Sugarcane Aphid as a Pest of Sorghum

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Winnsboro, LA

LSU AgCenter
Research & Extension

Melanaphis Task Force

- Formed in January 2013
- Consists of research and extension personnel from
  - Texas A&M University
  - Texas AgriLife Research & Extension
  - Louisiana State University
  - LSU AgCenter
  - USDA-ARS, Stillwater, OK
  - Oklahoma State University
- Purpose is to coordinate research and extension efforts
- This presentation contains a variety of information gleaned from this group

Courtesy of J. Beuzelin, LSU AgCenter

Emerging Pest for Gulf Coast Sorghum Producers

- Commonly found infesting sugarcane in Louisiana since 1999
- Observed infestations in sorghum beginning in mid-July, 2013
- One report of an infestation in sorghum in LA in 2008
- Also found in Johnson grass, sweet sorghum, sorghum-Sudan
- No observations on sugarcane, energy cane or Sudan grass
- Observed on corn in TX, but no colonization
- In LA was tentatively identified as sugar cane aphid, *Melanaphis sacchari* by Julien Beuzilen, supportive ID by Jeff Davis
- Additional confirmation as sugarcane aphid or closely related:
  - David Voegtlin, University of Illinois
  - Gary Miller, USDA-ARS, Beltsville, MD

G. Odvody/M. Brewer, AgriLife Research

Corn leaf aphid

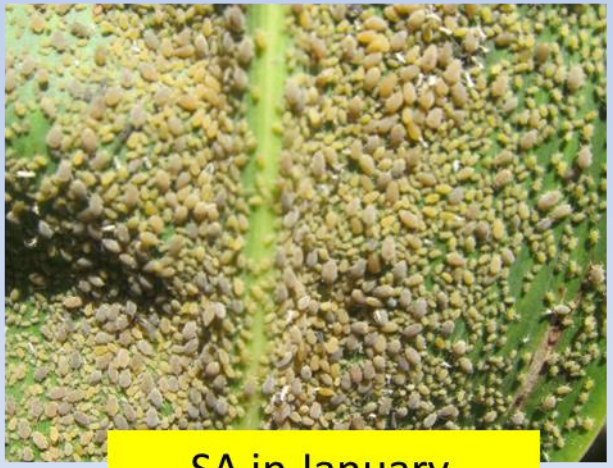
Yellow sugarcane aphid

SA in August, Corpus Christi

G. Odvody/M. Brewer, AgriLife Research

SA: sugarcane/sorghum aphid

Greenbug aphid

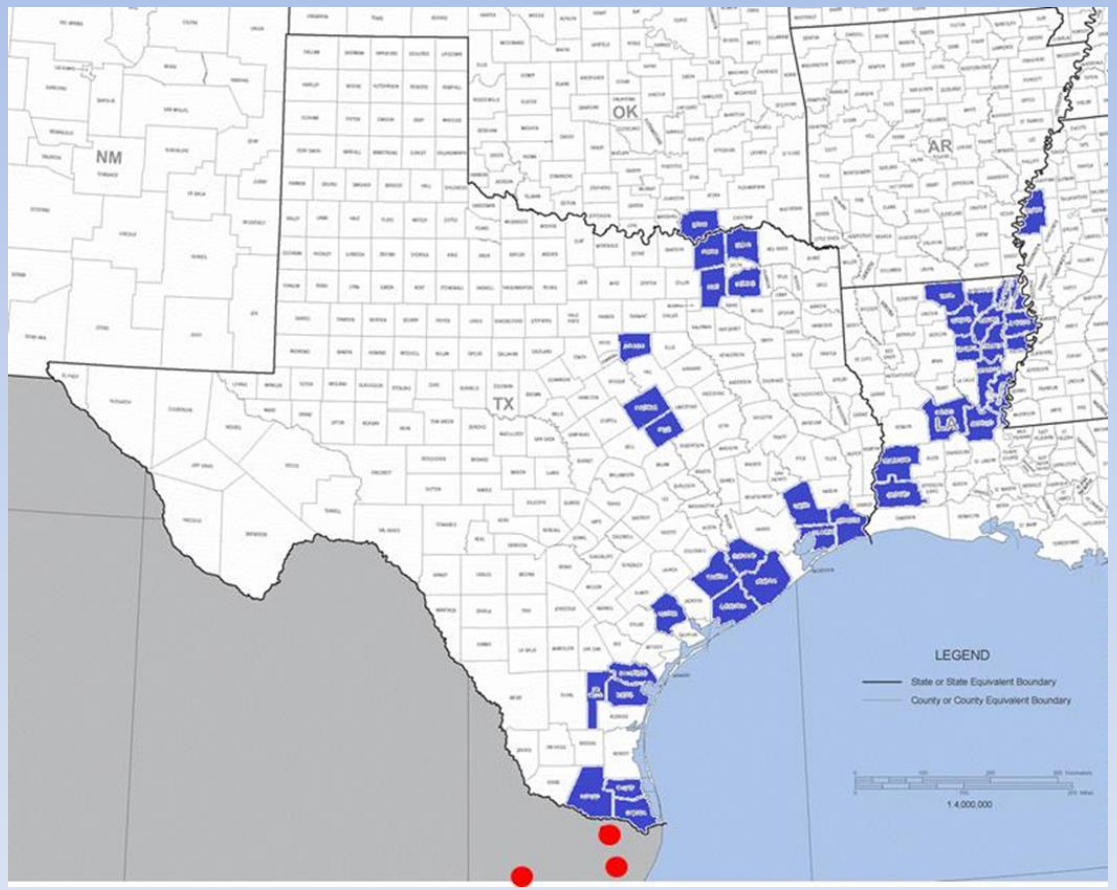


SA in January, remnant sorghum, RGV

R. Villanueva, AgriLife Extension

Distribution in 2013

- Detected in 38 counties and parishes of Texas, Louisiana, Oklahoma, and Mississippi
- Arkansas likely infested
- Found in one state in Mexico
- Globally, SA is a significant pest of sorghum in China, Taiwan, Japan, India South Africa, Botswana and Zimbabwe



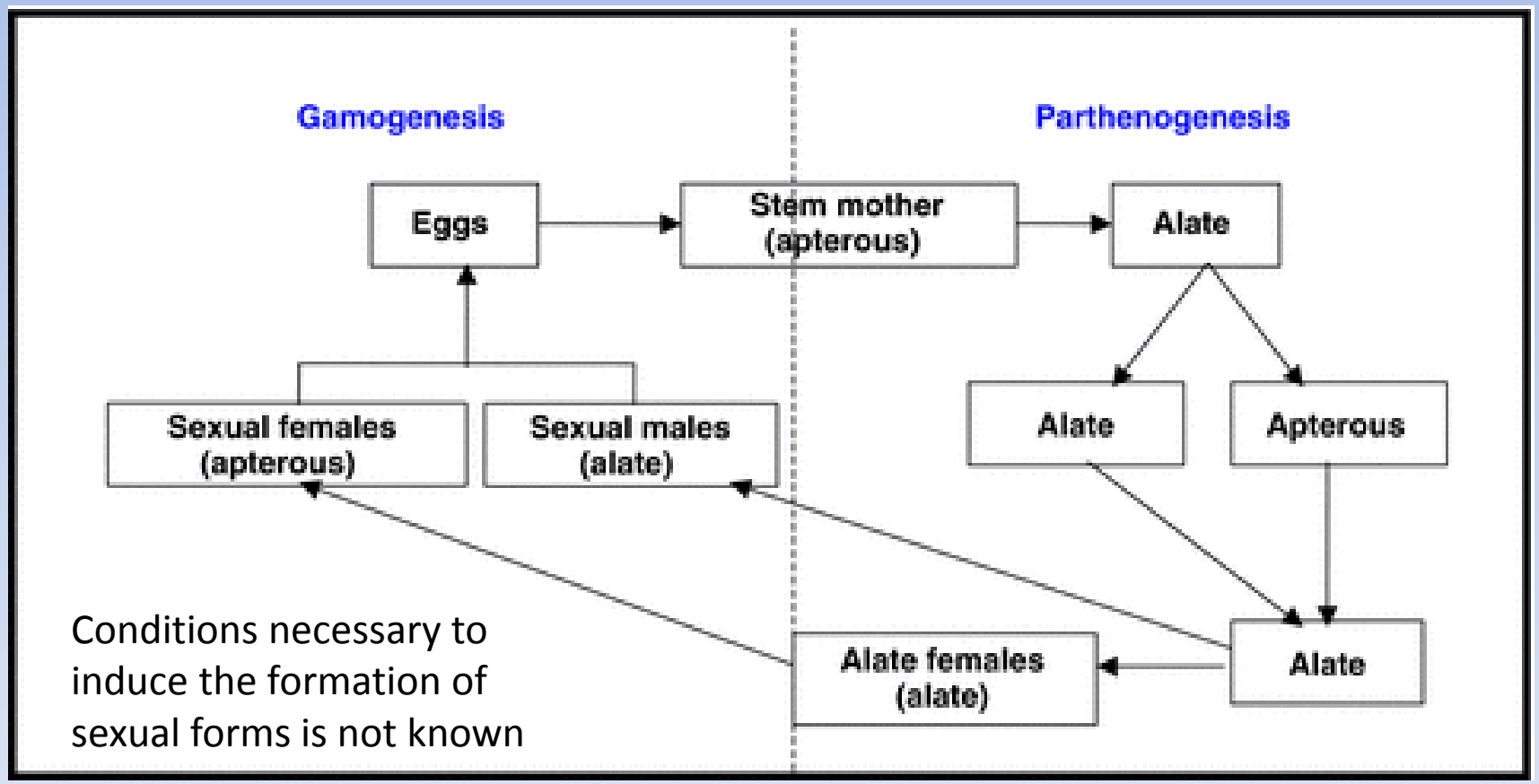
Courtesy of Melanaphis Task Force,
D. Anderson/R. Villanueva, AgriLife Research/Extension

Why the Shift to Sorghum?

- Not certain
- Well known sorghum pest in some parts of the world, but relegated to sugarcane in others
- But no reports in sorghum prior to 2013 outside of a single unsubstantiated incident 2008
- Interesting that where sorghum was heavily infest in 2013, nearby sugarcane was not
- Biotypic shift to a biotype (strain) that is an obligate sorghum feeder?
  - Scott Armstrong, USDA-ARS is investigating this aspect
- Sexual forms have been collected from sorghum

Courtesy of Melanaphis Task Force

Life Cycle

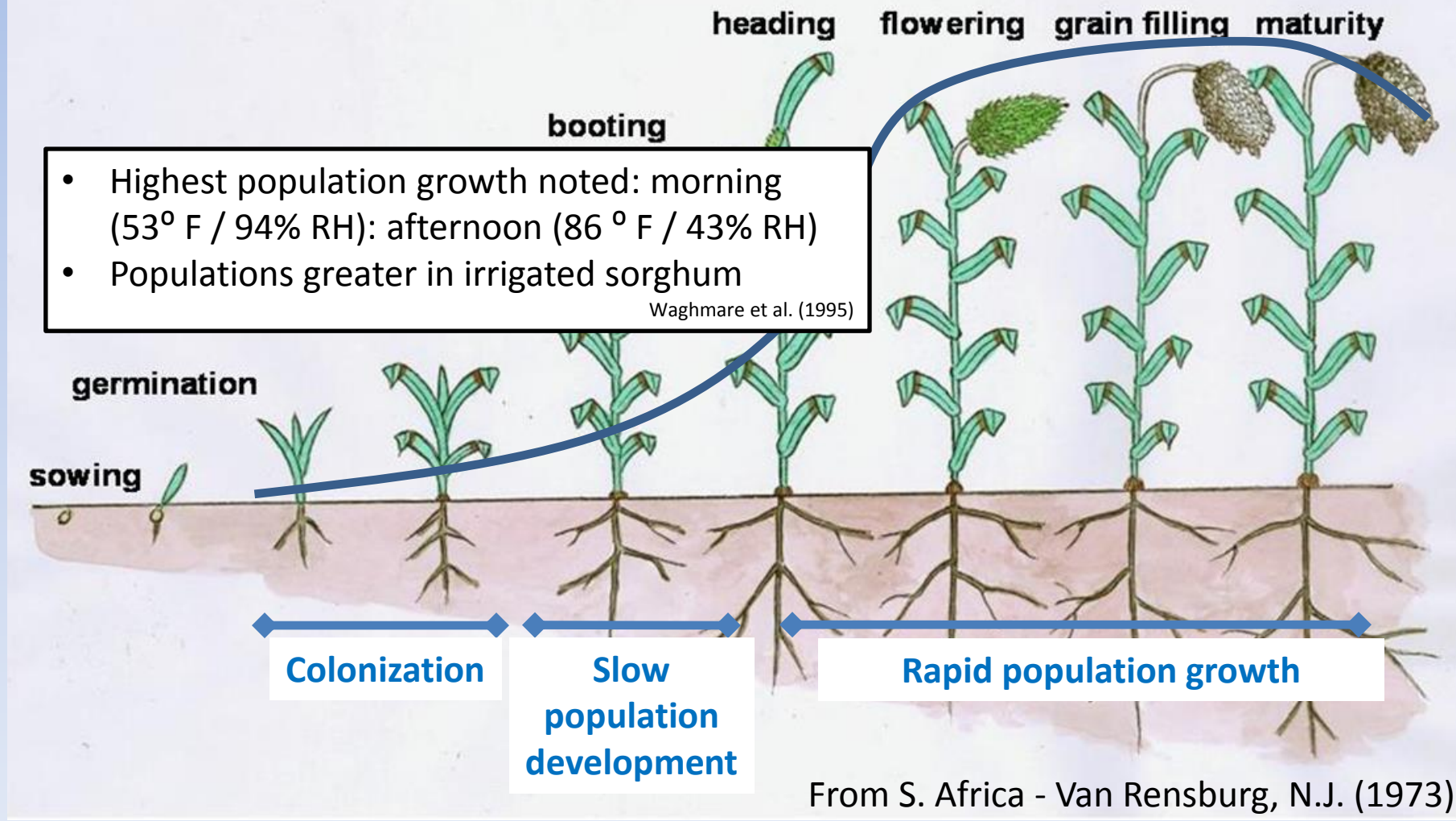


Conditions necessary to induce the formation of sexual forms is not known

C. Guo et al. 2011

Typical Sugarcane Aphid Population Development

But may develop high populations during boot



- Highest population growth noted: morning (53° F / 94% RH): afternoon (86 ° F / 43% RH)
- Populations greater in irrigated sorghum

Waghmare et al. (1995)

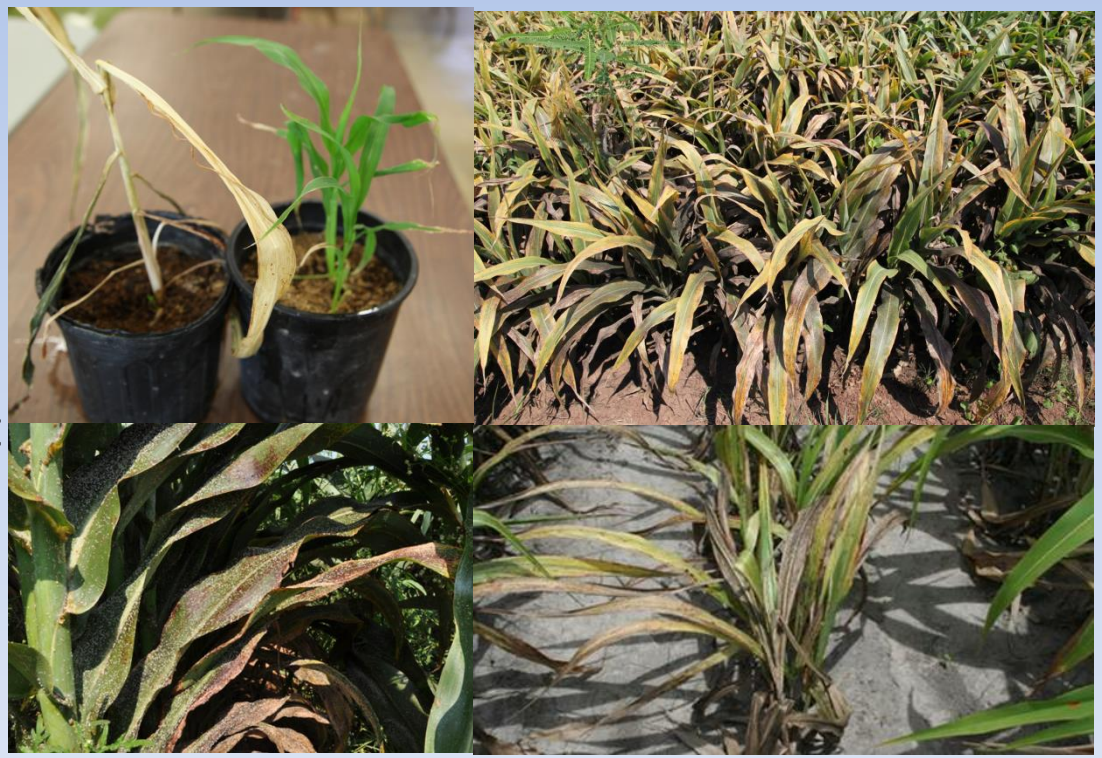
From S. Africa - Van Rensburg, N.J. (1973)

Injury to Sorghum

Courtesy of S. Armstrong, USDA-ARS, Stillwater, OK

- Feed primarily on underside of leaves and stems
- Reported to feed in xylem some places, phloem others
- General desiccation of plant tissue
- If a toxin is involved it is not acute in nature
- Associated reddening, purpling and necrosis of plant tissue
- Exasperated by dry conditions
- Once grain is filled, direct yield loss is highly unlikely

Not common in aphids; question validity although some aphids feed in both



Courtesy of D. Kerns, LSU AgCenter, R. Villanueva, Texas A&M AgriLife Extension


Area with aerial application error
Early boot stage
Courtesy of D. Kerns , LSU AgCenter

Factors Contributing to Direct Yield Loss

- Number of aphids necessary to cause yield loss depends on:
  - Plant growth stage
  - Plant moisture stress
  - Duration of the infestation
- Yield loss unlikely once sorghum is at the milk stage
- South Africa reports of yield losses 46-78%

Singh et al. (2004)

Courtesy of D. Peterson

Near Harvest Issues

Accumulation of copious amounts of honey dew, sooty mold and the aphids themselves

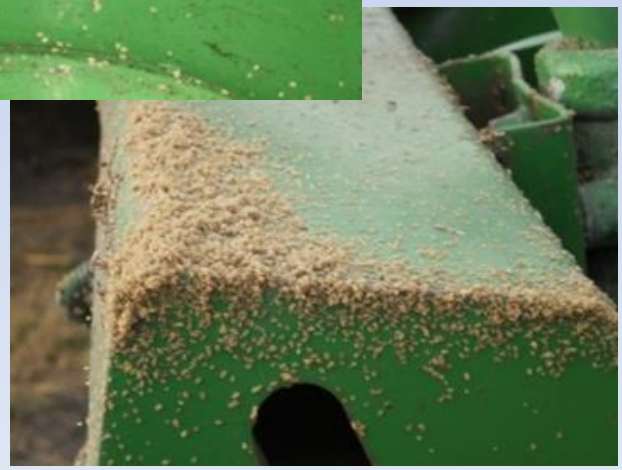
- Exasperated by dry weather
- Interference with Glyphosate uptake and efficacy
- Re-treated with
  - Sodium chlorate (4.8 qt + 1% COC)
- Result
  - Delayed harvest
    - 0-14 days (7 days avg)
  - Additional application expenses
    - $9-17 per acre ($10/acre avg)
  - Moisture issues at the elevator

Courtesy of D. Kerns , J. Beuzelin, LSU AgCenter

Yield Loss and Harvest Efficiency

Honey dew, sooty mold and aphid covered leaves resulted:

- Clogged screens
  - Grain loss over screens
    - 10-50% (22% avg)
- Slower harvest speed
  - 0-66% reduction (27% avg)
- Excessive belt wear, breakage, cleaning equipment
  - $1000s spent on repairs
  - Cleaning 8-55 hrs (33.5 h avg)



Courtesy of LSU AgCenter, R. Villanueva, AgriLife Extension

Insecticide Selection and Efficacy

Currently labeled for aphids in sorghum

- Chlorpyrifos (Lorsban, Nufos, etc)
  - 30-60 dayPHI
- Dimethoate
  - 28 day PHI
- Pre-mixes
  - Cobalt
    - Chlorpyrifos + Gamma-cyhalothrin
      - 30-60 day PHI
  - Stallion
    - Chlorpyrifos + Zeta cypermethrin
      - 30 day PHI

Too long for late-season infestations

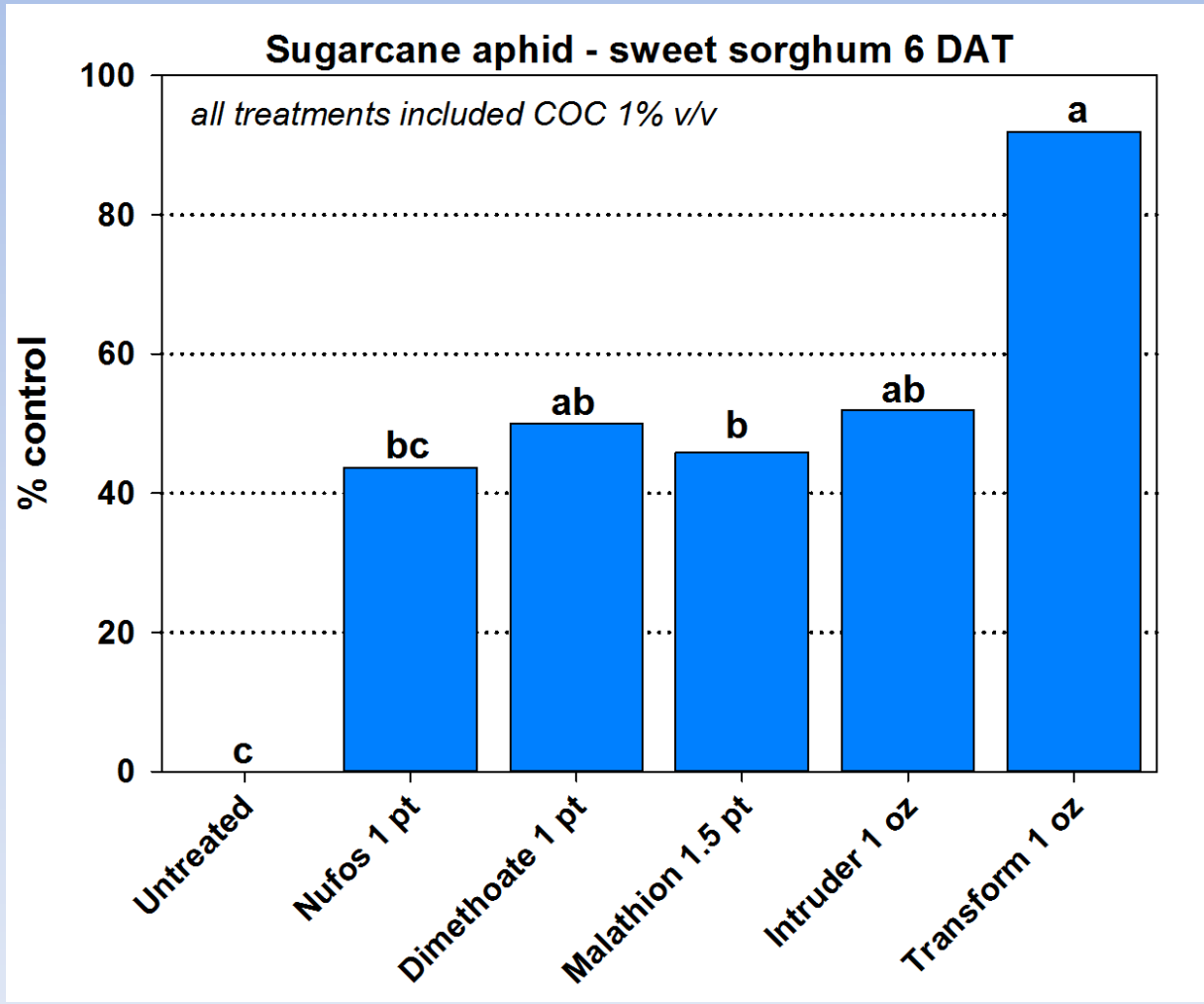
Other labeled and non-labeled possibilities

- Pyrethroids (variety)
  - 14-30 day PHI
- Malathion
  - 3 day PHI
- Intruder
  - Not labeled
- Imidacloprid
  - Not labeled
- Transform
  - Not labeled

Winnsboro, LA

September 10, 2013

- Mature sweet sorghum
- Plots 4 rows x 30 ft
- RCB 4 replicates
- Counted aphids from 5 leaves per plot
- Applied at 10 GPA
- Averaging ~600 aphids per leaf at application
- Chart represents % control based on Henderson-Tilton's equation
- Tukeys HSD $P < 0.05$

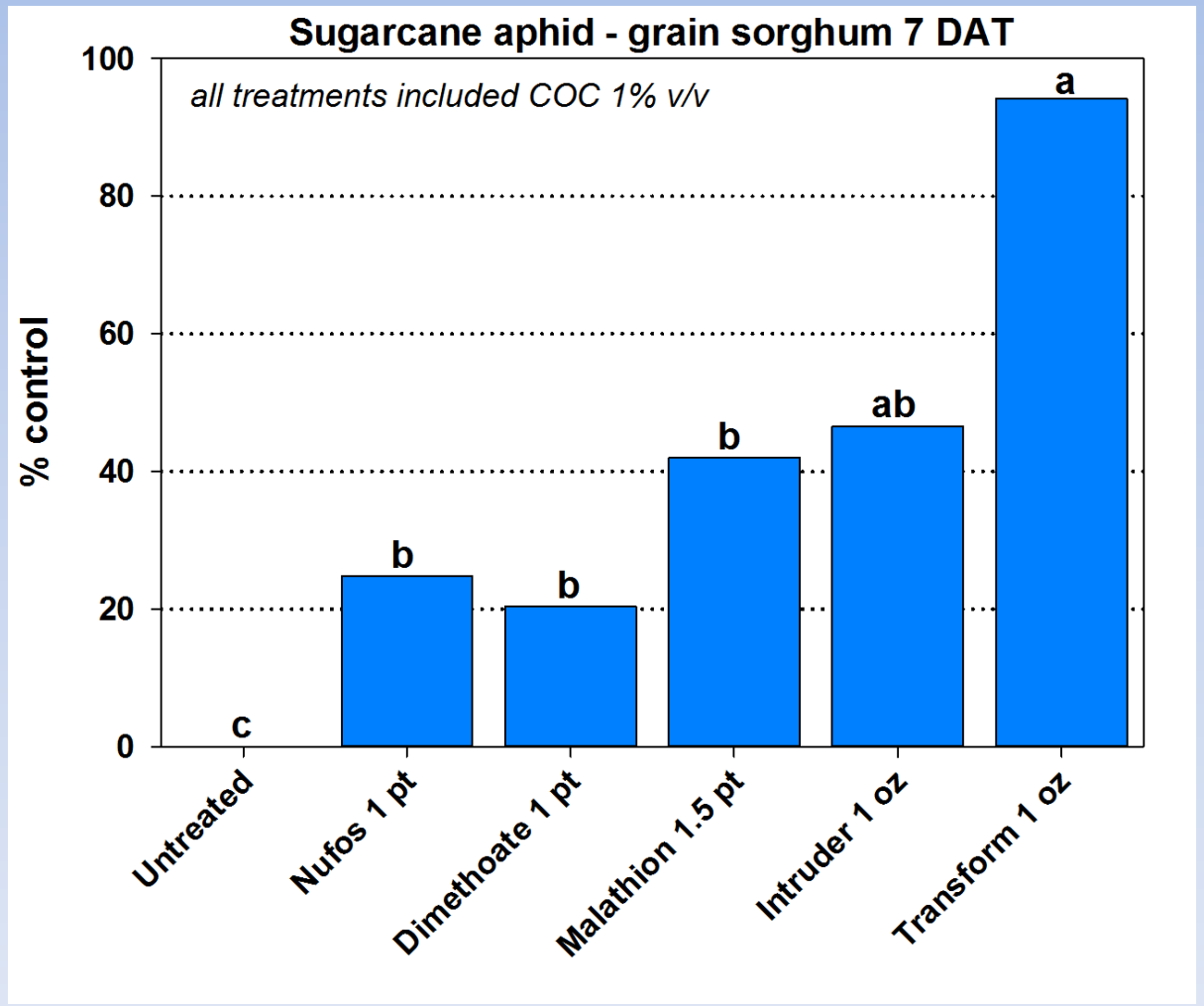


D. Kerns, S. Brown LSU AgCenter

St. Joseph, LA

September 12, 2013

- Mature grain sorghum
- Plots 4 rows x 50 ft
- RCB 4 replicates
- Counted aphids from 5 leaves per plot
- Applied at 10 GPA
- Averaging ~400 aphids per leaf at application
- Chart represents % control based on Henderson-Tilton's equation
- Tukeys HSD $P < 0.05$

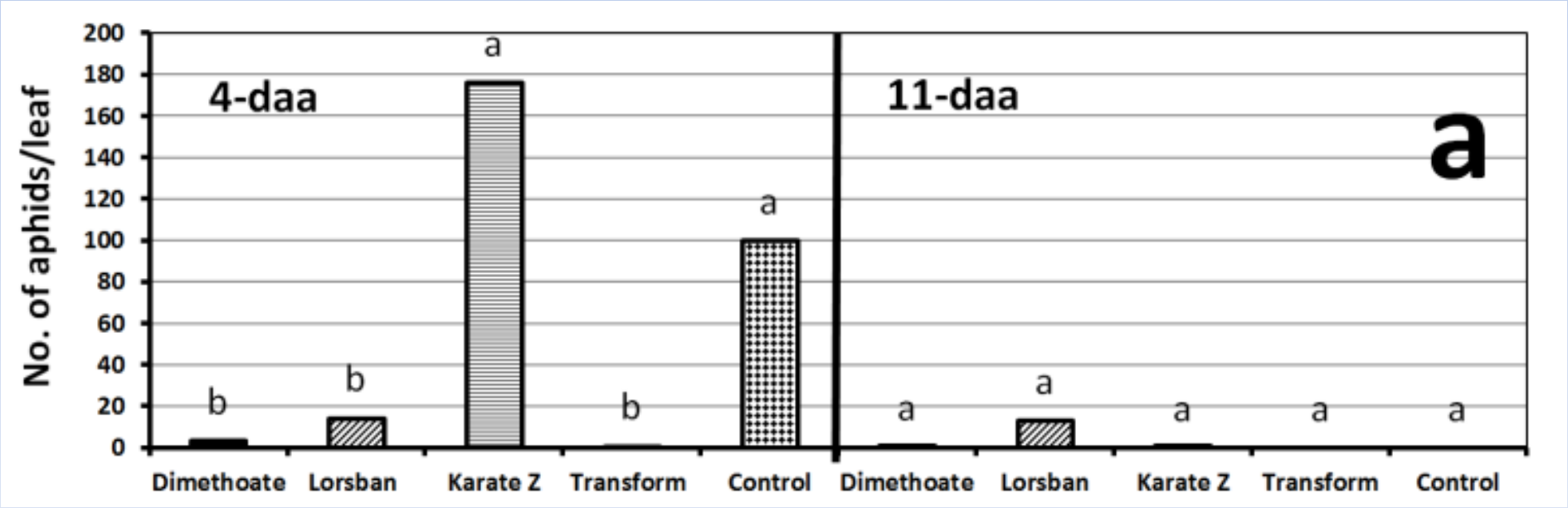


D. Kerns, S. Brown LSU AgCenter

Beaumont, TX

August 30, 2013

- Mature grain sorghum
- Plots 1 rows x 50 ft
- RCB 4 replicates
- Counted aphids from 10-20 leaves/plot
- Applied at 12 GPA
- LSD $P < 0.05$

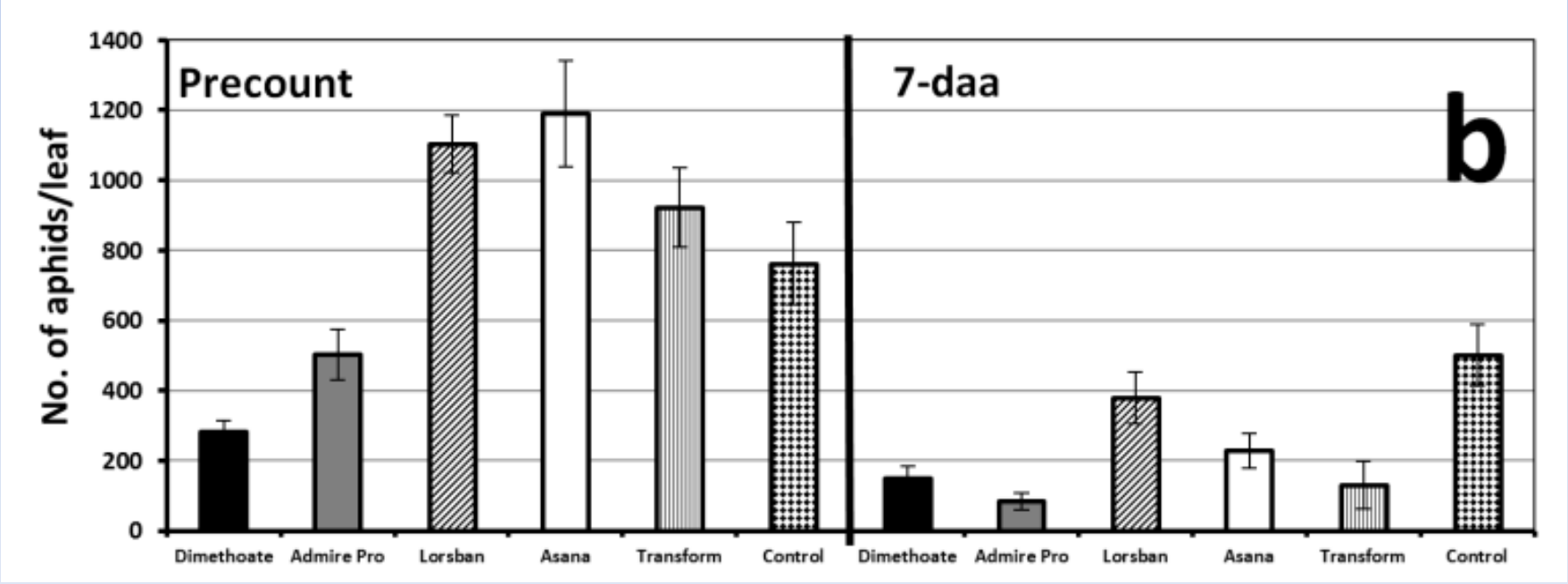


Weslaco, TX

October 29, 2013

- Mature grain sorghum
- Plots 4 rows x 50 ft
- RCB 4 replicates

- Counted aphids from 10-20 leaves/plot
- Applied at 10 GPA
- LSD $P < 0.05$



R. Villanueva & D. Sekula Texas A&M AgriLife

Insecticide Summary

- Flared aphids or provided poor control
  - Chlorpyrifos
    - Too long a PHI
  - Pyrethroids
  - Malathion
- Inconsistent control
  - Dimethoate
    - Too long a PHI

- Non-labeled
  - Admire Pro (Imidacloprid)
    - Good where tested
    - 1 trial
  - Intruder (Acetamaprid)
    - Inadequate control
  - Transform (Sulfoxaflor)
    - Consistently highly efficacious
    - 4 trials
    - (0.75-1.0 oz/ac)

Best Option for Section 18

MUST HAVE PHI NO MORE THAN 14 DAYS

Natural Enemies

A number of predators and a least one parasitoid have been observed preying on sugarcane aphid in sorghum

R. Villanueva, AgriLife Extension

M. Brewer, AgriLife Research

R. Villanueva, AgriLife Extension

However, their ability to effectively mitigate a sugarcane aphid infestation is questionable based on current observations

Insecticide applications targeting headworms and midge may be impacting the effectiveness of late-season aphid natural enemies

What Does the Future Hold?

- Scenario #1
  - Non-issue
  - Doesn't return to sorghum
- Scenario #2
  - Similar to 2013
  - Similar geographic distribution
  - Late-season infestation
  - Harvest issues
- Scenario #3
  - Infestation occurs earlier in the season
  - Distribution spreads to a larger area
  - Crop injury, direct yield loss and harvest issues

D. Kerns, LSU AgCenter

Economic Impact - 2013

Based on Louisiana Sorghum Production

Survey Case	Acres Impacted	Estimated % Yield Loss	% Harvest Speed Reduction	Increased Desiccation Costs ($)	Machinery Downtime (Hours)
1	3,000	50	0	9.00	44
2	1,500	33	0	0.00	48
3	2,200	15	66	10.00	24
4	300	100	NA	NA	NA
5	275	15	25	NA	8
6	250	25	30	10.00	8
7	3,000	10	20	11.00	55
8	450	5	50	17.00	48
Wt. Averages	1,372	27.80%	22.06%	$8.40	40.8 hrs
		SA control	No SA control		% change
Returns above Costs		$89.26	($29.03)		-132.52%

K. Guidry, LSU AgCenter

Recommendations Going into 2014

- Don't rely on seed treatments
  - We don't know for sure how effective these are towards SA (need data)
  - Level and length of control is dependent on weather and the product
- If SA colonization is evident, treat to prevent desiccation and necrosis
  - Be more aggressive during dry conditions; especially with non-irrigated sorghum
- There are tolerant sorghum hybrids
  - TX2763 background
- Depending on Section 18 registration, Dimethoate or Transform are currently the products of choice
  - Transform is less toxic to many aphid natural enemies than Dimethoate
  - Long PHI renders Dimethoate useless
- TX has requested a Section 18 registration for Transform
- LA is requesting a Section 18 registration for Transform
  - LA will prohibit use during bloom to facilitate registration
  - Not sure for TX
- If Transform Section 18 registration is not granted
  - Work within Dimethoate PHI restrictions and try to prevent large SA population buildup
    - May not work
  - 14-18 days prior to harvest utilize a high rate of a sodium chlorate desiccant with 1% v/v COC

Research & Extension Activities

Research

- Surveys of sugarcane aphids and their natural enemies (TX, LA, OK; AR & MS?)
- Continued insecticide efficacy testing (TX, LA)
- Foliar curative insecticides
- Seed treatments
- Comprehensive evaluation of impact of harvest aids for crop desiccation to facilitate harvest when aphids are present (LA)
- Economic thresholds (TX, LA)
- Investigate biotypic status and host suitability (USDA-ARS, Stillwater, OK)
- Screening sorghum germplasm for resistance (TX, USDA-ARS, Stillwater, OK)

Extension

- Develop a regional Extension Bulletin/Fact Sheet (TX, LA, OK)
- Presentations at grower and commodity outreach events (TX, LA, OK)
- Presentations at national and regional professional and commodity based meetings

D. Kerns, LSU AgCenter

THANK YOU

Members of the Melanaphis Task Force and supporting organizations

- Louisiana
  - D. Kerns, S. Brown, J. Beuzelin, K. Guidry (LSU AgCenter)
  - Louisiana Department of Agriculture and Forestry
- Texas
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- Oklahoma
  - T. Royer, K. Giles (Oklahoma State University)
  - S. Armstrong (USDA-ARS, Stillwater, OK)
- Supporting organizations
  - National Sorghum Producers
  - Texas Sorghum Producers
  - Louisiana Soybean & Grain Research & Promotion Board
  - United Sorghum Checkoff Program