Common arthropod pests in blackberries and options to manage these pests

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Blackberry Pests

- Several mite species are known to infest blackberries
  - Broad mite, *Polyphagotarsonemus latus* Banks (Tarsonemidae)
  - Twospotted spider mite, *Tetranychus urticae* Koch, is a major pest of blackberries
- Flower thrips, like *Frankliniella bispinosa,* cause feeding injury that can lead to fruit deformities
- Stink bugs feed on fruits and can cause yield loss in high numbers

P. Latus

T. urticae

F. bispinosa

Objectives: Mites

- Survey mite fauna in organic and conventional blackberry in Florida and Georgia and determine phytophagous and predatory mite species

- Evaluate the potential for biological control using the predatory mite *Neoseiulus californicus* as an alternative to broad-spectrum pesticides for management of phytophagous mite species

- Compare the performance of *N. californicus* with abamectin (Agri-Mek® SC) for reducing *T. urticae* density in blackberry

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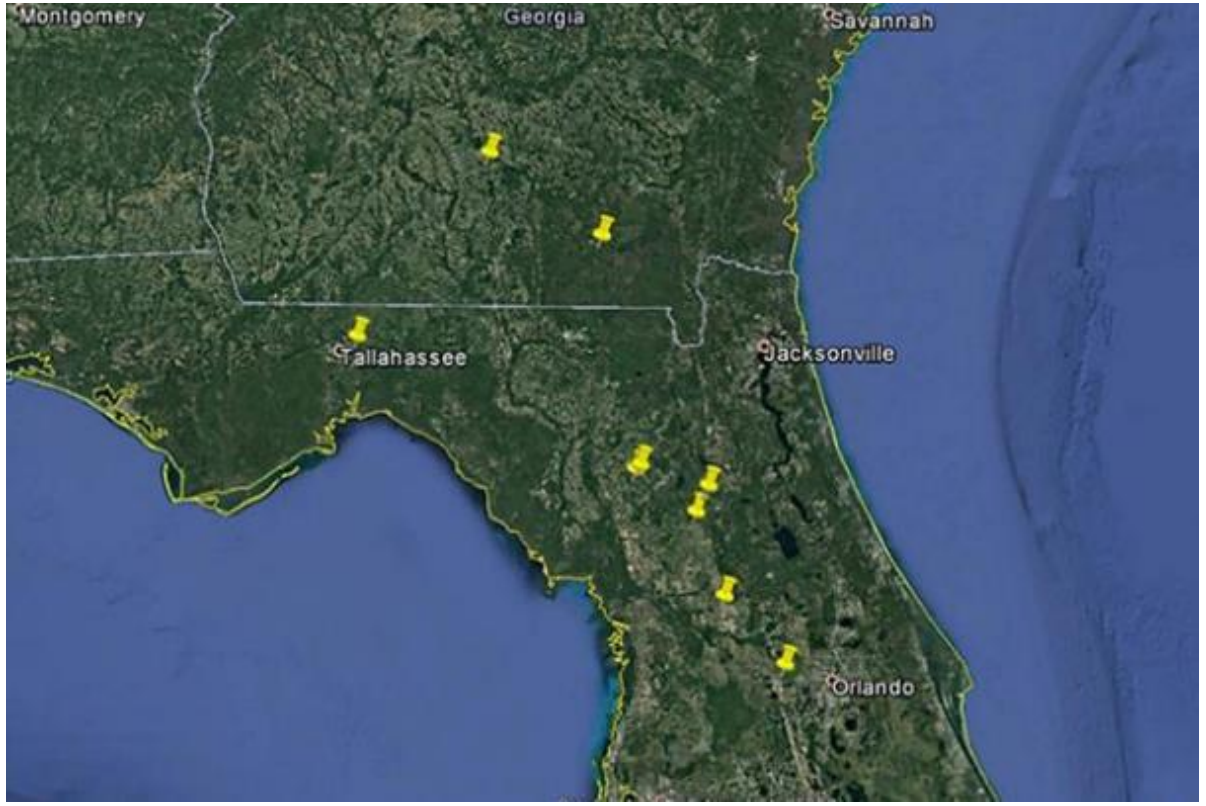
Survey mite fauna in organic and conventional blackberry in Florida and Georgia

- Orlando, FL to Brookfield, GA
- Survey was conducted from June to October
- Leaf sampling was collected twice per month



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Blackberry cultivars sampled in GA & FL

Cultivar	Erect	Thorns	Season
Arapaho	Erect	No	Early
Choctaw	Erect	Yes	Early
Freedom	Erect	No	Floricane crop very early, Primocane crop from early September to first frost
Kiowa	Erect	Yes	Mid
Natchez	Erect	No	Early (slightly before or with Arapaho)
Navaho	Erect	No	Mid to late
Osage	Erect	No	Mid
Ouachita	Erect	No	Early to mid
Von	Erect	No	Mid to late

Number of plants sampled per site was determined by the total number of plants in the planting

0- 50	All plants
51-200	50 plants
201-400	60 plants
More than 400	20% of the total number of plants

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Sampling Protocol

- 20 leaves per plant were collected and placed in paper bags
- Mites were preserved in vials containing 70% ethanol
- Mite species were mounted on microscopes slides and dried at 50 ^{o}C for 5-7 d
- Specimen identifications were made at the Division of Plant Industry (DPI) in Gainesville, FL

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Predatory mites recorded on blackberry plants in organic and conventional farms in GA & FL

Family	Species	Organic		Conventional			Total
		♀	♂	L/N	♀	♂	
Phytoseiidae	*Galendromus* (*Galendromus*) *floridanus* (Muma)*	5	-	-	2	1	8
	Phytoseius chanti Denmark	4	-	-	-	-	4
	Proprioseius meridionalis Chant	2	-	-	2	-	4
	Typhlodromips dentilis (De Leon)	4	-	-	1	-	5
	Typhlodromalus peregrinus (Muma)	14	-	-	15	-	29
	Amblyseius sp.	1	2	-	-	-	3
	Phytoseius sp.1	4	-	-	1	-	5
	Phytoseius sp.2	6	-	-	-	-	6
	Proprioseiopsis sp.	3	1	-	-	-	4
Ascidae	*Asca* sp.	-	1	-	-	-	1
Cheyletidae	(*Oudemanscheyla*) *denmarki* (Yunker)	1	-	-	1	-	2
Erythraeidae	*Lasioerythraeus* sp.**	-	-	1L	-	-	1
Stigmaeidae	*Agistemus* sp.	-	-	8N	-	-	8
Predatory Mite Number		44	4	9	22	1	80
Total Predatory Mite Number (Organic/ Conventional)		**57**			**23**		**80**

L: Larva; N: Nymph

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Phytophagous mites recorded on blackberry plants in organic and conventional farms in GA & FL

		Organic			Conventional		
		♀	♂	L/N	♀	♂	Total
Tarsonemidae	*Polyphagotarsonemus latus* (Banks)	3	2	-	2	3	10
	Tarsonemus (*Tarsonemus*) *bilobatus* Suski	1	-	-	-	-	1
	Tarsonemus (*Tarsonemus*) *confusus* Ewing	2	-	-	3	-	5
Tetranychidae	*Eotetranychus carpini* (Oudemans)	4	18	-	-	-	22
	Tetranychus schoenei McGregor	3	8	-	3	9	23
	Tetranychus urticae Koch	-	2	-	-	3	5
	Tetranychus sp.	-	5	-	-	1	6
Phytophagous Mite Number		13	35	0	8	16	72
Total Phytophagous Mite Number (Organic/ Conventional/ Total)		**48**			**24**		**72**
Total Mite Number		57	39	9	30	17	152
GENERAL TOTAL (Organic/ Conventional/ Total)		**105**			**47**		**152**

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Potential for biological control using the predatory mite, *N. californicus*

Experimental Design and Treatments

- Randomized complete block with 3 trts & 5 reps
- 8 plants/plot
- Blackberry plants were artificially infested by clipping bean leaves infested with 5 *T. urticae* motiles onto the leaves

Treatments

- Release of *N. californicus* at 1:10 ratio
- Application of abamectin (Agri-Mek® SC) at the manufacturer's labeled rate of 225 ml/ha.
- Untreated plots (no treatment)

- Plants were sampled weekly for 6 weeks, by collecting 20 leaves per plot

Mean ± SEM number of *T. urticae* motiles and eggs per leaf on blackberry plants

	Treatment					
	(Mean ± S.E. M Motiles/ leaf*)			(Mean ± S.E. M Eggs/ leaf*)		
Dates	**Agri-Mek® SC**	***N. californicus***	**Control**	**Agri-Mek®- SC**	***N. californicus***	**Control**
05 Sept 2016**	66.80 ± 5.76 a	57.75 ± 4.04 a	64.50 ± 6.90 a	8.75 ± 3.24 a	1.10 ± 0.06 a	5.20 ± 2.89 a
12 Sept 2016	1.83 ± 0.60 b	3.47 ± 0.54 b	26.70 ± 1.14 a	1.07 ± 0.65 ab	0.60 ± 0.30 b	2.80 ± 2.47 a
19 Sept 2016	0.97 ± 0.27 b	0.00 ± 0.00 c	10.47 ± 0.37 a	0.00 ± 0.00 a	0.10 ± 0.10 a	0.00 ± 0.00 a
26 Sept 2016	0.77 ± 0.16 b	0.00 ± 0.00 c	10.57 ± 0.72 a	0.00 ± 0.00 a	0.00 ± 0.00 a	0.00 ± 0.00 a
03 Oct 2016	0.47 ± 0.03 b	0.00 ± 0.00 c	8.54 ± 0.48 a	0.00 ± 0.00 a	0.00 ± 0.00 a	0.00 ± 0.00 a
10 Oct 2016	0.60 ± 0.24 b	0.00 ± 0.00 c	5.83 ± 0.17 a	0.00 ± 0.00 a	0.00 ± 0.00 a	0.00 ± 0.00 a
17 Oct 2016	0.13 ± 0.061 b	0.00 ± 0.00 c	3.63 ± 0.12 a	0.00 ± 0.00 b	0.00 ± 0.00 b	0.17 ± 0.13 a

Means within the row followed by a different letter are significantly different at P ≤ 0.05 based on Tukey's Studentized Range (HSD) test.

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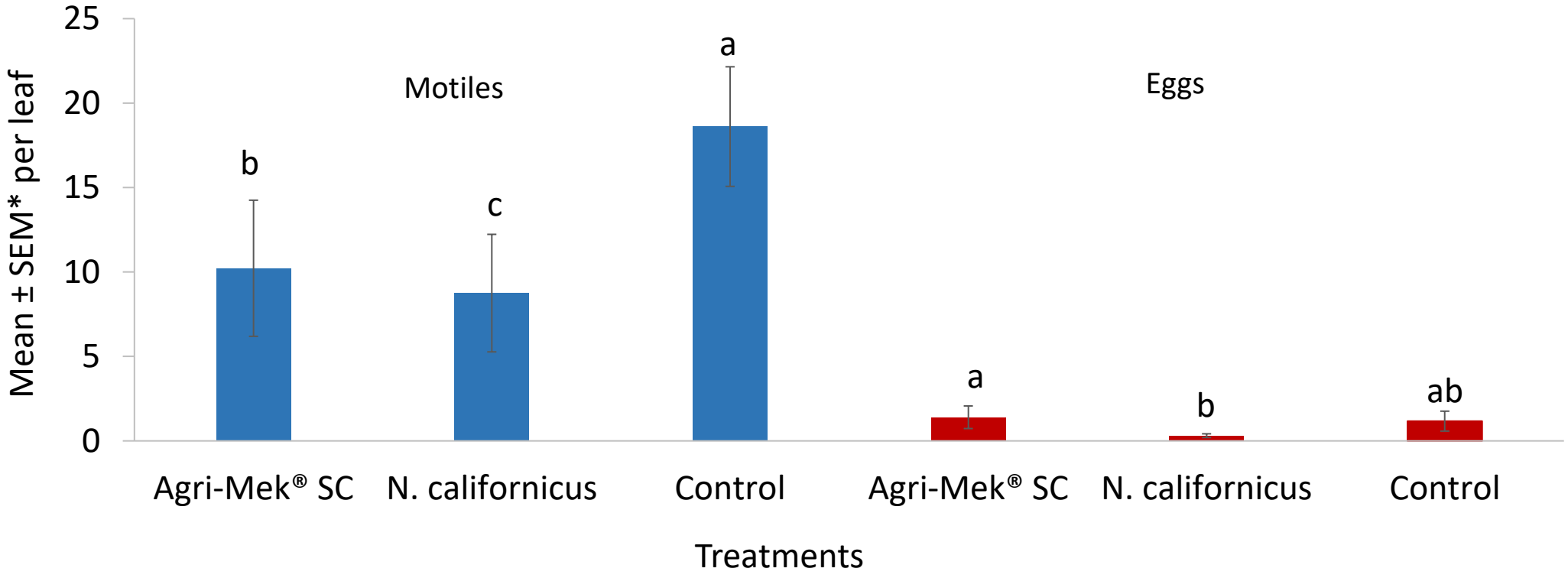
Overall *T. urticae* motiles and eggs per leaf in different treatments on blackberry plants



*Standard Error of Mean (SEM). Motiles: $F = 514.00$; df = 2, 80; $P \leq 0.0001$; Eggs: $F = 2.26$; df = 2, 80; $P = 0.028$

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Summary and Findings

- We found 5 families with predatory mites; the family Phytoseiidae was the dominant mite species (85% of the species recorded)
- Twice as many mite species were collected in the organic plantings when compared with the conventional planting
- More females than males were recorded on both organic plantings and conventional plantings
- *Neoseiulus californicus* was consistently the most effective trt that reduced population of twospotted spider mite

Akyazi et al. 2021 Acarologia

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Objectives: Flower Thrips

- Determine the species complex of flower thrips in blackberries
- Determine if thrips density differed among blackberry cultivars

Methods

- Study site: Citra PSREU
- Cultivars: Arapaho, Chickasaw, Choctaw, Kiowa, Natchez, Ouachita
- Weekly flower samples collected
  - 5 flowers per bush from 3 bushes per row
  - Adult thrips, larval thrips, and natural enemies were counted
  - Adult thrips were Identified to species

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Results: Flower Thrips Species Complex

- *F. bispinosa* 99.8%
- Other species
  - *Haplothrips graminis*
  - *Microcephalothrips abdominalis*
  - *Thrips hawaiiensis*

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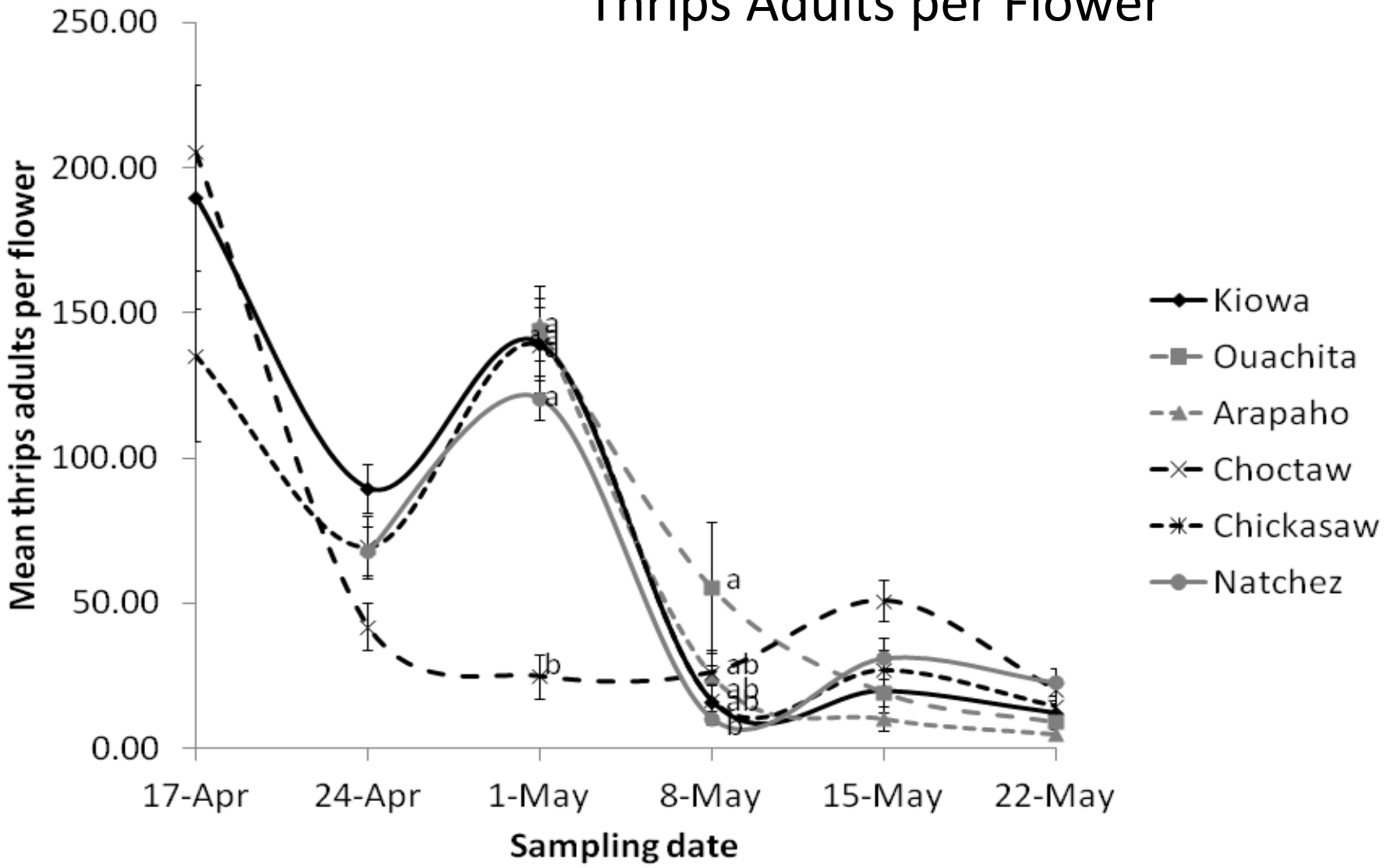
Thrips Adults per Flower



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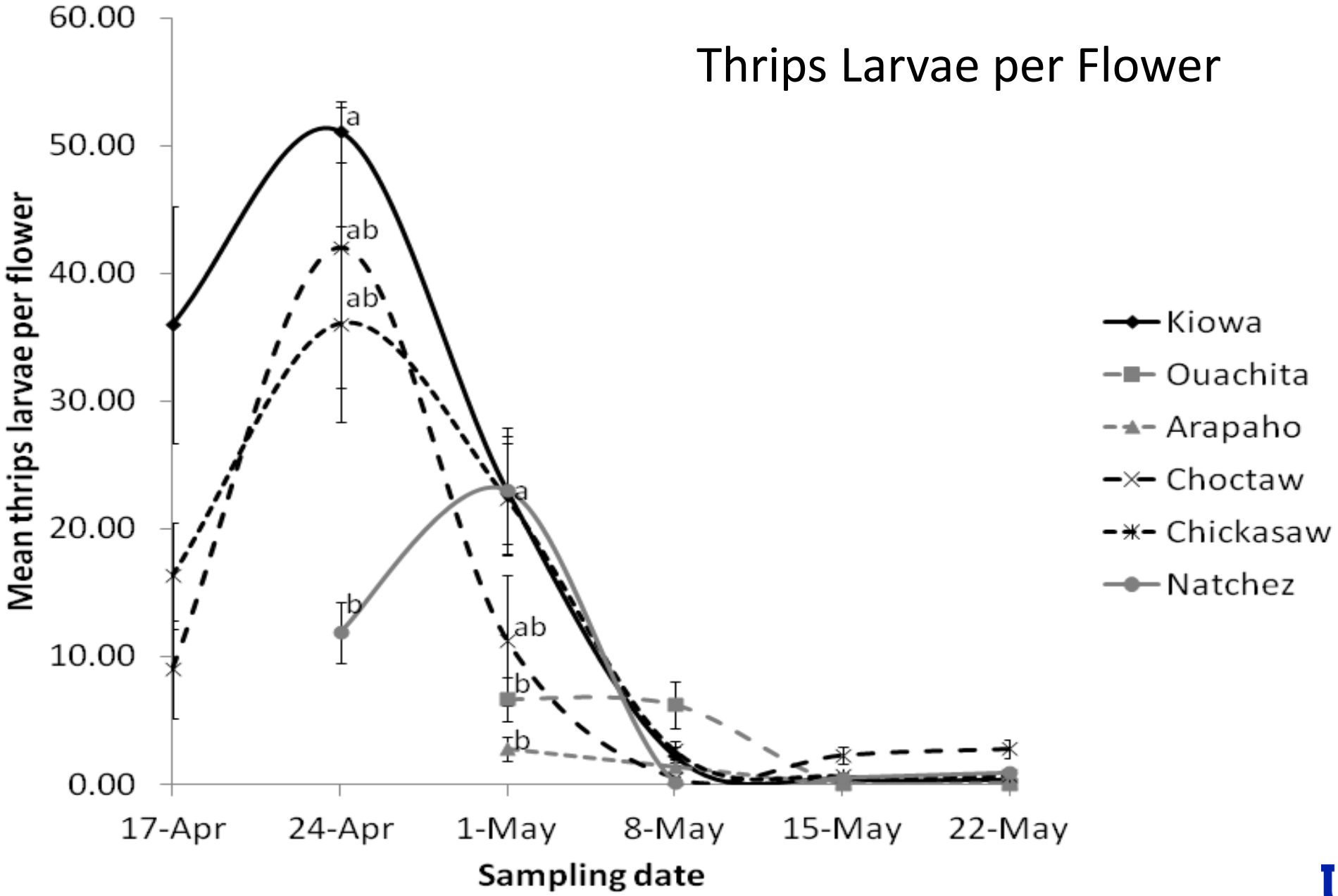
Thrips Larvae per Flower



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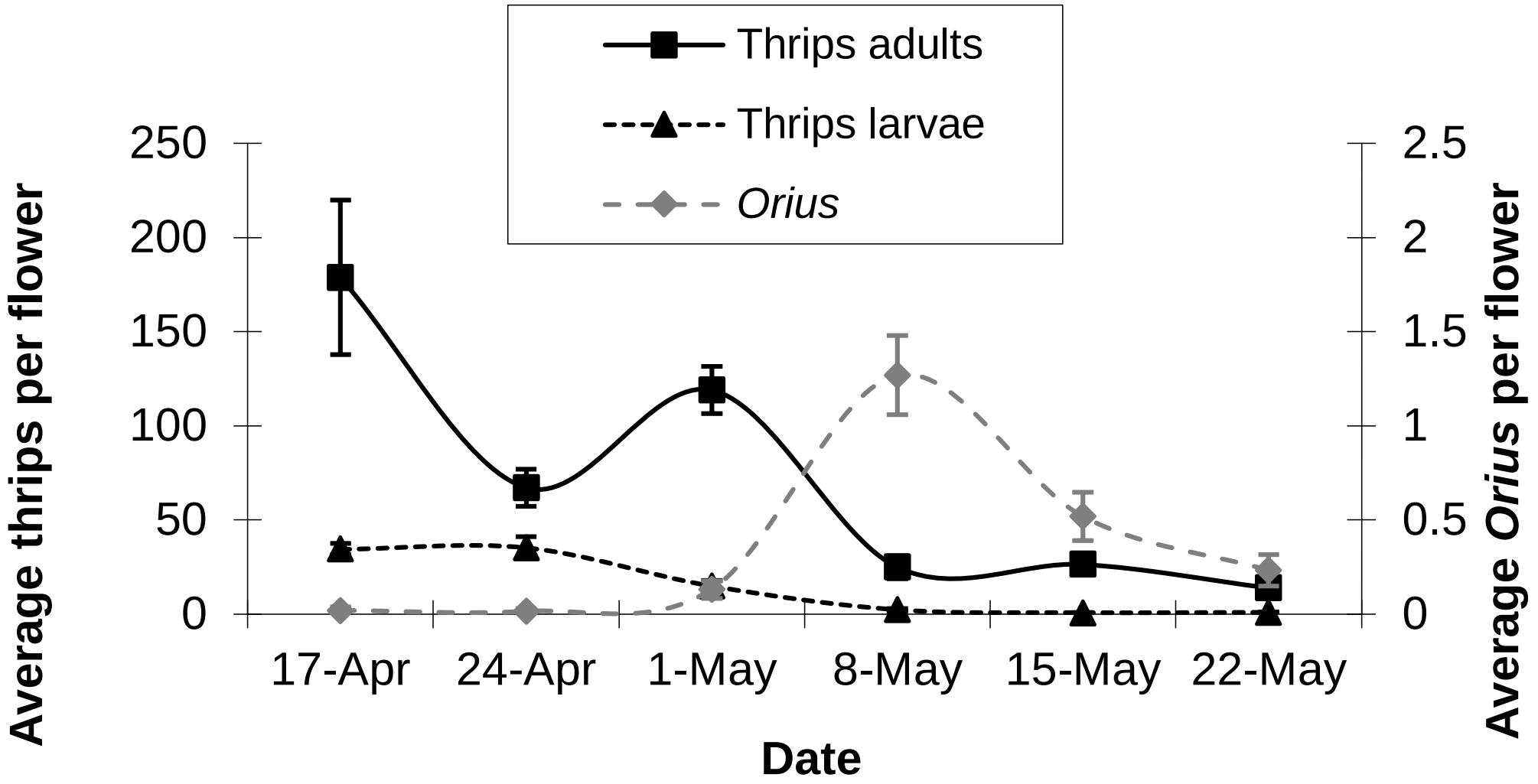

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Summary: Flower Thrips

- *F. bispiosa* was the dominant species of flower thrips
- Flower thrips numbers were highest in earlier flowering cultivars
- *Orius* sp. appears to be an important predator in the system

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Objectives: Stink Bugs

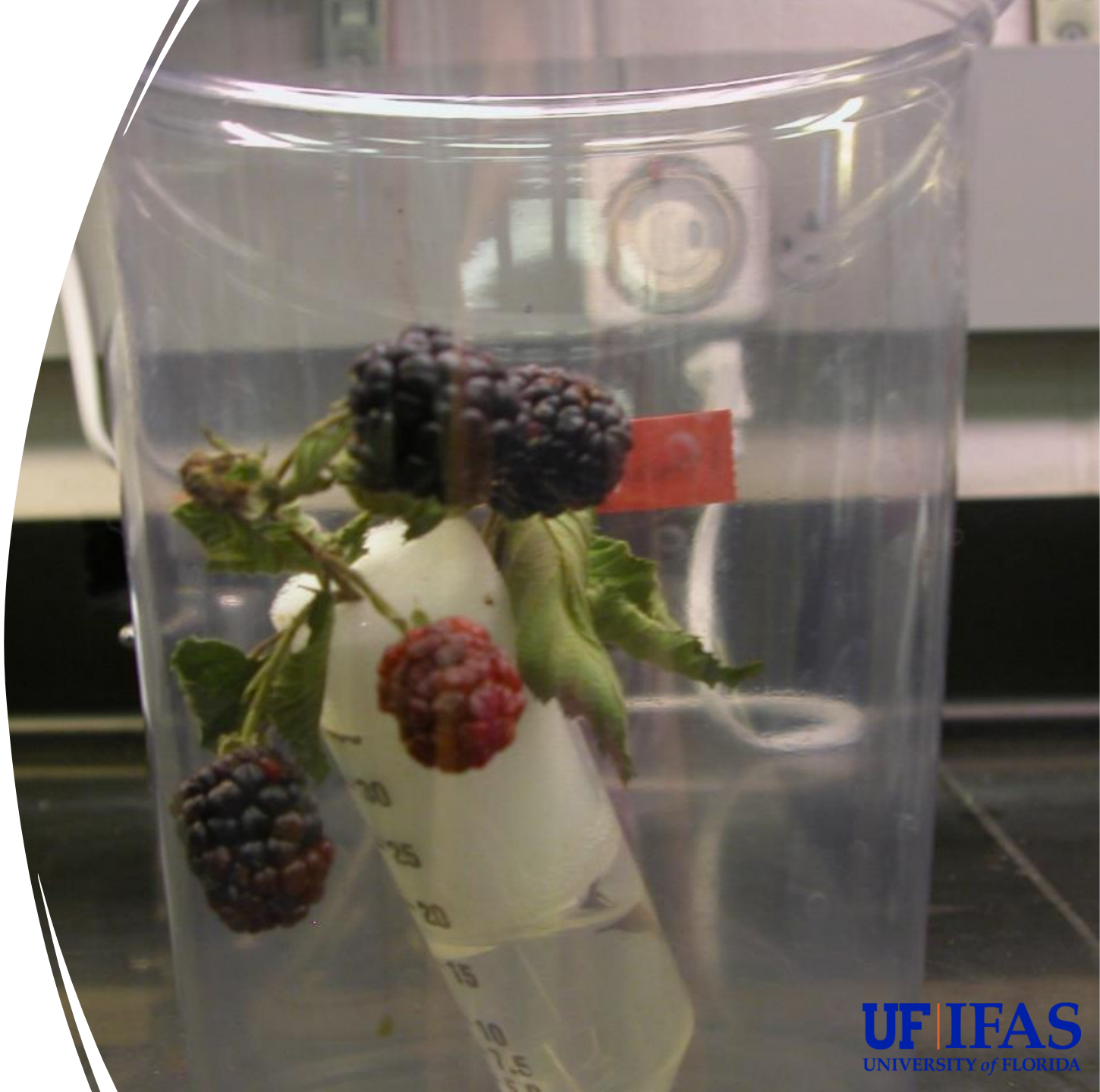
- Determine what stink bug species are present in blackberries
- Compare commercial traps and lures
- Feeding assays to determine feeding injury and berry stage preference

Methods: Stink Bugs, Field

- Study site: Citra PSREU
- Cultivars: Arapaho, Chickasaw, Choctaw, Kiowa, Natchez, Ouachita
- To sample stink bug species, 4 random bushes per cultivar were sampled every 2 weeks by shaking branches 4 times over a tray
- Trece tube traps and yellow pyramid traps with and without lures were compared over a 3-week period

Methods: Stink Bugs, Lab

- Study site: Small Fruit and Vegetable IPM lab in Gainesville, FL
- 4 reps of 3 trts: green fruit, turning (red) fruit, ripe fruit
- *Euschistus quadrator* adult females, adult males, and 3rd instars were released onto blackberry shoots, after being starved for 24 h, and allowed to feed for 72 h
- Berries were stained so that stylet sheaths could be counted



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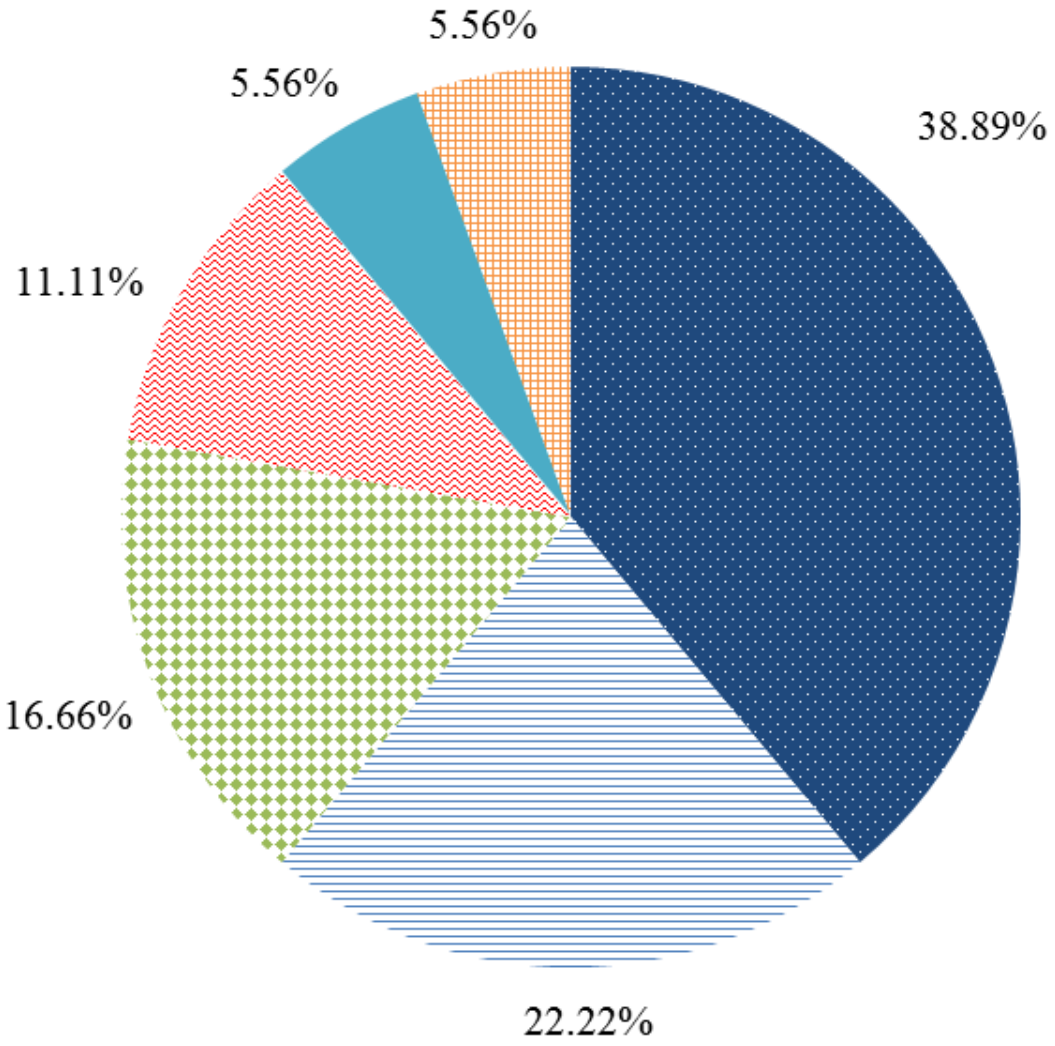
Results: Stink Bug Species



- *E. quadrator*
- *E. servus*
- *E. obscurus*
- *T. custator*
- *P. punctulatus*
- *P. maculiventris*

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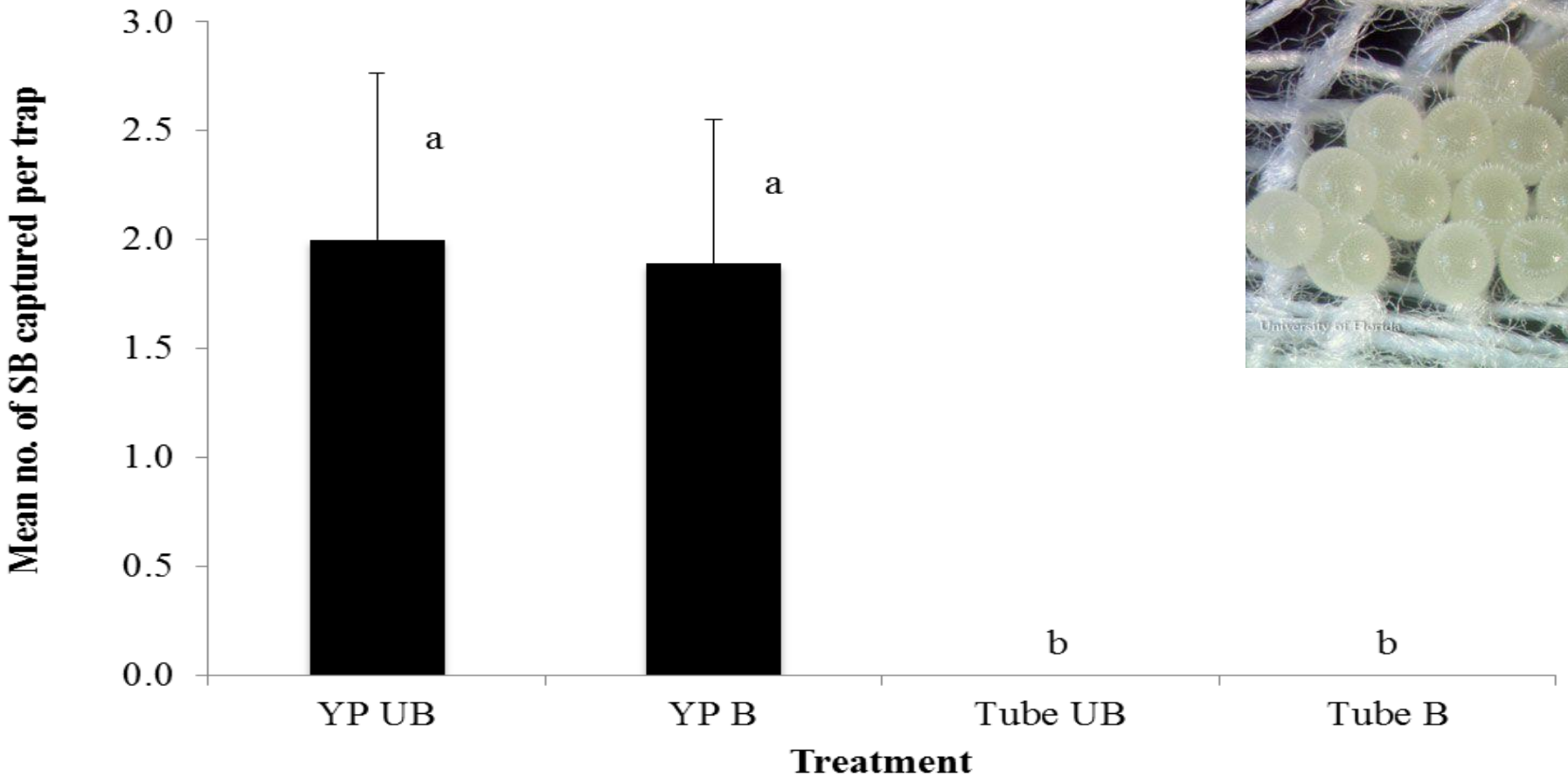
Results: Trap and Lure Comparison



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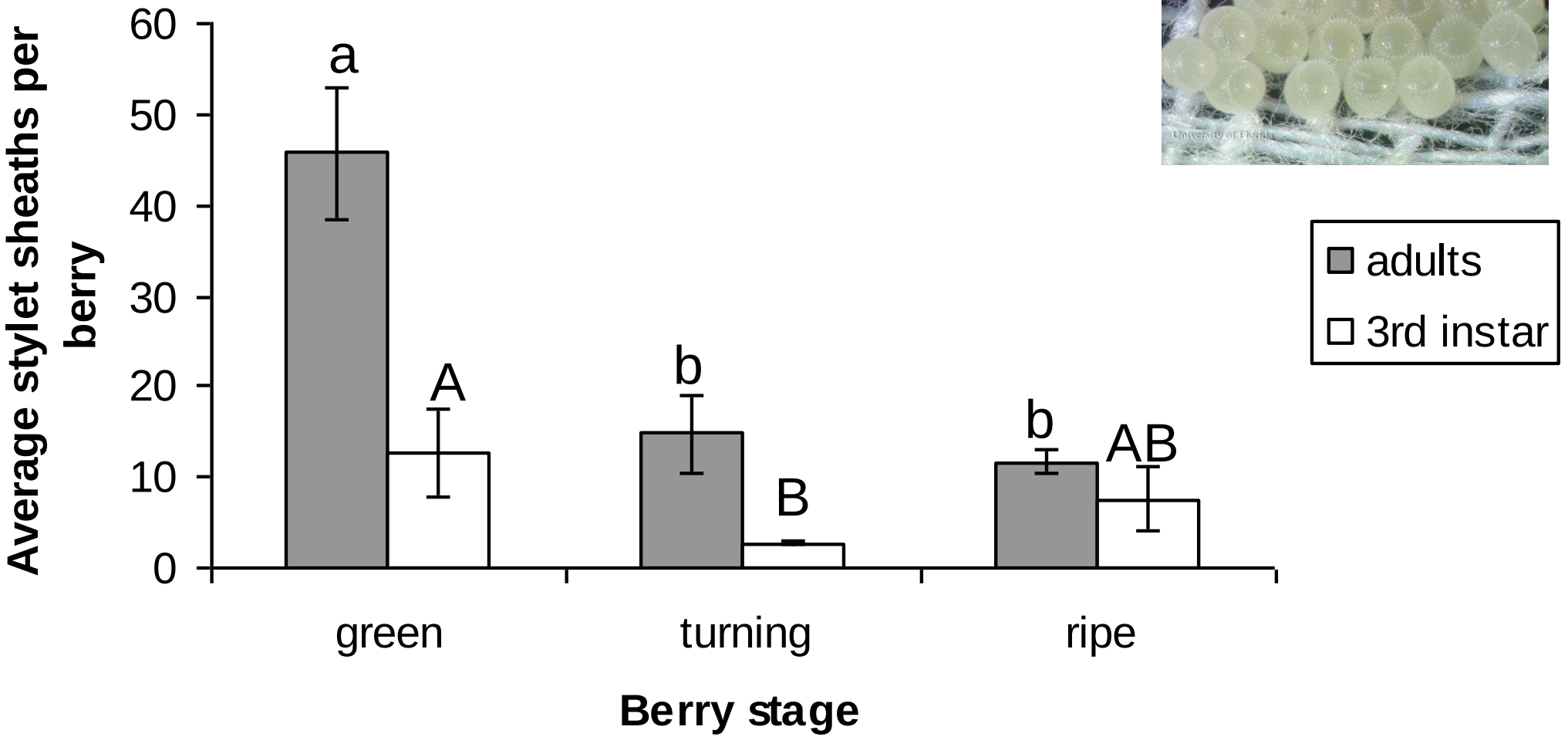
Results: Feeding Assays



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Summary: Stink Bugs

- *E. quadrator* was the dominant species of stink bugs
- Yellow pyramid traps caught more stink bugs with no additional bugs caught when lures were placed in them
- Adults fed more on green berries, while 3rd instars fed on green and ripe berries more than turning (red) berries

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Acknowledgements

Thank you!

Questions

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