

Louisiana Agricultural Technology & Management Conference
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Redbanded Stink Bug FAQ

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Mid-South Soybean Stink Bug Pest Complex



Nezara viridula



Chinavia hilaris



Euschistus servus



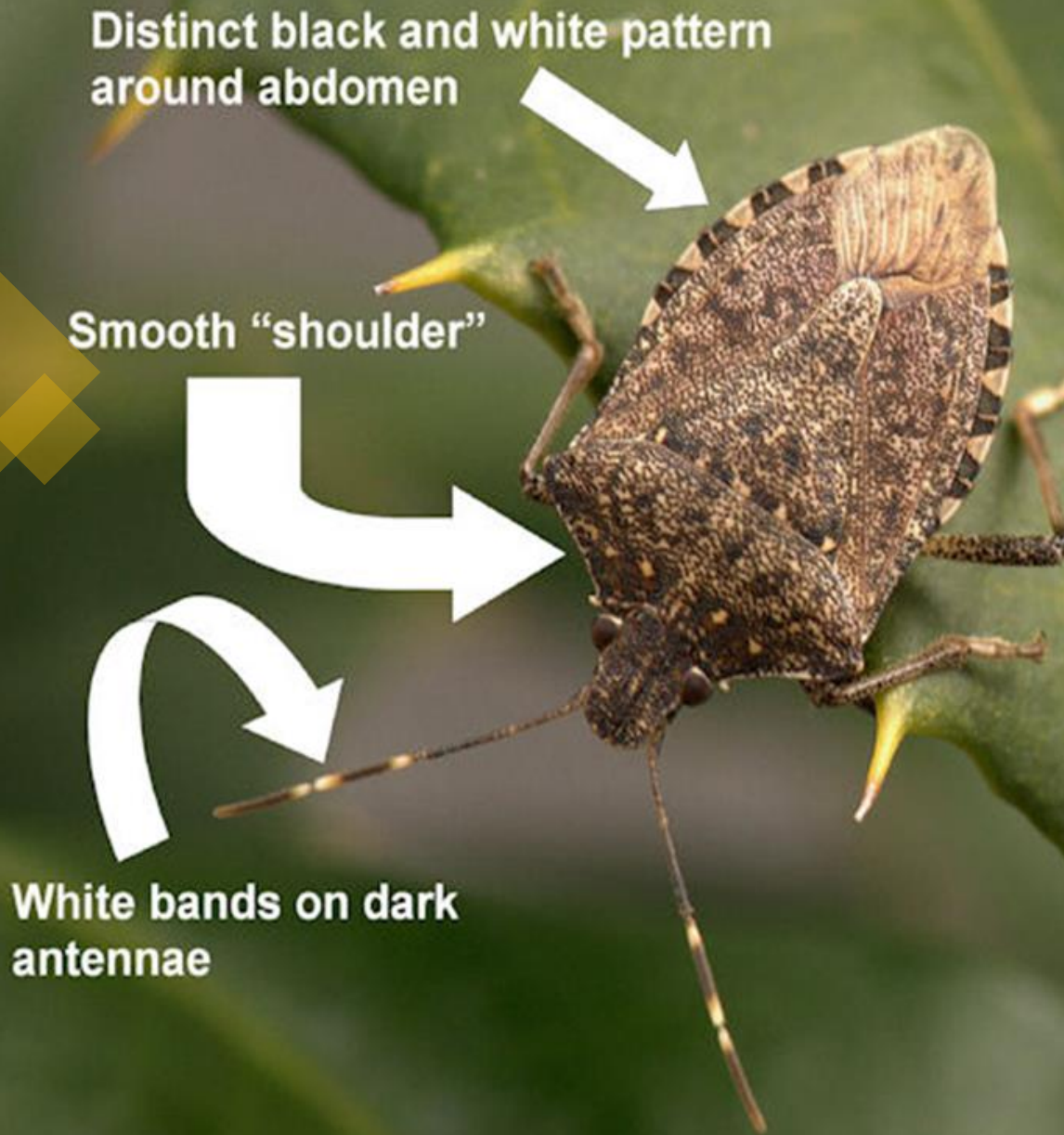
Russ Ottens, University of Georgia, Bugwood.org



Euschistus quadrator

Brown marmorated stink bug (*Halyomorpha halys* Stahl)





Distinct black and white pattern around abdomen

Smooth "shoulder"

White bands on dark antennae

- **In June 2021, we confirmed a reproducing population at a property in Iberville Parish**
- **Range did not change this year and is not impacting row crops currently**

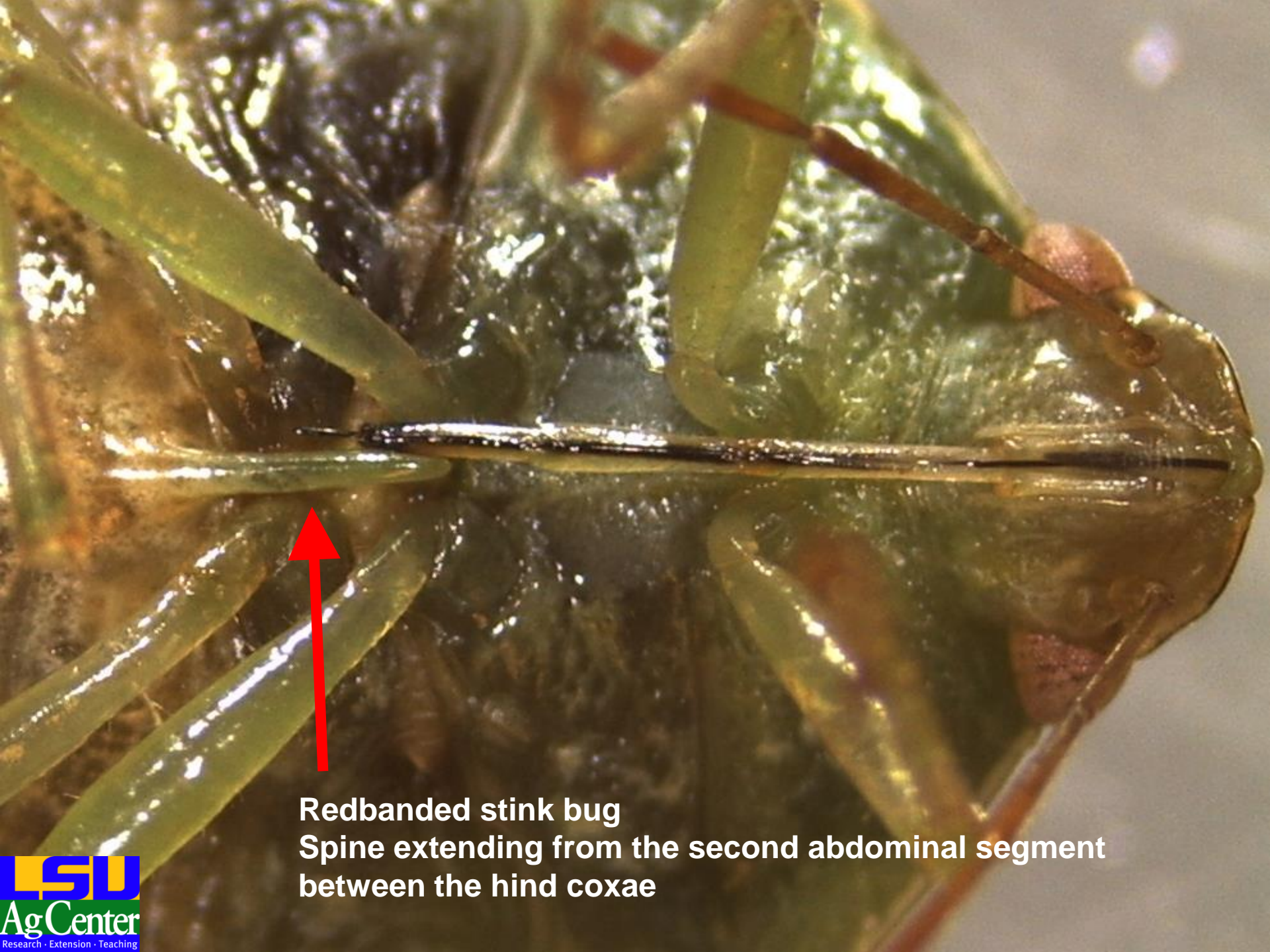
That red stink bug...



Redbanded Stink Bug



Red Shouldered Stink Bug



**Redbanded stink bug
Spine extending from the second abdominal segment
between the hind coxae**



Not all stink bugs are bad



Podisus maculiventris (Say), spined soldier bug

Q1. When and where are redbanded stink bugs active?



Temperature is important to stink bug overwintering survival

Redbanded stink bug supercooling point is -4°F

Redbanded stink bug lethal temperatures (LT):

At 23°F , $\text{LT}_{50} = 4 \text{ hr}$ and $\text{LT}_{90} = 7 \text{ hr}$

At 32°F , redbanded stink bug had to be exposed for 7 days to see 95% mortality



Temperature is important to stink bug overwintering survival

How well did redbanded stink bug survive this winter?

From November 1, 2022, to February 8, 2023, the weather station at Chase, LA has recorded **32 hr** at 23°F.

Lowest air temperature reached: 12°F

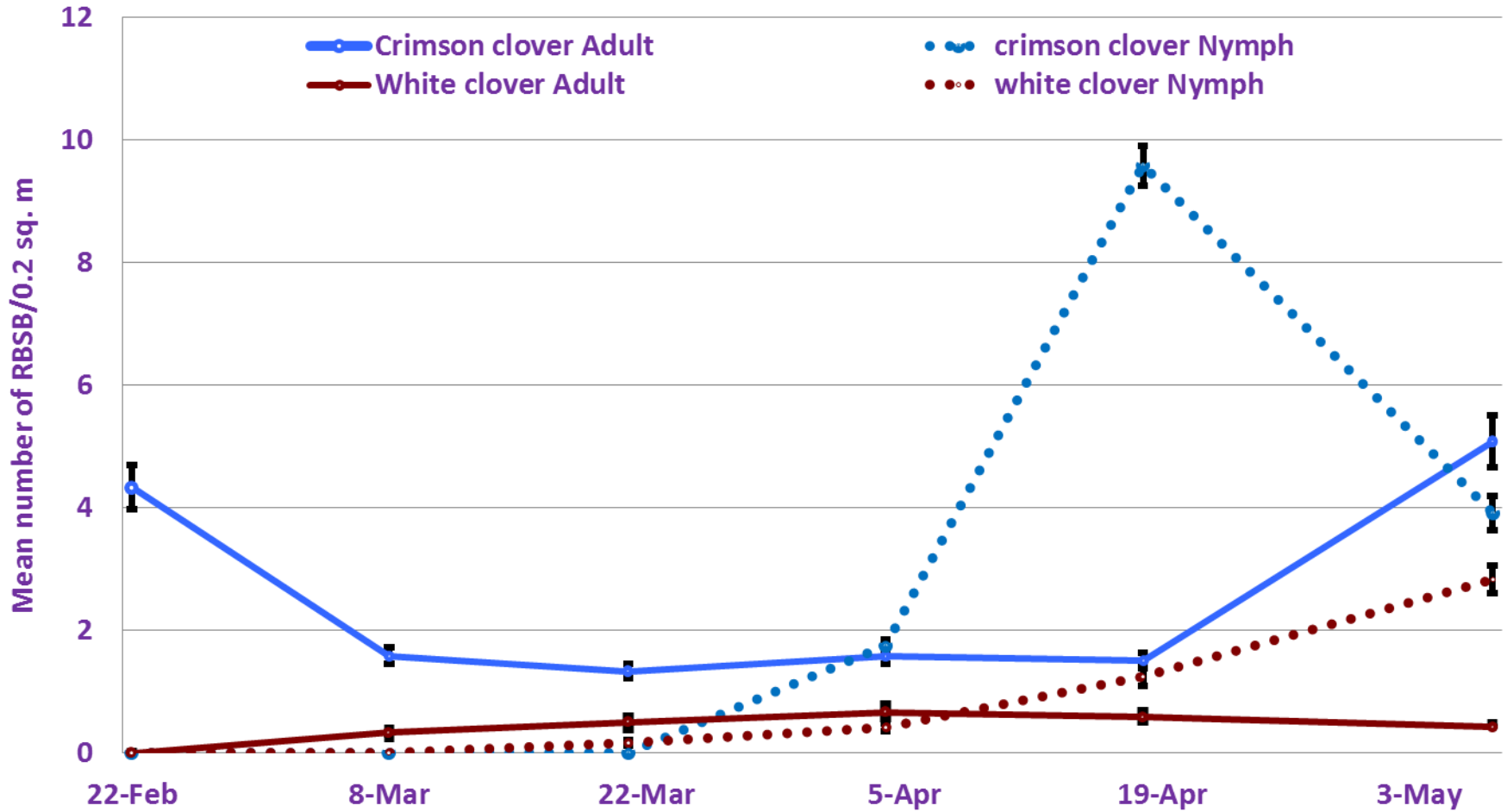
From November 1, 2022, to February 8, 2023, the weather station at Baton Rouge, LA has recorded **13 hr** at 23°F.

Lowest air temperature reached: 20°F



When are redbanded stink bugs active?

All year



Where are redbanded stink bugs active? **On weeds**



Scientific name

Indigofera suffruticosa

Common name

Bush indigo

Survivorship

90%

Sesbania herbacea

Hemp sesbania

75%



Lotus corniculatus

Birdsfoot trefoil

70%

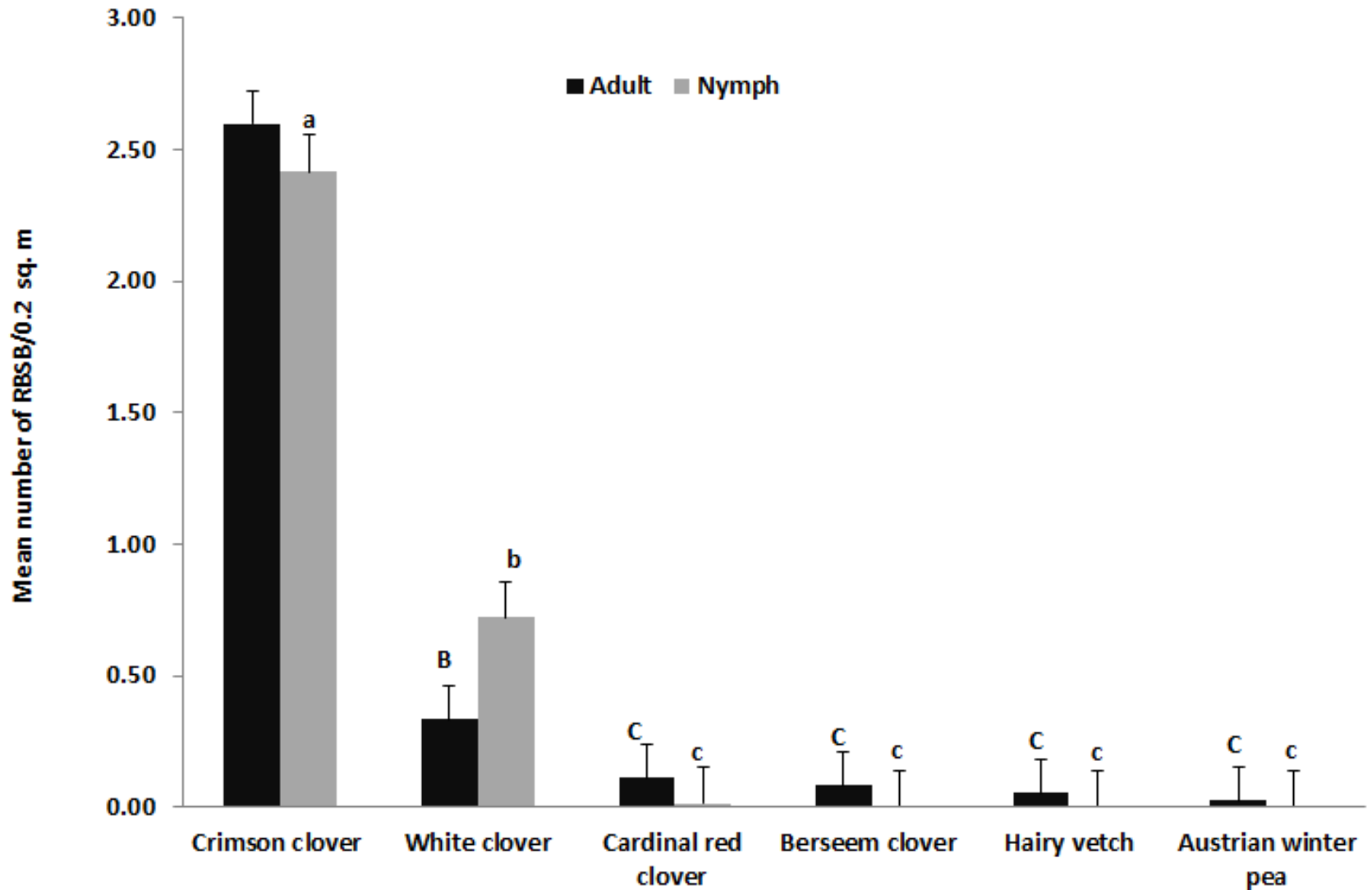
Ligustrum lucidum

Glossy privet

100%



Where are stink bugs active? **In cover crops**





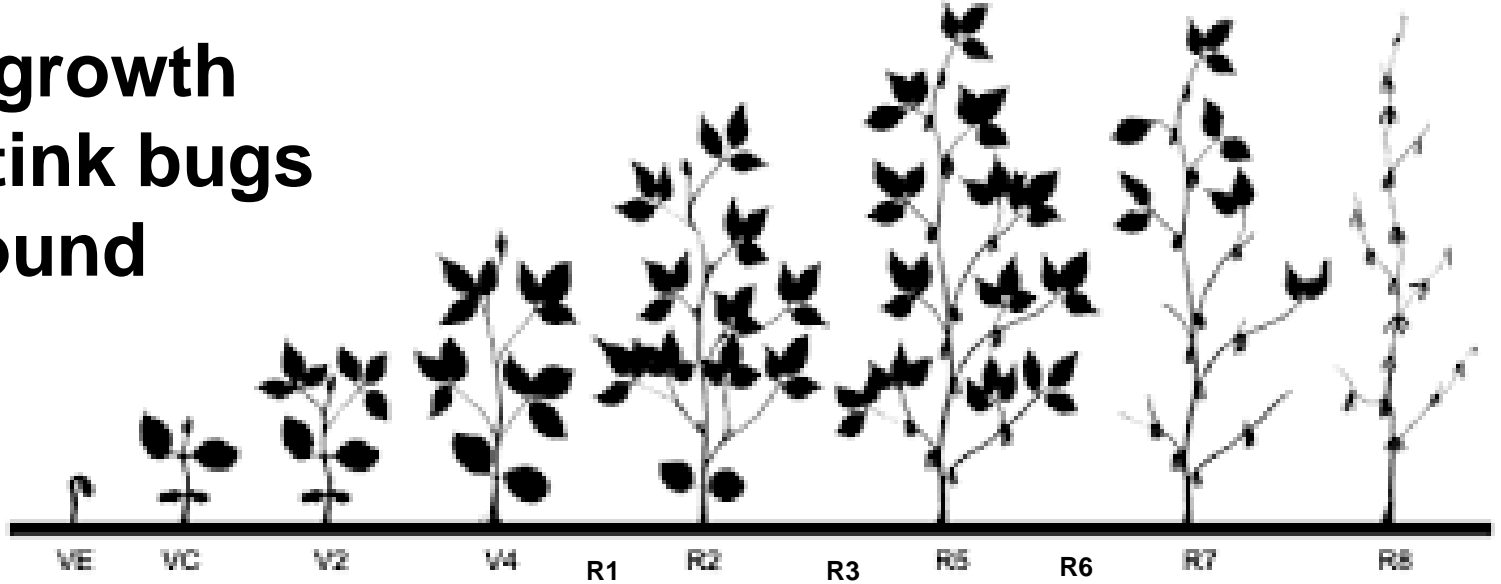
WRONG
WAY

Stink bugs are in cover crops

- Based on mean nymphal production over 3 years, a single acre of crimson clover can produce **570,000** RBSB in a 12-week period
- In comparison, a single acre of soybeans produces **35,000** RBSB, 16 times less.



Specific growth stages stink bugs can be found





Q2. Are redbandeds resistant to current insecticides?

Resistance to current chemistries?

Insecticide resistance monitoring for redbanded stink bug

Acephate (Orthene)

2022: LC₅₀ 10.0 ppm

2021: LC₅₀ 10.0 ppm

2020: LC₅₀ 10.0 ppm

2015: LC₅₀ 10.0 ppm

2011: LC₅₀ 6.0 ppm

2010: LC₅₀ 3.5 ppm

No change since 2015



Resistance to current chemistries?

Insecticide resistance monitoring for redbanded stink bug

Bifenthrin (Brigade)

2022: LC₅₀ 2.5 ppm

2020: LC₅₀ 2.5 ppm

2010: LC₅₀ 0.5 ppm

5X increase over 10 years



Identification of microsatellite alleles for a population genetics study of the invasive pentatomid soybean pest, *Piezodorus guildinii*

Hannah T. Shult, Jeff Davis, and Claudia Husseneder



Department of Entomology, LSU AgCenter, Louisiana State University, Baton Rouge, LA 70806

- Small founder population with limited genetic diversity.
- Harsh winters and/or extreme insecticide pressure are reducing genetic diversity.
- RBSB has limited dispersal rates and mate with individuals in their vicinity, most likely their relatives.
- Resistance will be localized but will be permanent

LSU AgCenter
Identification of microsatellite alleles for a population genetics study of the invasive pentatomid soybean pest, *Piezodorus guildinii*
Hannah T. Shult, Jeff Davis, and Claudia Husseneder
Department of Entomology, LSU AgCenter, Louisiana State University, Baton Rouge, LA 70806

Abstract

The re-introduced stink bug, *Piezodorus guildinii* (Westwood), is an economically important crop pest which is invasive to the United States. This pest is poorly controlled by traditional insecticide practices which means improved control is required, aided by a better understanding of this species, its necessary, invasive traits and its population dynamics of the species. This study sought to identify polymorphic microsatellites of *P. guildinii*. Microsatellites are a source of DNA sequence variation and are used to identify genetic diversity. This study aimed to identify polymorphic microsatellites which would allow for the identification of population structure of the pest species *P. guildinii*. We searched for microsatellites in the genome of *P. guildinii*. We identified 10 microsatellites for the species *P. guildinii*. We used the 10 microsatellites to identify population structure of *P. guildinii*. We found that the populations in Louisiana (Louisiana population) and those in Mississippi (Mississippi population) were genetically similar and were differentiated from other populations. This study found that the populations in Louisiana and Mississippi were genetically similar and were differentiated from other populations. This study found that the populations in Louisiana and Mississippi were genetically similar and were differentiated from other populations.

Introduction

Piezodorus guildinii (Westwood), the re-introduced stink bug is an invasive pest species. It was first reported in southern Louisiana in 2000 and has since become the predominant stink bug species on soybean fields, causing extensive economic damage and production losses that occur following unusually harsh winters (Davis et al. 2012). The species is of particular interest due to the increased damage caused by individual compared to other stink bug species, its ability to quickly traverse the shortest stink bug pest, and the sufficient population control by insecticides (Carter, Greeney, and Ansolt 2002; Berlin et al. 2010). Therefore, it is necessary to gain more knowledge about the biology and distribution of *P. guildinii*.

By elucidating the population structure of *P. guildinii*, we can begin to understand its distribution, patterns of dispersal behavior, and potential management strategies. This knowledge can help us identify the source population of *P. guildinii* and determine whether it is native to Louisiana or was introduced from another region.

Genotyping microsatellite loci (loci with small tandem repeats) allows us to identify population structure. Microsatellites acquire change at a higher rate than other parts of the genome, which allow for differences in allele diversity to accumulate between and within populations. Information regarding these loci can be used to identify genetic diversity to provide information on the population structure. The goal of this project was to identify polymorphic microsatellite loci for *P. guildinii* in order to determine the population structure of this invasive pest species.

Materials & Methods

Piezodorus guildinii individuals were collected by sweep net from soybean fields at Markus, Bayou, and from the Research Station, LA in 2010, 2011, 2012, and 2013. Samples were stored in 95% ethanol. DNA was extracted from the legs of at least 30 individuals per population. To minimize contamination, a single individual from each location was used for DNA extraction using the Qiagen DNeasy Blood and Tissue kit (Qiagen, Crawfordsville, IN). Genomic DNA was quantified using a Qubit dsDNA HS Assay kit (Life Technologies, Gaithersburg, MD). Sequencing results were screened for microsatellite loci using MISA Computer.

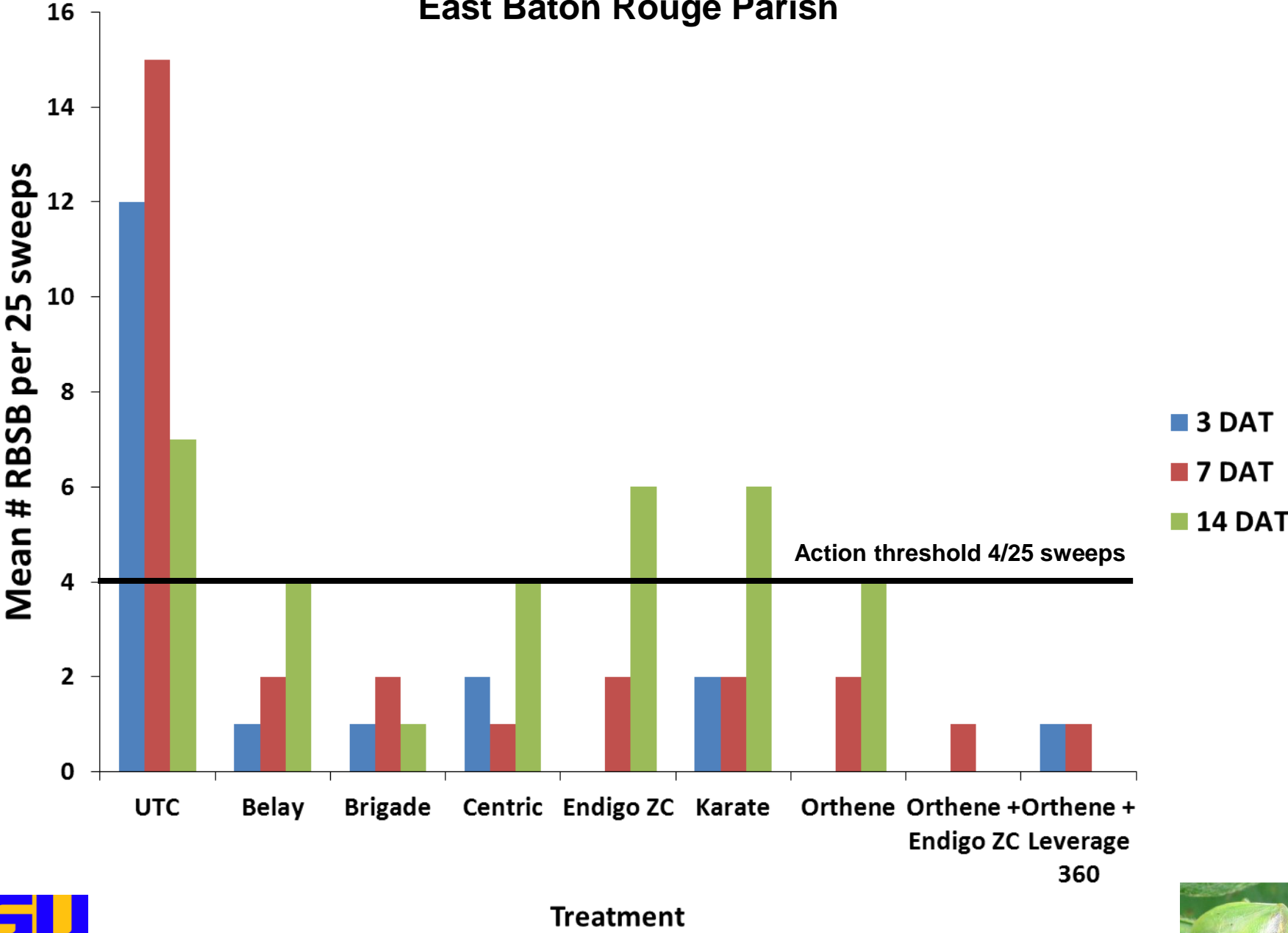
Primers for microsatellite loci were designed using a combination of Primer3Plus and manual design, and optimized using F12 Primer Suite (Bioinformatics.org). An M13 tag was added to the forward primer in order to allow the PCR product to be fluorescently labeled during electrophoresis. Standard PCR was performed at 94°C for 30 seconds, 55°C for 30 seconds, and 72°C for 2 minutes. PCR was performed using the Q10 Master Mix (BioLabs, Beverly, MA) with an initial denaturation of 94°C for 2 minutes, then 30 cycles of 94°C for 30 seconds, 55°C for 30 seconds, and 72°C for 2 minutes. PCR products were separated using polyacrylamide gels on the 11Cet 4300 DNA Analyser. Gel images were captured using Gene Reader (Bio-Rad, Richmond, CA). Base-pair (bp) allele length and determine heterozygosity (H_e).

Statistical analyses were performed using FSTAT (Ducoudré 1998) AND GDA to determine genetic relatedness, observed heterozygosity, and gene diversity between the two populations.

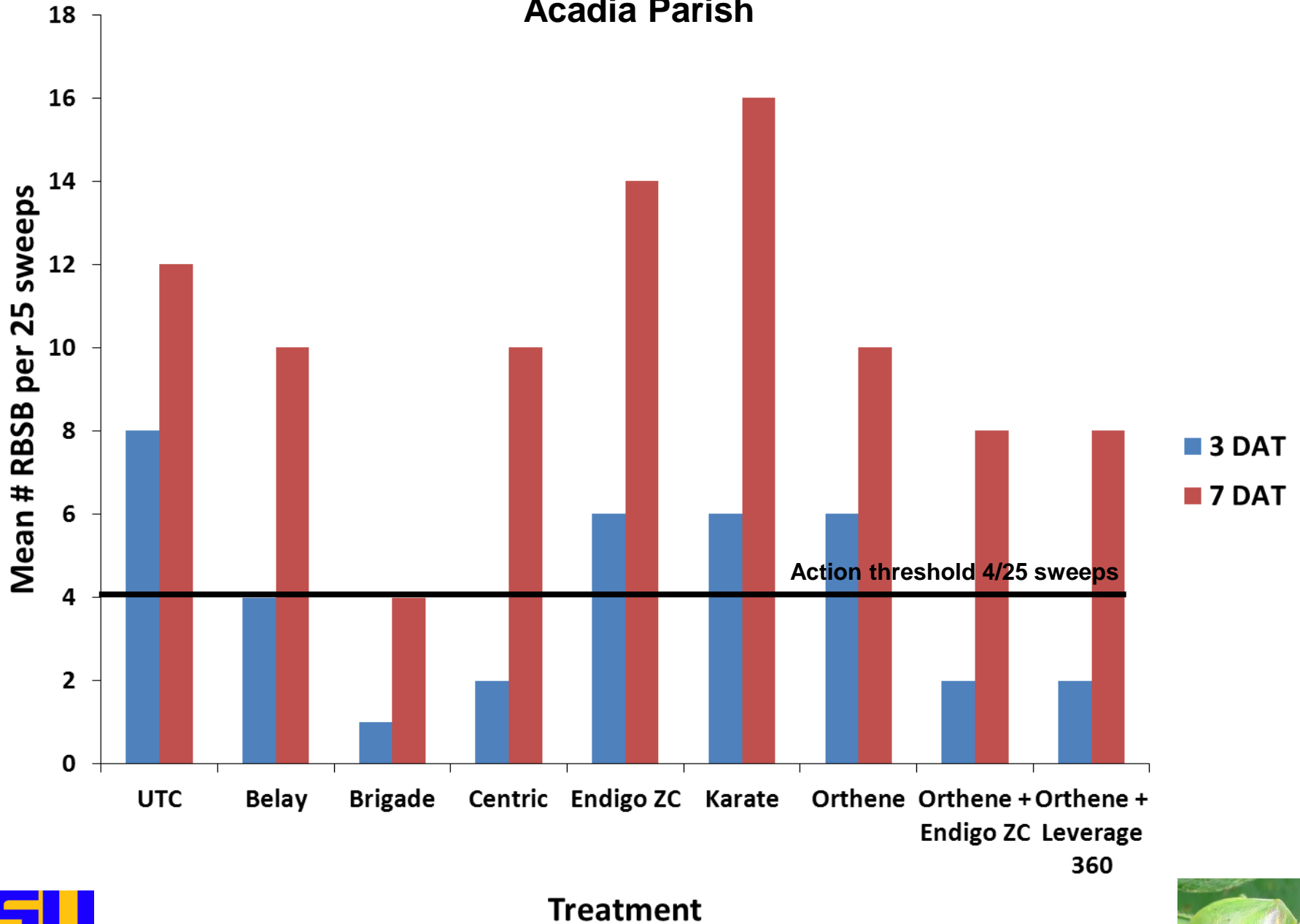
| Allele | Population | Frequency | H _e |
|--------|------------|-----------|----------------|
| 100 | LSU | 0.033 | 0.196 |
| 101 | LSU | 0.033 | 0.196 |
| 102 | LSU | 0.033 | 0.196 |
| 103 | LSU | 0.033 | 0.196 |
| 104 | LSU | 0.033 | 0.196 |
| 105 | LSU | 0.033 | 0.196 |
| 106 | LSU | 0.033 | 0.196 |
| 107 | LSU | 0.033 | 0.196 |
| 108 | LSU | 0.033 | 0.196 |
| 109 | LSU | 0.033 | 0.196 |
| 110 | LSU | 0.033 | 0.196 |
| 111 | LSU | 0.033 | 0.196 |
| 112 | LSU | 0.033 | 0.196 |
| 113 | LSU | 0.033 | 0.196 |
| 114 | LSU | 0.033 | 0.196 |
| 115 | LSU | 0.033 | 0.196 |
| 116 | LSU | 0.033 | 0.196 |
| 117 | LSU | 0.033 | 0.196 |
| 118 | LSU | 0.033 | 0.196 |
| 119 | LSU | 0.033 | 0.196 |
| 120 | LSU | 0.033 | 0.196 |
| 121 | LSU | 0.033 | 0.196 |
| 122 | LSU | 0.033 | 0.196 |
| 123 | LSU | 0.033 | 0.196 |
| 124 | LSU | 0.033 | 0.196 |
| 125 | LSU | 0.033 | 0.196 |
| 126 | LSU | 0.033 | 0.196 |
| 127 | LSU | 0.033 | 0.196 |
| 128 | LSU | 0.033 | 0.196 |
| 129 | LSU | 0.033 | 0.196 |
| 130 | LSU | 0.033 | 0.196 |
| 131 | LSU | 0.033 | 0.196 |
| 132 | LSU | 0.033 | 0.196 |
| 133 | LSU | 0.033 | 0.196 |
| 134 | LSU | 0.033 | 0.196 |
| 135 | LSU | 0.033 | 0.196 |
| 136 | LSU | 0.033 | 0.196 |
| 137 | LSU | 0.033 | 0.196 |
| 138 | LSU | 0.033 | 0.196 |
| 139 | LSU | 0.033 | 0.196 |
| 140 | LSU | 0.033 | 0.196 |
| 141 | LSU | 0.033 | 0.196 |
| 142 | LSU | 0.033 | 0.196 |
| 143 | LSU | 0.033 | 0.196 |
| 144 | LSU | 0.033 | 0.196 |
| 145 | LSU | 0.033 | 0.196 |
| 146 | LSU | 0.033 | 0.196 |
| 147 | LSU | 0.033 | 0.196 |
| 148 | LSU | 0.033 | 0.196 |
| 149 | LSU | 0.033 | 0.196 |
| 150 | LSU | 0.033 | 0.196 |



East Baton Rouge Parish



Acadia Parish

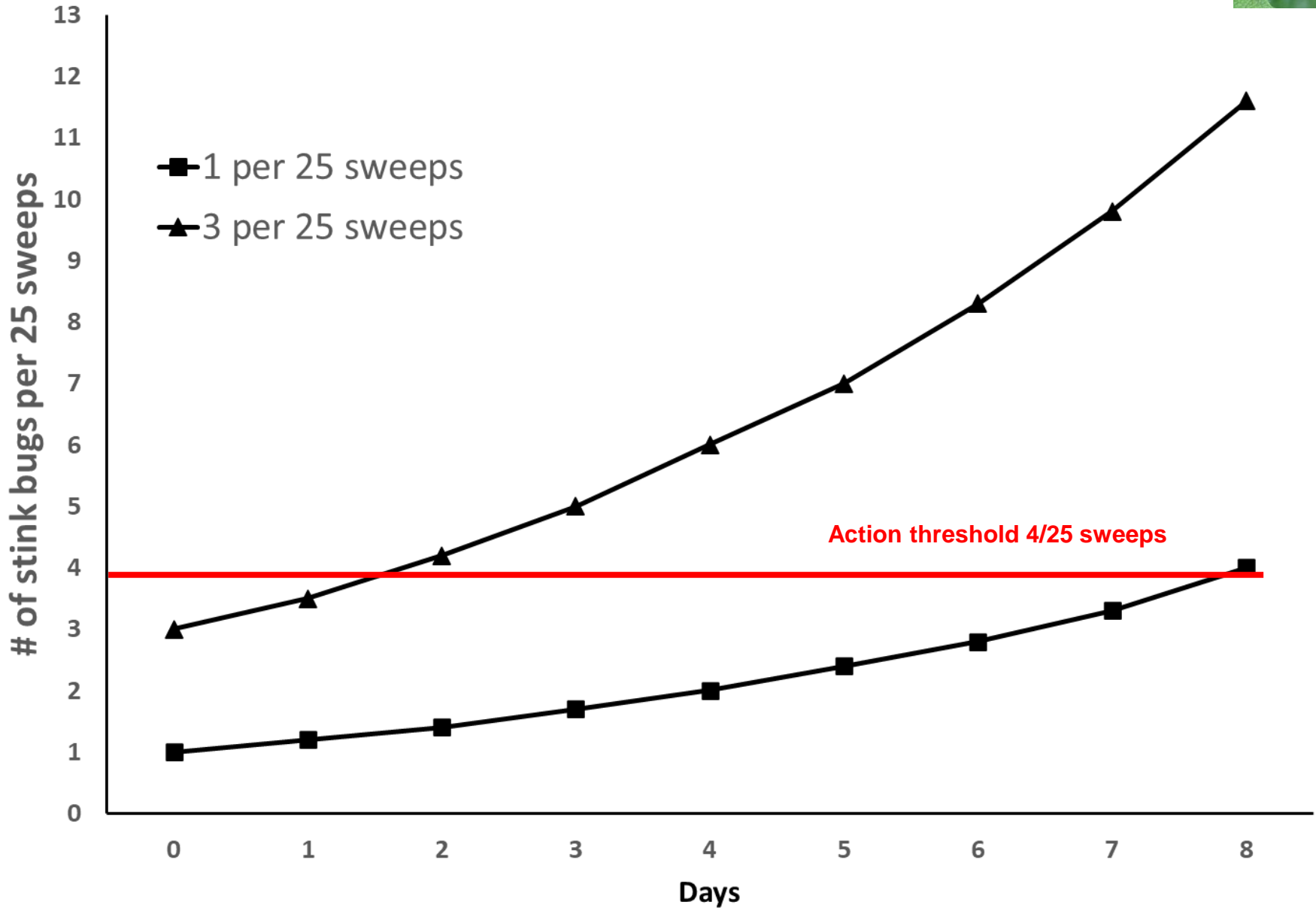


Q3. When can I terminate stink bug control?





Redbanded stink bug population growth curve





Losses can occur even at R8

Effect of stink bug feeding on MGV soybean

% wt loss (g) due to stink bug feeding

| Stink bug spp. | 1 DAT | 5 DAT | 10 DAT | 15 DAT |
|---------------------|--------|--------|--------|--------|
| <i>C. hilaris</i> | 0.0 a | 0.0 a | 0.0 a | 0.0 a |
| <i>E. quadrator</i> | 0.0 a | 0.0 a | 0.0 a | 0.0 a |
| <i>N. viridula</i> | 1.1 a | 5.0 b | 6.4 b | 8.2 b |
| <i>P. guildinii</i> | 3.5 a | 7.5 b | 12.8 b | 10.3 b |
| <i>P-value</i> | 0.5594 | 0.0274 | 0.0009 | 0.0181 |

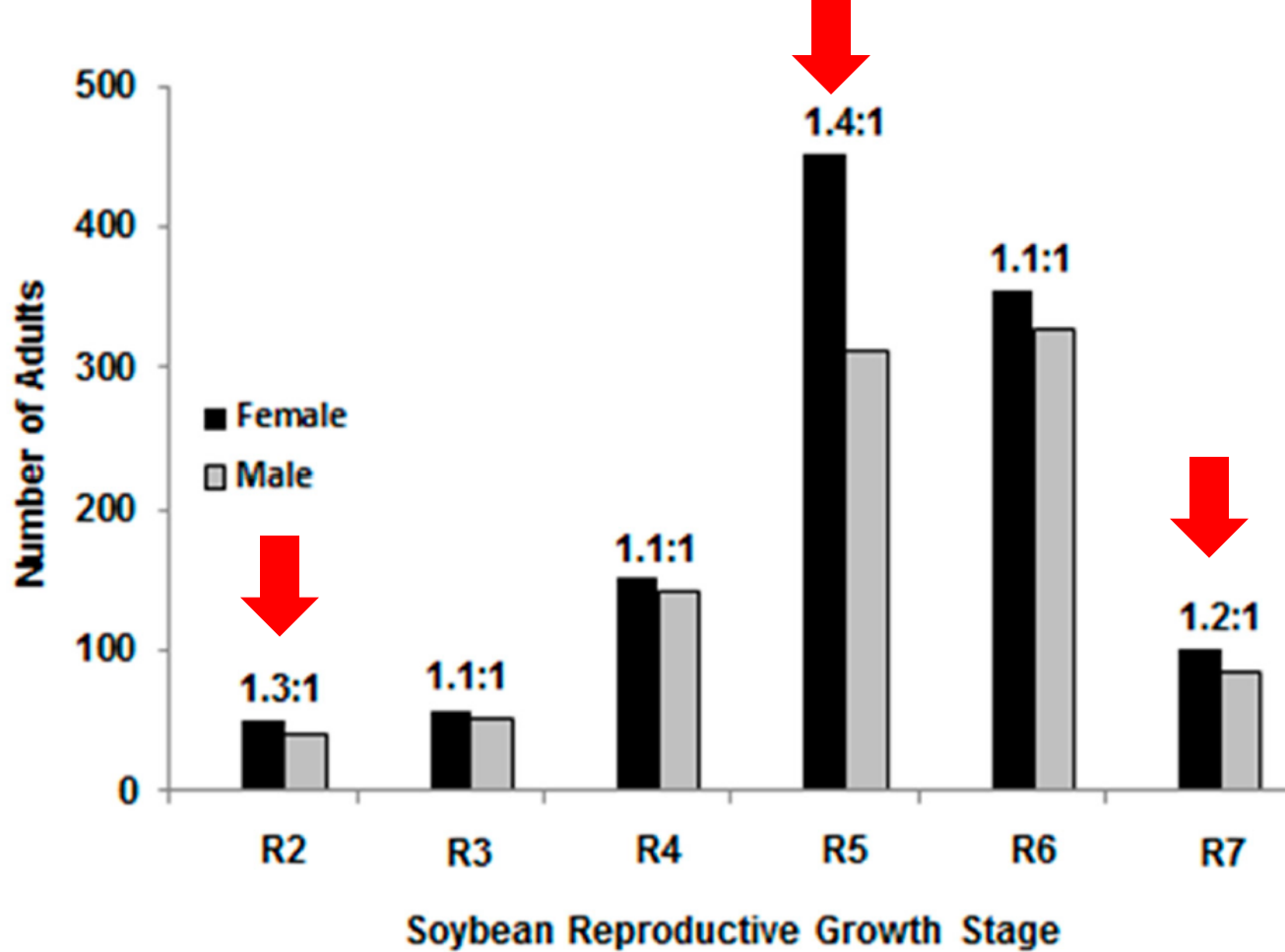


Figure 3. Redbanded stink bug sex ratio during soybean reproductive growth stages.

More females at R2, R5, and R7 = more eggs

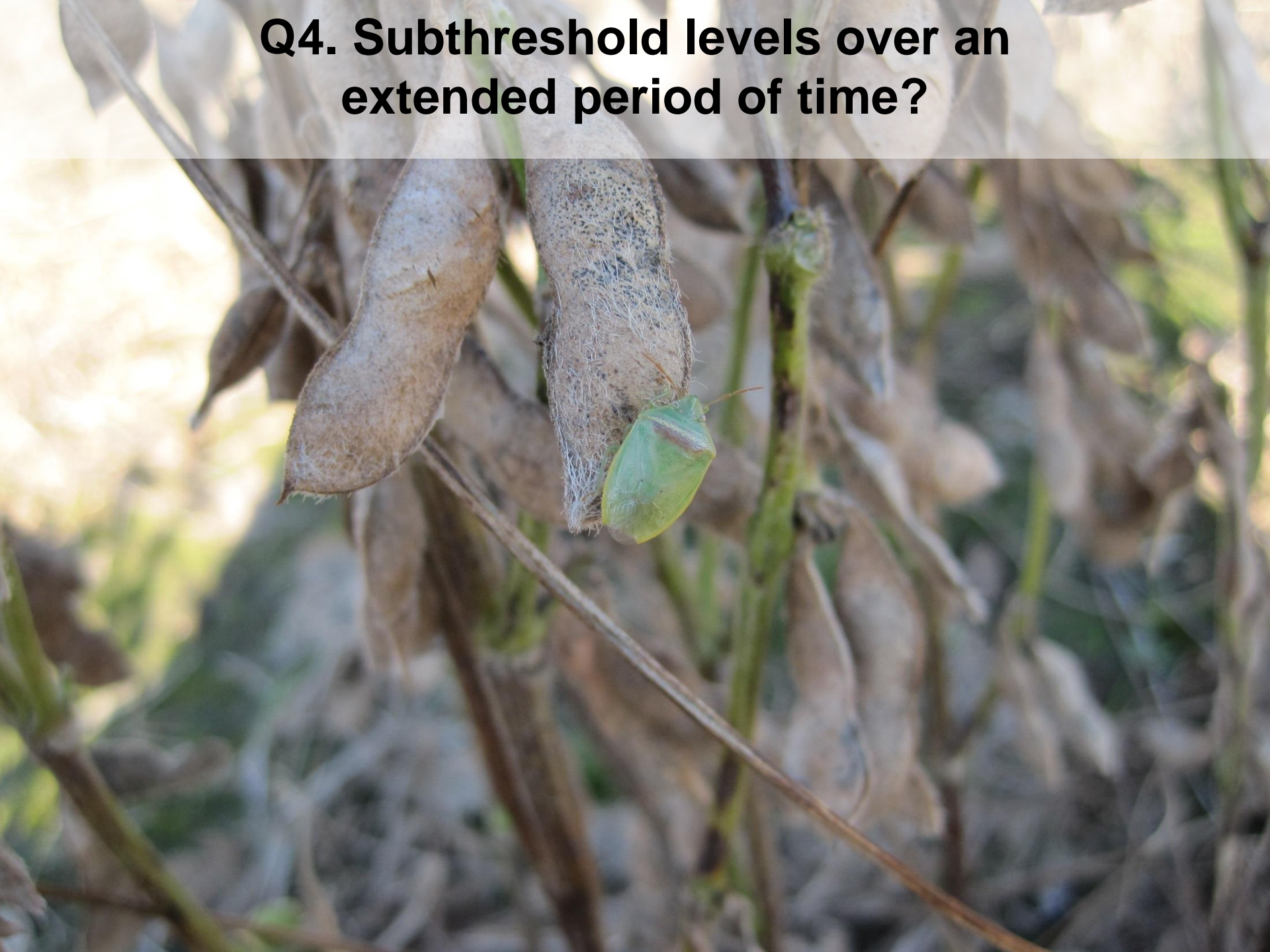
More eggs = more stink bugs

It's important to have a small stink bug population on your farm at the end of the year

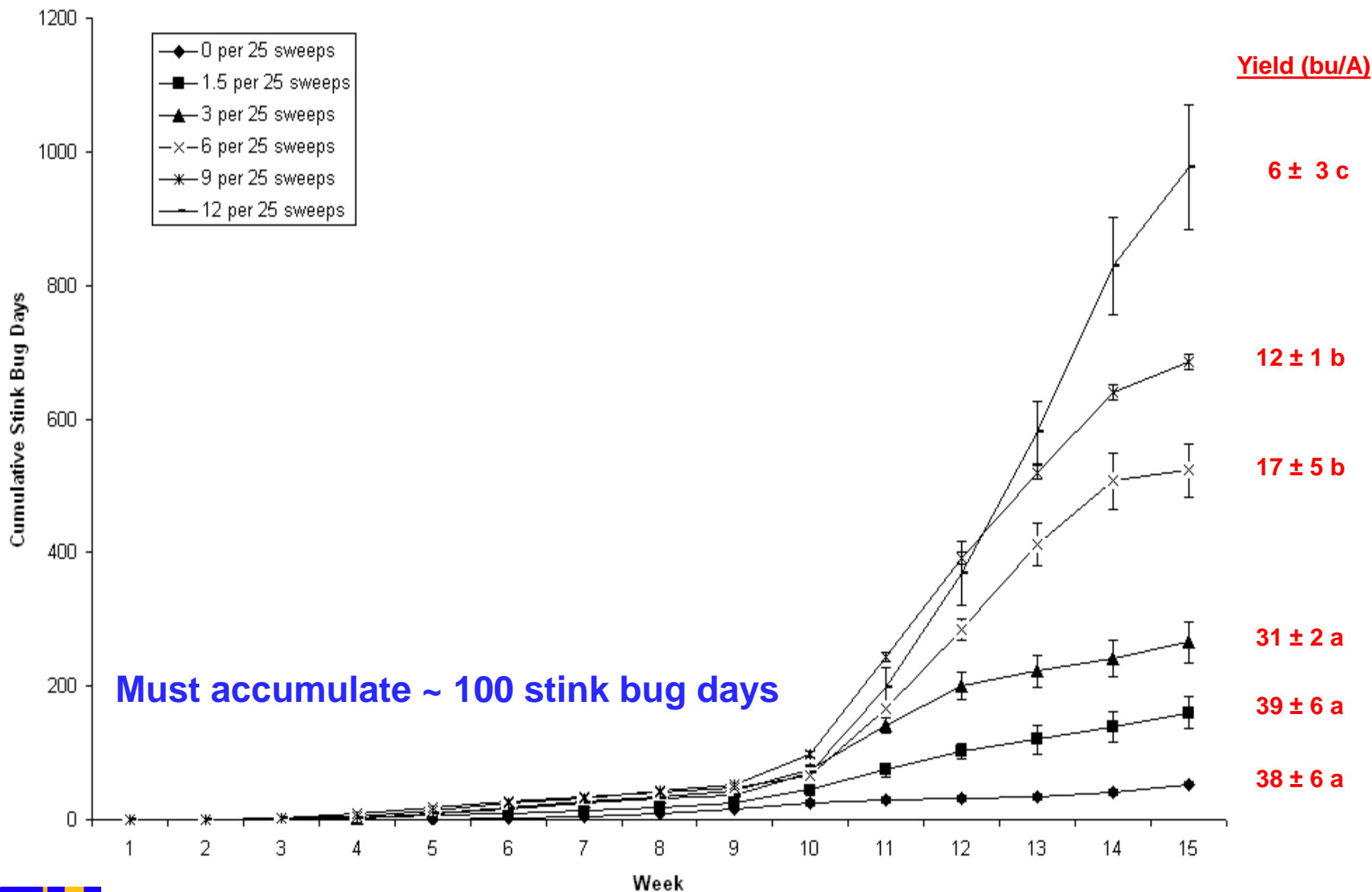
| <u>Month</u> | <u>Initial pop. 100</u> | <u>Initial pop. 5</u> | <u>Cold event</u> |
|--------------|-------------------------|-----------------------|-------------------|
| Oct. | 100 | 5 | 5 |
| Nov. | 432 | 22 | 22 |
| Dec. | 1,867 | 93 | 8 |
| Jan. | 8,073 | 403 | 35 |
| Feb. | 34,891 | 1,744 | 150 |
| Mar. | 150,797 | 7,539 | 645 |
| Apr. | 651,739 | 32,586 | 2,791 |



Q4. Subthreshold levels over an extended period of time?



Sub-threshold levels of stink bugs over an extended period?



Means followed by the same letter are not significantly different (REGWQ; $P > 0.05$).



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Thank you

Questions?