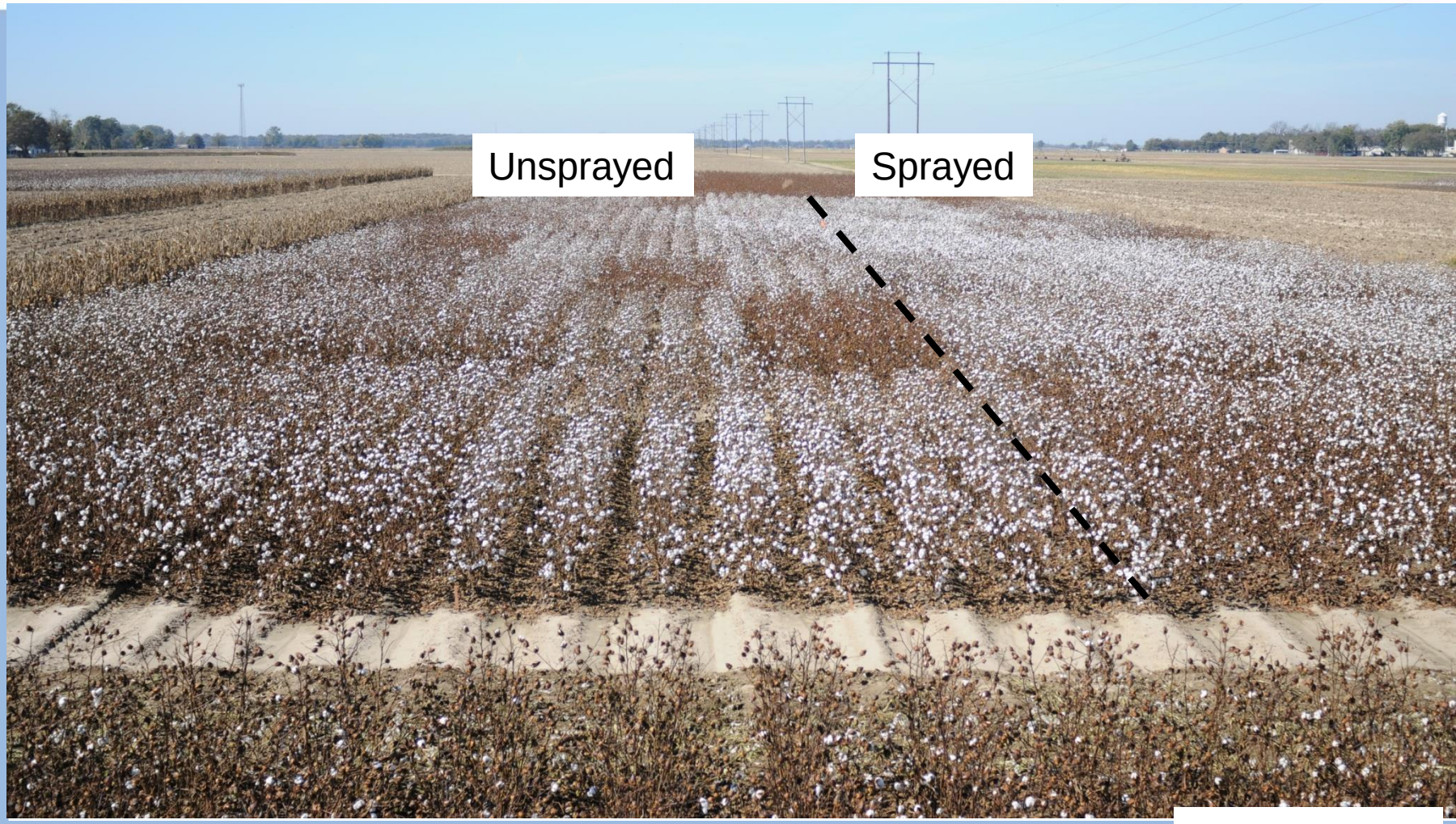
Mississippi Location



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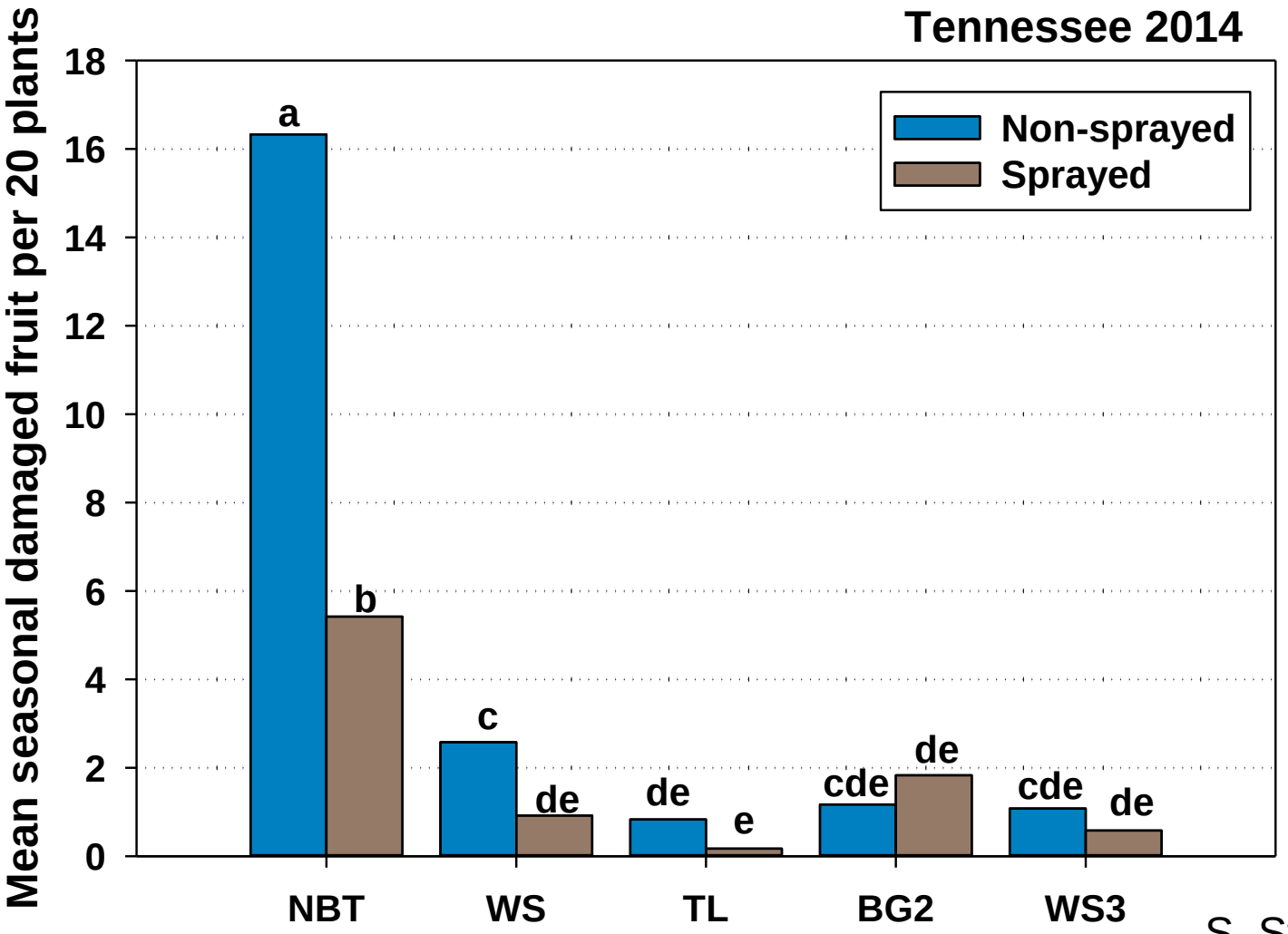
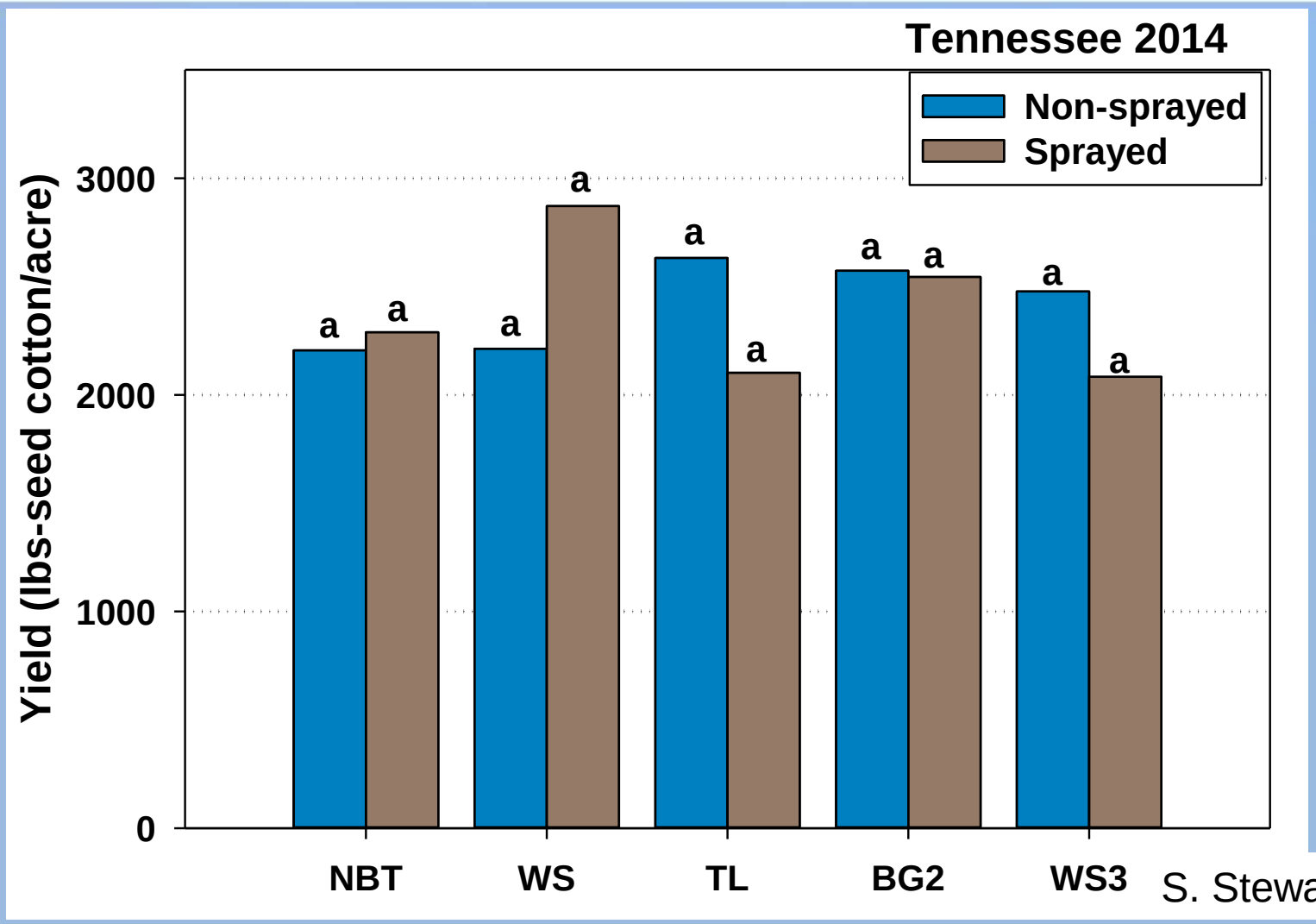
Damaged fruit - Tennessee



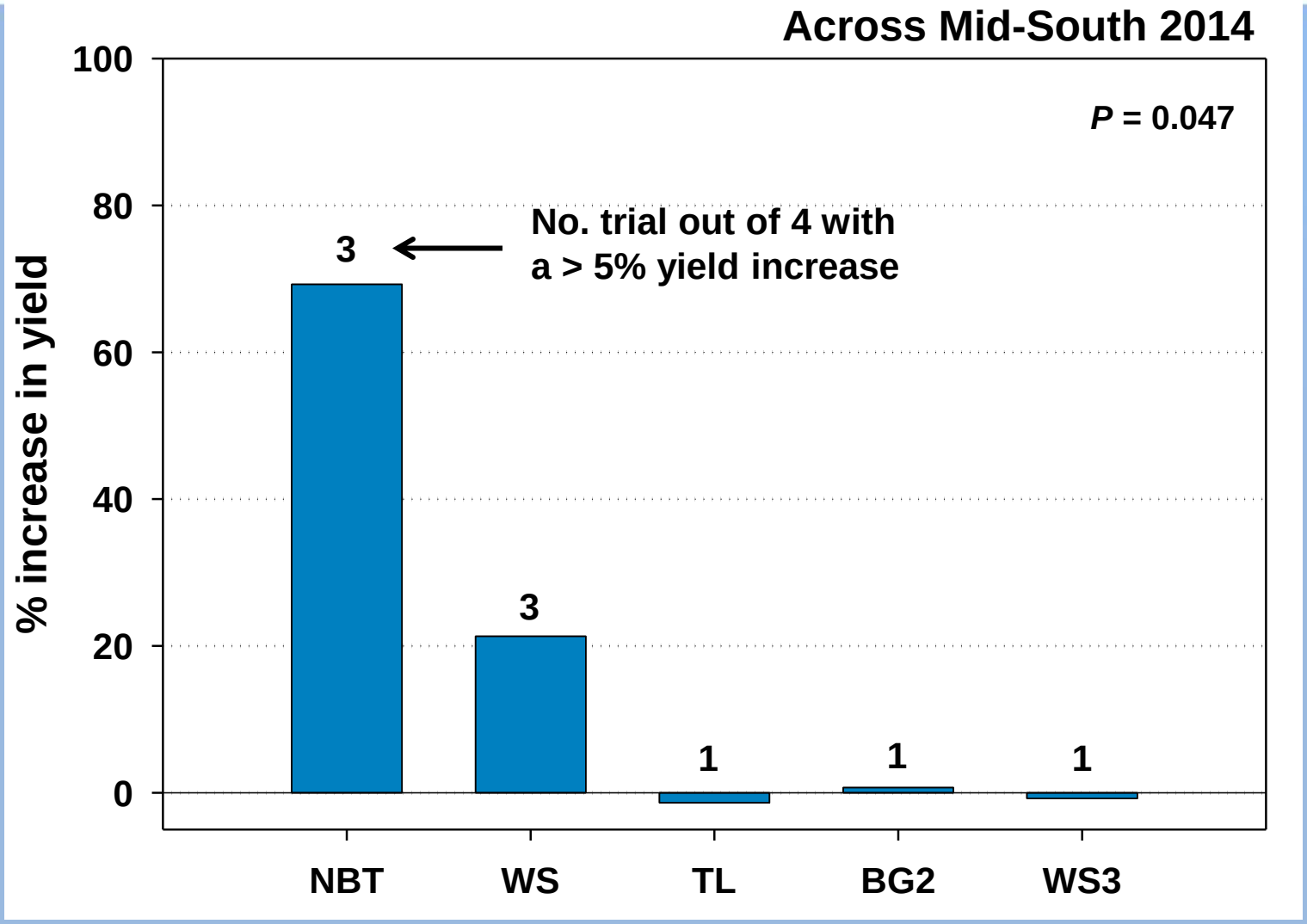
S. Stewart, UT

Yield - Tennessee

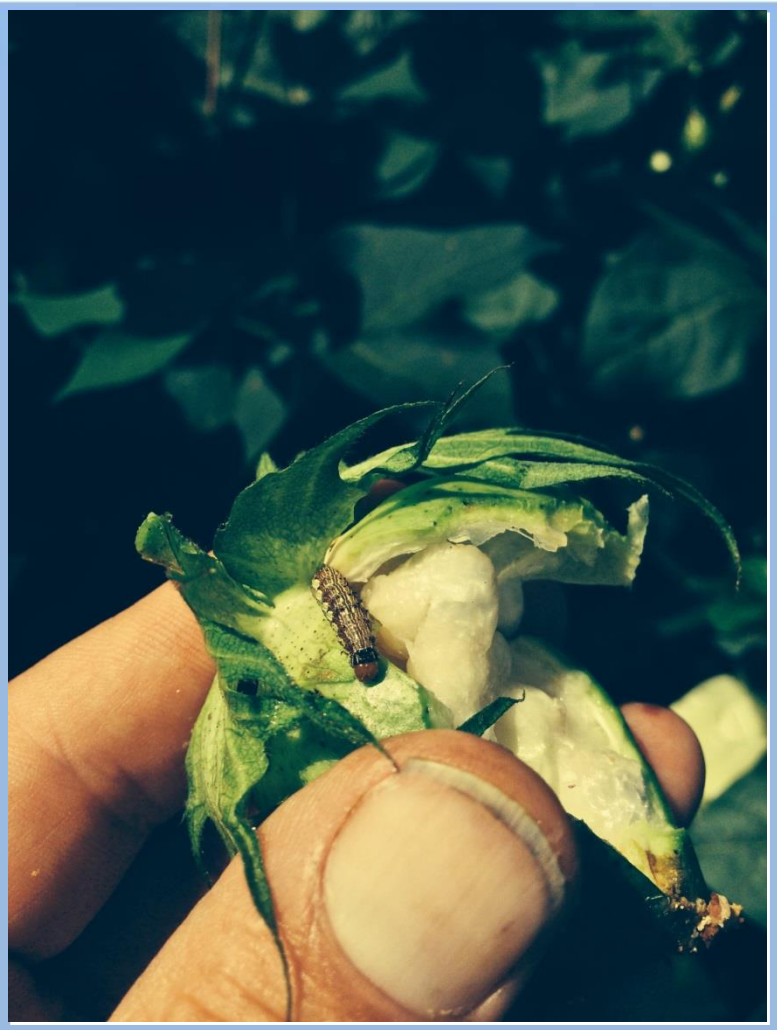


S. Stewart, UT

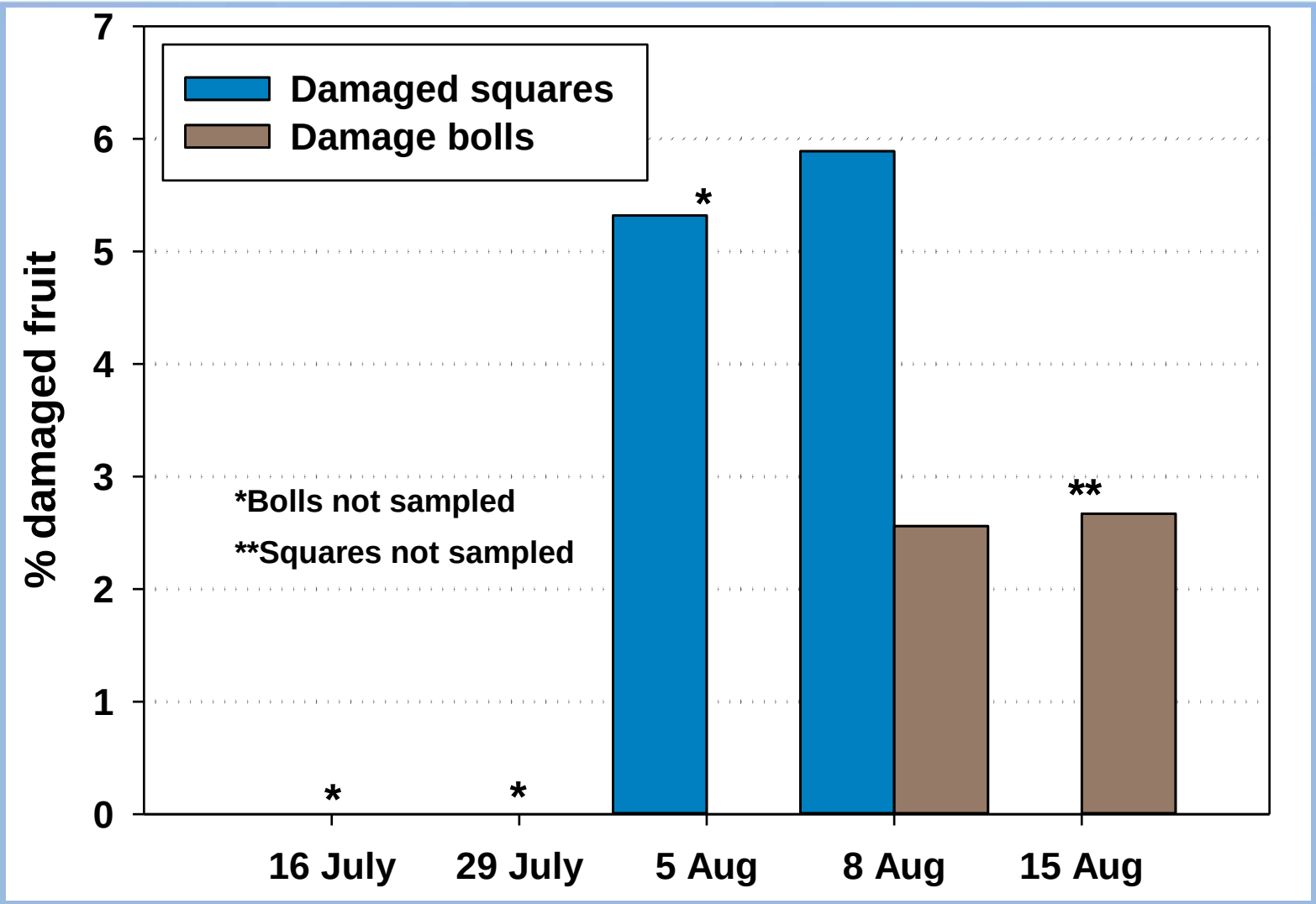
Sprayed vs Non-sprayed



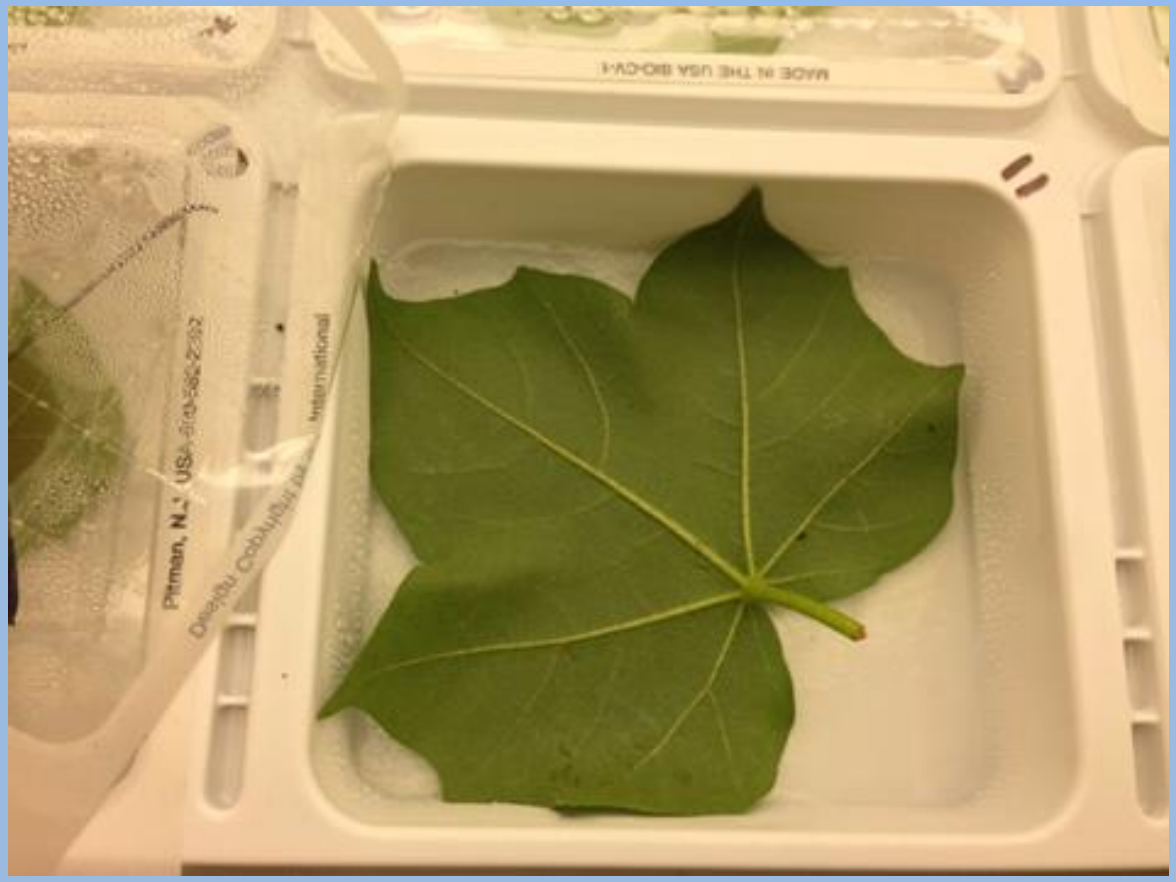
Injury to Widestrike 3



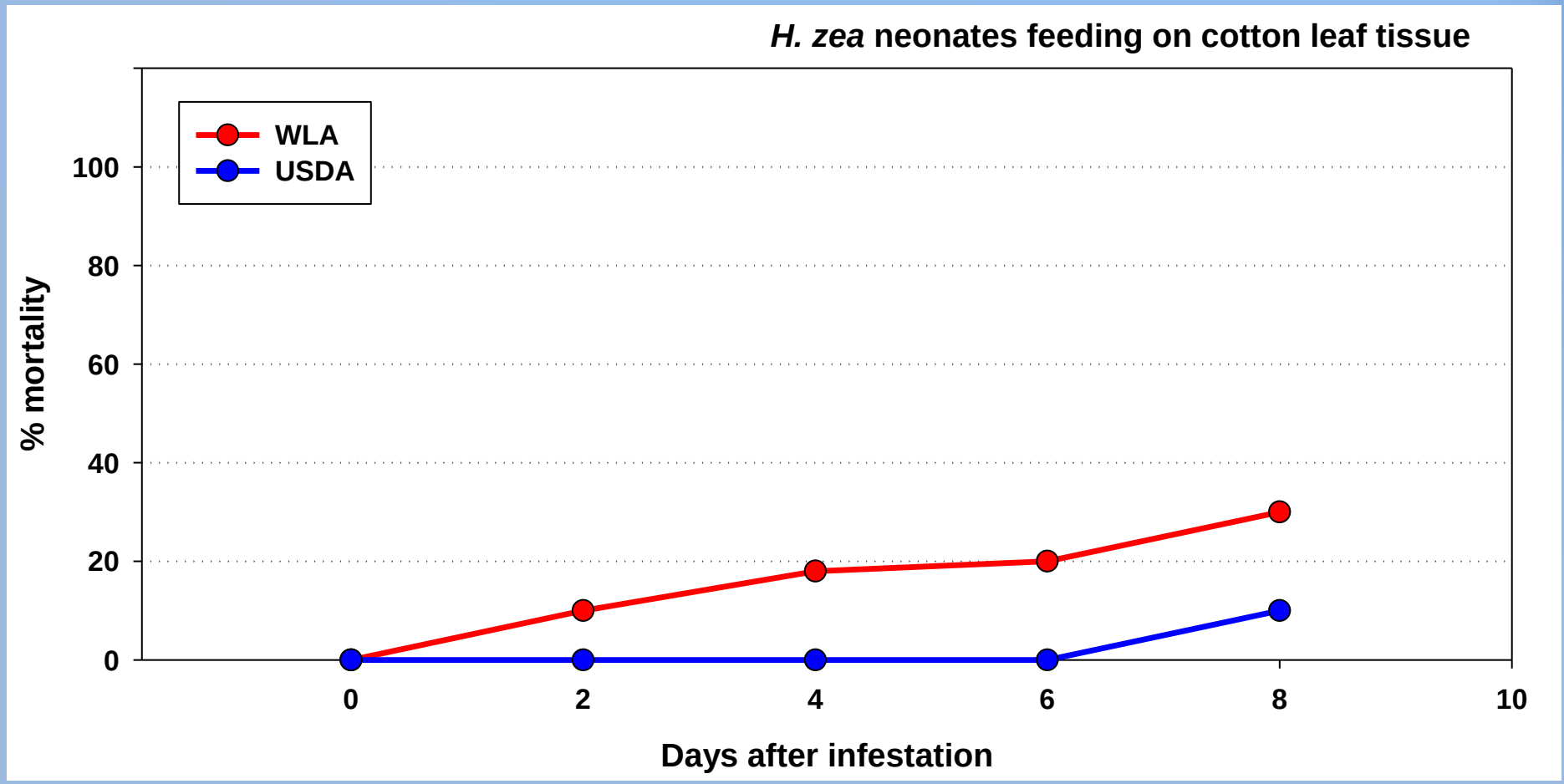
H. Zea injury to Widestrike 3



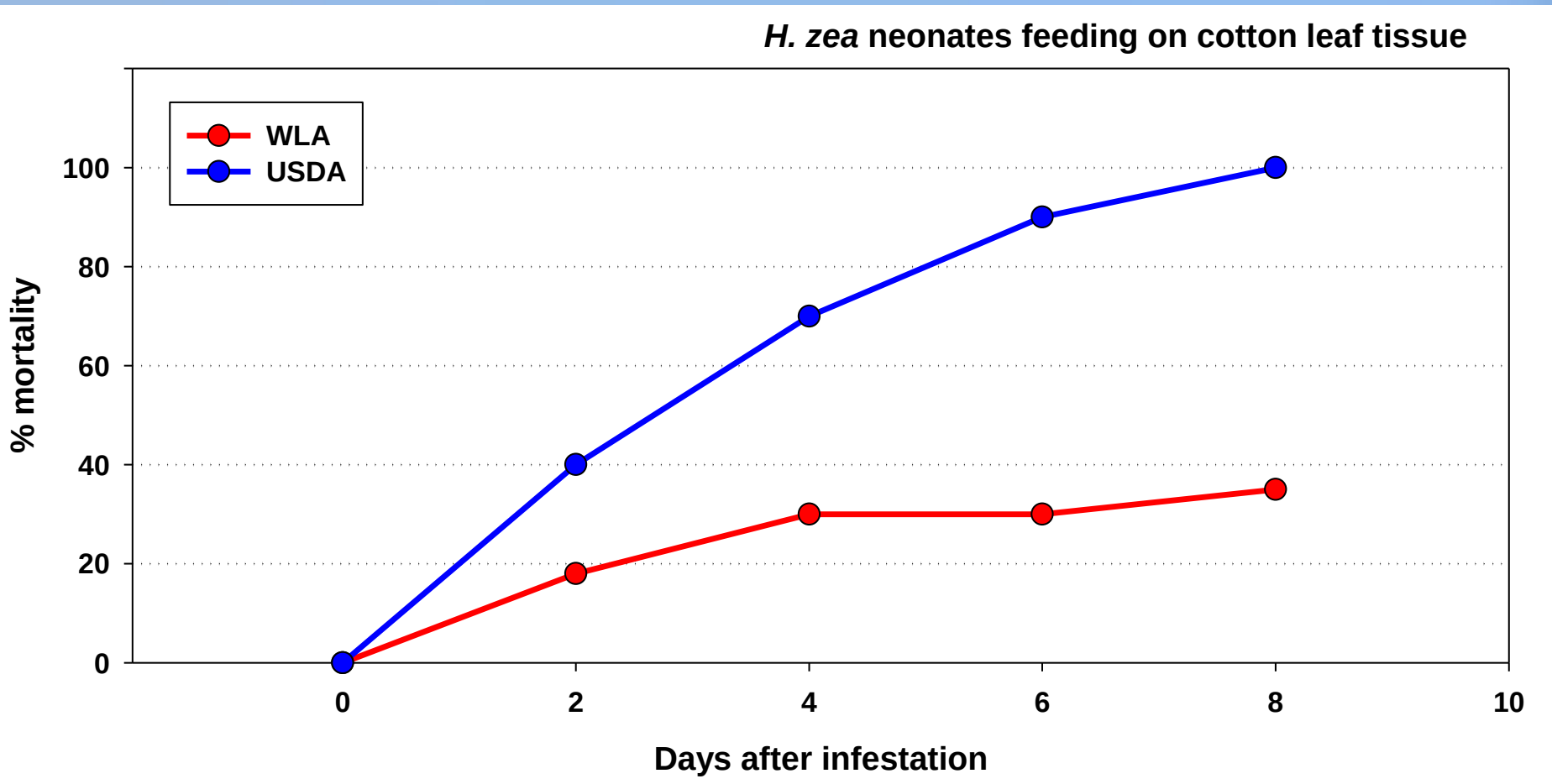
Leaf tissue bioassays



Non-Bt – F1

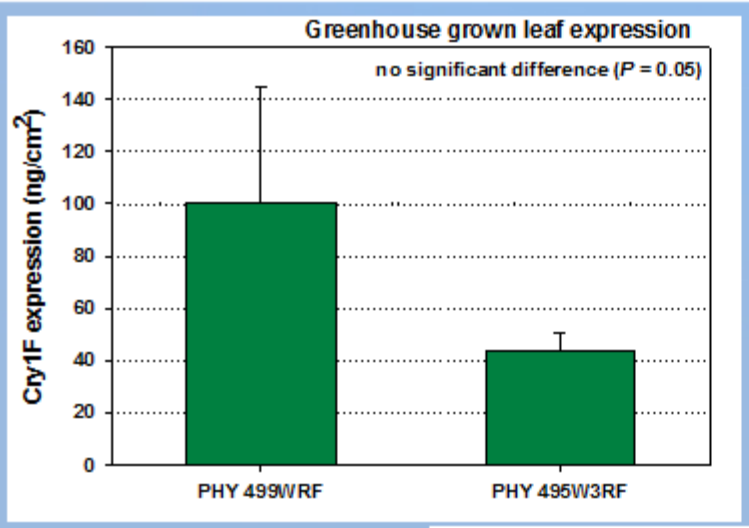

H. zea neonates feeding on cotton leaf tissue
WLA
USDA
% mortality
100
80
60
40
20
0
0
2
4
6
8
10
Days after infestation

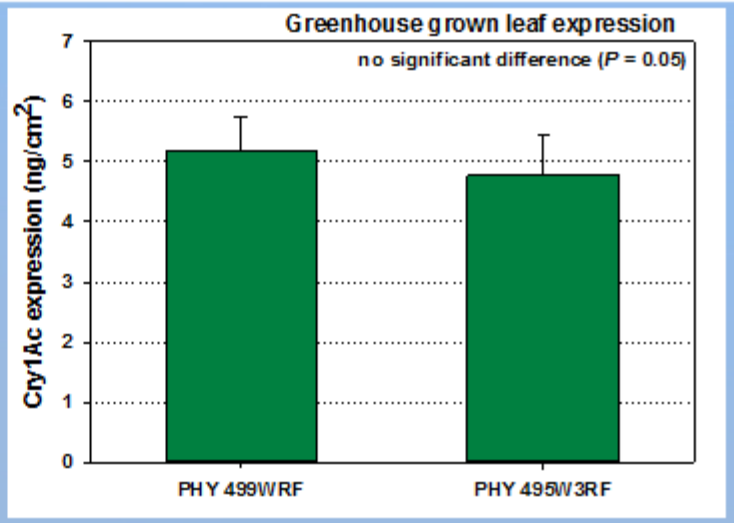
Widestrike 3 – F1



Quantifying Bt Expression

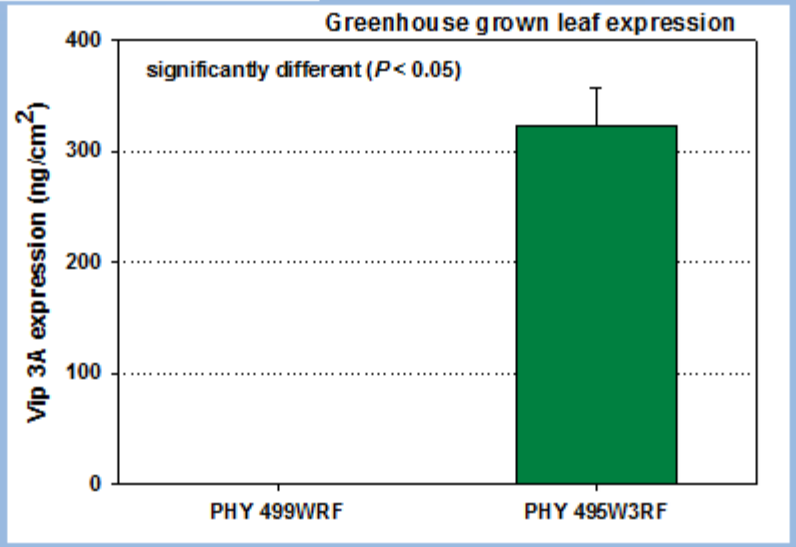
Cry1F



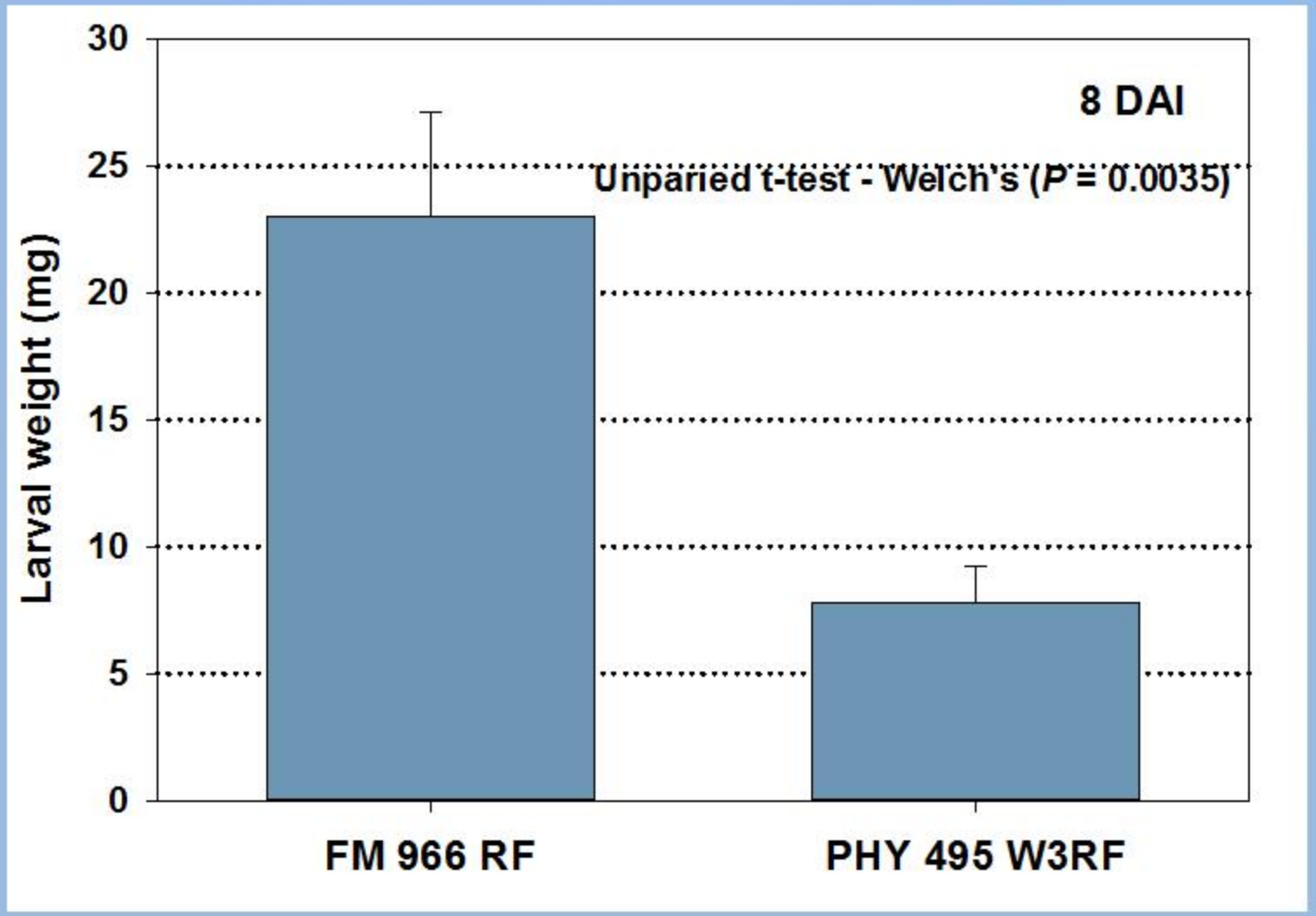


Cry1Ac

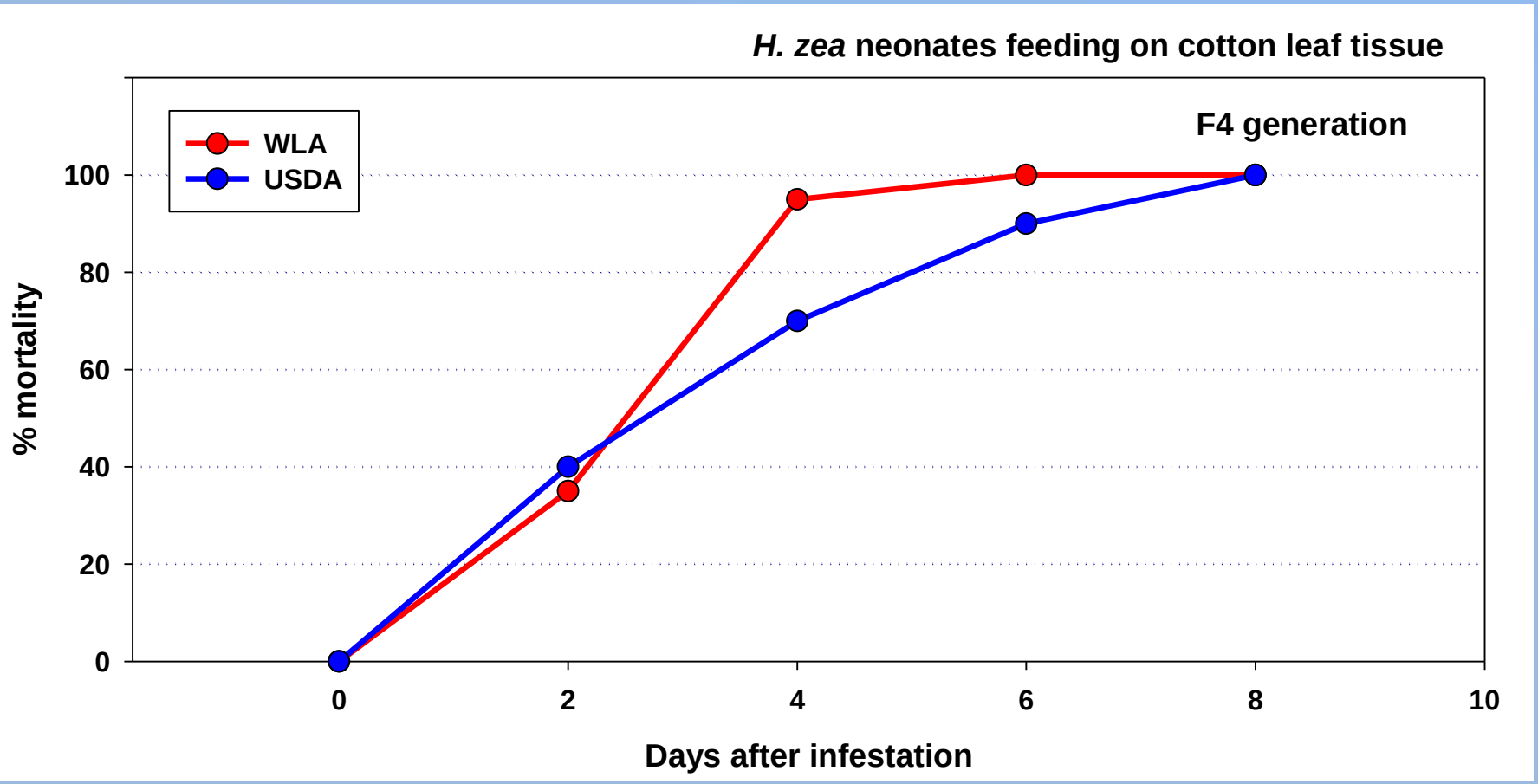
Vip3A



Larval weights - WLA

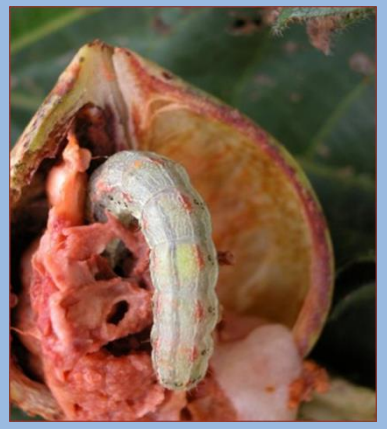


Widestrike 3 – F4



Do we have Bt resistance in *H. zea*?

- Not certain
  - Definitely variability is susceptibility
  - Needs to be heritable
- Field data demonstrates ALL current Bt cottons can experience unacceptable injury
- Possible contributing factors in Bt efficacy
  - Varietal expression
  - Plant maturity and health
  - Environmental conditions
  - High pest pressure



General Bt Technology Comparison

Pest	Bollgard (Cry1Ac)	Bollgard II (Cry1Ac + Cry2Ab)	Widestrike (Cry1Ac + Cry1F)	TwinLink (Cry1Ab + Cry2Ae)	Widestrike 3 (Cry1Ac + Cry1F + Vip3A)
	1996	2003	2005	2013	2014
Bollworm	4	2.5	4	2.75	2.7
Tobacco Bubworm	1	1	1	Based on limited data	
Pink Bollworm	1	1	1	1	1
Beet Armyworm	2	2	2	2	1
Fall Armyworm	2.5	2	1	2	1
Soybean Looper	1	1	1	1	1

1 = Complete control; 2 = Rarely requires oversprays; 3 = Sometimes requires oversprays;
4 = Frequently requires oversprays

Research Supported by:

cotton

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Questions?