

# Cotton Plant Response to Selected *Lygus* Infestation Levels in the Texas High Plains

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3<sup>rd</sup> International *Lygus* Symposium  
28 October-1 November, 2012; Scottsdale, AZ

# Outline

- Introduction - *Lygus* as an emerging cotton pest in Texas
- Factors affecting cotton plant response to *Lygus* injury
  - Cultivar
  - Irrigation
  - Cotton phenology
  - *Lygus* growth stages
- Summary and management recommendations

# Introduction



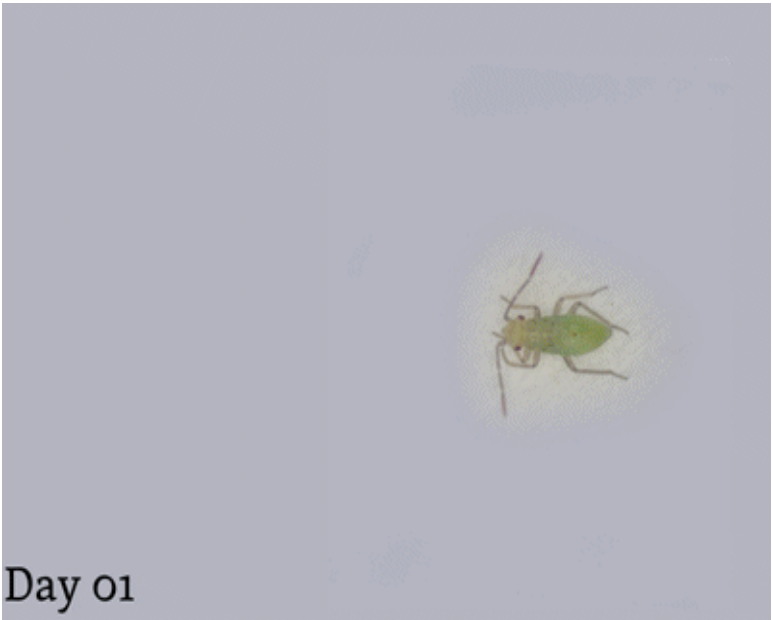
**Square**



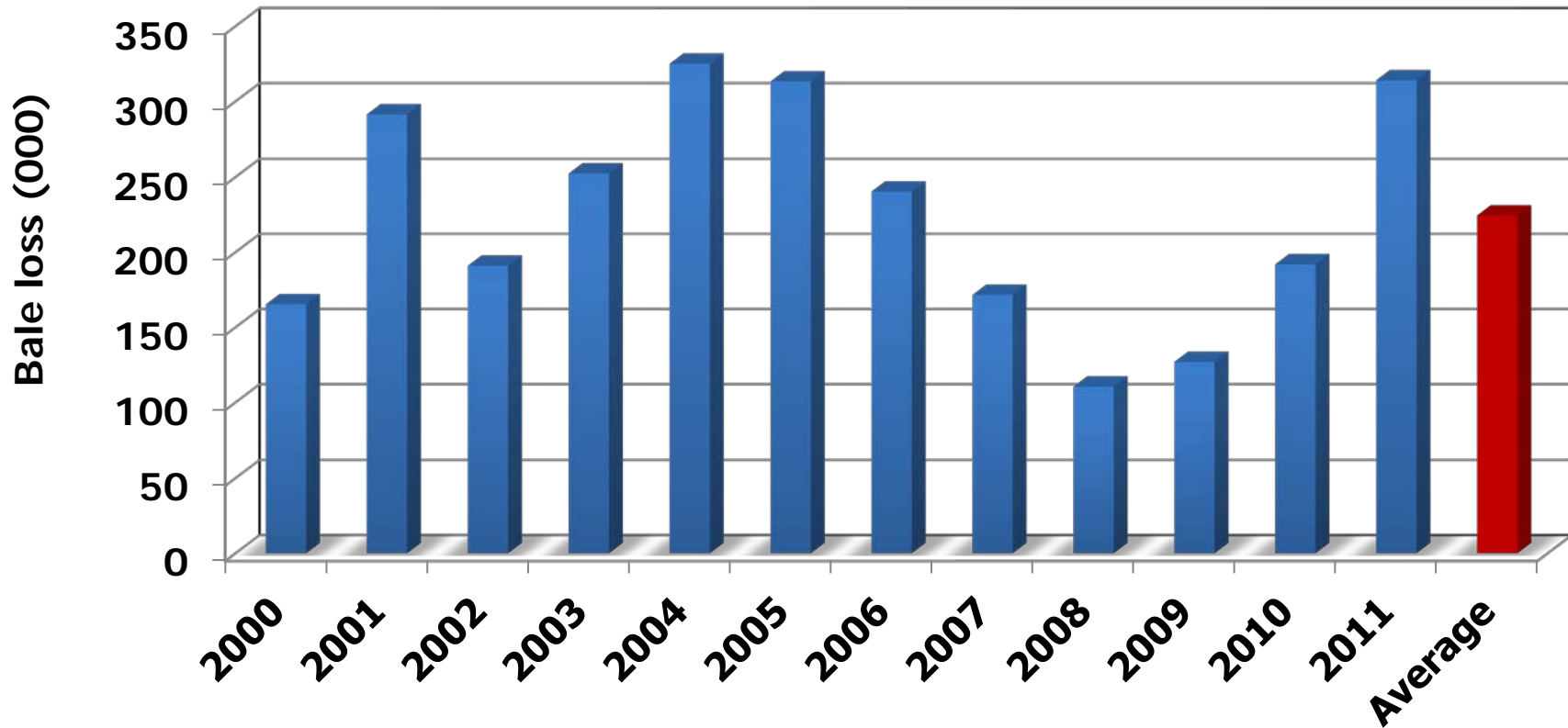
**Bloom**



**Boll**

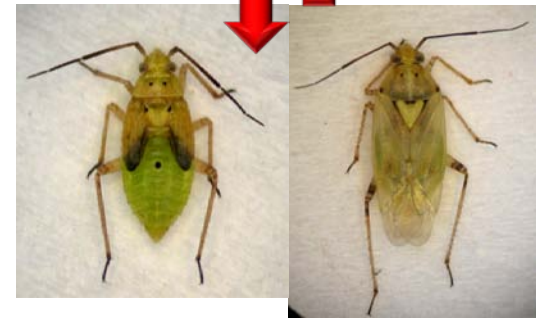


# US Cotton Losses Due to *Lygus* Bug



# Basis for Plant Compensation Research

- Overcompensation of manual removal of 100% squares until first flower (Leser, Baugh & Doederlein 2001-2003)
- Lamesa, Texas; center-pivot irrigation (75% ET replacement)
- Similar compensatory data reported from other studies (Australia)



# Factors Affecting *Lygus*-Cotton Plant Interactions

- Time of injury
- Duration of feeding
- Amount of injury
- Plant stress
  - Water
  - Nitrogen



# Four Major Projects on Plant Compensation to *Lygus* Injury

To characterize the plant compensatory response to *Lygus* injury

- Cotton cultivar (early maturing, full season)
- Irrigation level (dryland, deficit, full)
- Cotton phenology (pre-flower, early flowering)
- *Lygus* life stages (late-instar nymphs, adults)

# General Experimental Protocol

- *Lygus hesperus* were reared in laboratory
- Randomized block design field experiments with 4 blocks
  - Cotton cultivars
  - Irrigation levels
  - Crop phenology
  - *Lygus* life stages
- Nymphs (3<sup>rd</sup> instar) released weekly for three consecutive weeks
- Plant growth and developmental response to various levels of *Lygus* nymph infestations





# *Lygus* Bug Release Treatments

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- 0 *Lygus* released; insecticide spray control (SC)
- Untreated control, natural background population (UC)
- 1 *Lygus* released per plant (1PP)
- 3 *Lygus* released per plant (3PP)



# Sequence of Experimental Activities

<p>First plant mapping (pre- release)</p> <p><b>First release of Lygus bug</b></p> <p>Insecticides spray in SC plots only</p>	<p>Second plant mapping</p> <p><b>Second release of Lygus bug</b></p> <p>Insecticides spray in SC plots only</p>	<p>Third plant mapping</p> <p><b>Third release of Lygus bug</b></p> <p>Insecticides spray in SC plots only</p>	<p>Fourth plant mapping</p> <p><b>Insecticides spray in all the plots</b></p>
<p><b>Week one</b></p>	<p><b>Week two</b></p>	<p><b>Week three</b></p>	<p><b>Week four</b></p>



# Results

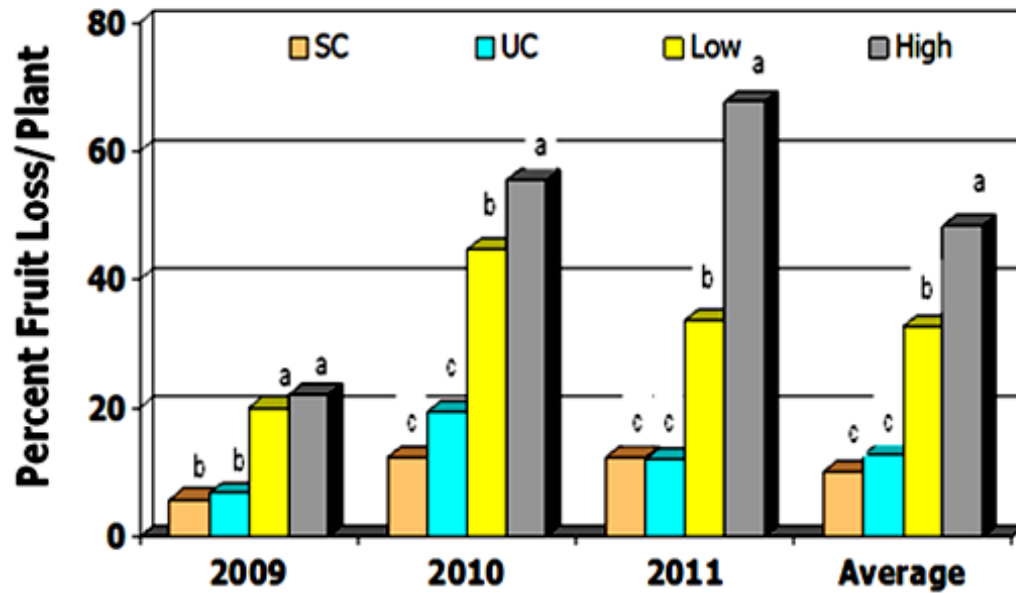
## Cotton Cultivar

**DP 104 B2RF vs. DP 161 B2RF**

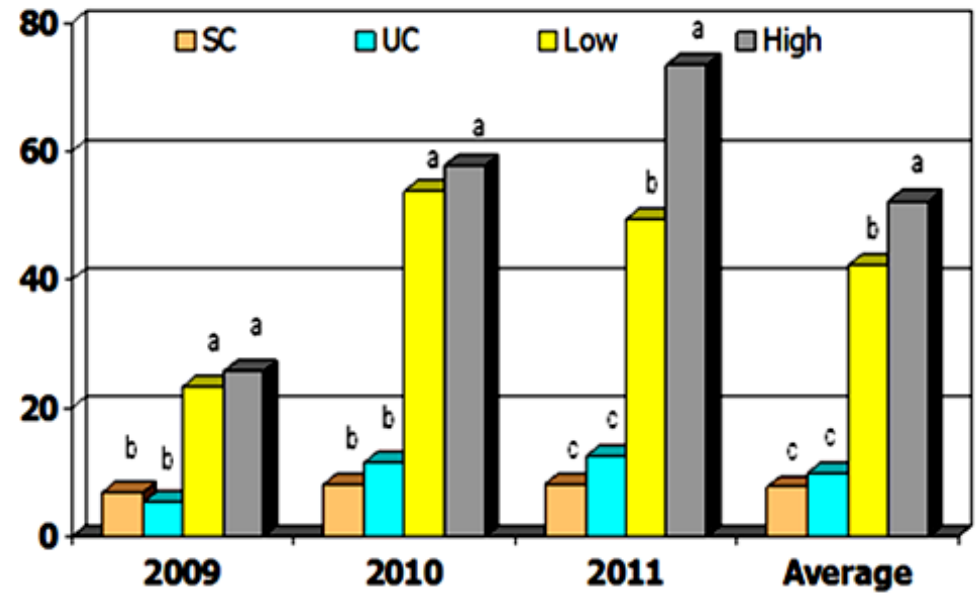
**2009-2011**

# Fruit Loss through 4 wk into Squaring

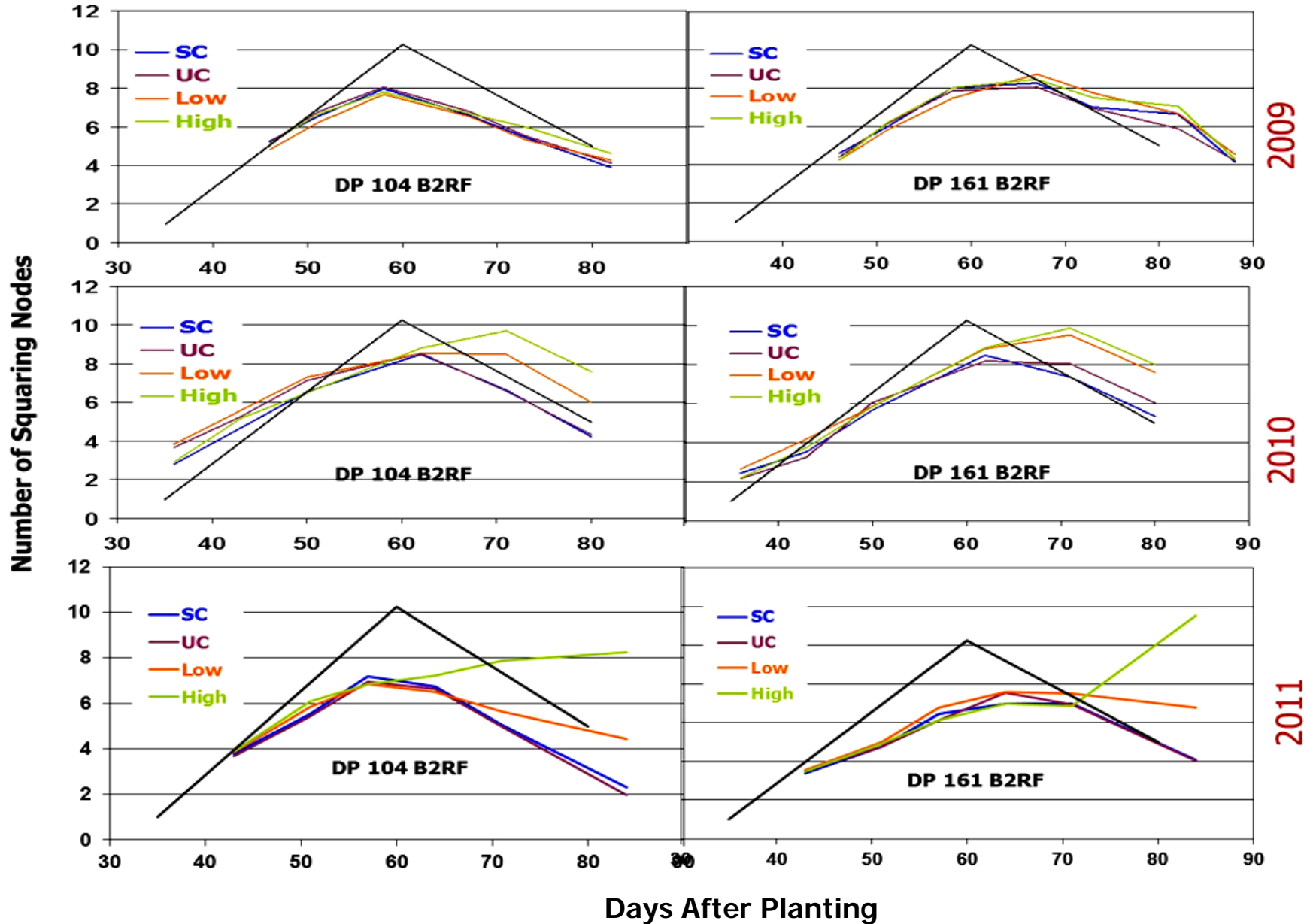
DP104 B2RF



DP 161 B2RF

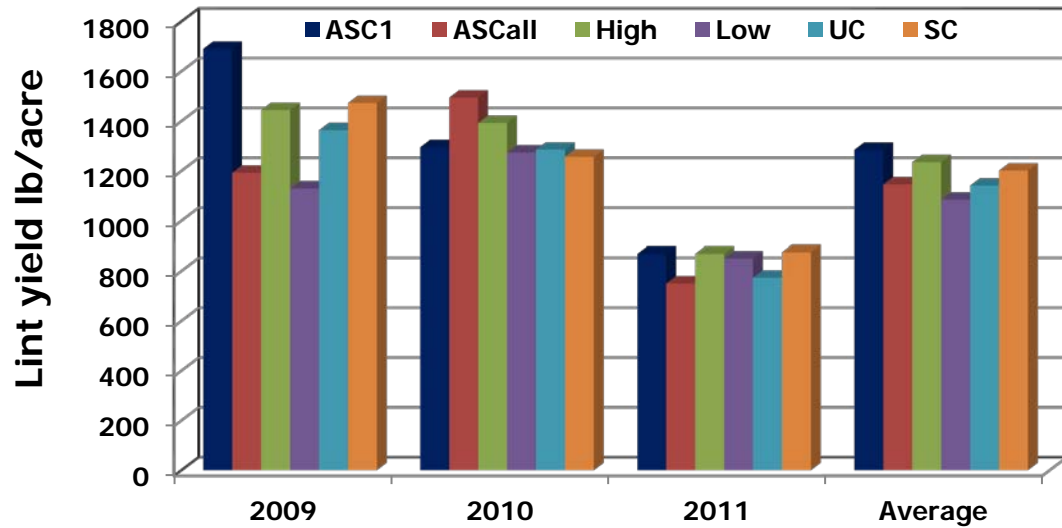


# Fruiting Profile as Influenced by *Lygus*-Induced Fruit Loss

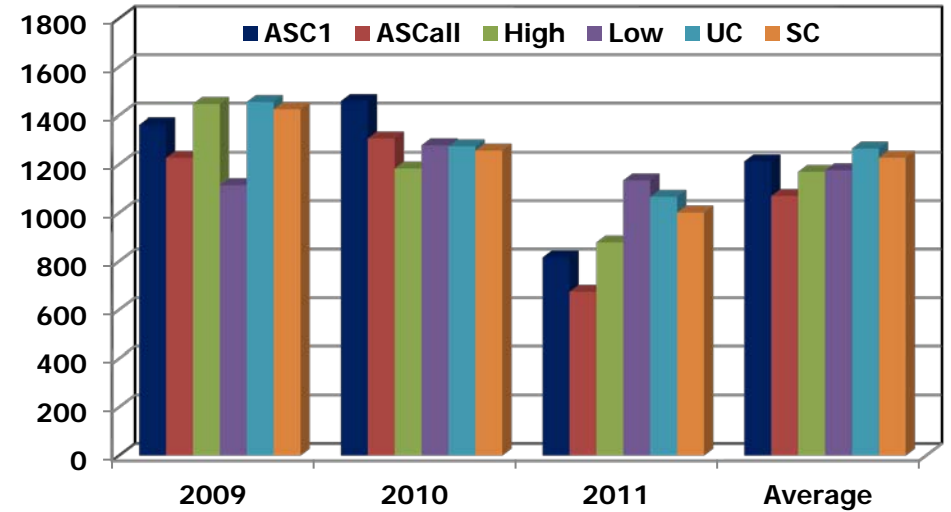


# Lint Yield

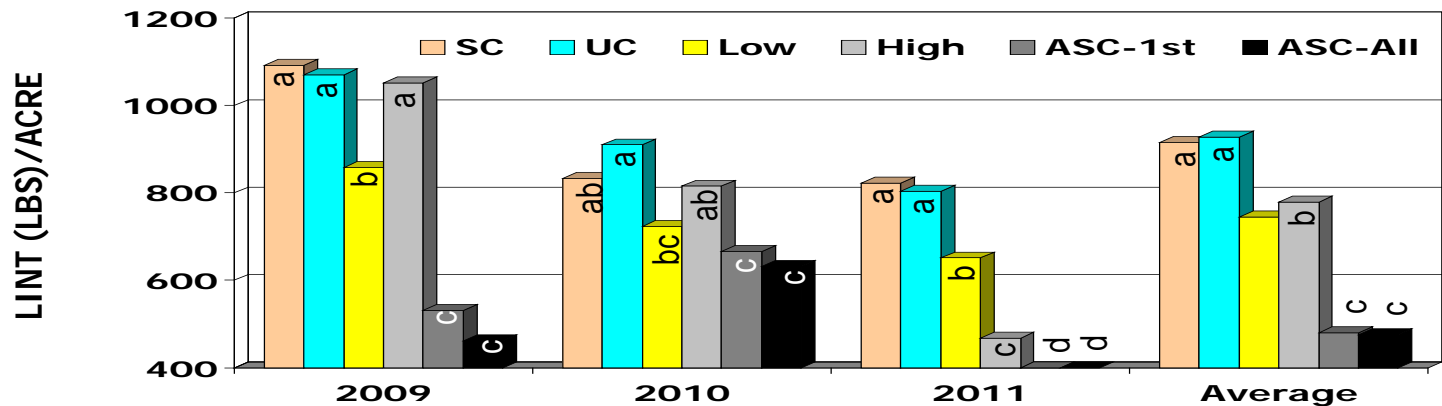
## DP 104 B2RF



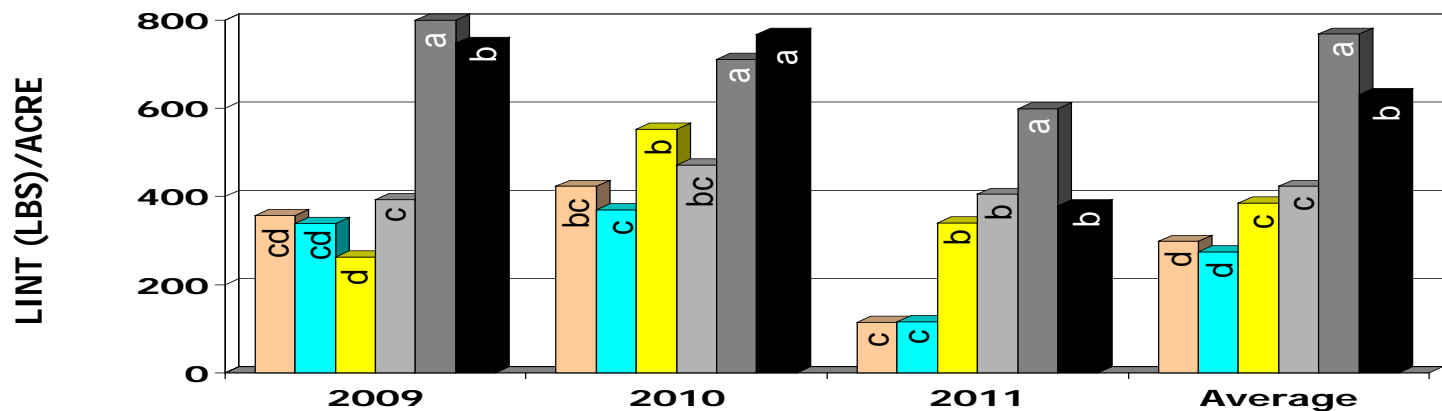
## DP 161 B2RF



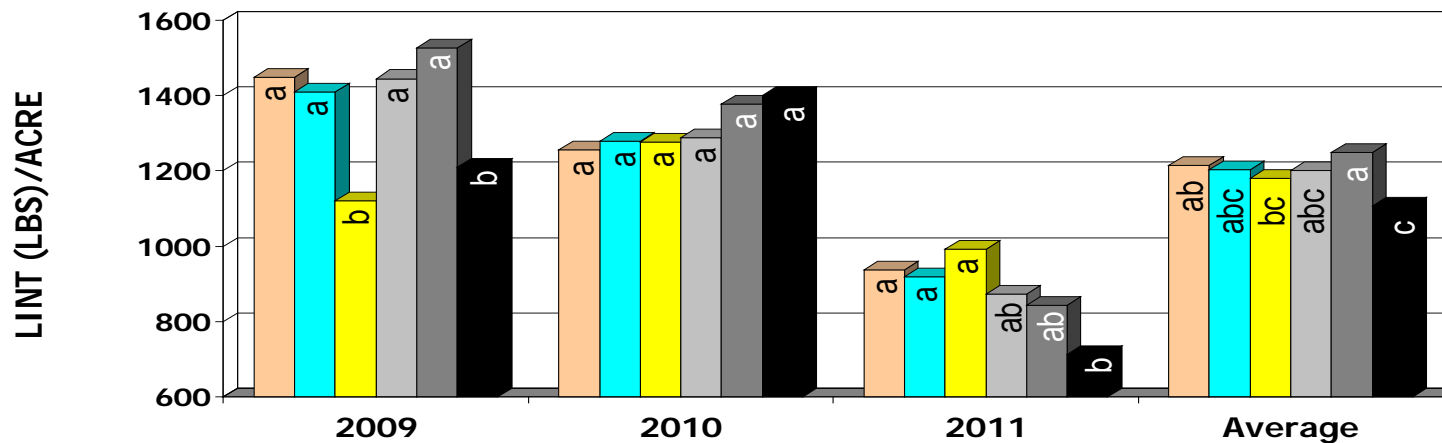
# Lint Yield (Cultivars Averaged)



FIRST POSITIONS



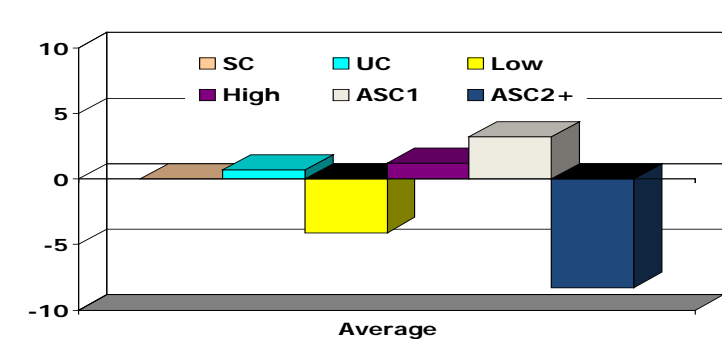
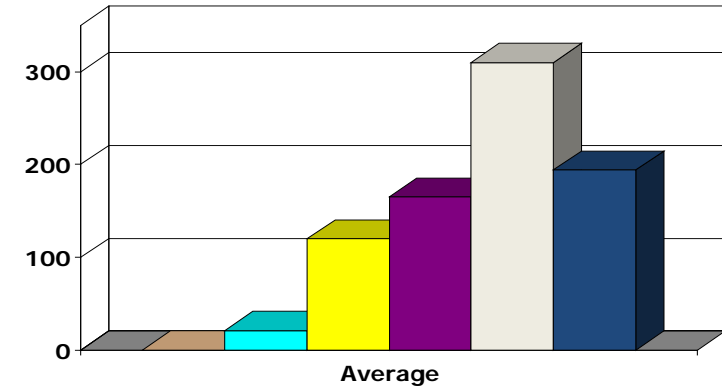
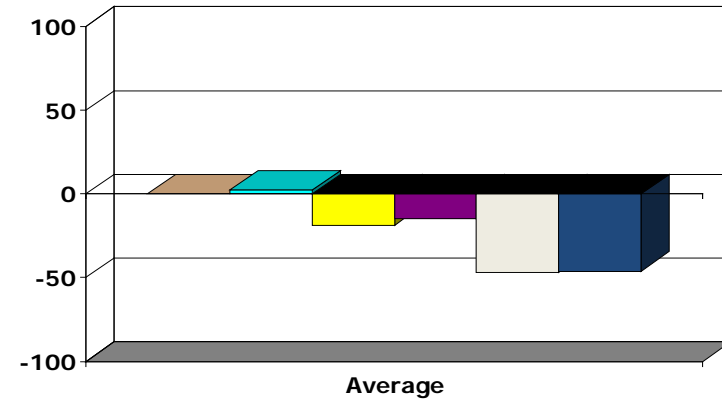
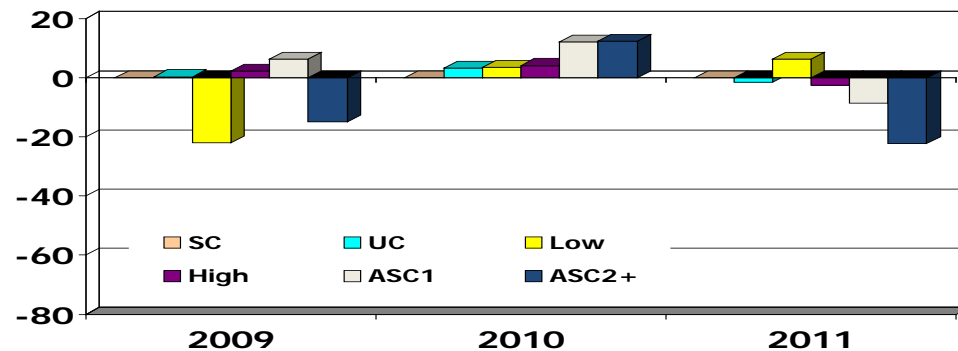
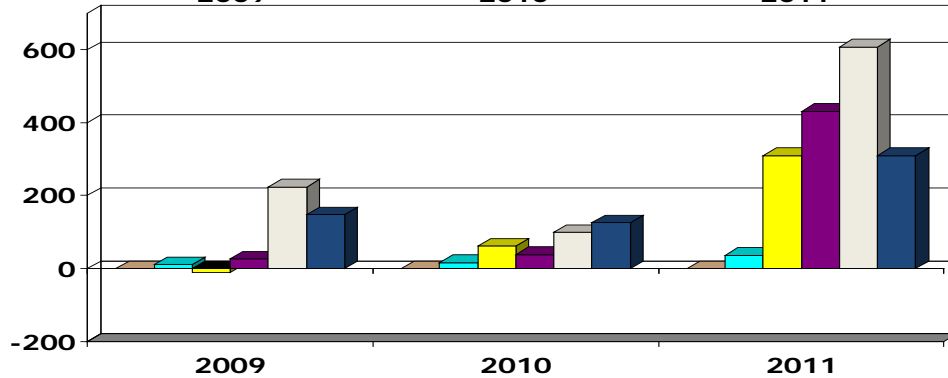
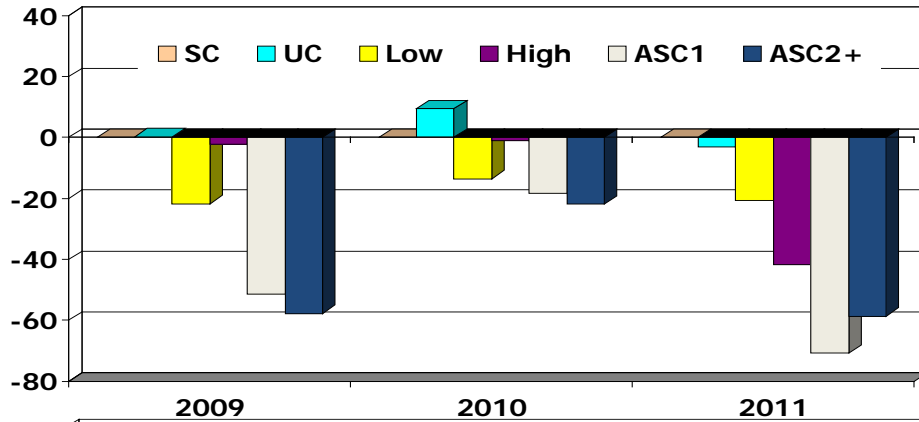
LATERAL POSITIONS



TOTAL OF ALL POSITIONS

# Percent Compensation

Percent Difference from SC



First Position

Lateral Positions

All Positions Combined

SC=sprayed control; UC=unsprayed control; Low=2-4 bugs/plant; High=6-8 bugs/plant; ASC=artificial removal of 1<sup>st</sup> positions; ASC2+= removal of all squares



A white duck is swimming in a body of water. The duck is positioned in the center-right of the frame, facing right. Its head is above water, and its body is partially submerged. The water is a light blue-green color. The duck's feathers are white and appear slightly wet. The background is a soft, out-of-focus view of the water's surface.

**Irrigation Levels**  
**(Low vs. High Water)**  
**2005-2007**

# LEPA Irrigation System

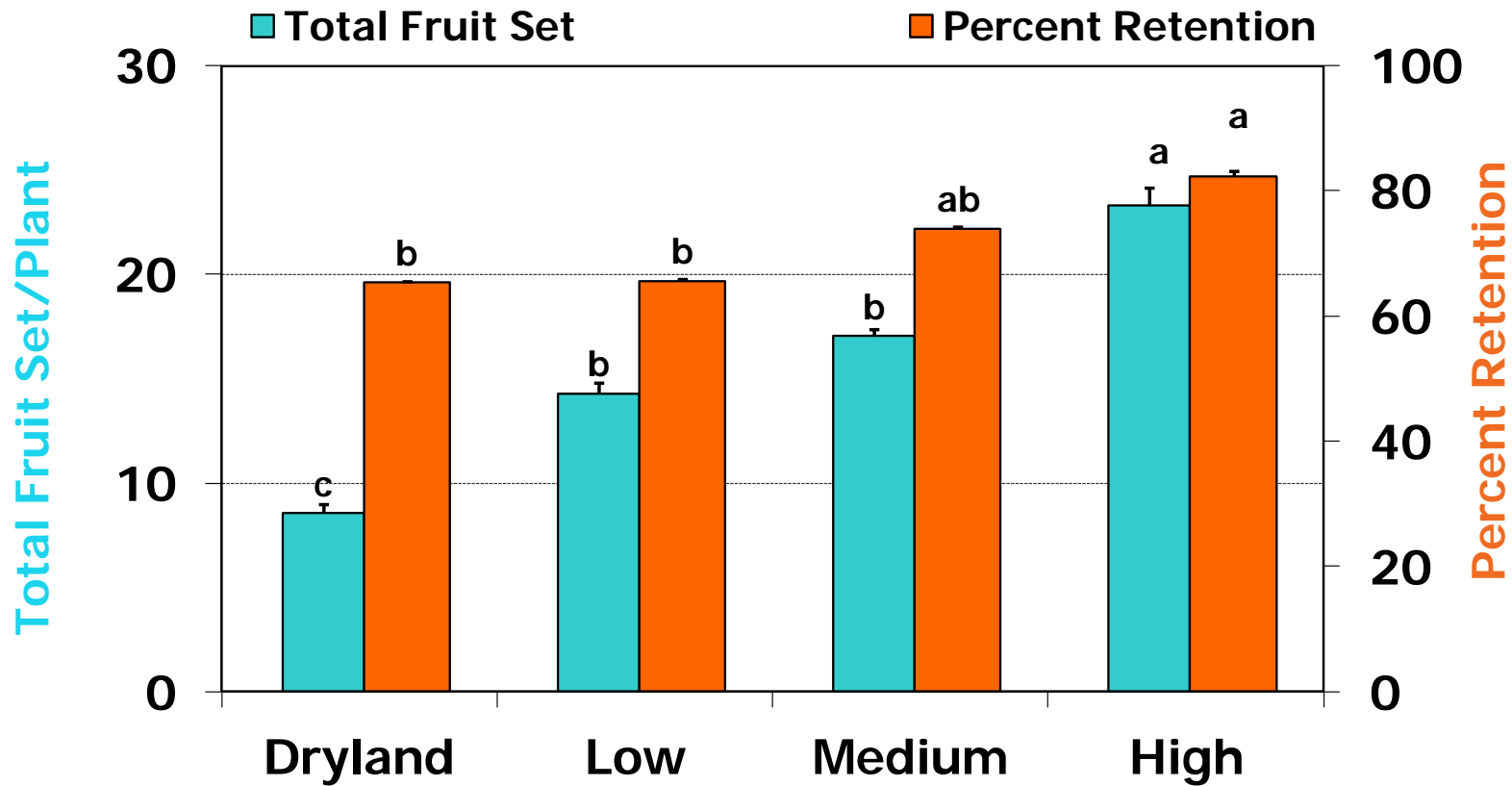


**Low water=30% ET, Medium water=60% ET, and High water=80% ET**



# Total Number of Fruit Set and Percent Fruit Retention

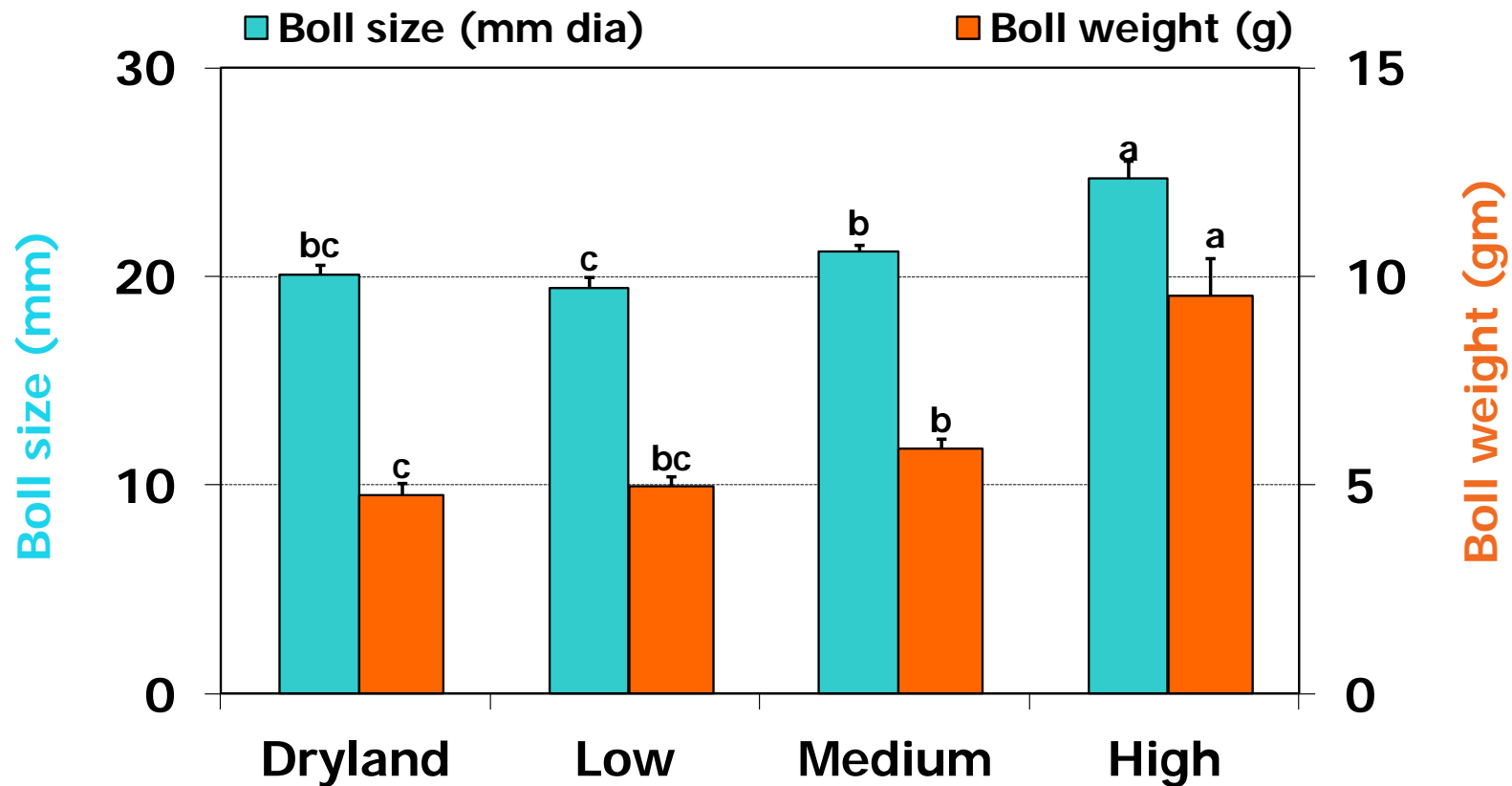
Complete Plant Mapping  
Lubbock, Texas



*Drip irrigated with Low=30, Medium= 60, and High= 80% ET Replacement.*

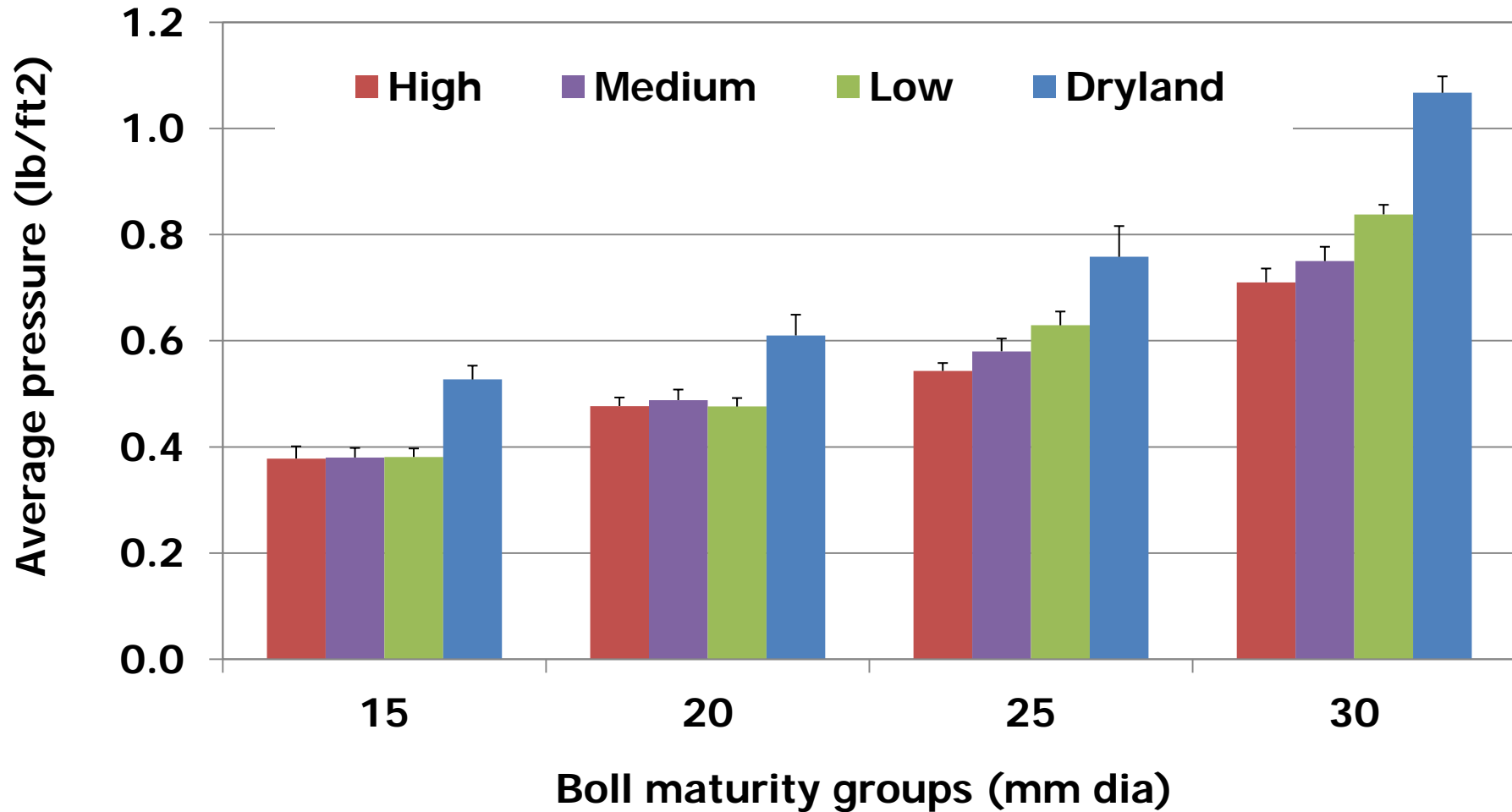


# Boll Size and Weight at 250 HU (>60°F) as Influenced by Irrigation Lubbock, TX



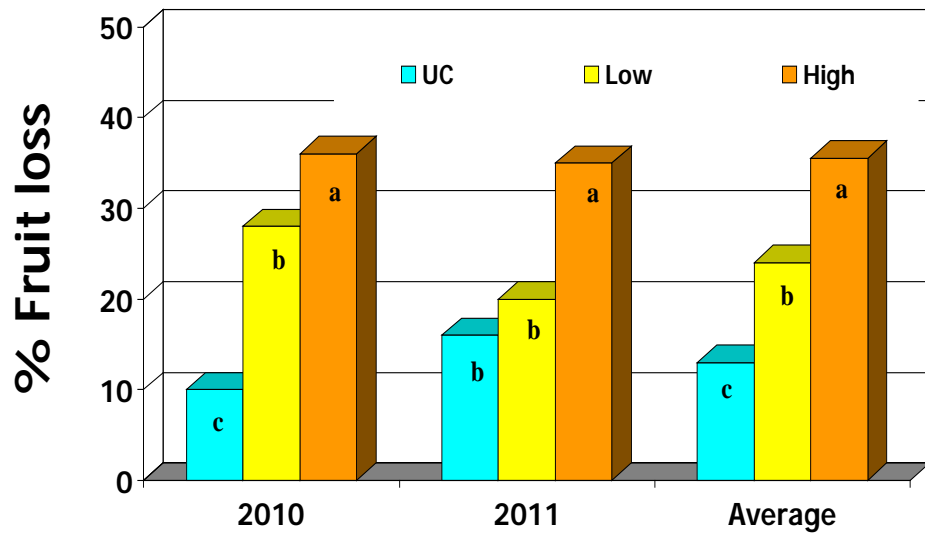
*Drip irrigated with Low=30, Medium= 60, and High= 80% ET Replacement.*

# Carpel Wall Toughness as Affected by Irrigation, Lubbock, TX

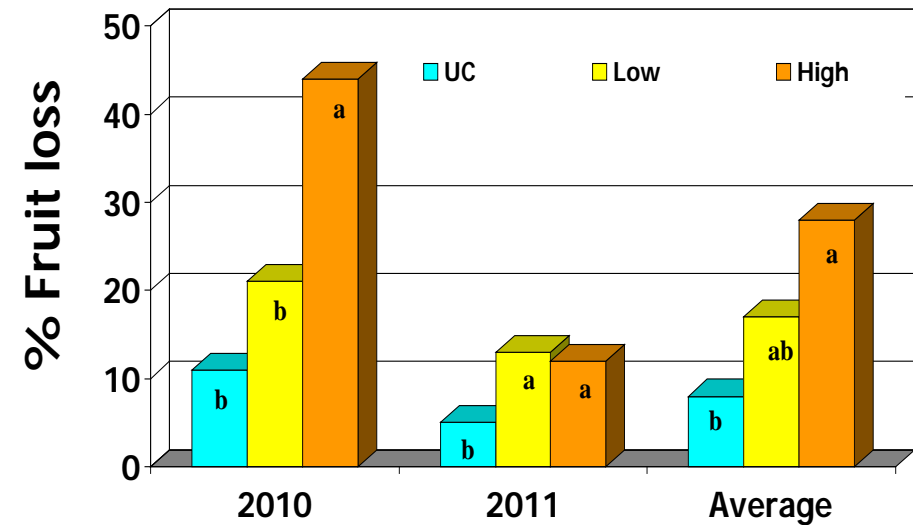


# Percent Square Loss

## Low Water



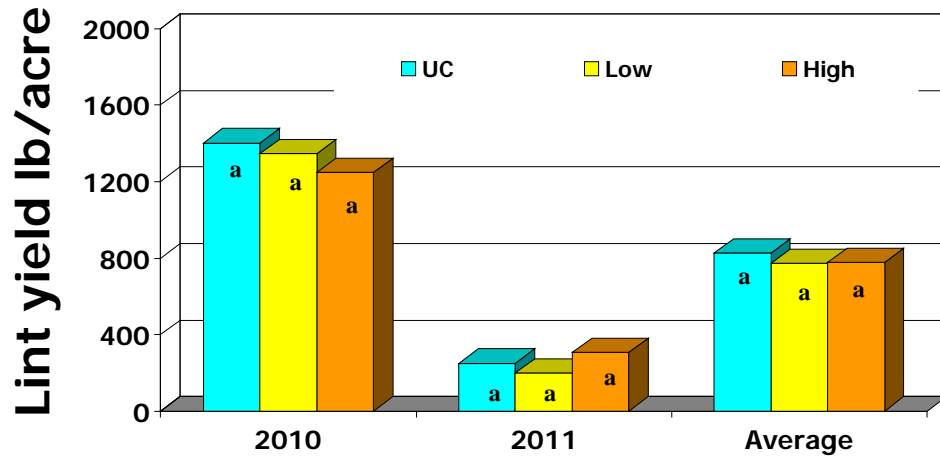
## High Water



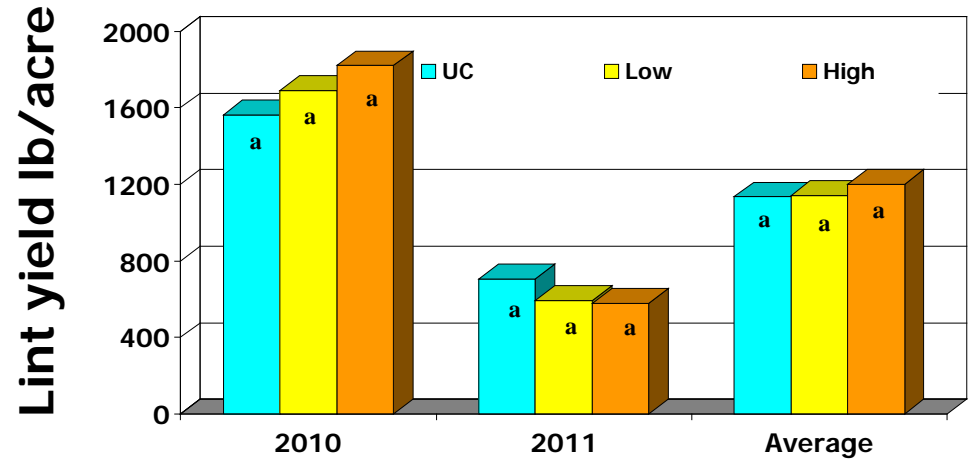
UC=unsprayed control; Low=2-4 bugs/plant; High=6-8 bugs/plant

# Lint Yield

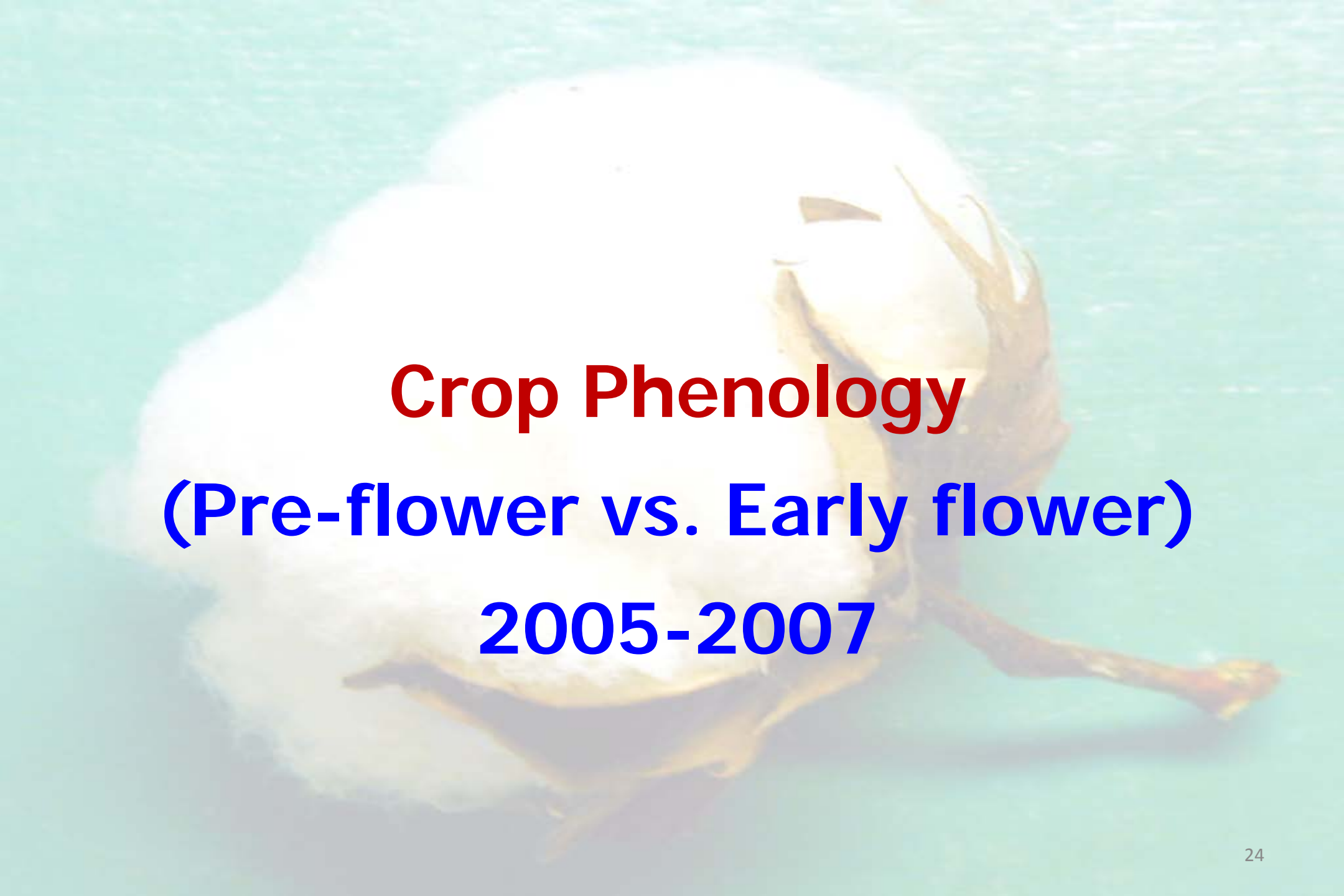
## Low Water



## High Water



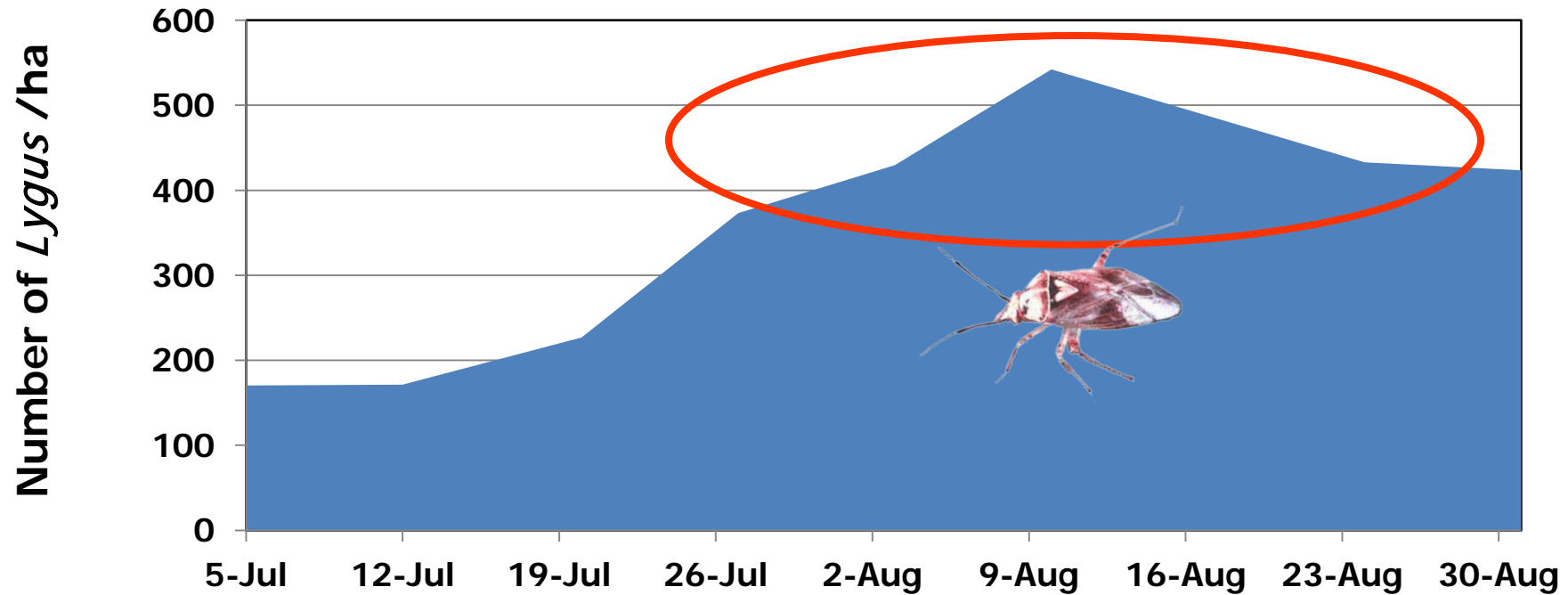
UC=unsprayed control; Low=2-4 bugs/plant; High=6-8 bugs/plant



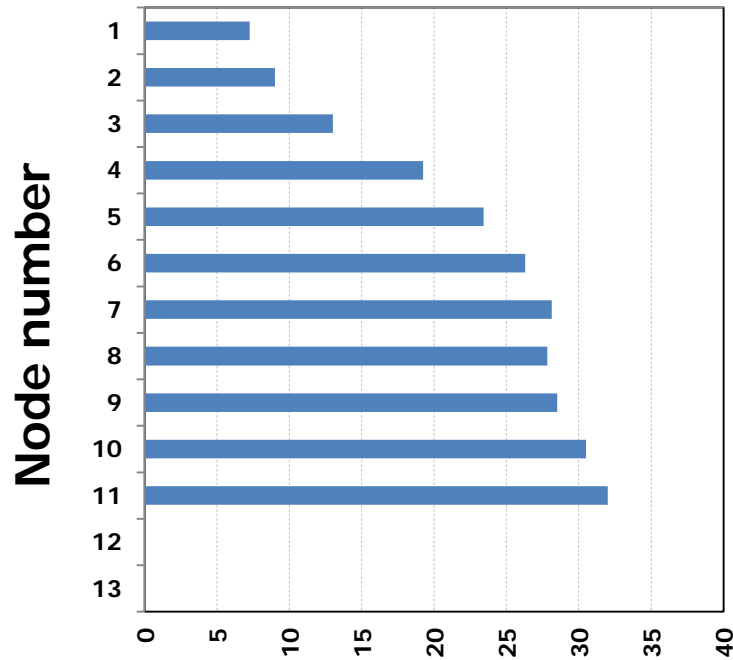
**Crop Phenology**  
**(Pre-flower vs. Early flower)**  
**2005-2007**



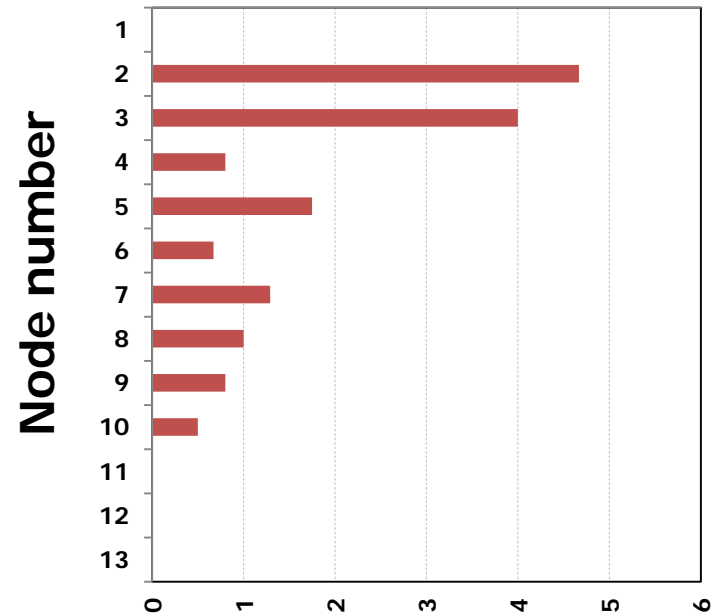
# *Lygus*: A Mid-Season Cotton Pest in the Texas High Plains



# Cotton Fruit Feeding Preference of *Lygus*



Boll diameter

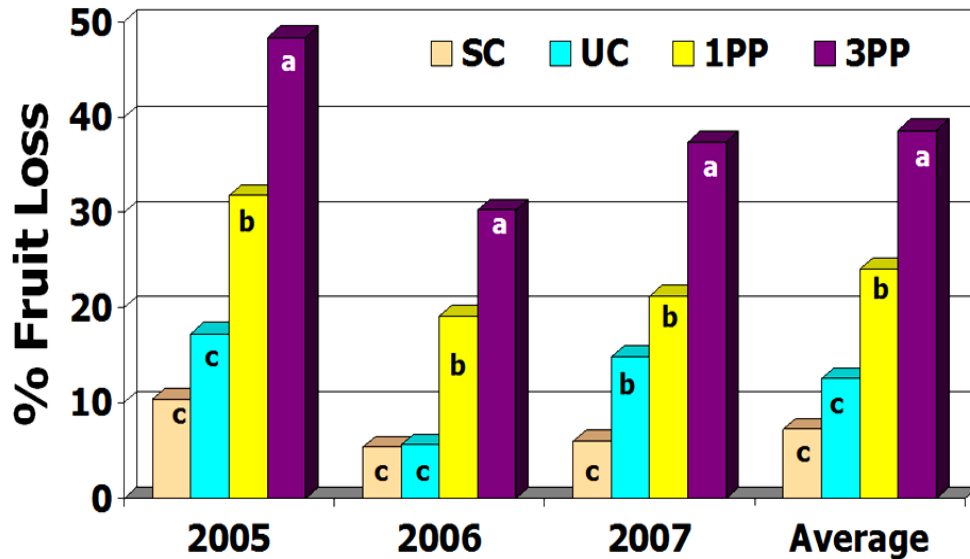


External lesions

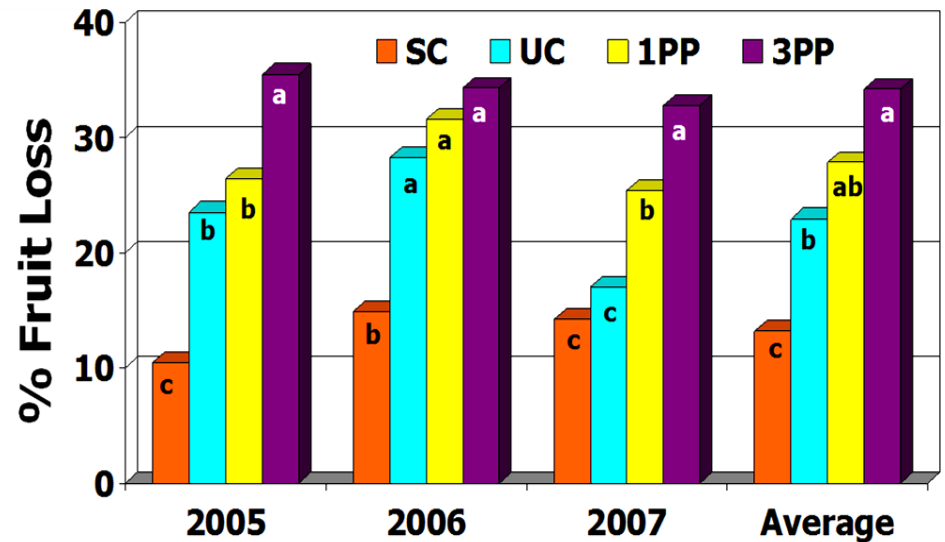
**Relationship between nodal position (boll age), boll size, and *Lygus* injury**

# Percent Square Loss

## Pre-bloom



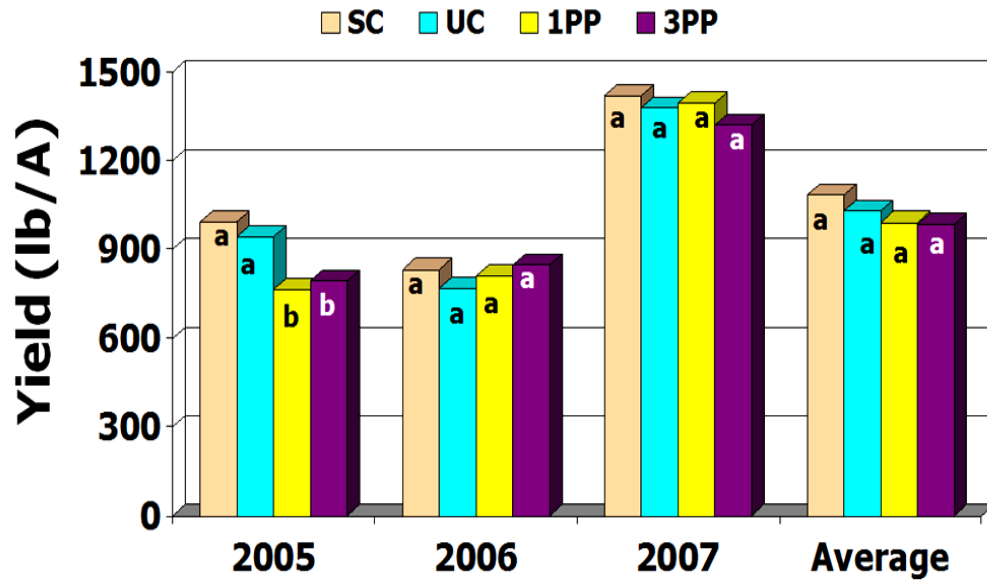
## Early bloom



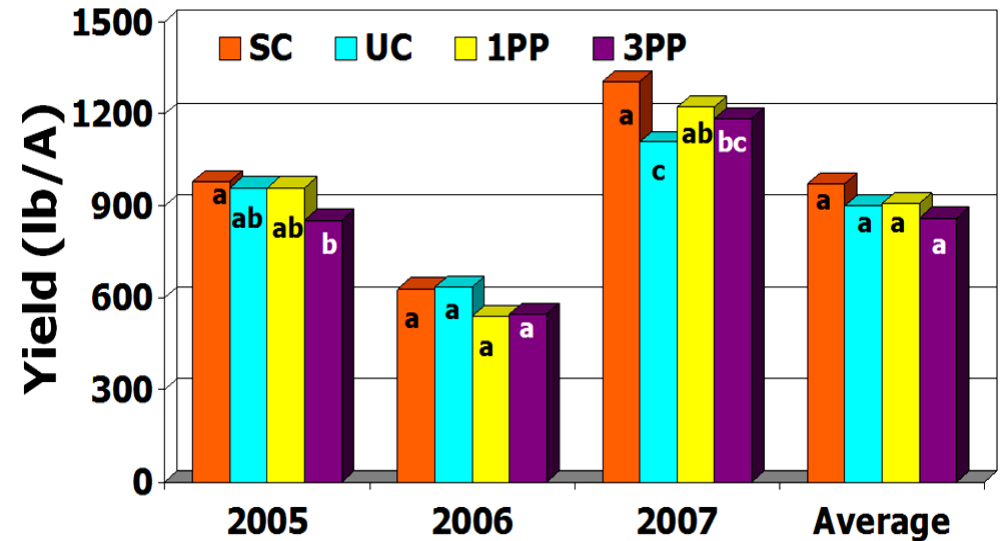
SC=sprayed control; UC=unsprayed control; 1PP=1 bug/plant; 3PP=3 bugs/plant

# Lint Yield

## Pre-bloom



## Early bloom



SC=sprayed control; UC=unsprayed control; 1PP=1 bug/plant; 3PP=3 bugs/plant

A large, fluffy white Lygus nymph is shown from a top-down perspective against a light blue background. The nymph has a rounded, white body and several pairs of legs extending outwards. The text is overlaid on the center of the nymph's body.

*Lygus* Growth Stages  
(Adults vs. Nymphs)  
2009

# Research Methods

- Four boll age cohorts (150-450 HU > 60 °F)



150 HU



250 HU



350 HU



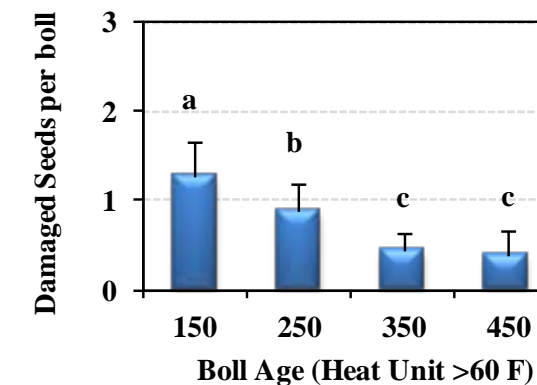
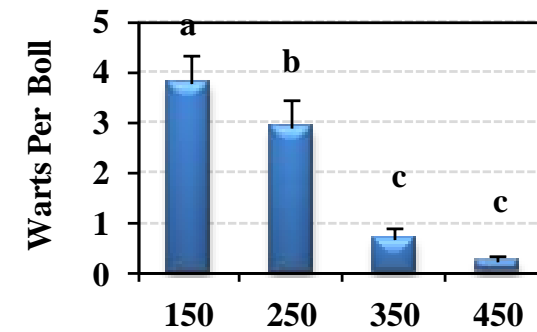
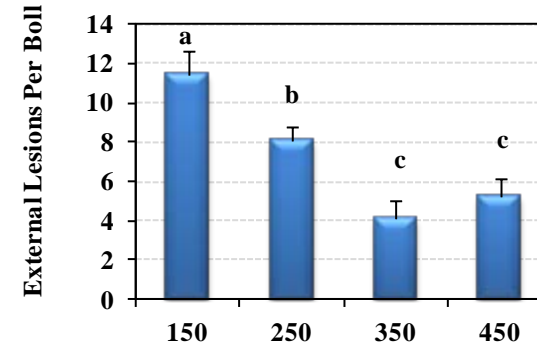
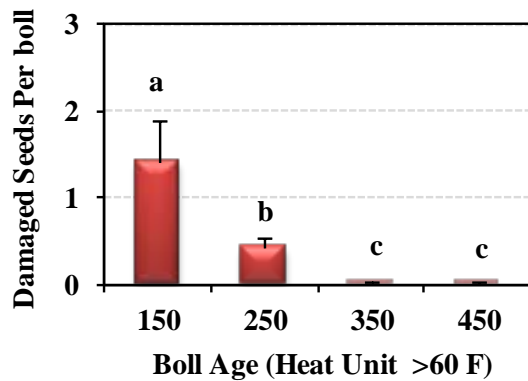
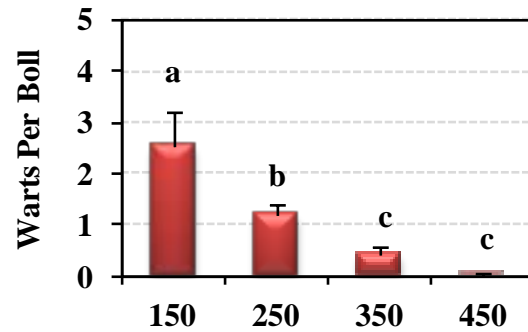
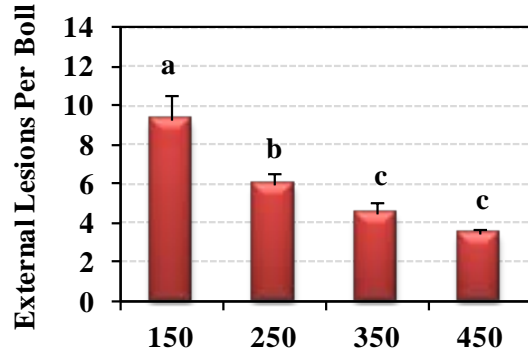
450 HU

- For each age cohort and its control, 200 bolls were caged individually at flowering (total=1,000)
- One adult or fourth instar *Lygus* introduced into each cage for 48 h

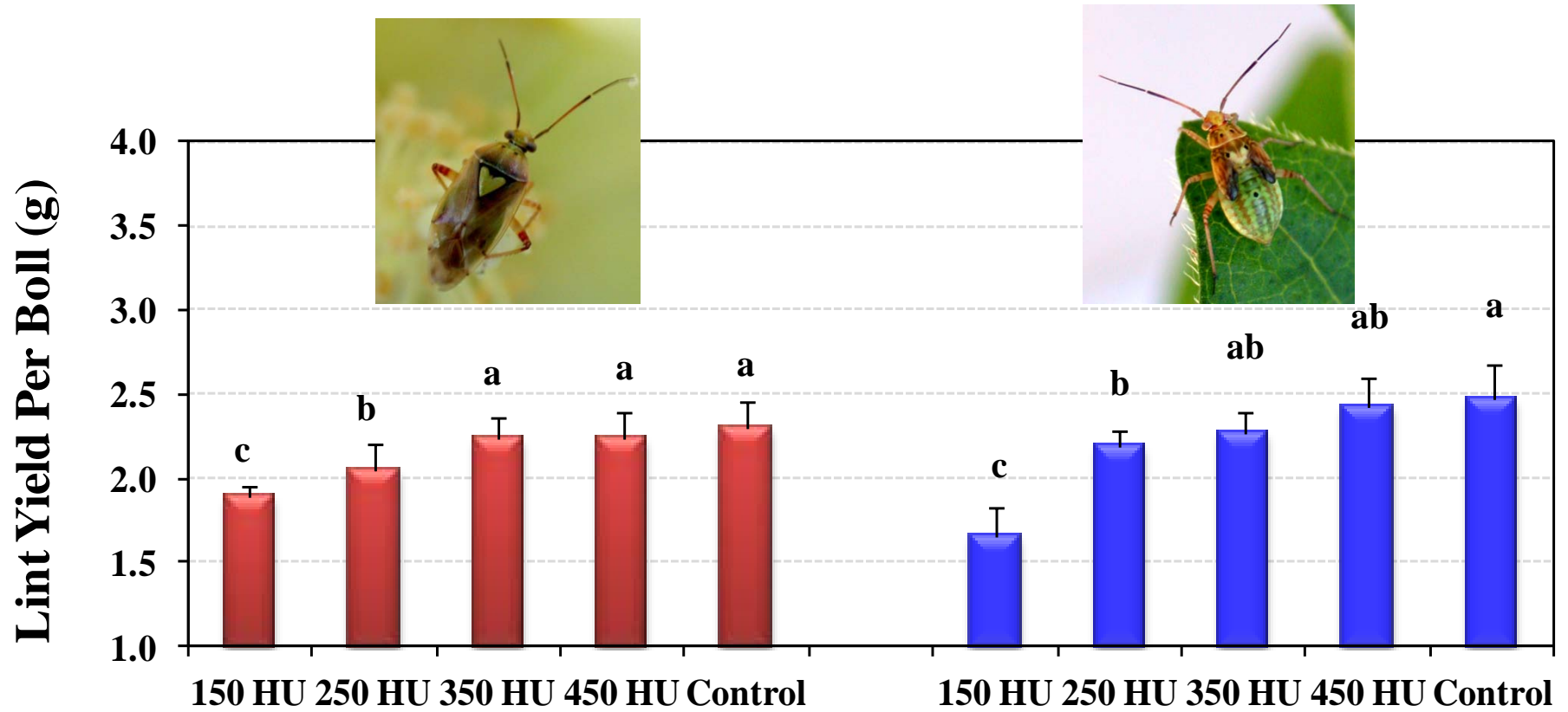


# Adult vs. Nymph

## External Lesions, Internal Warts, Seed Damage



# Adult vs. Nymph Lint Yield Reduction





# Conclusions

- Cotton plants can compensate 25-30% early season square loss in the Texas High Plains
- In-season squaring pattern in cotton plant may be altered due to *Lygus* infestations, but the selected cultivars did not vary in their abilities to compensate for the lost fruits
- While lint yield values were different in high and low water plots, cotton plants compensated *Lygus* induced fruit loss in both low and high water plots
- Both adults and nymphs can cause significant damage to young (<7-10 day old) bolls, but late instar nymphs were more injurious to cotton than adults in Texas High Plains cotton



# Acknowledgments



Cotton Incorporated

