

Control of Pecan Insects 2009 - 2010



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Objectives

- Determine the efficacies of a new chemical control of pecan aphids.
- Screen pecan cultivars for low aphid population development.
- Measure the efficacies of multicolored Asian ladybeetle for biological control of pecan aphids.
- Find an effective *Prionus* root borer attractant.

Acknowledgement

- Thanks to:
 - Georgia Agricultural Commodity Commission for Pecans for research support funds.
 - Drs. Haider Karar and Ghulam Abbas for research on aphid population dynamics on different cultivars and MALB efficacy.
 - Liz Wiggins for research work on convergent lady beetle efficacy.
 - Mary Jo Townsend and Eric Goodwin for work on the efficacy of pesticides.

Aphid Biology

A close-up photograph of a green pecan leaf. The leaf shows signs of damage, including small holes and yellowish-brown spots. Several aphids are visible on the leaf surface. A yellowish-green aphid is located near the center, and a black aphid is visible on the right side. The leaf's venation is clearly visible.

Yellow pecan aphid adult and nymph


Black pecan aphid adult and nymph

3 species inhabit the foliage

Yellow pecan aphid, *Monelliopsis pecanis* Bissell

Black pecan aphid, *Melanocallis caryaefoliae* (Davis)

Blackmargined aphid, *Monellia caryella* (Fitch)

A close-up photograph of a green leaf with several reddish-purple spots and a small blackmargined aphid adult insect. The leaf has a prominent vein structure. The aphid is positioned in the center of the leaf, near a cluster of spots. A text box is overlaid on the image, containing the text "Blackmargined aphid adult".

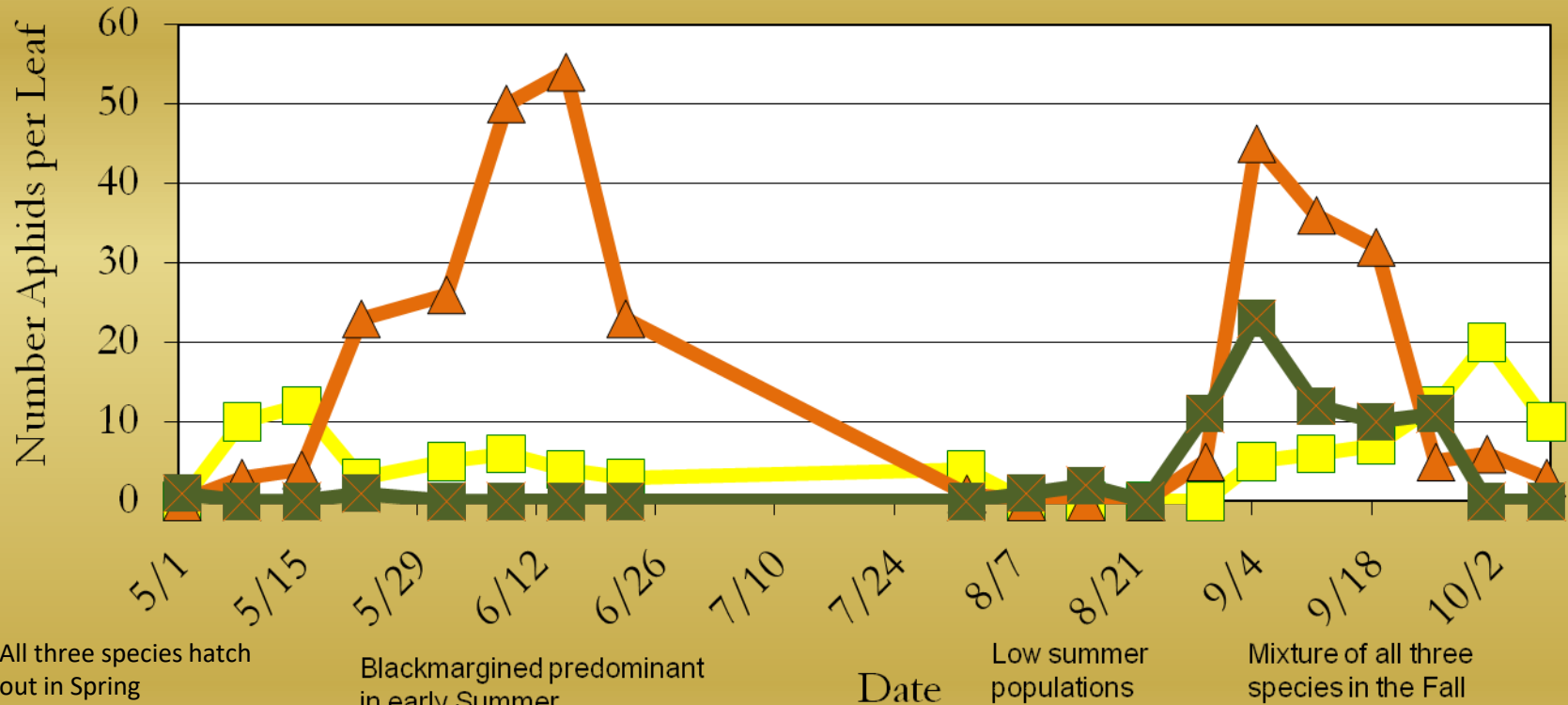
Blackmargined aphid adult

During the presentation we'll use the term "yellow aphids". Blackmargined aphid and yellow pecan aphid nymphs are difficult to distinguish in the field while counting. The counts for these two aphids are lumped together and labeled as "yellow aphids".

Seasonal Occurrence of Pecan Aphids

All three species have similar biology

Eggs (overwintering stage) >>>>> Asexual generations >> >>>>> >>>>Unknown>>>>> >>>>Asexual generations >Sexual Forms
 (High T, Leaf Condition, Alt. Host)



All three species hatch out in Spring

Blackmargined predominant in early Summer

Date

Low summer populations

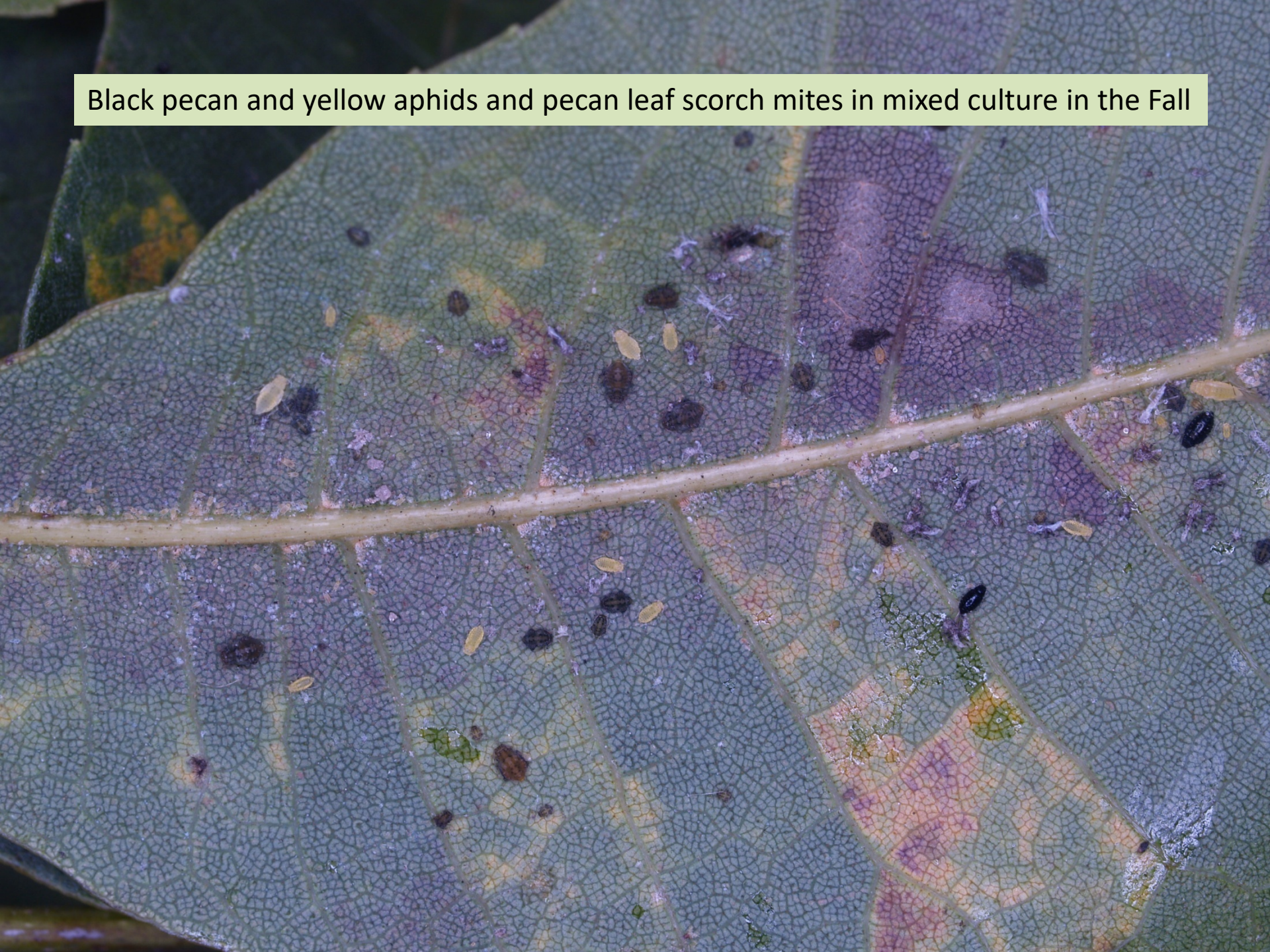
Mixture of all three species in the Fall



Blackmargined aphids are most abundant in spring and the again in the Fall



Black pecan and yellow aphids and pecan leaf scorch mites in mixed culture in the Fall



Eventually, one species will become the predominant species

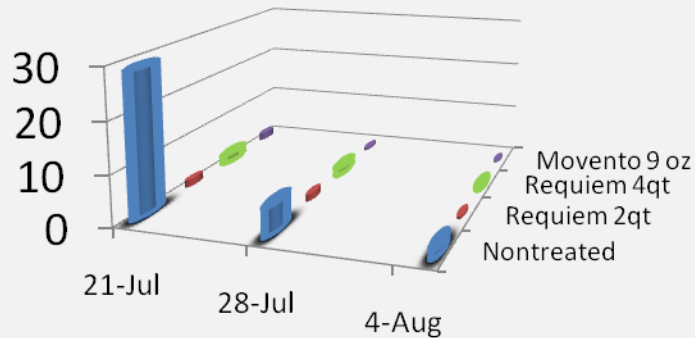


Effective Aphid Control Methods

- Systemic insecticides
- Reduced N fertilizer rates
- Tolerant pecan cultivars
- Foliar insecticidal sprays
- Importation of natural enemies
- Conservation biological control
 - Supplying alternate prey with **intercrops**
 - **Food sprays** to attract predators to the foliage
 - **Ant control**
 - **Use safer insecticides** for aphid predators against nut pests

Efficacy of New Material

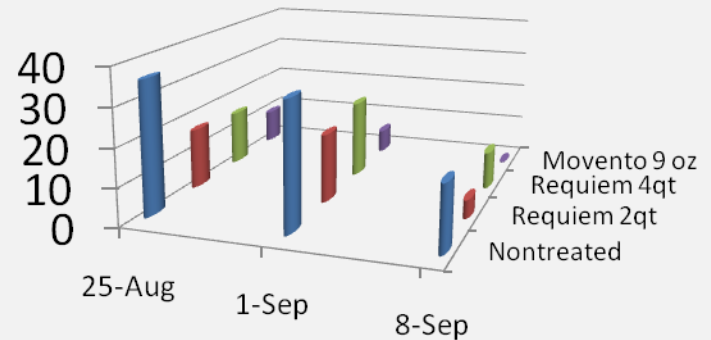
Yellow Aphids/leaf



■ Nontreated ■ Requiem 2qt
■ Requiem 4qt ■ Movento 9 oz

Sprays applied on July 20, 2009

Black Pecan Aphids/leaf

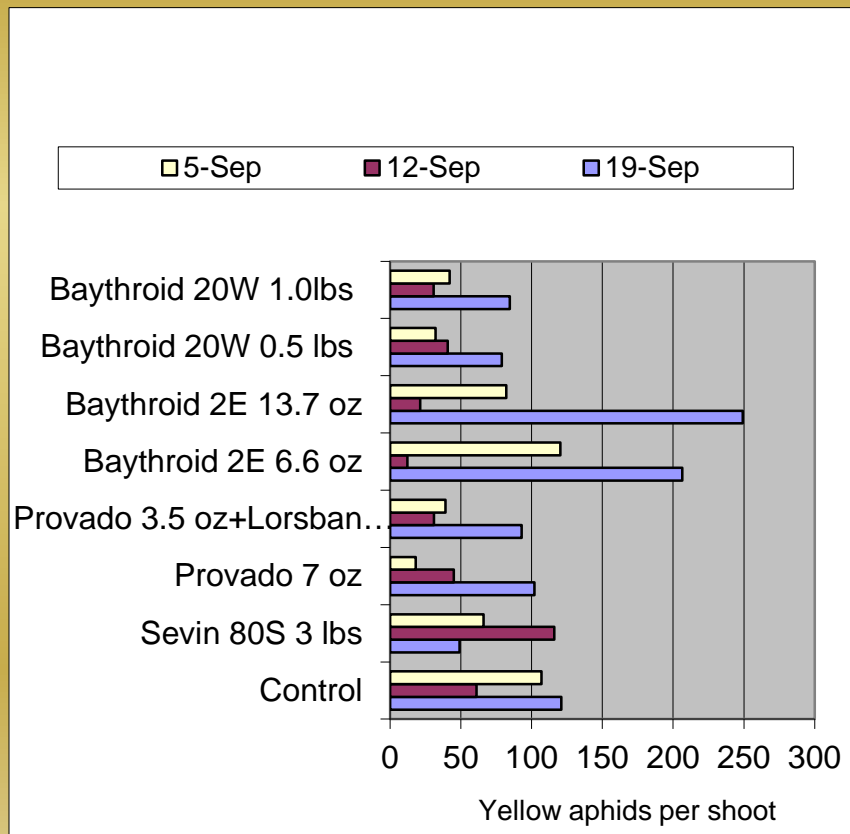


■ Nontreated ■ Requiem 2qt
■ Requiem 4qt ■ Movento 9 oz

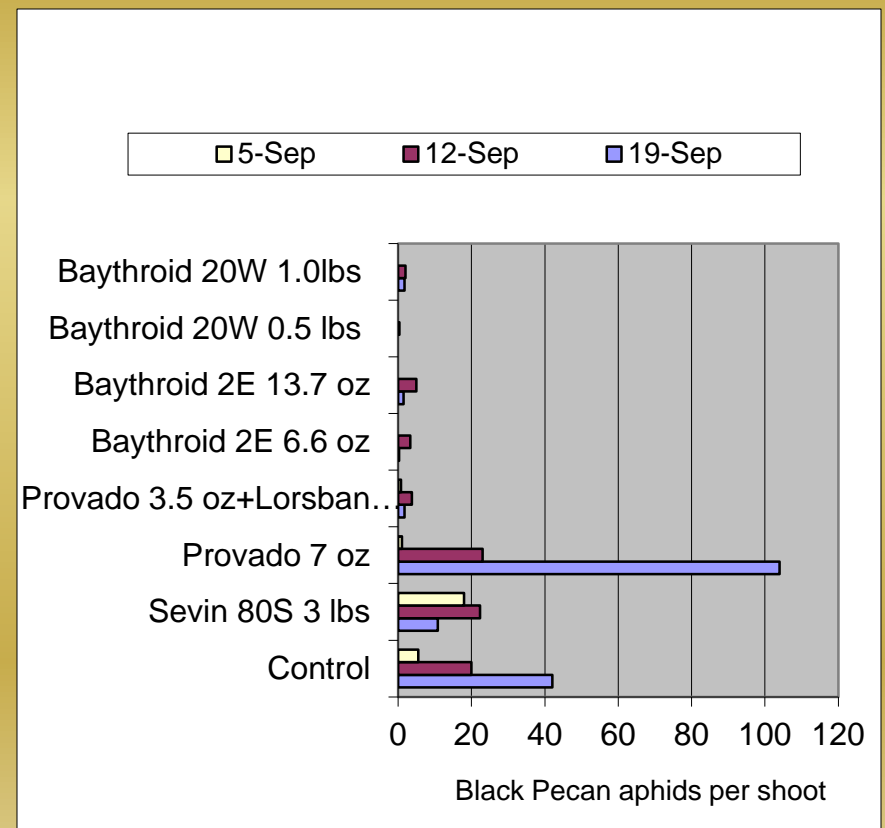
Sprays applied on August 24, 2009

Aphid Abundance In Pecan Weevil Control Treatments

Yellow aphids/shoot



Black pecan aphids/shoot



2009 Visiting Scholars Research on HPR and Biocontrol



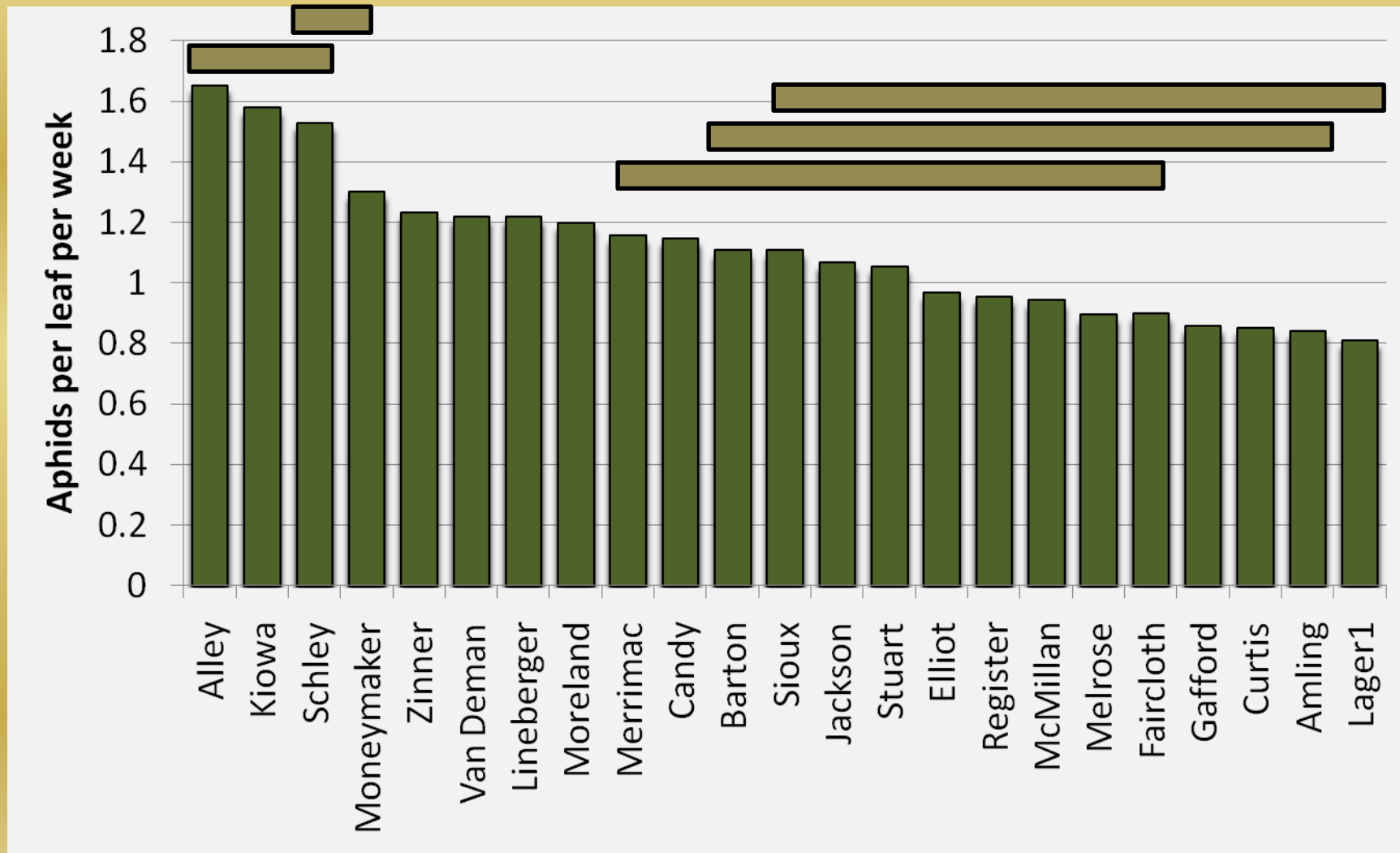
Methods and Materials

Objective 2: Cultivar Differences

Aphid abundance varied between 23 different pecan cultivars in a provenance collection in Tift Co., Ga. Cultivars were ranked by the number of aphids per week over a 14 week period and then each of the cultivars was qualitatively evaluated based on the seasonal occurrence of the three aphid species. Trees were bearing fruit and at 12 – 80 years old.

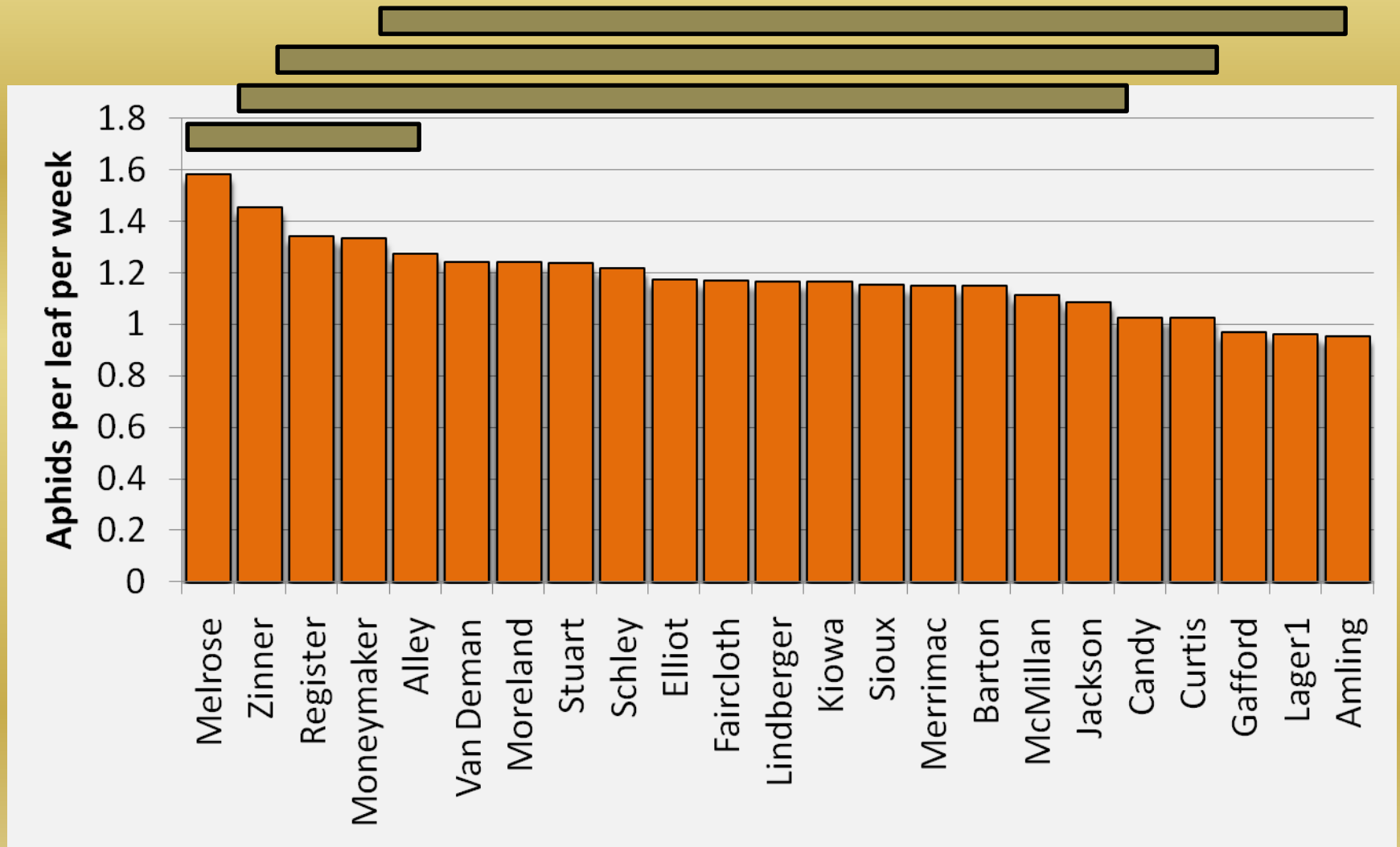
The orchard was treated with routine fungicide sprays, no insecticide sprays and standard mowed sod with herbicided tree rows for weed control. Fertilizer was applied 2 times at 100 lbs actual N as 10-10-10 in the early and late spring. Data were analyzed with GLM Procedure (SAS) to determine if cultivar and tree age were significant sources of variation in the data.

Black Pecan Aphid



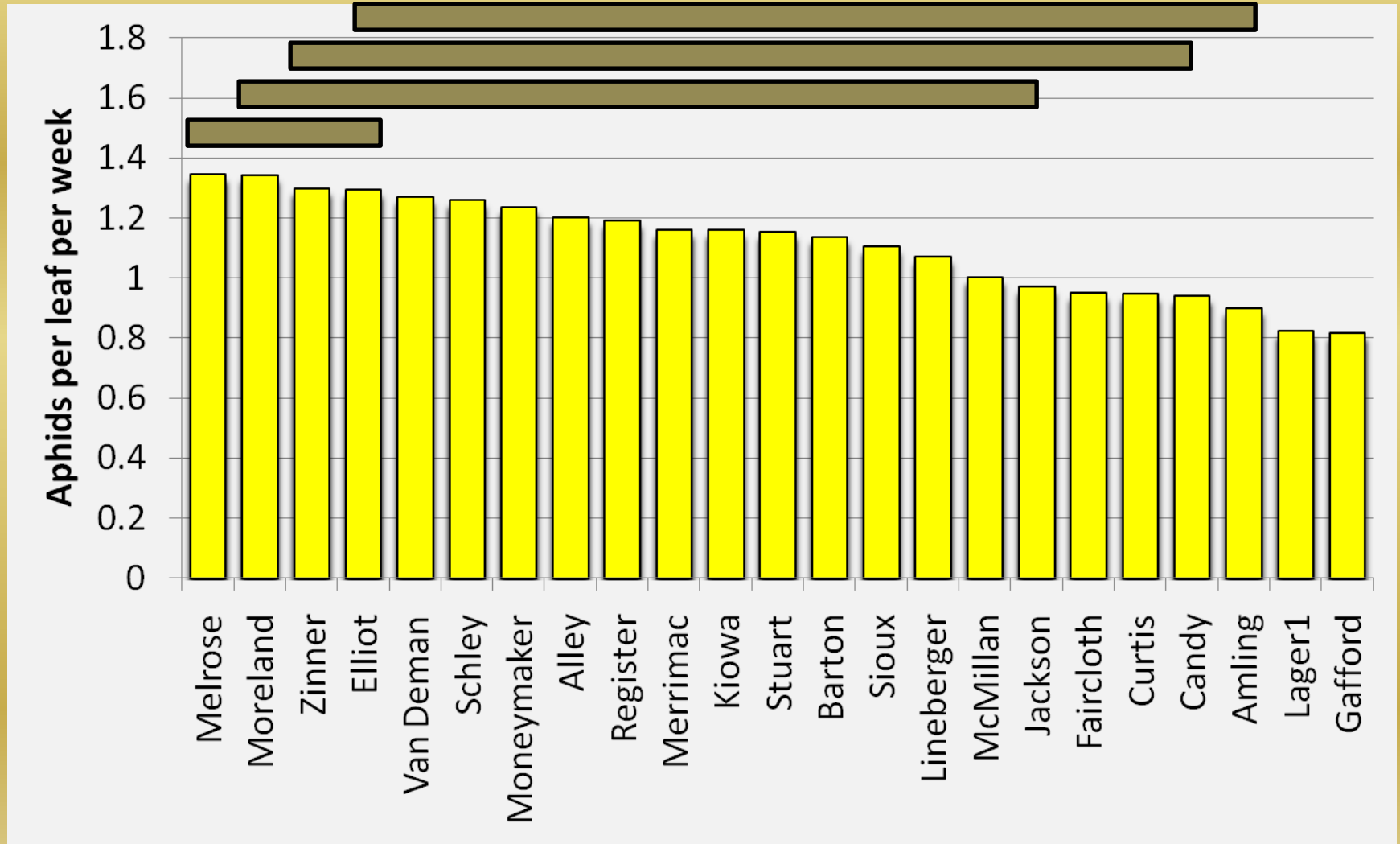
Means below the same tan bar are not significantly different $P < 0.01$, Proc GLM, DMRT

Blackmargined Aphid



Means below the same tan bar are not significantly different $P < 0.01$, PROC GLM, DMRT

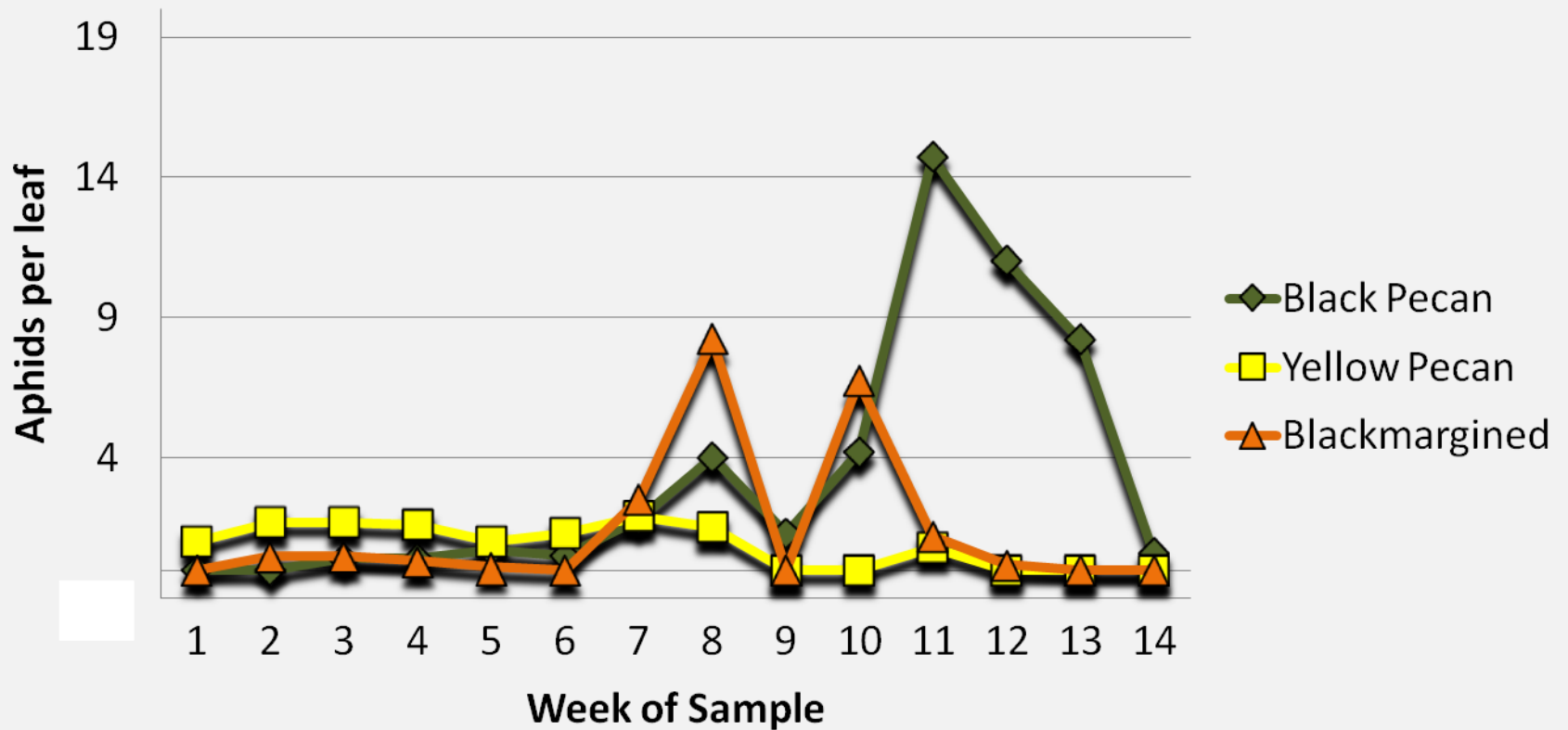
Yellow Pecan Aphid



Means below the same tan bar are not significantly different $P < 0.01$, PROC GLM, DMRT

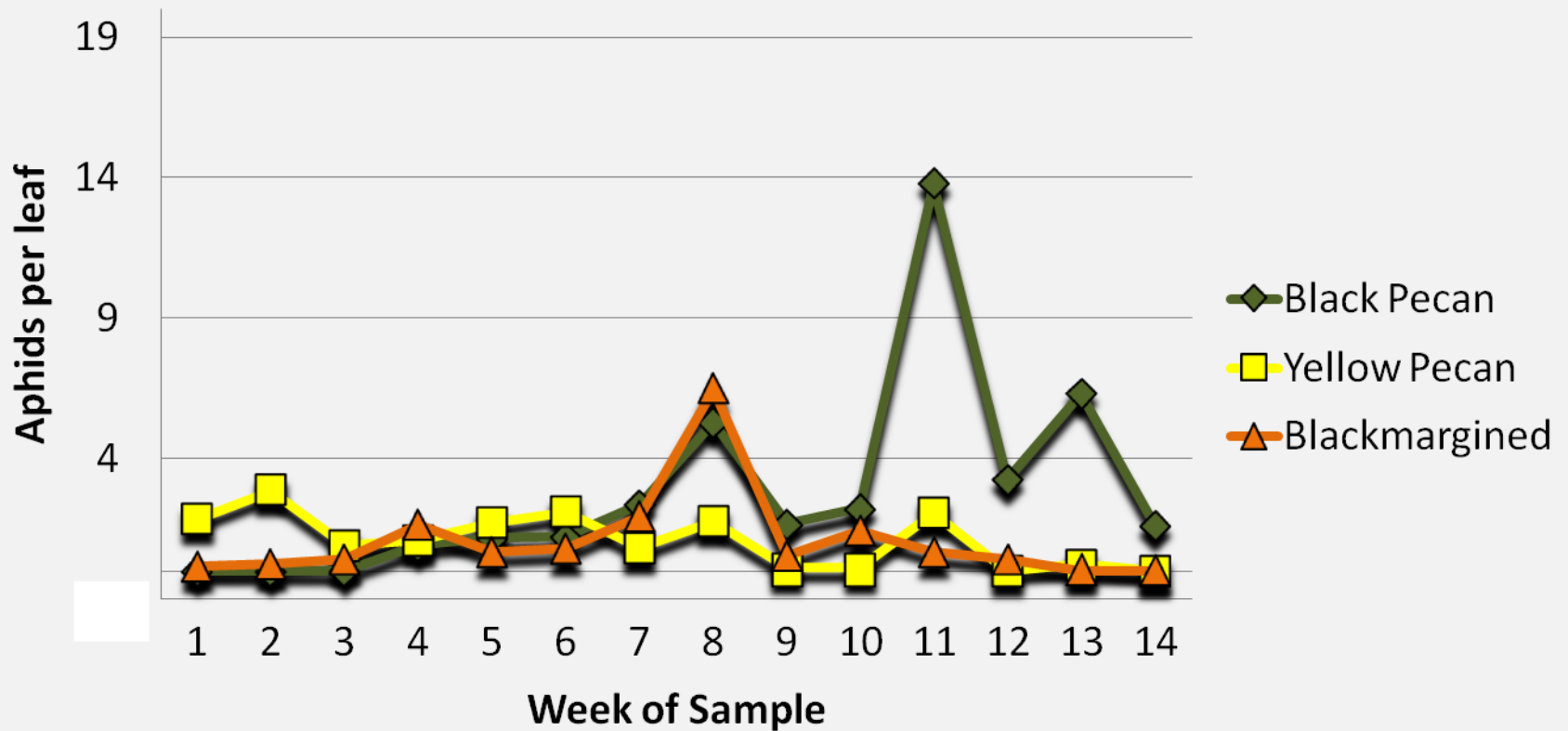
Pecan Cultivar - Alley

Seasonal Abundance of Pecan Aphids by Species



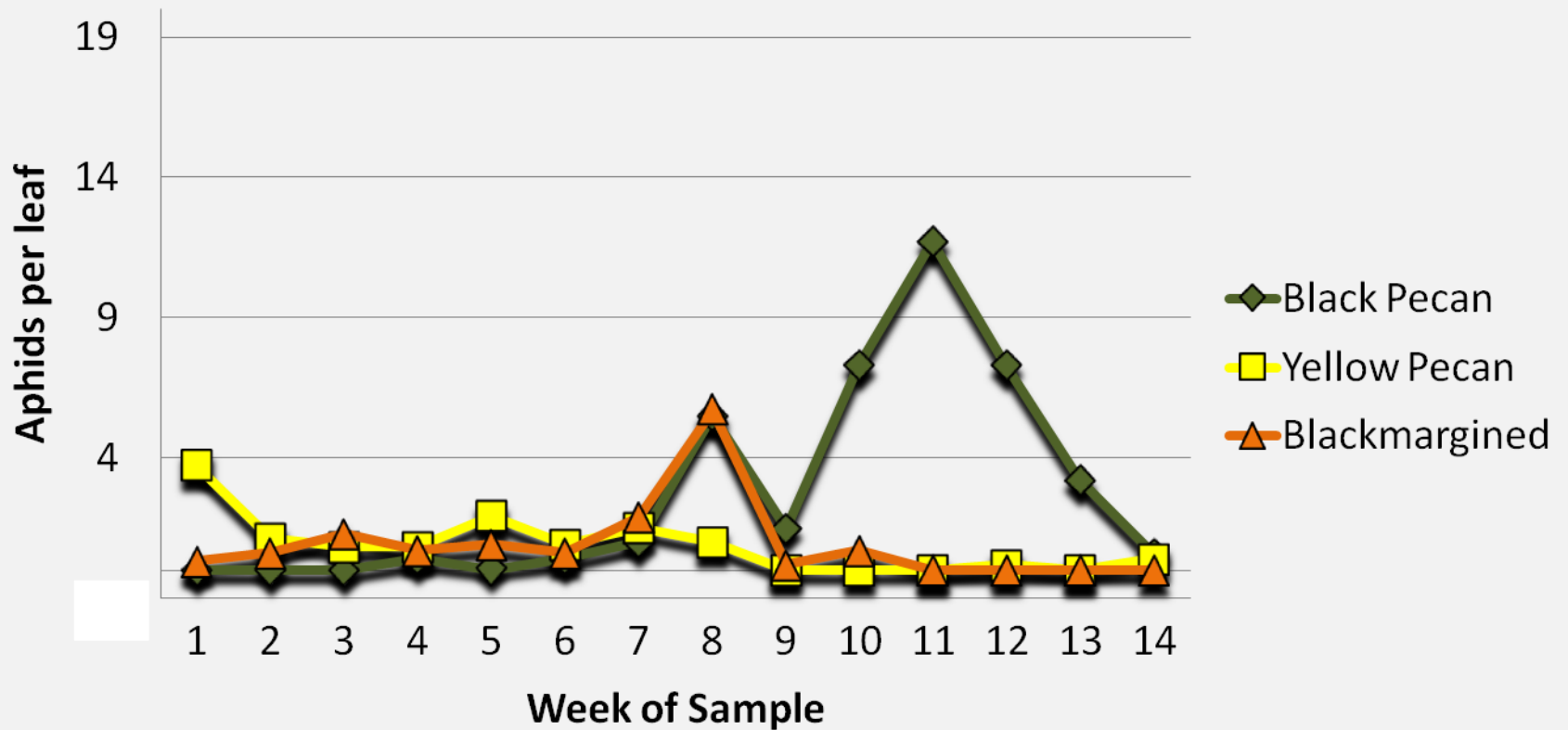
Pecan Cultivar – Schley

Seasonal Abundance of Pecan Aphids by Species



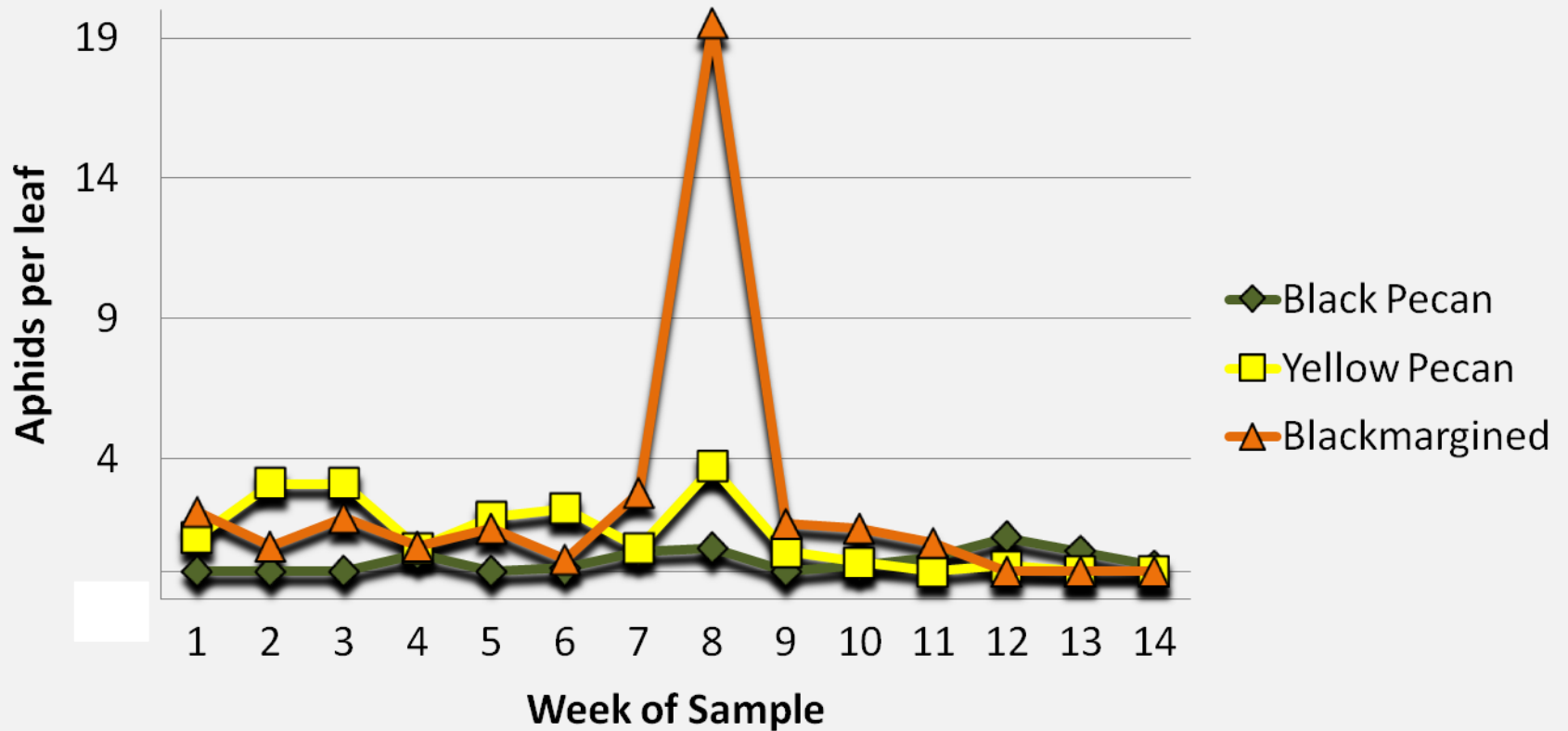
Pecan Cultivar - Kiowa

Seasonal Abundance of Pecan Aphids by Species



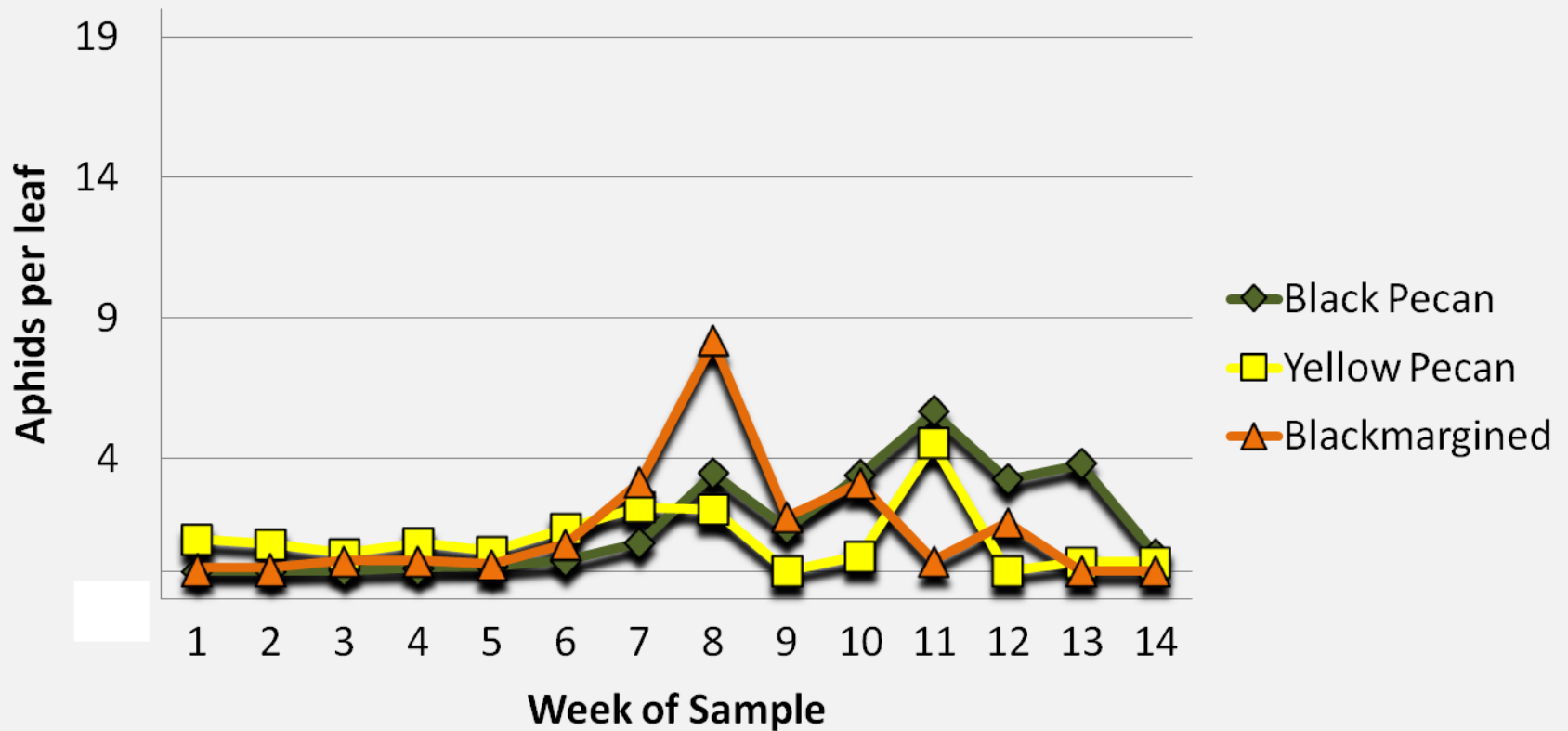
Pecan Cultivar – Melrose

Seasonal Abundance of Pecan Aphids by Species



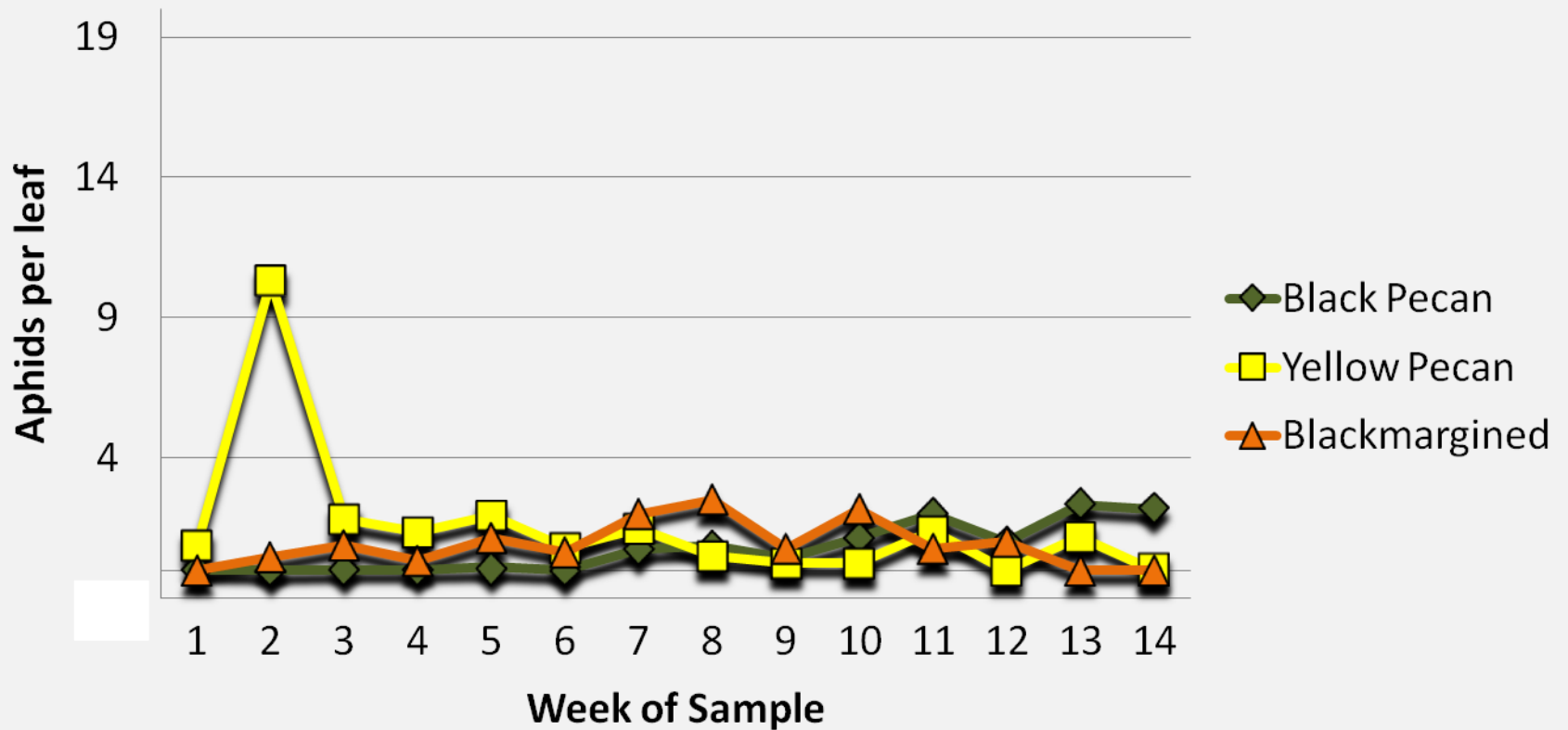
Pecan Cultivar – Moneymaker

Seasonal Abundance of Pecan Aphids by Species



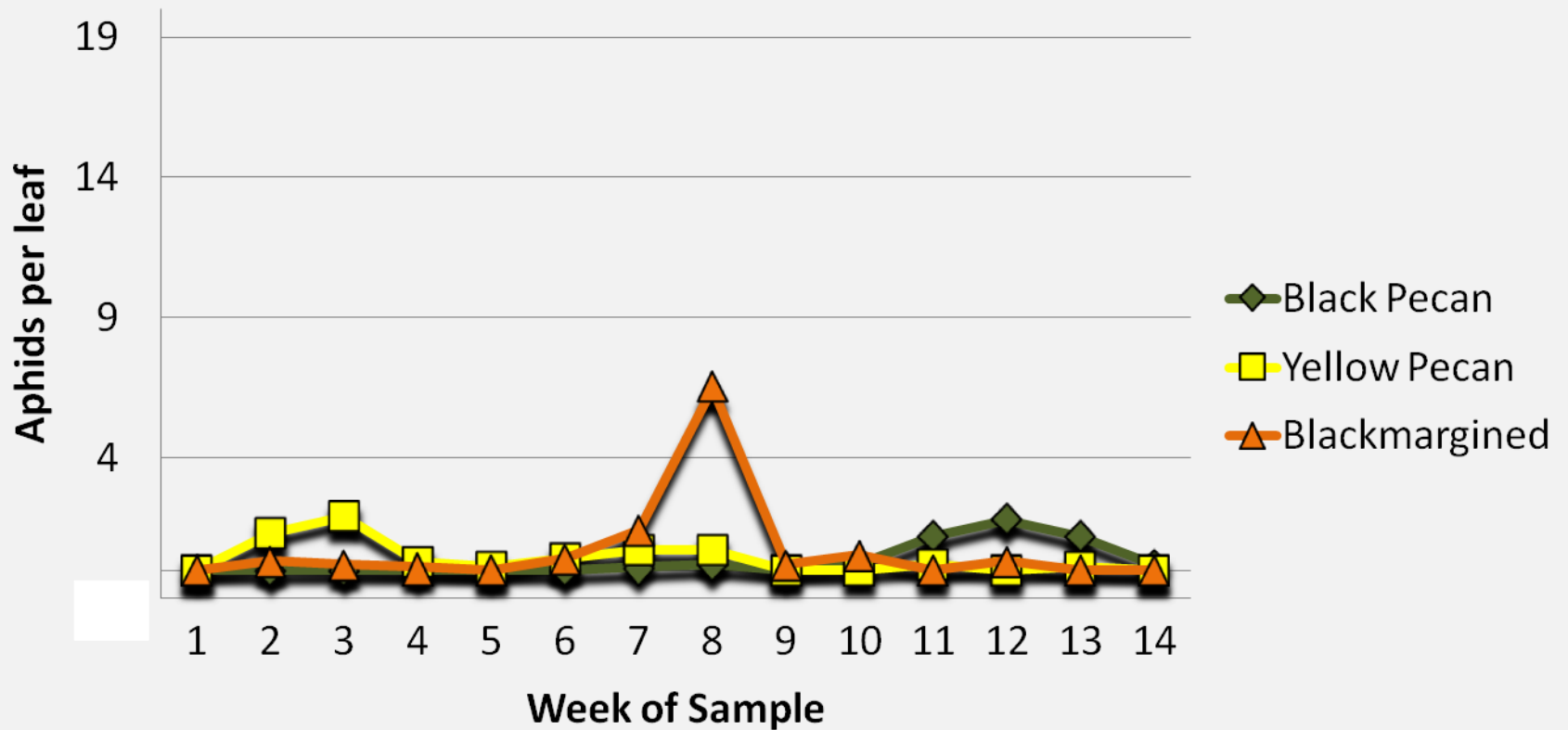
Pecan Cultivar - Elliot

Seasonal Abundance of Pecan Aphids by Species



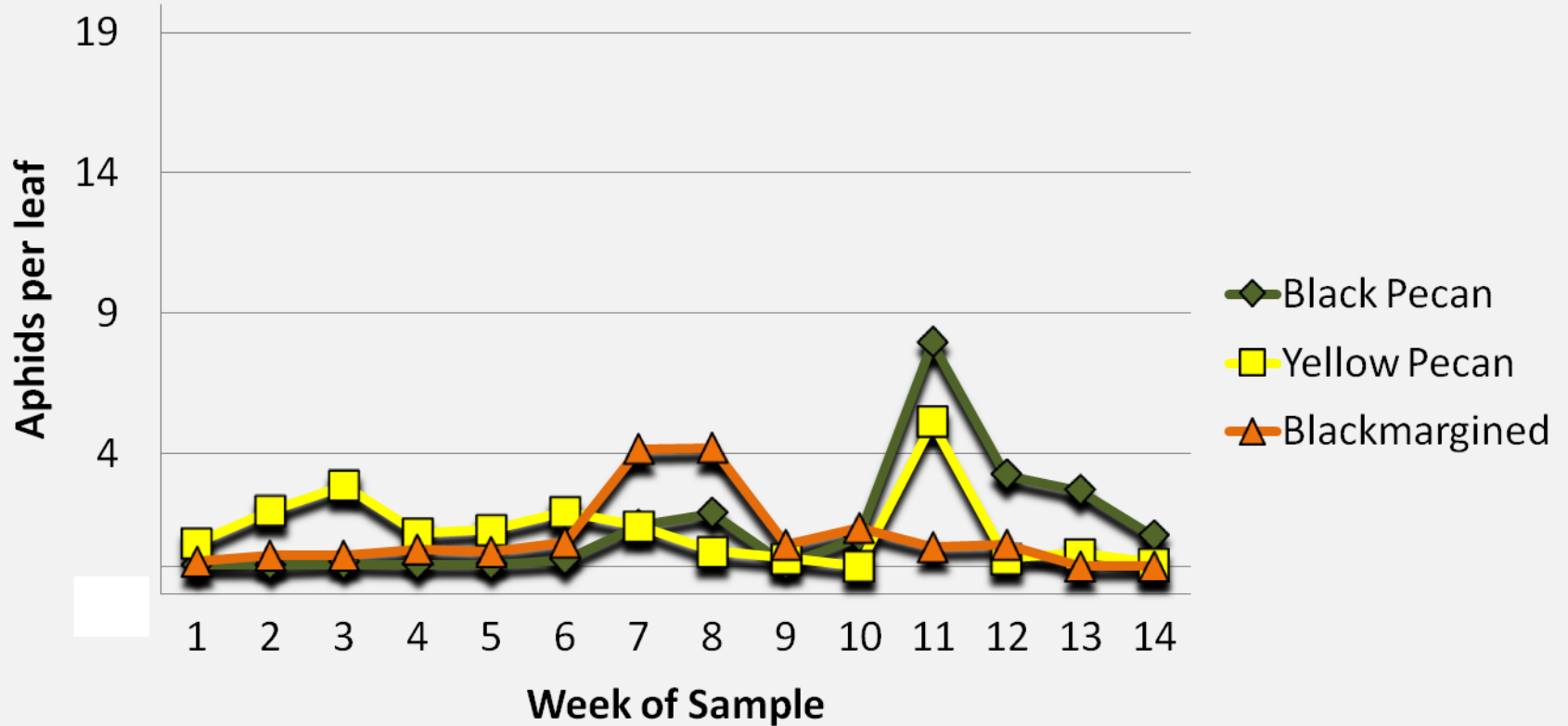
Pecan Cultivar - Curtis

Seasonal Abundance of Pecan Aphids by Species



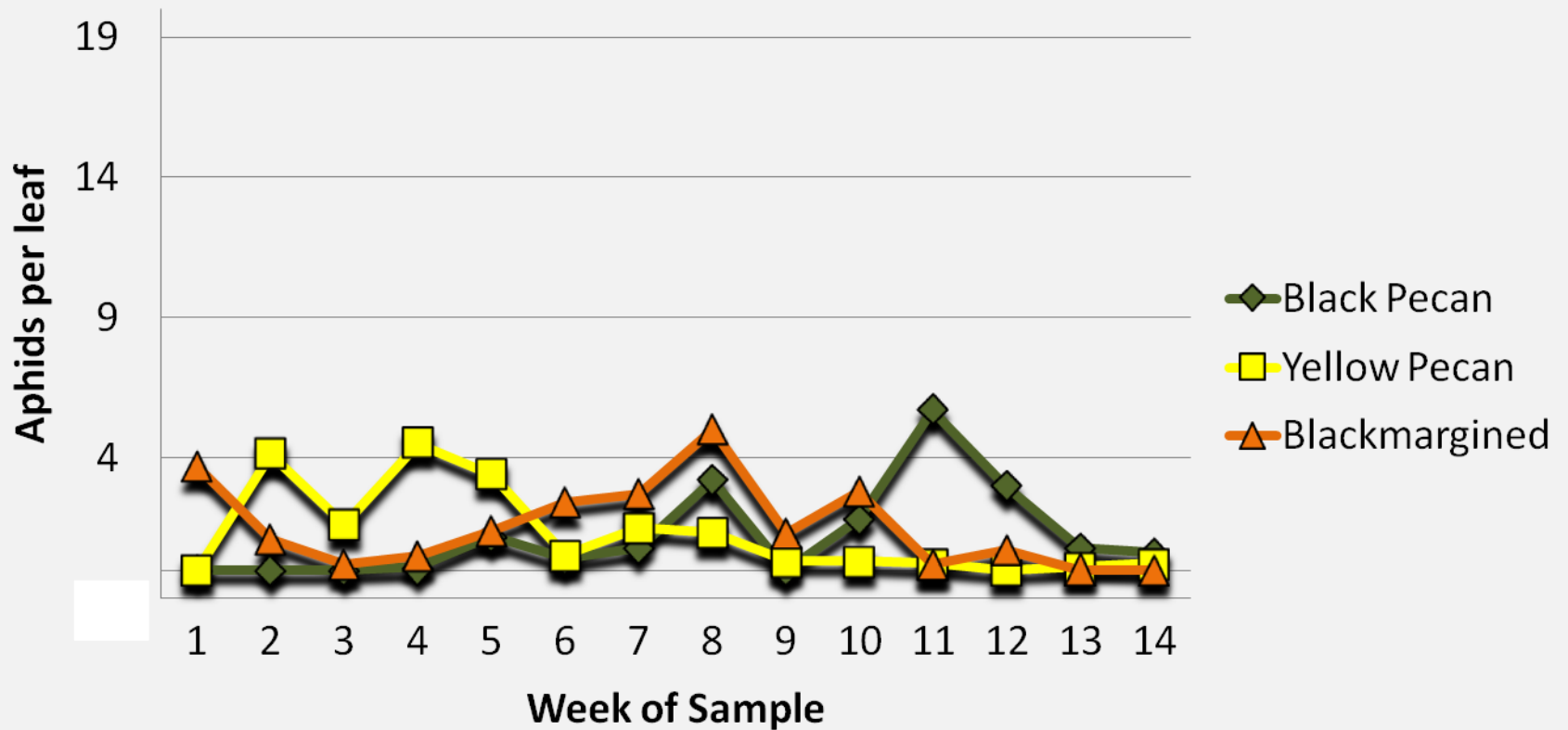
Pecan Cultivar – Van Deman

Seasonal Abundance of Pecan Aphids by Species



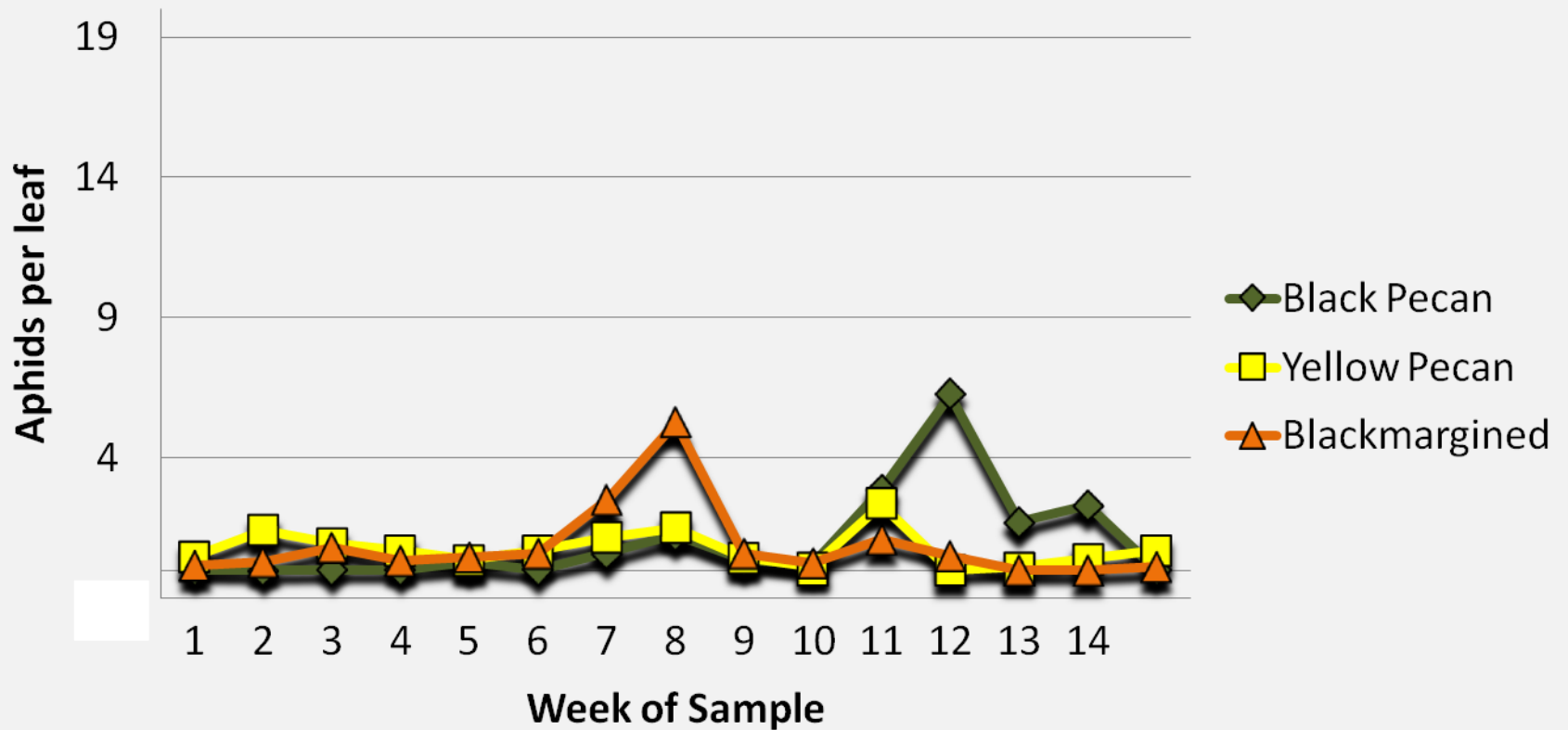
Pecan Cultivar – Zinner

Seasonal Abundance of Pecan Aphids by Species



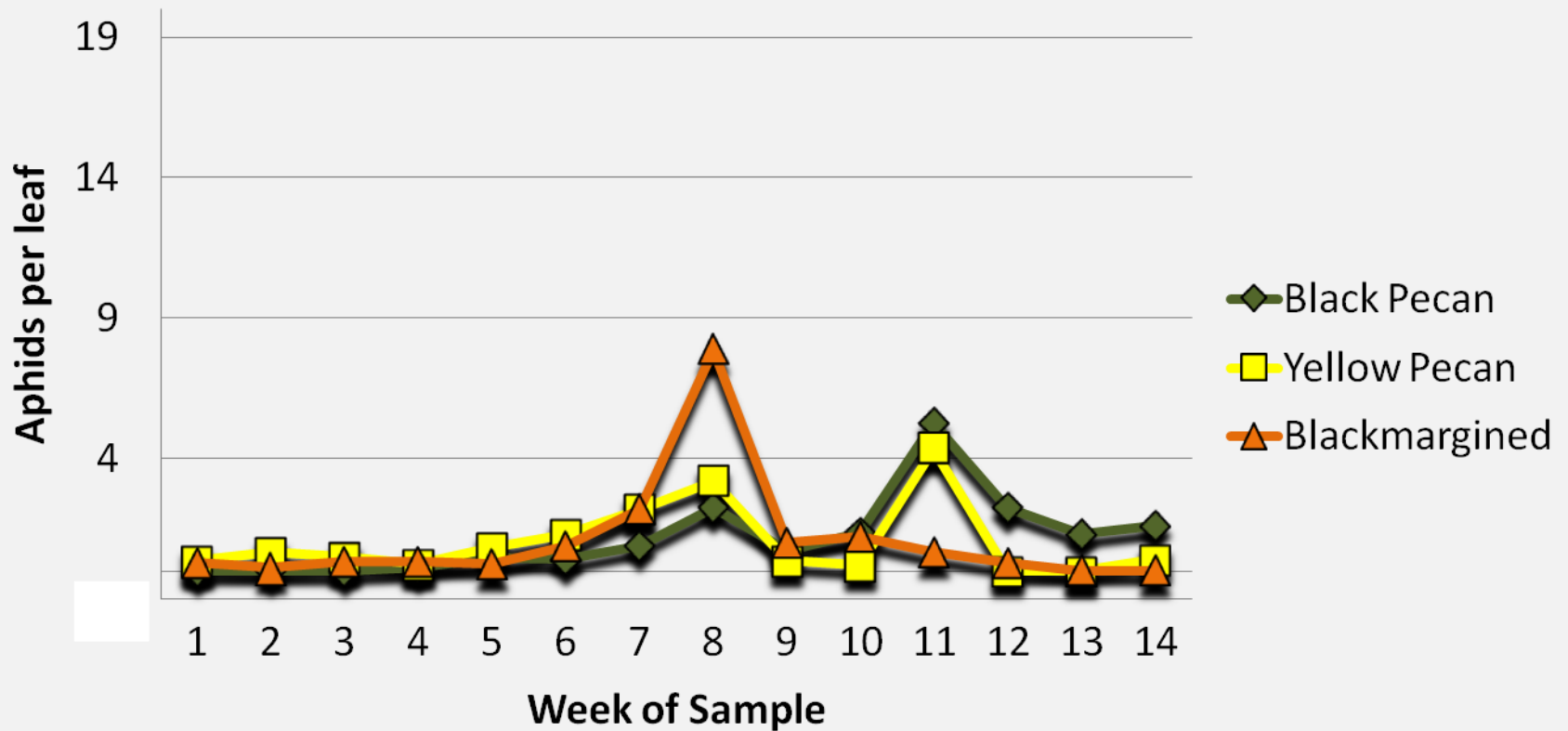
Pecan Cultivar – Sioux

Seasonal Abundance of Pecan Aphids by Species



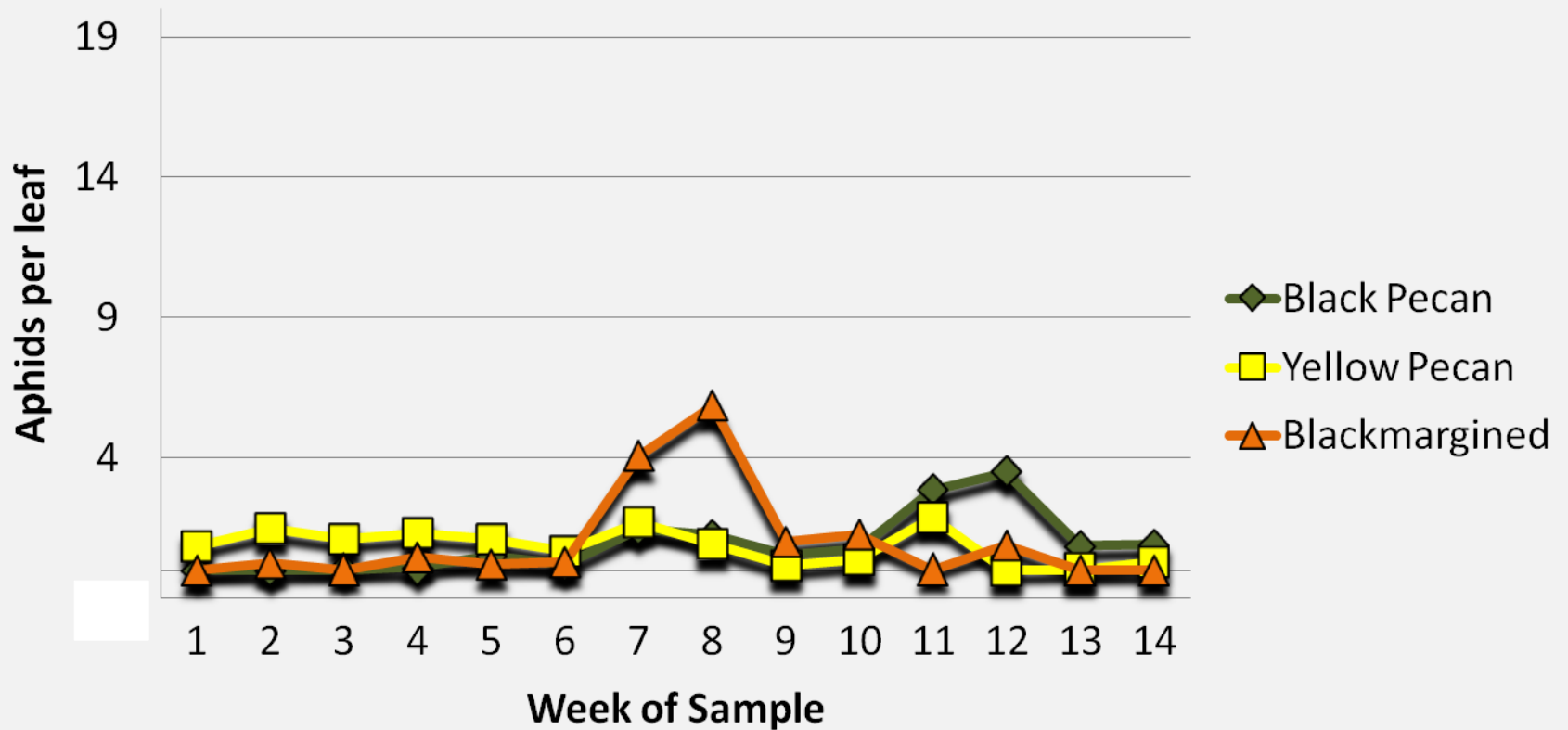
Pecan Cultivar – Merrimac

Seasonal Abundance of Pecan Aphids by Species



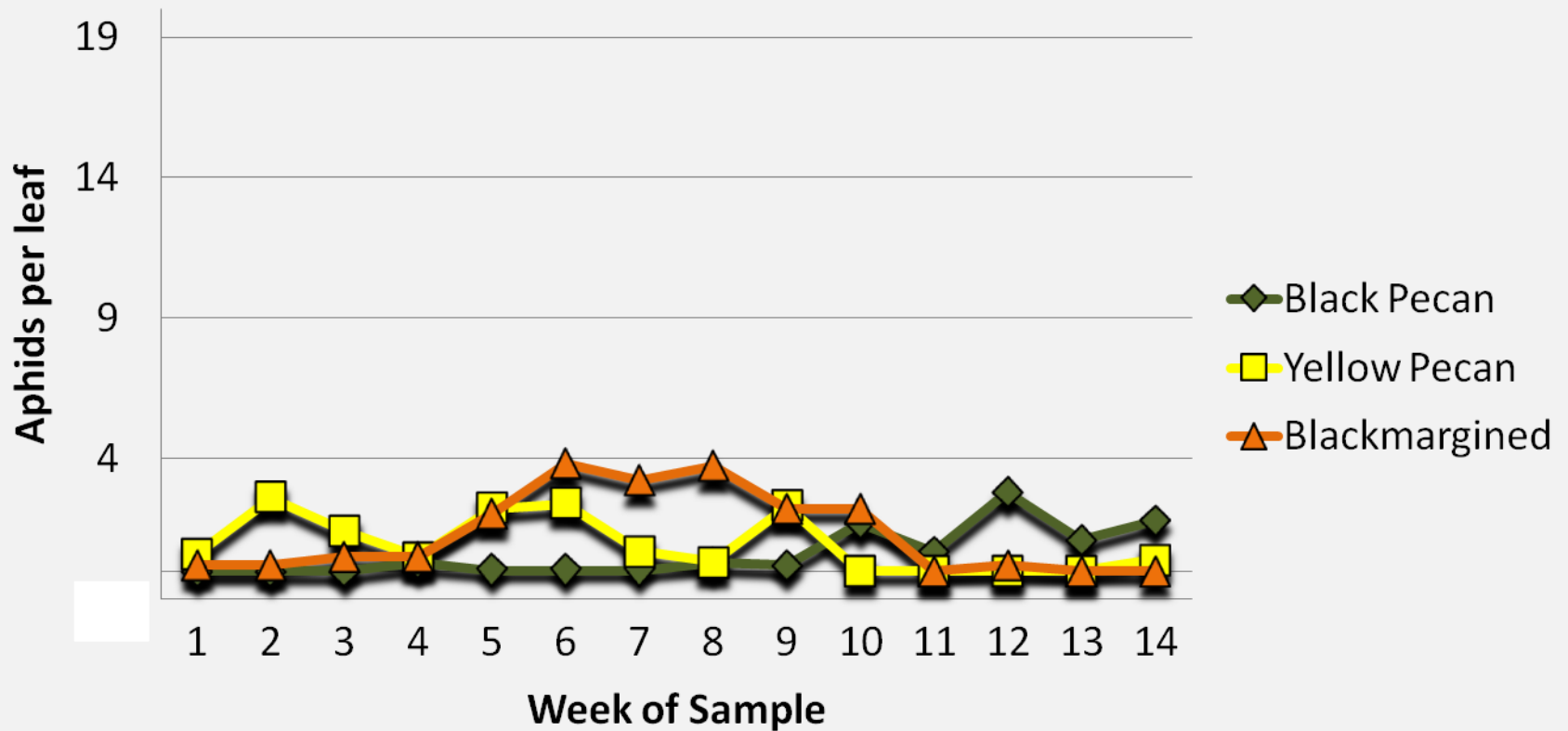
Pecan Cultivar - Barton

Seasonal Abundance of Pecan Aphids by Species



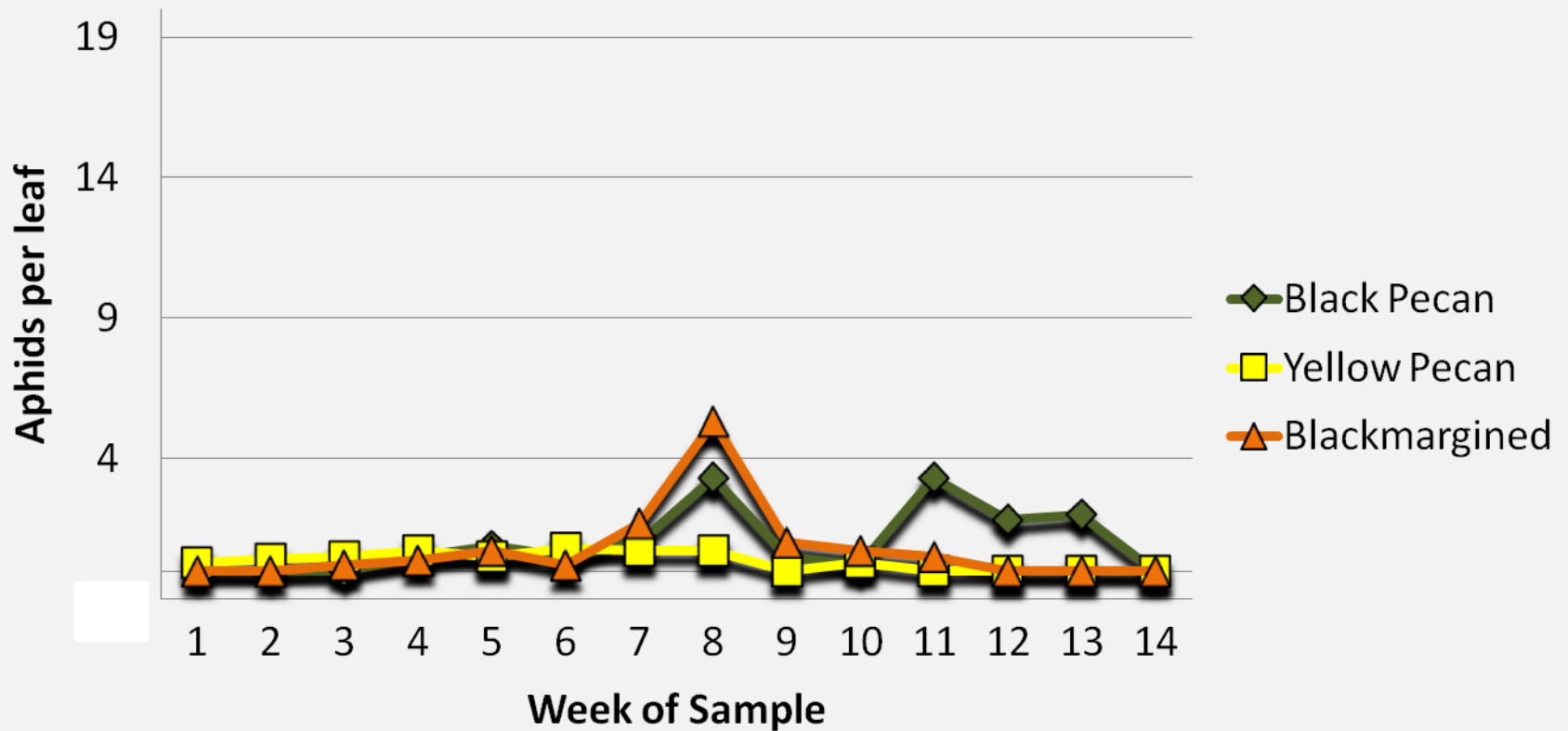
Pecan Cultivar – Register

Seasonal Abundance of Pecan Aphids by Species



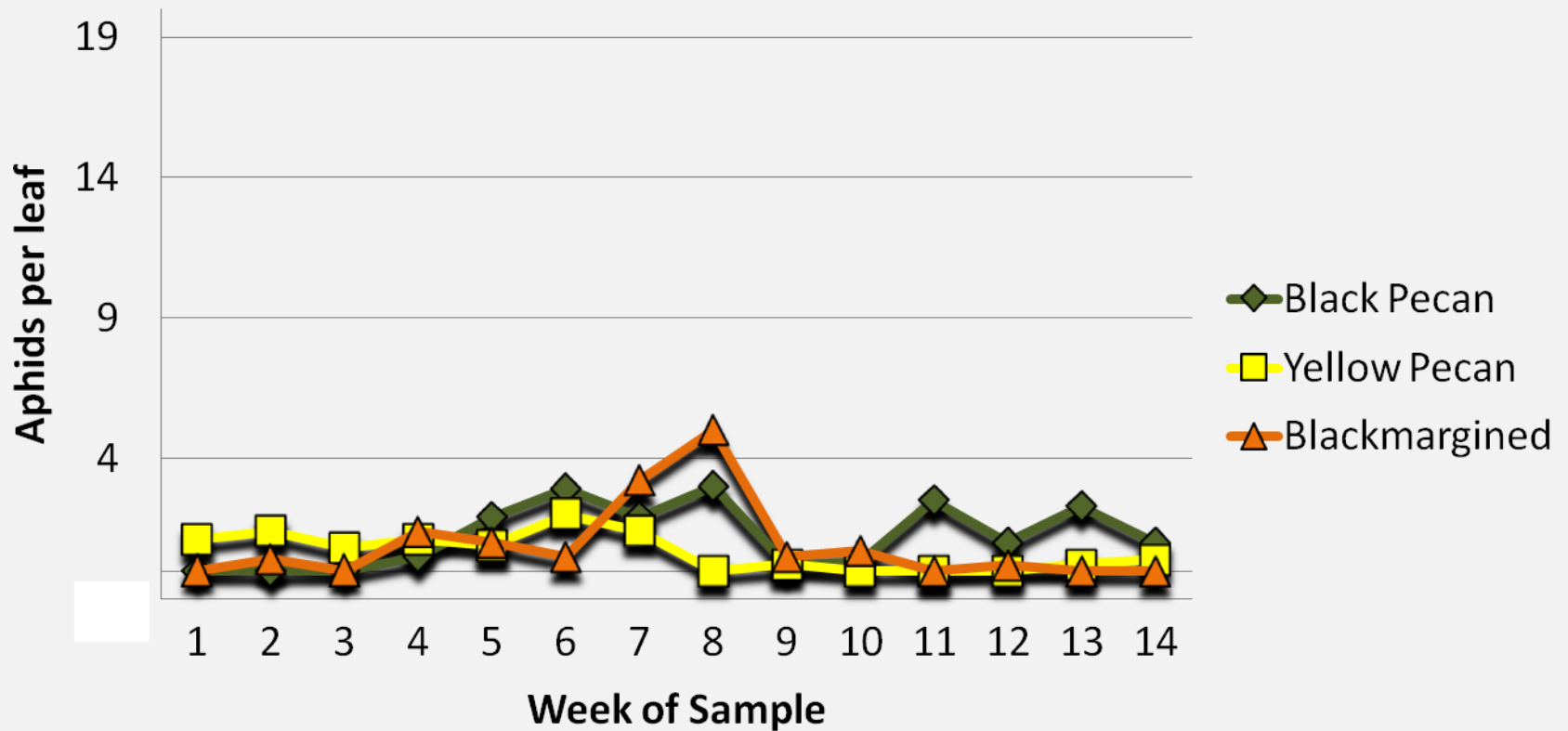
Pecan Cultivar - Candy

Seasonal Abundance of Pecan Aphids by Species



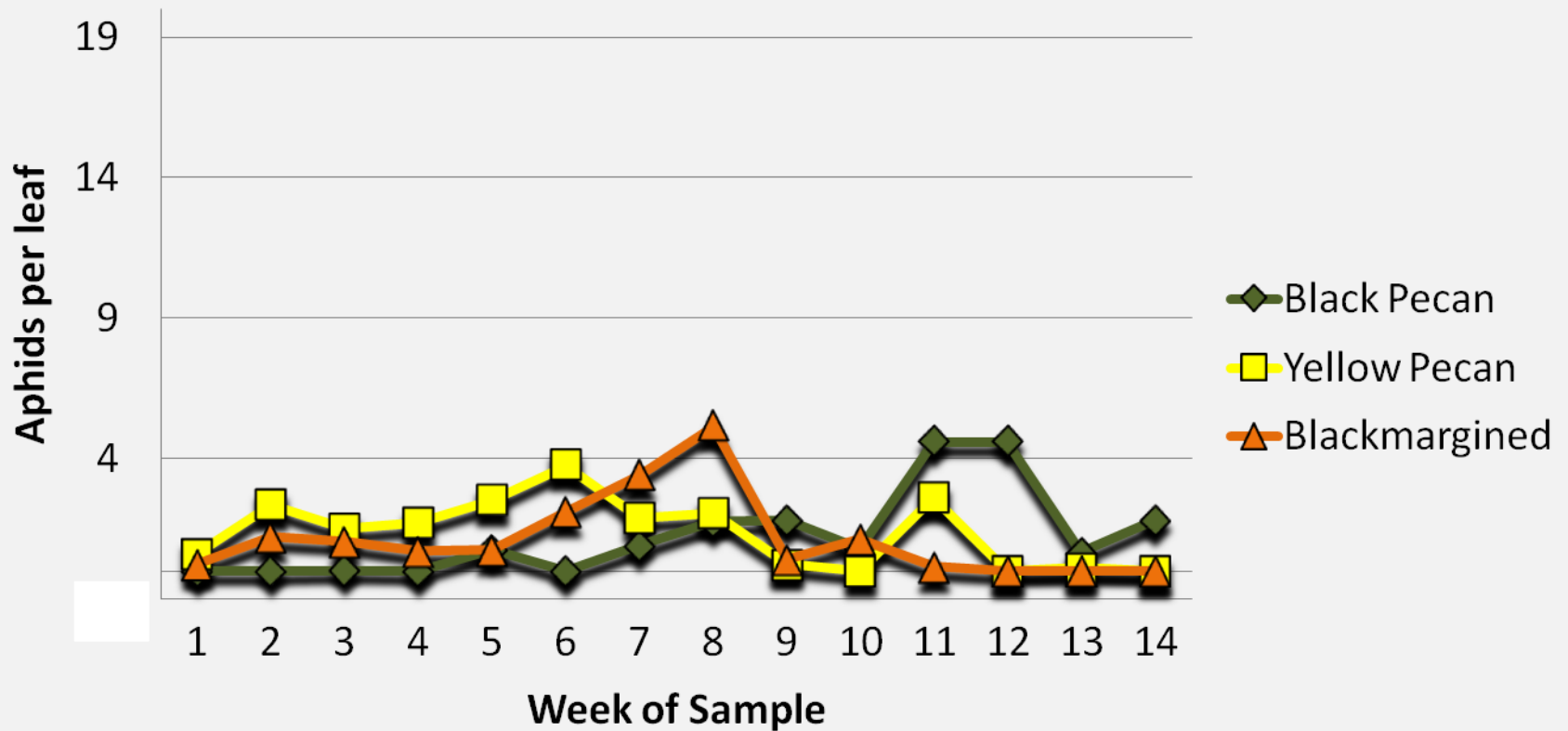
Pecan Cultivar – Lineberger

Seasonal Abundance of Pecan Aphids by Species



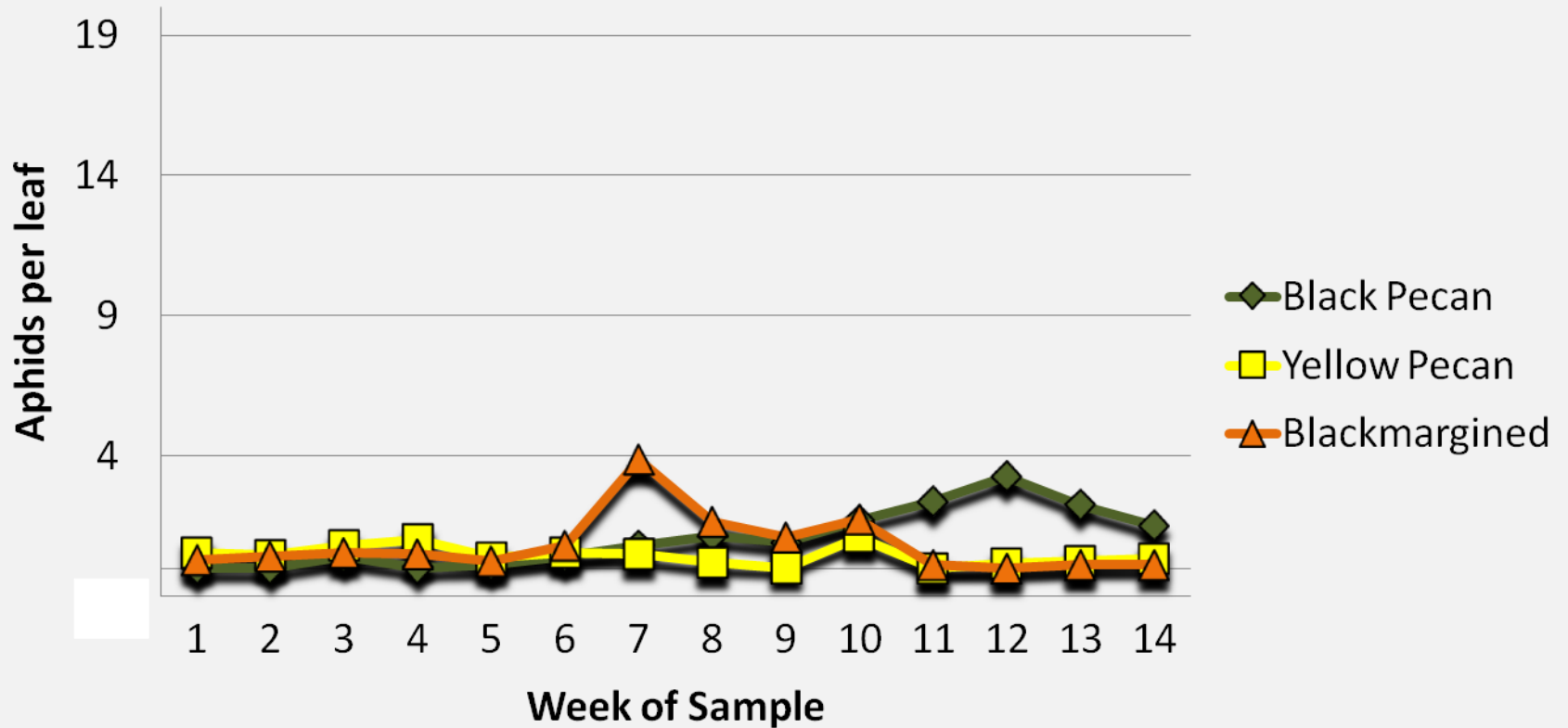
Pecan Cultivar – Moreland

Seasonal Abundance of Pecan Aphids by Species



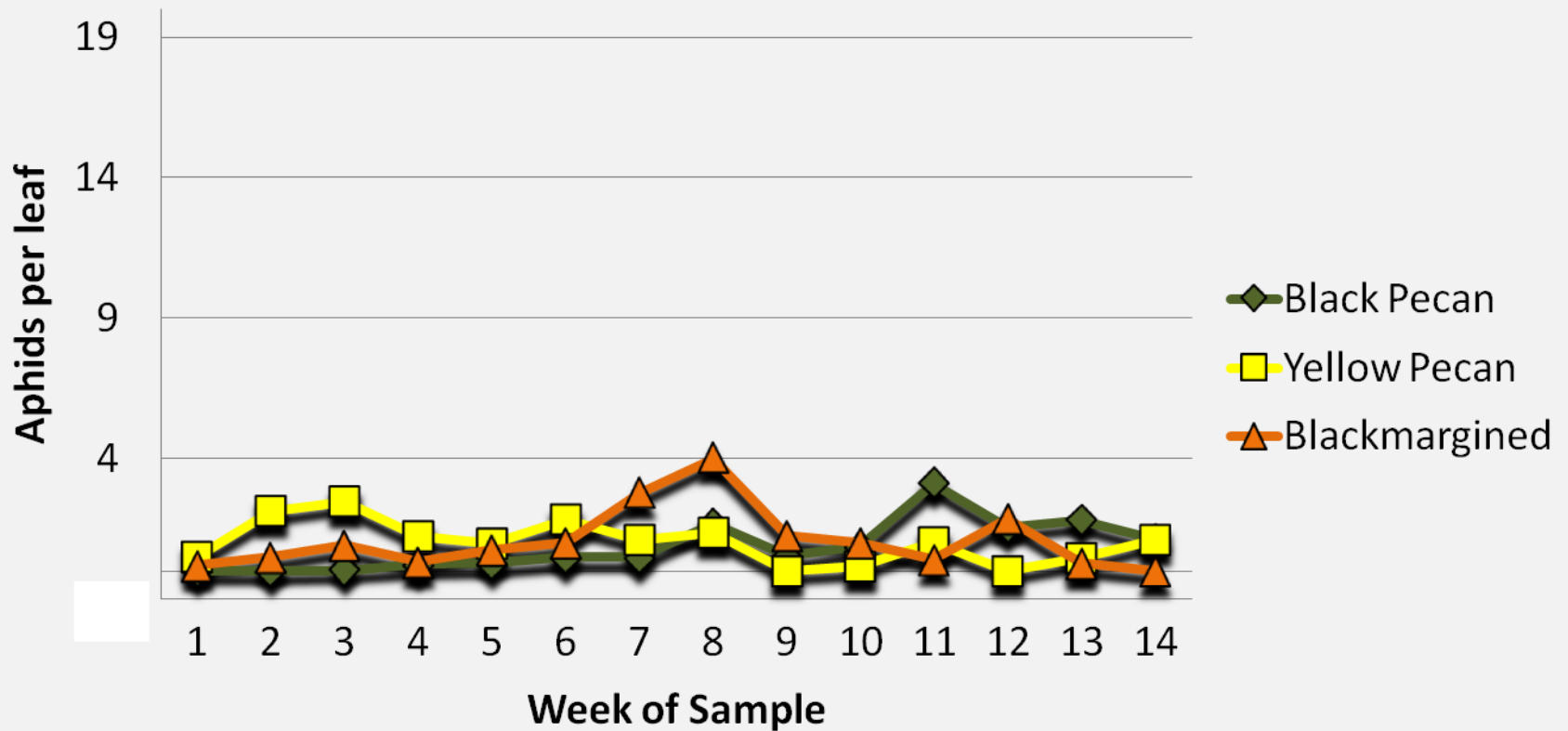
Pecan Cultivar - Jackson

Seasonal Abundance of Pecan Aphids by Species



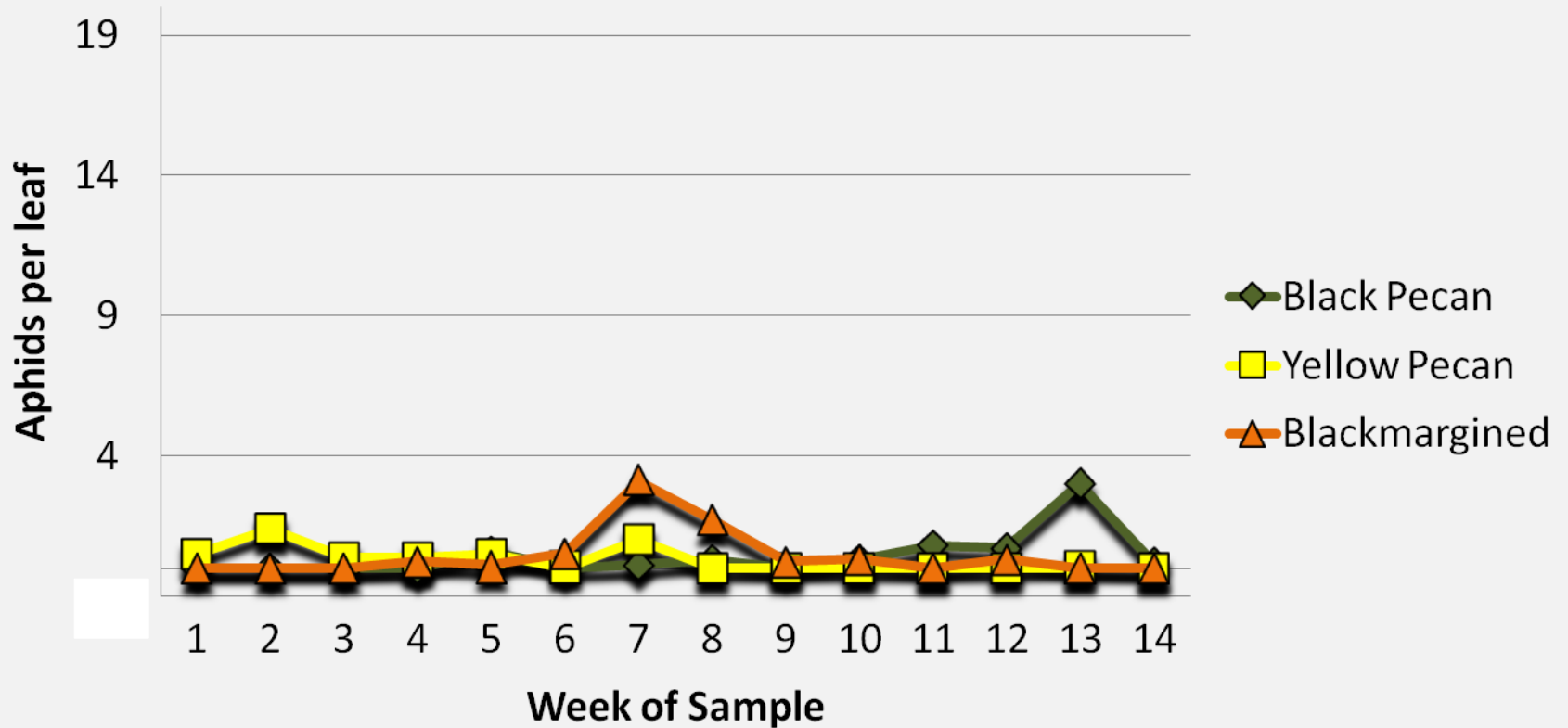
Pecan Cultivar – Stuart

Seasonal Abundance of Pecan Aphids by Species



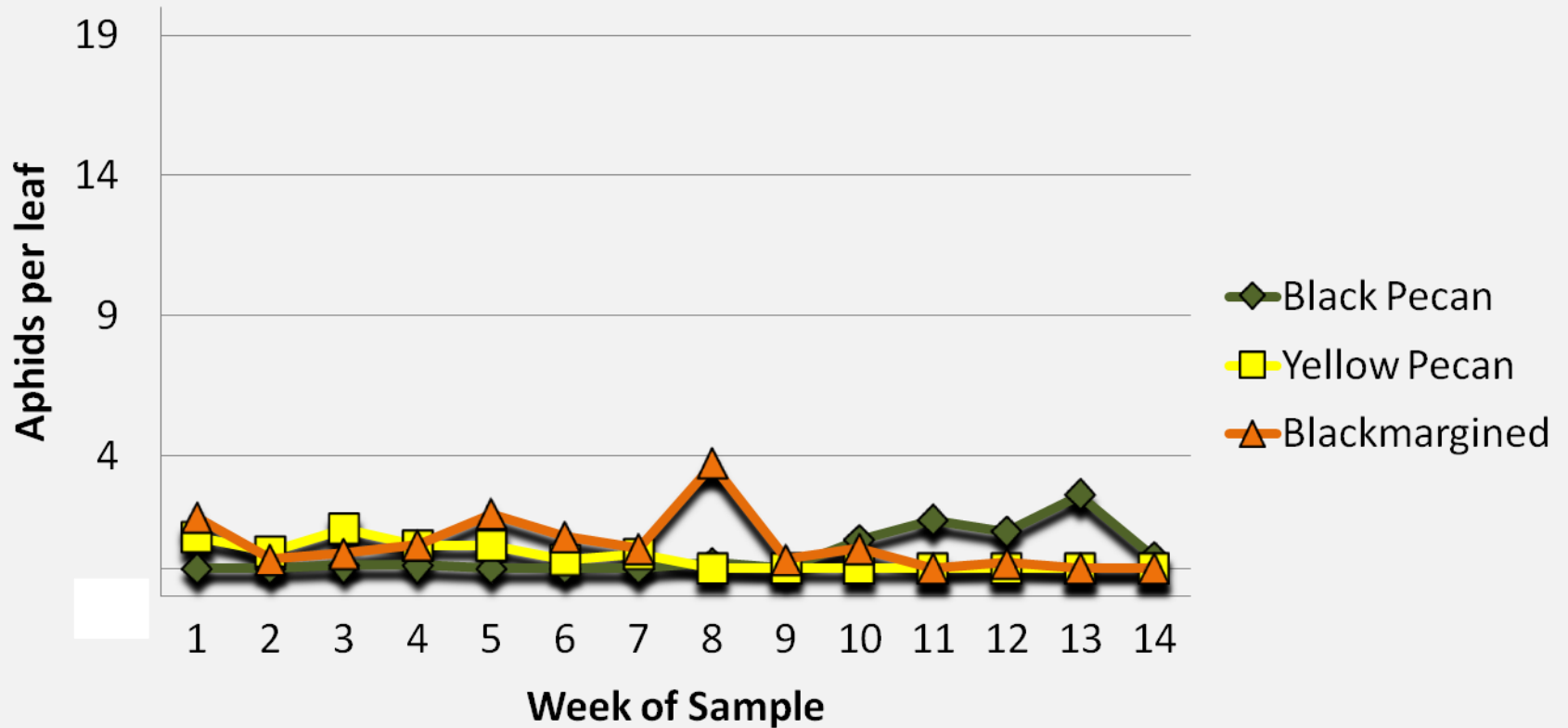
Pecan Cultivar - Amling

Seasonal Abundance of Pecan Aphids by Species



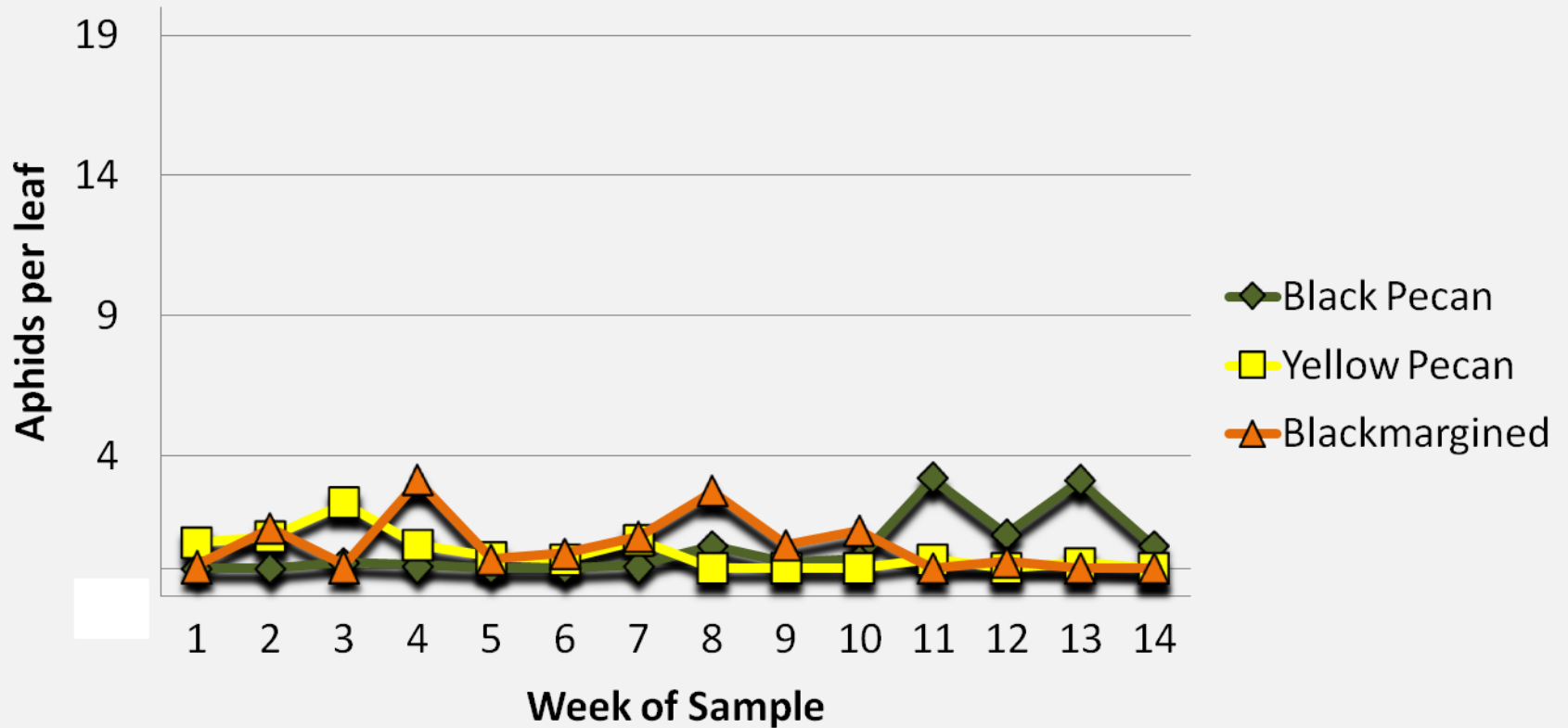
Pecan Cultivar - Faircloth

Seasonal Abundance of Pecan Aphids by Species



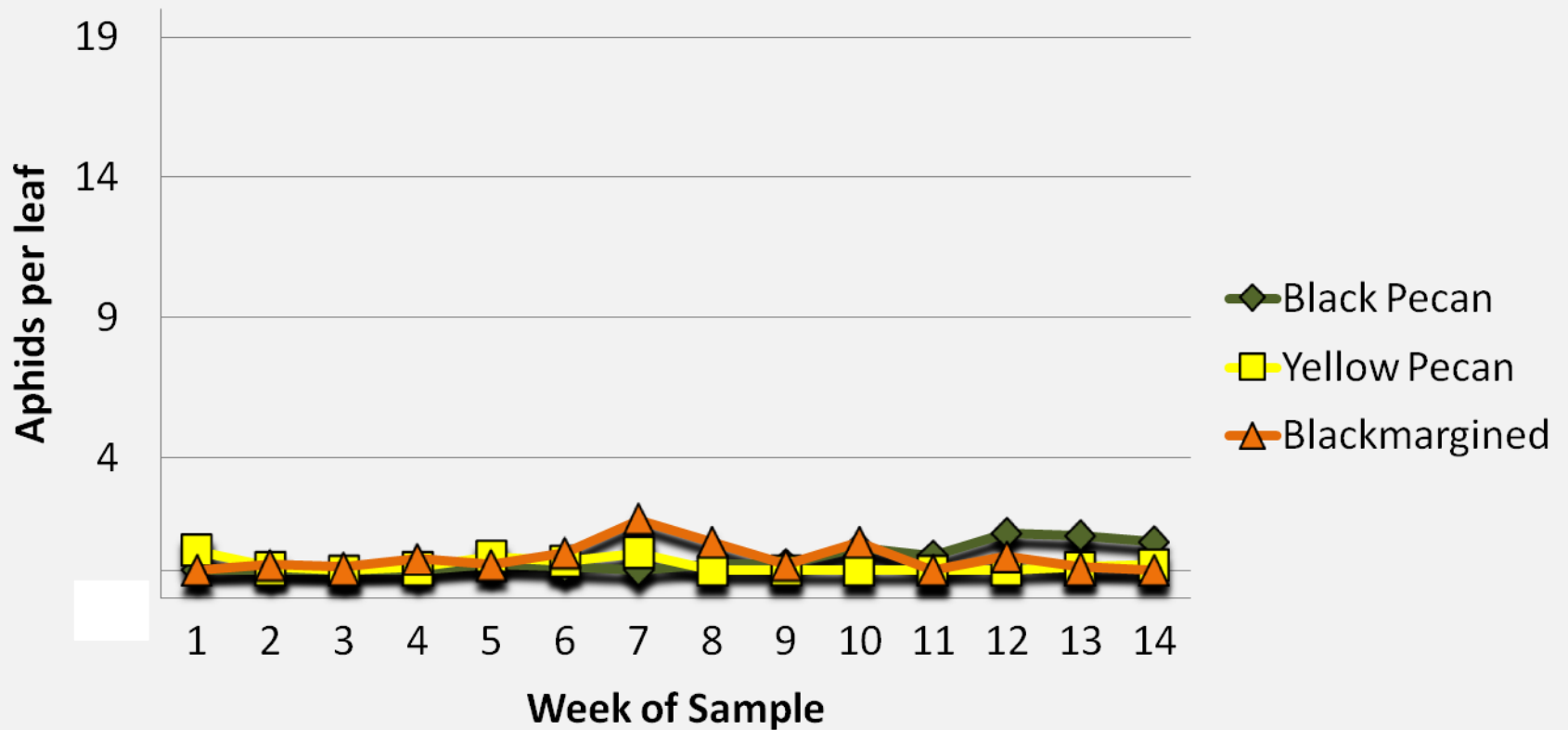
Pecan Cultivar – McMillan

Seasonal Abundance of Pecan Aphids by Species



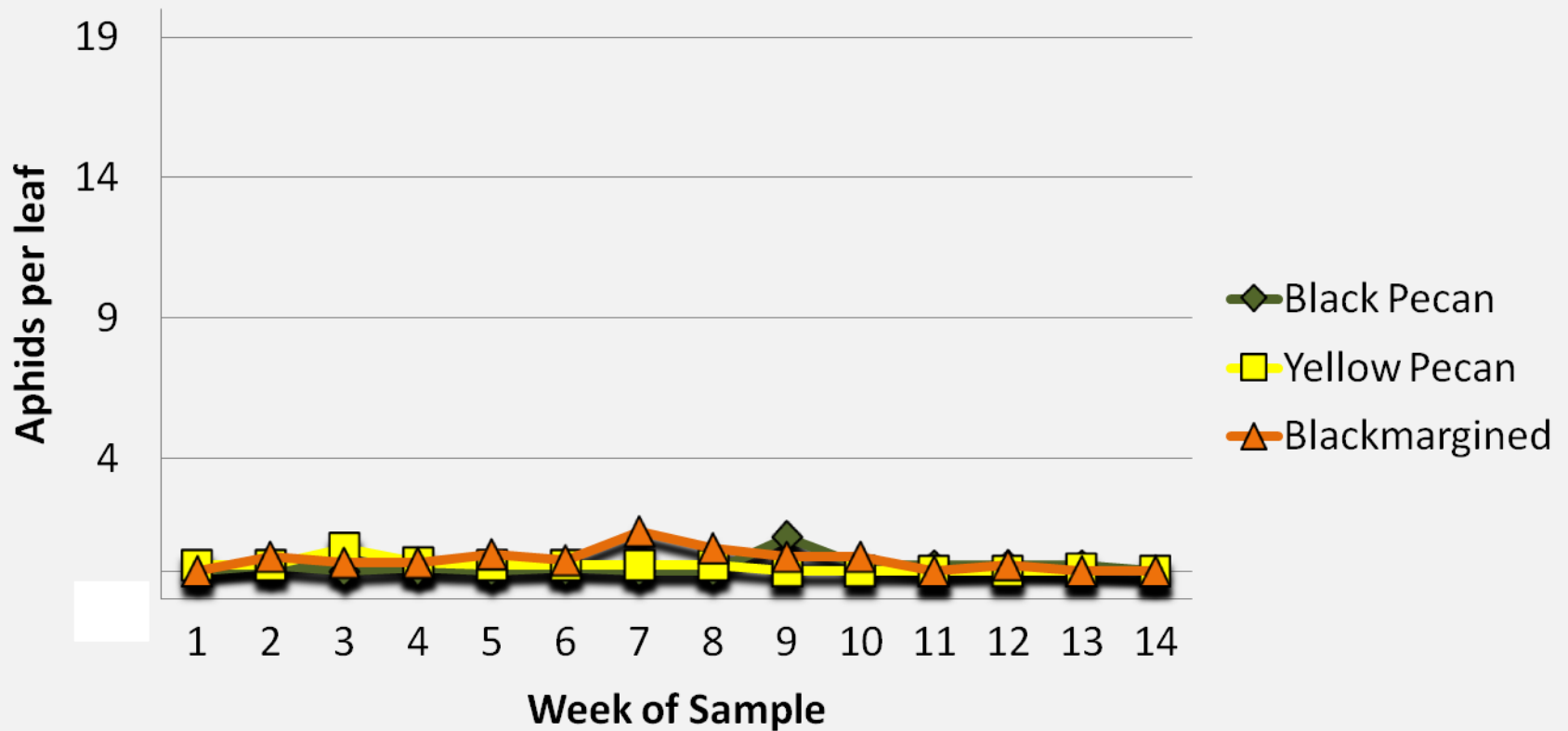
Pecan Cultivar - Gafford

Seasonal Abundance of Pecan Aphids by Species

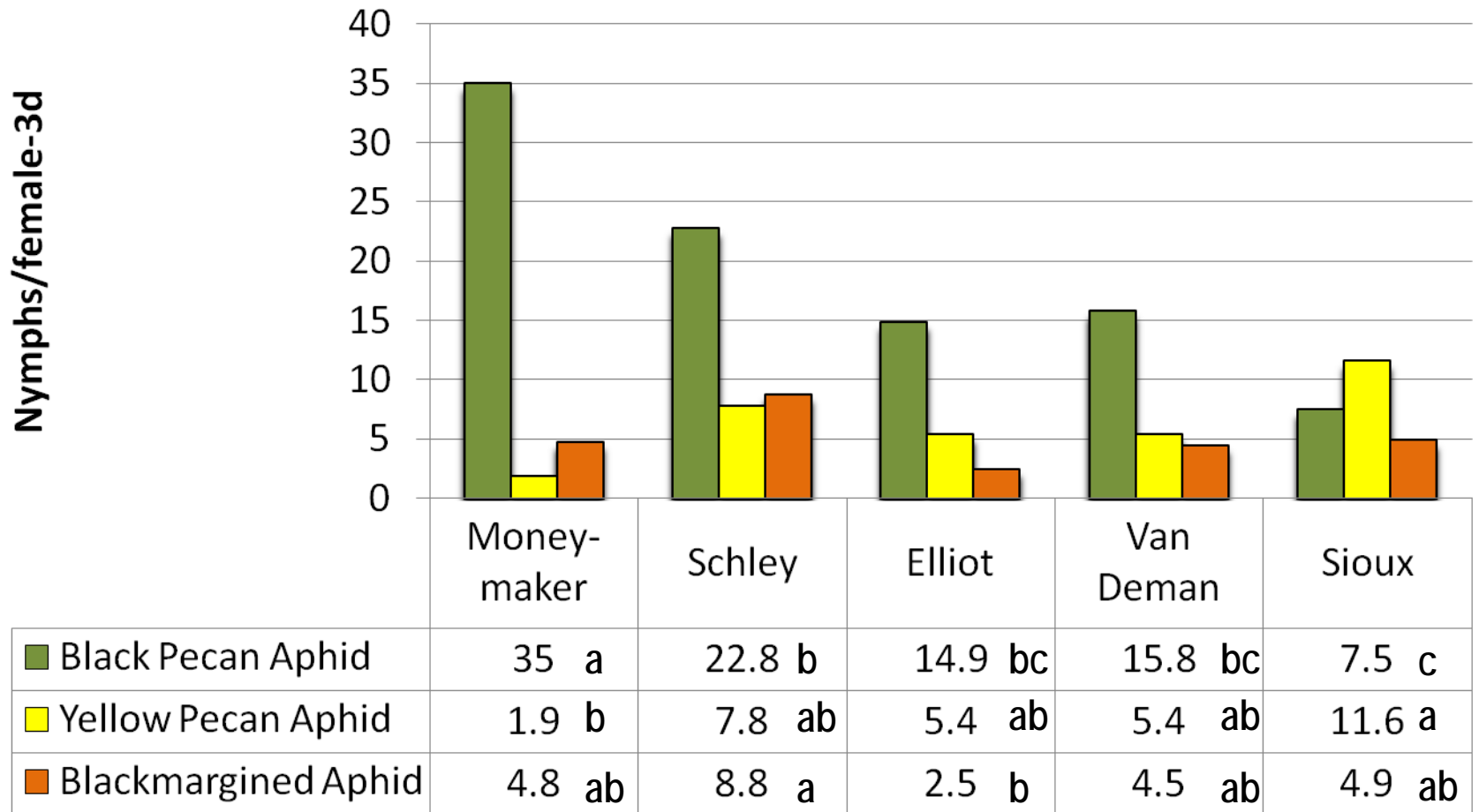


Pecan Cultivar – Lager 1

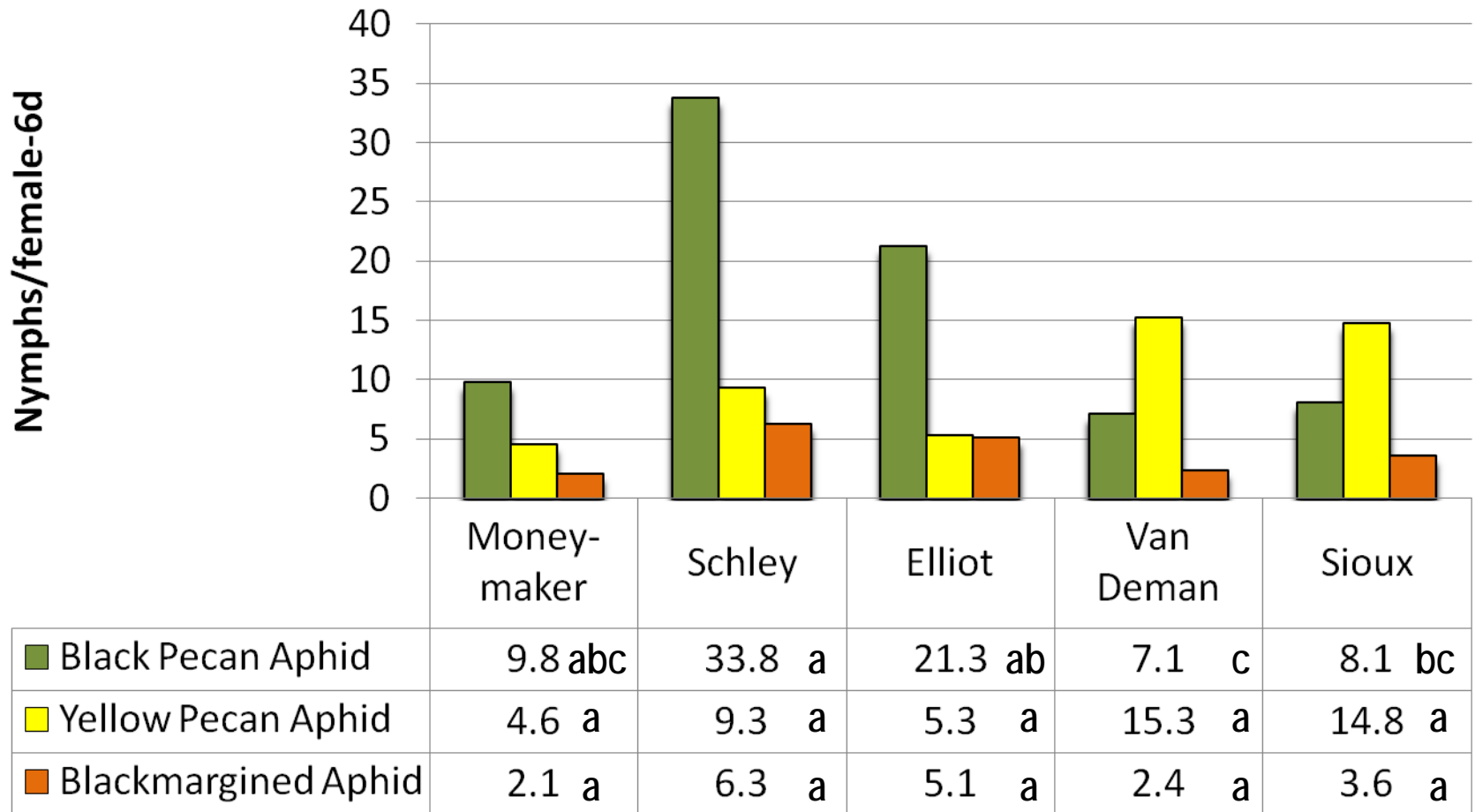
Seasonal Abundance of Pecan Aphids by Species



Reproductive rate of 3 aphid species on selected pecan cultivars over 3 days



Reproductive rate of 3 aphid species on selected pecan cultivars over 6 days



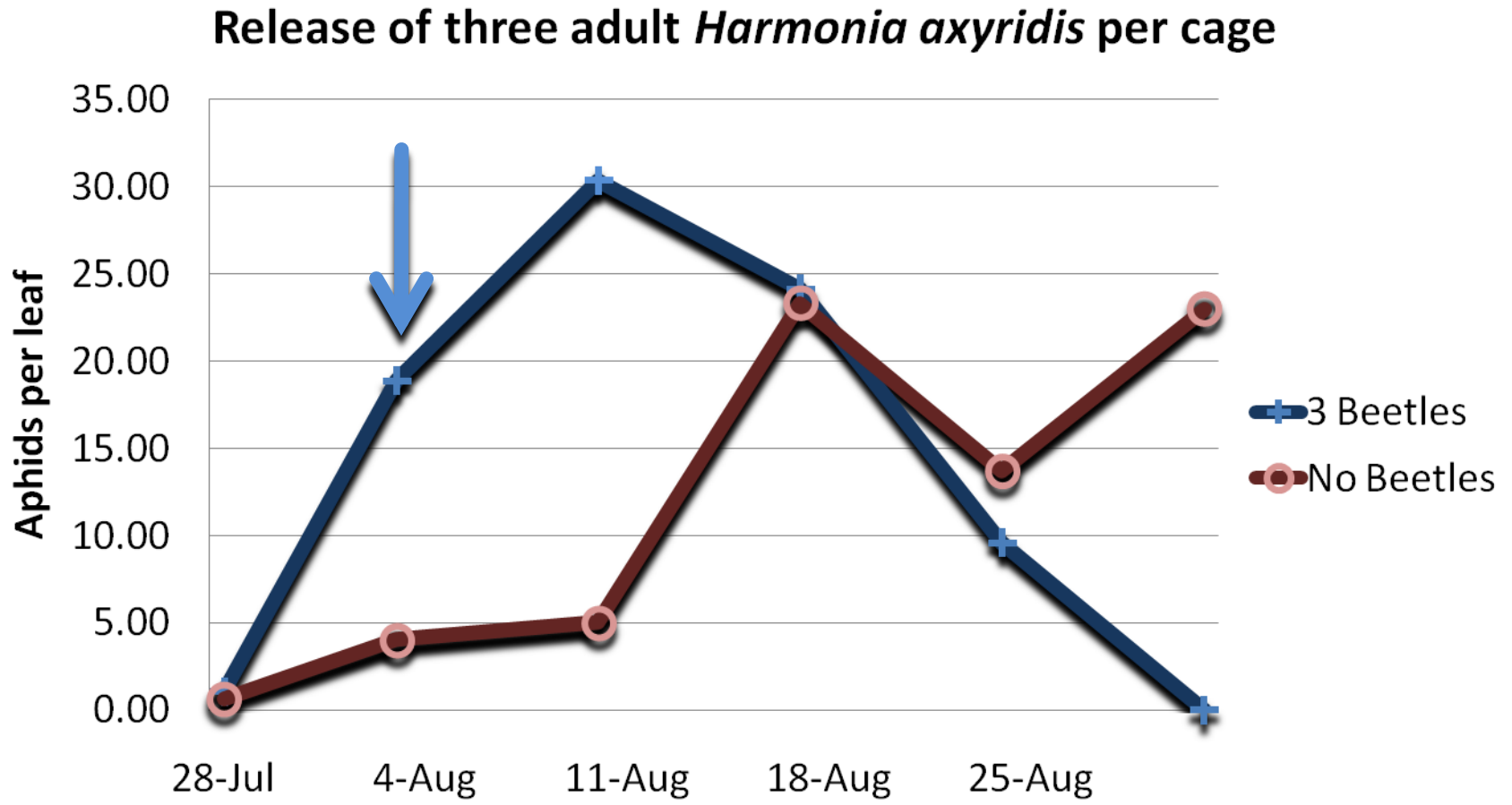
Multicolored Asian Ladybeetle Research for 2009

- The interactions between Multicolored Asian ladybeetles and aphids were observed in sleeve cages on large Kiowa and Moreland pecan trees in Tift Co. Aphid colonies were started as single species populations and as mixed populations of three species and beetles were introduced after 12-18 days of population growth. Cages were monitored every 3-5 days for aphid abundance in cages with beetles and cages without beetles

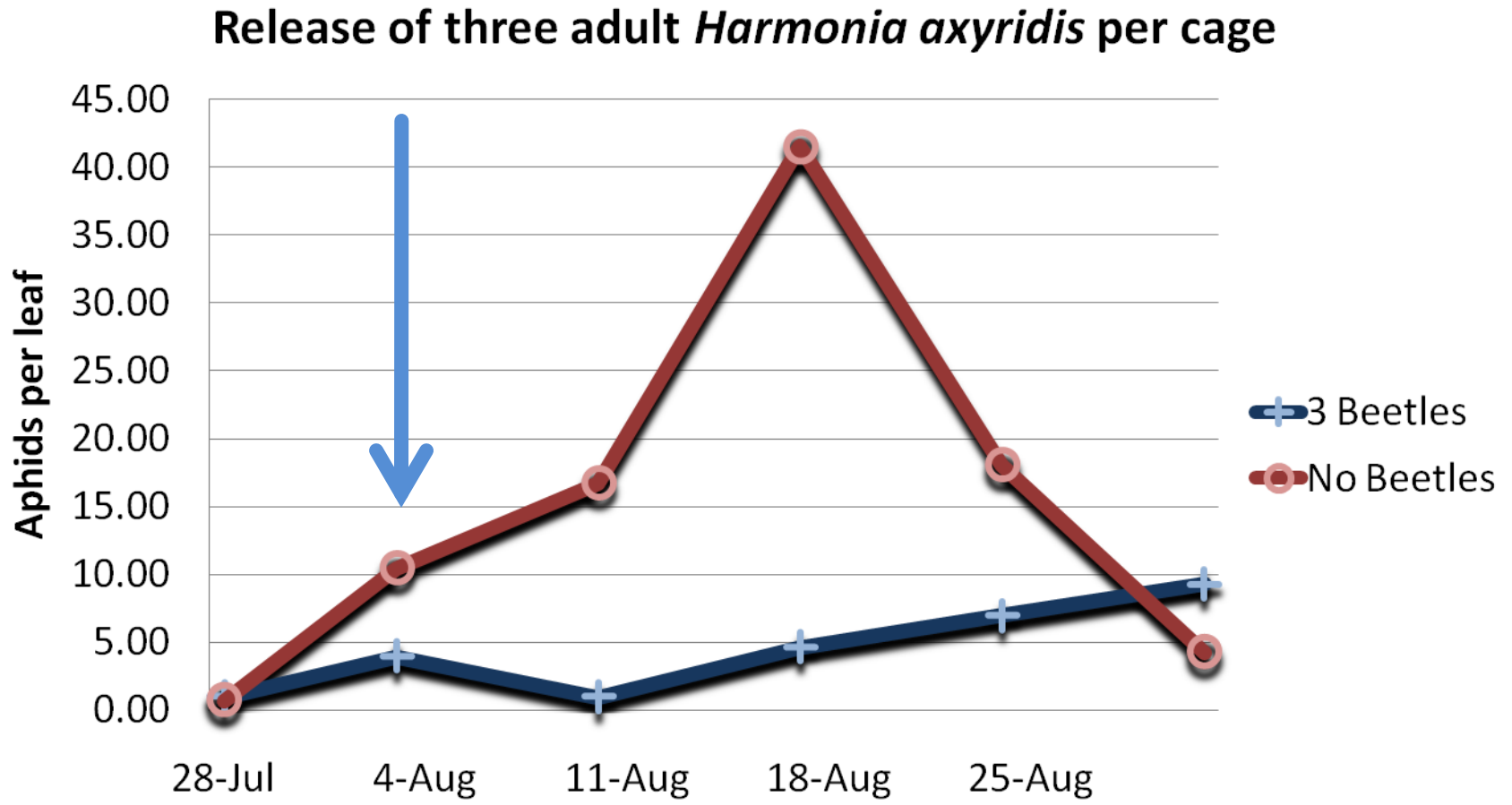
Sleeve Cages



Blackmargined Aphid



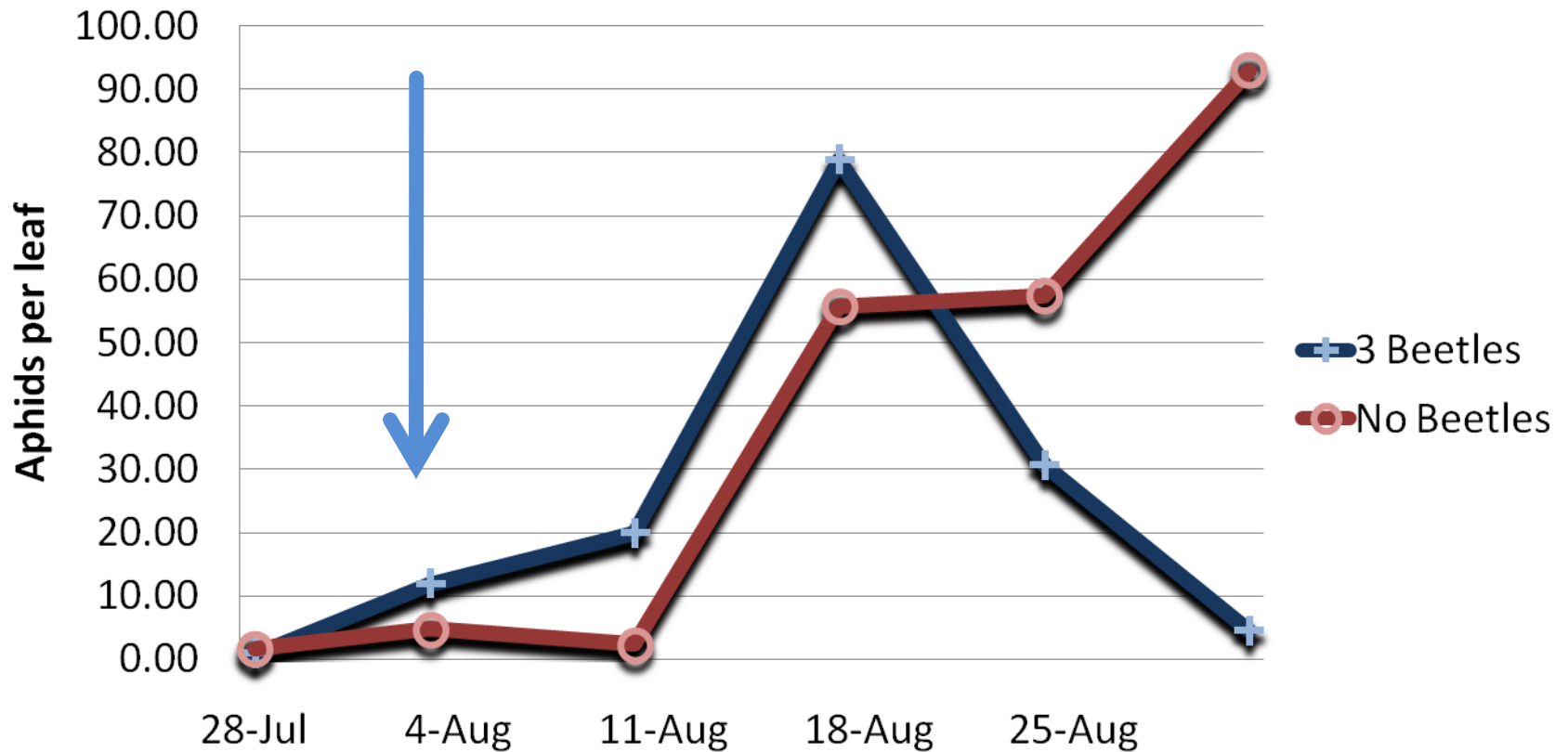
Yellow Pecan Aphid



Date of release of *H. axyridis* adult in the cages was 4-Aug

Black Pecan Aphid

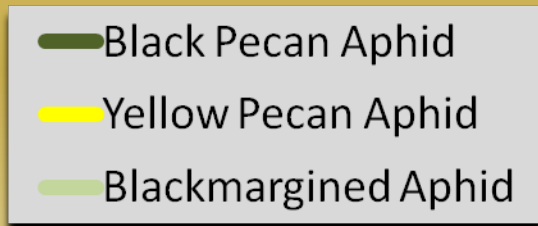
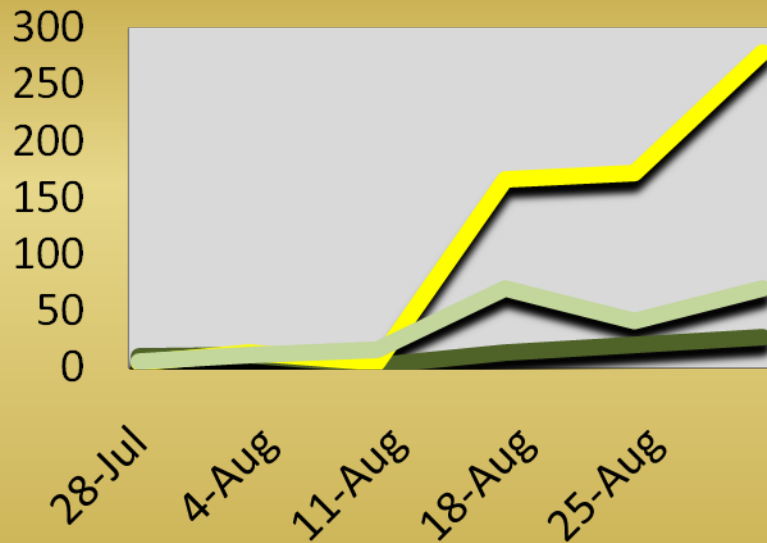
Release of three adult *Harmonia axyridis* per cage



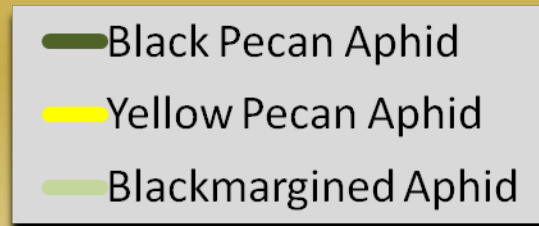
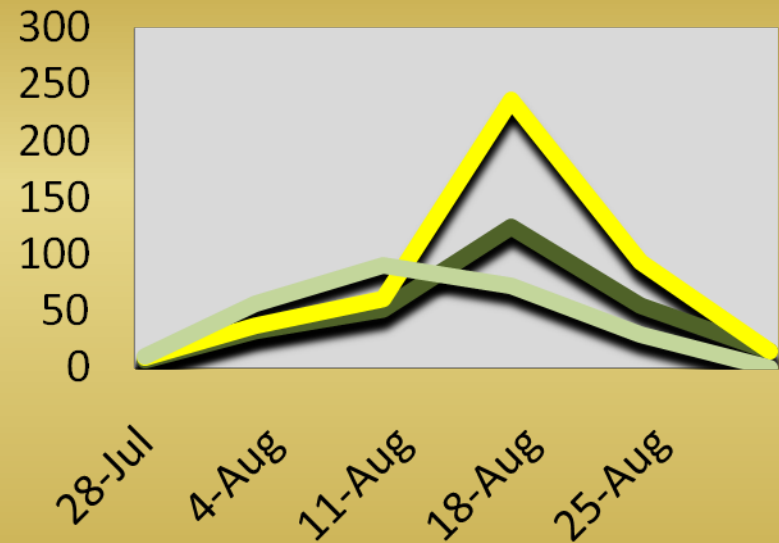
Date of release of *H. axyridis* adult in the cages was 4-Aug

Mixed Aphid Populations with and without *Harmonia axyridis* in cage - Kiowa

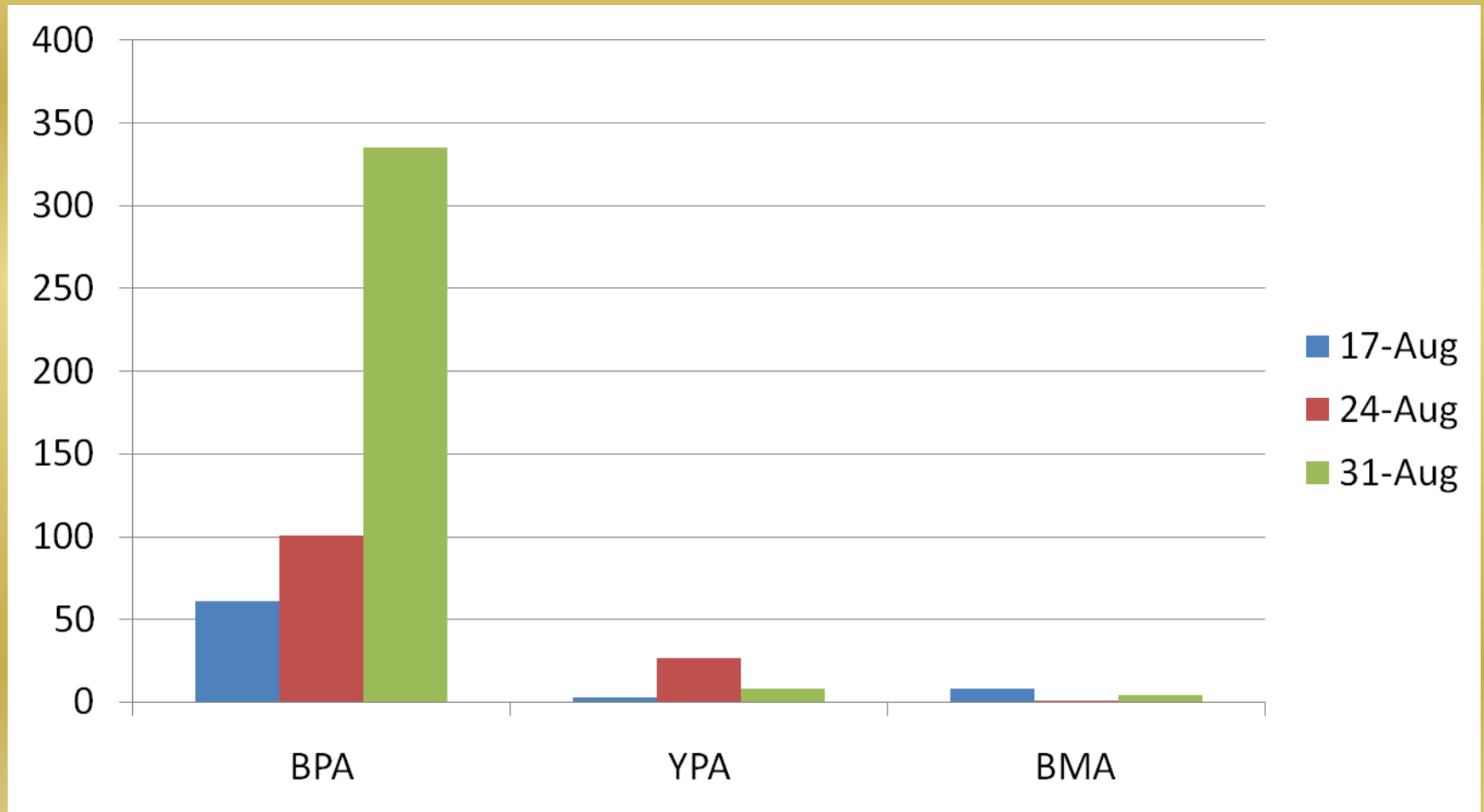
No Beetles



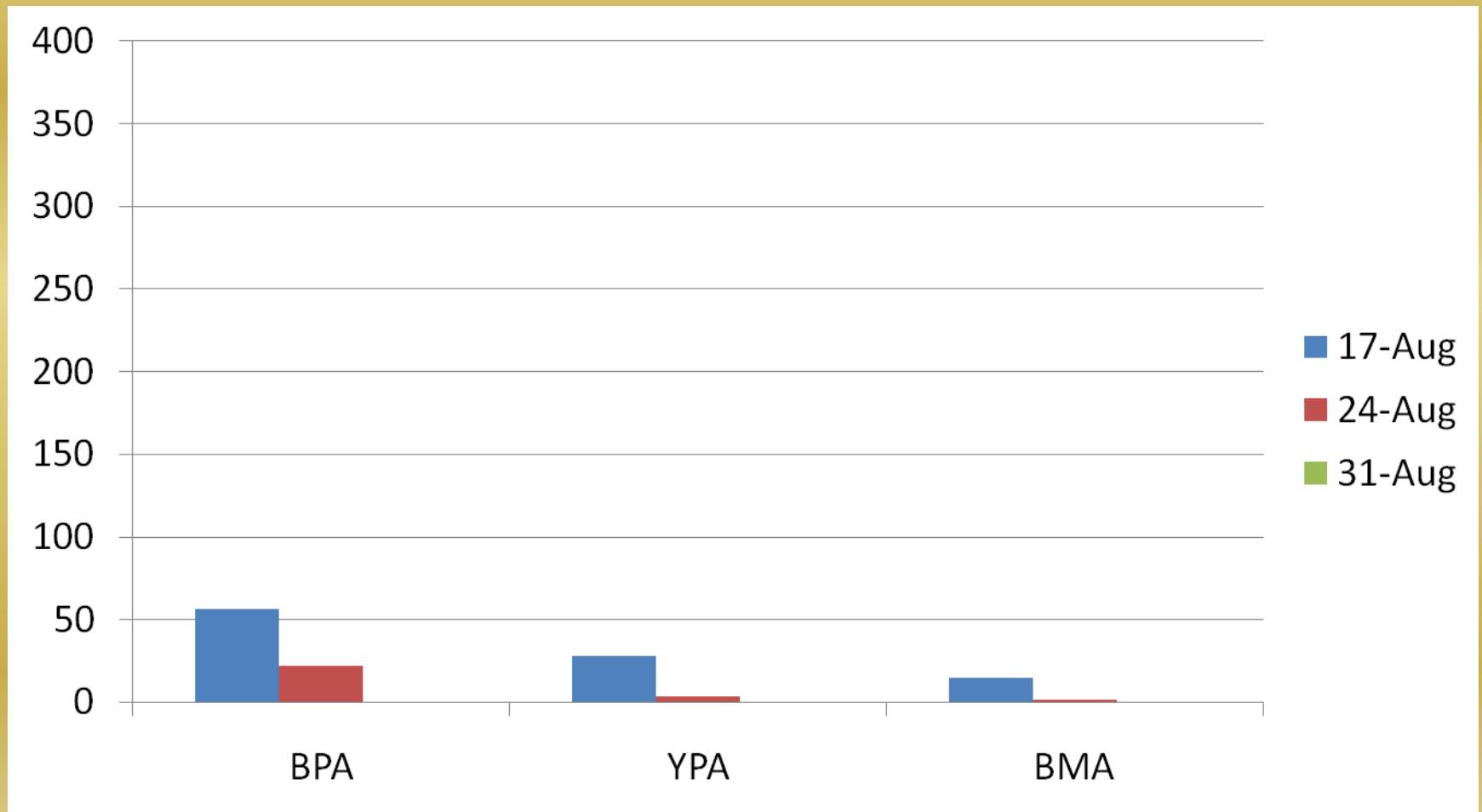
3 Beetles



Treatment – No Beetle



Treatment – 1 Beetle/cage



Ladybeetles on Tuliptree



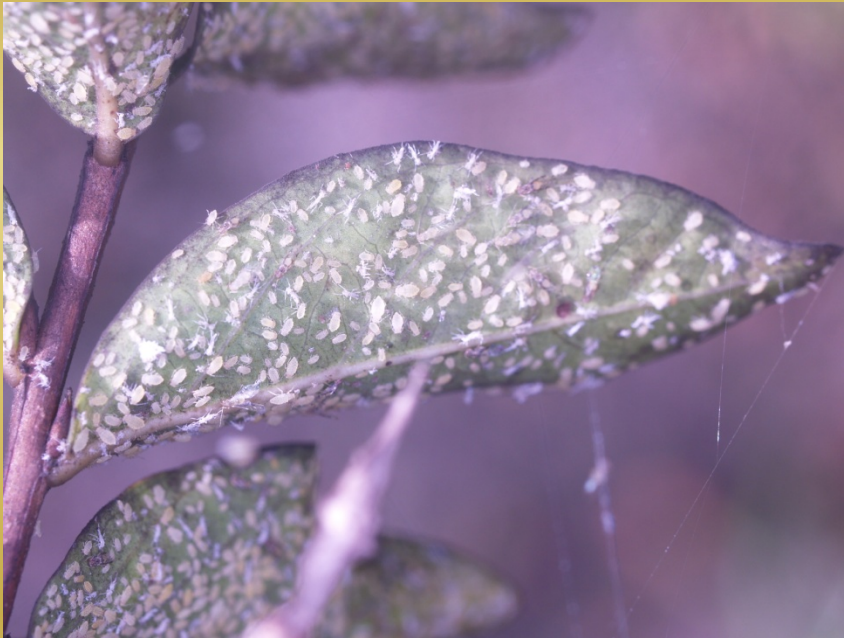
Ladybeetles on Birch



Ladybeetles on Muscadine Grape



Ladybeetles on Crape Myrtle



Ladybeetle on “Desirable” Pecan



Multicolored Asian Ladybeetle



Adult convergent ladybeetles on annual plants

Sesbania

Buckwheat



Interaction with Ants



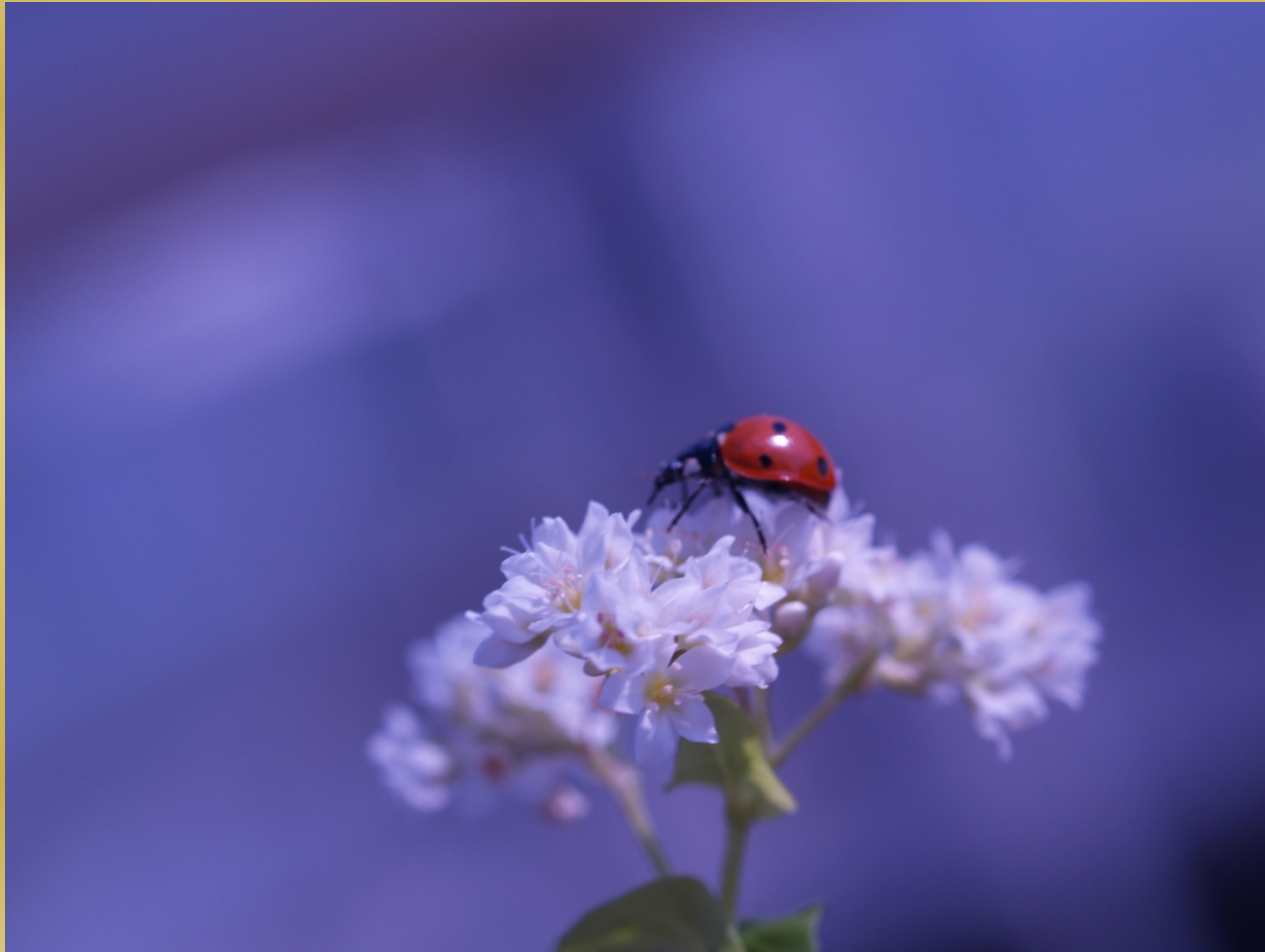
Sesbania



Ladybeetle eggs undisturbed by ants



Convergent ladybeetle on buckwheat

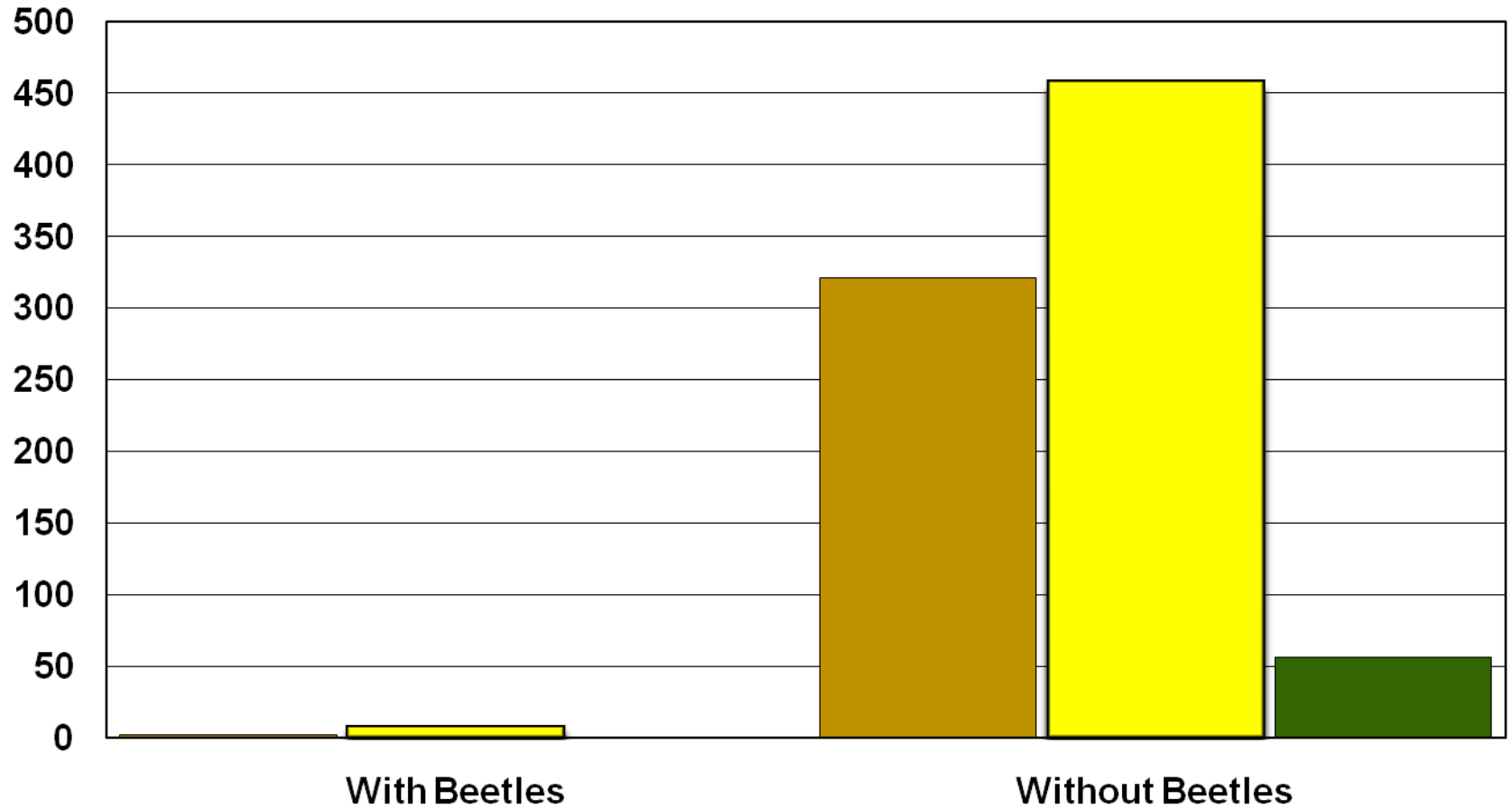


Ants interfere with ladybeetles on buckwheat



Aphid Abundance in Sleeve Cages 2 weeks After Convergent Ladybeetle Release

Aphids/leaf



■ Blackmargined Aphids

■ Yellow Pecan Aphids

■ Black Pecan Aphids

Bringing in Convergent Ladybeetles



Mass release of Convergent Ladybeetles

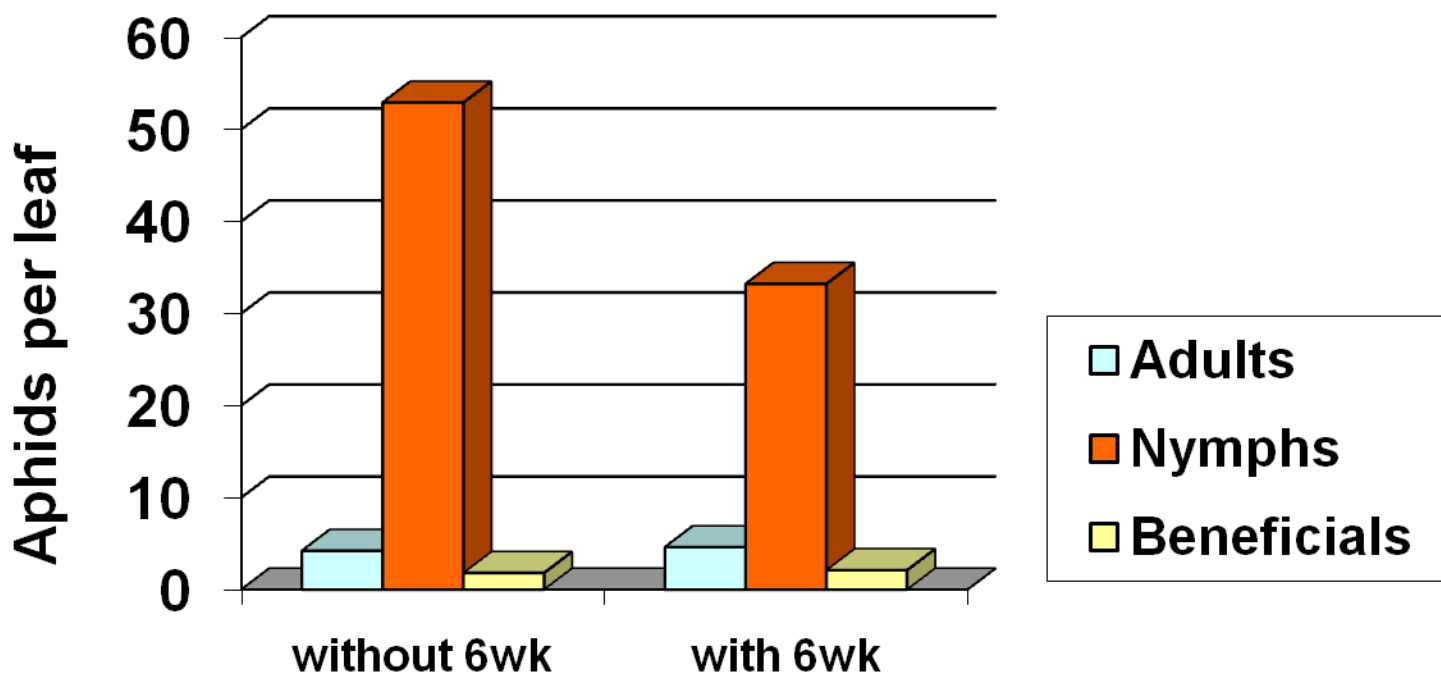
Labeling



Release



Peak blackmargined aphid abundance on pecan leaves in 100 tree orchard blocks with and without ladybeetles 6 weeks after release on May 17



Summary and Conclusions

- Obj. 1: The new insecticides controlled yellow aphids and suppressed the black pecan aphid populations. The standard Movento spray treatment was the best control.
- Obj. 2: Lager-1, Amling and Gafford and Curtis had very low aphid populations during the entire season whereas, Alley, Stuart and Schley at the same site high significantly higher populations.
- Obj. 3: - *Harmonia axyridis* directly reduces yellow pecan aphid populations and latently reduces blackmargined and black pecan aphid populations in single species cultures. In mixed cultures all three aphid species are eventually are controlled by the beetles but at different rates. Convergent ladybeetle looked great in the cages and mediocre in the field.

2009 Root Borer Research - *Prionus* root borer pheromone discovered at UC-Davis and field trials at UGA, UA, UI, NMSU, USU and UEA

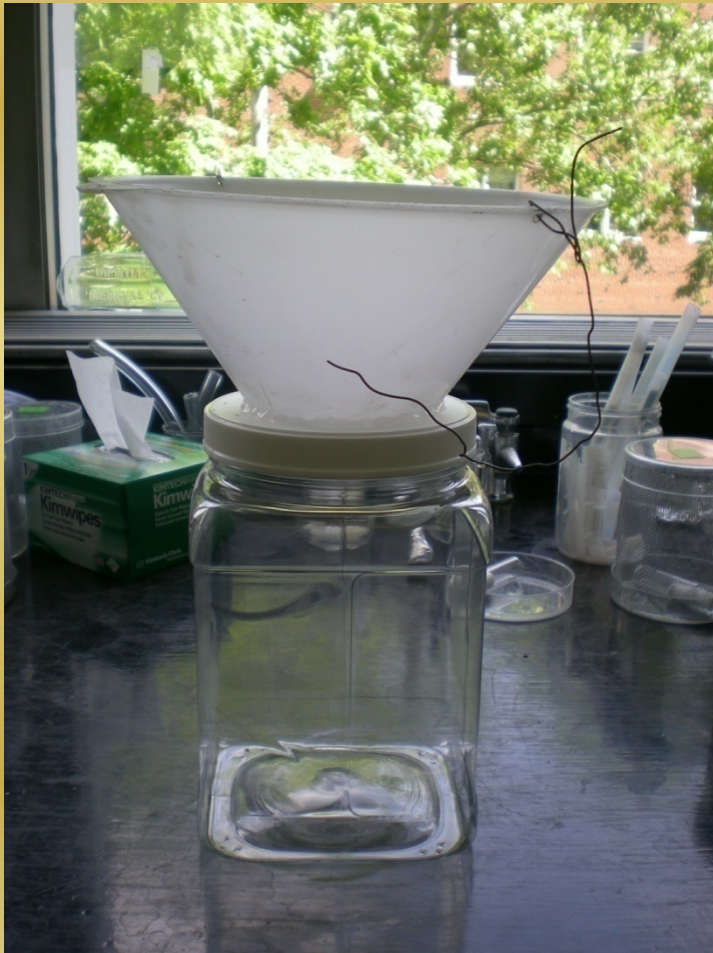


Photo Courtesy Shawn Steffan
Utah State University Extension

Prionus catch at Tifton and Cordele

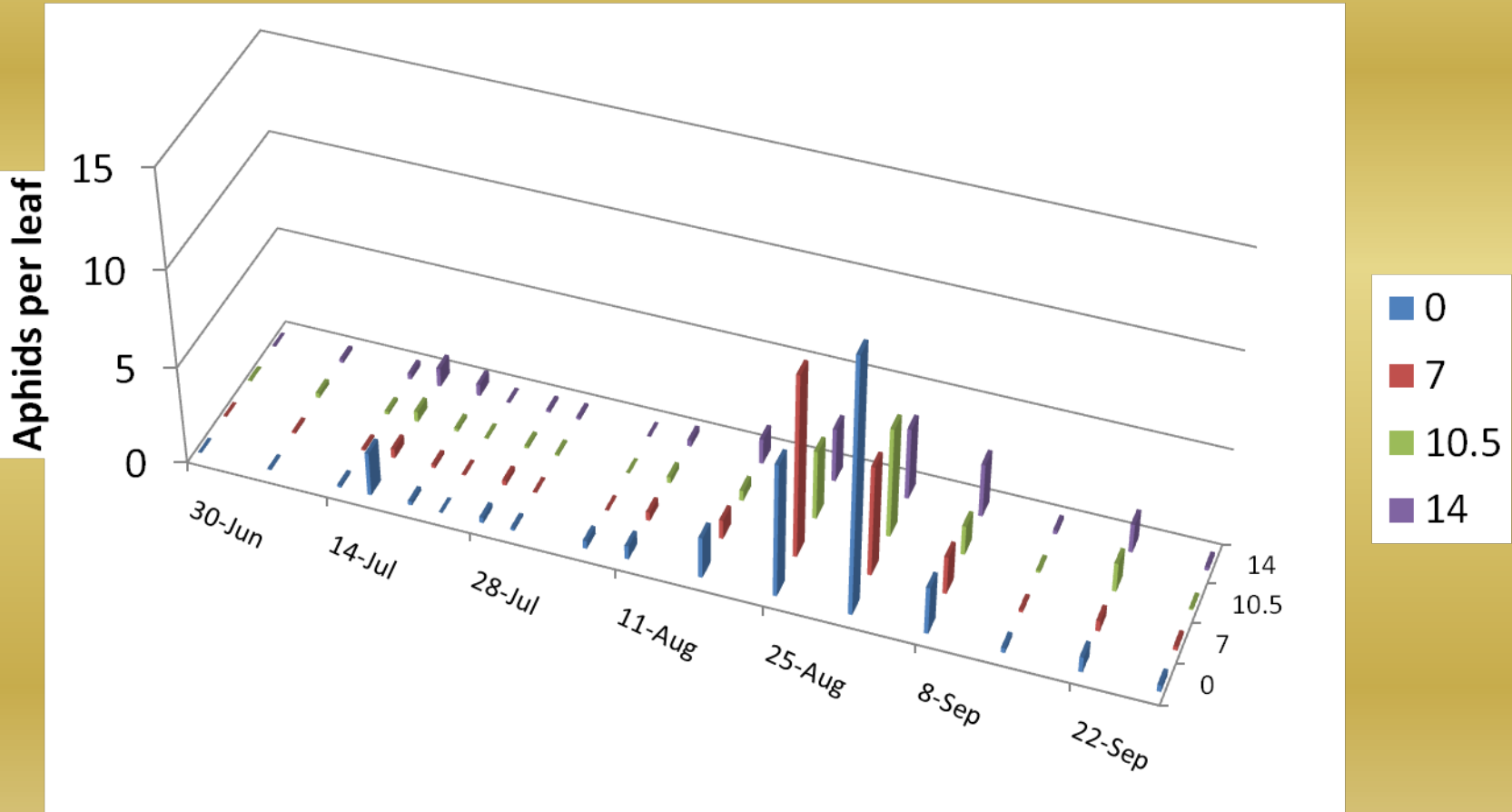


Location in North America or Europe		<i>Prionus</i> spp.	No. captured in pheromone/ control traps
North America	Arizona	<i>linsleyi</i>	1/0
	California	<i>californicus</i>	128/0
		<i>lecontei</i>	12/0
	Georgia	<i>imbricornis</i>	140/0
		<i>laticollis</i>	115/0
	Idaho	<i>californicus</i>	803/6-
		<i>integer</i>	2/0
	Utah	<i>californicus</i>	236/26
		nov. sp.	3/0
	N. Mexico	<i>aztecus</i>	26/3
United Kingdom	East Anglia	<i>coriarius</i>	11/0

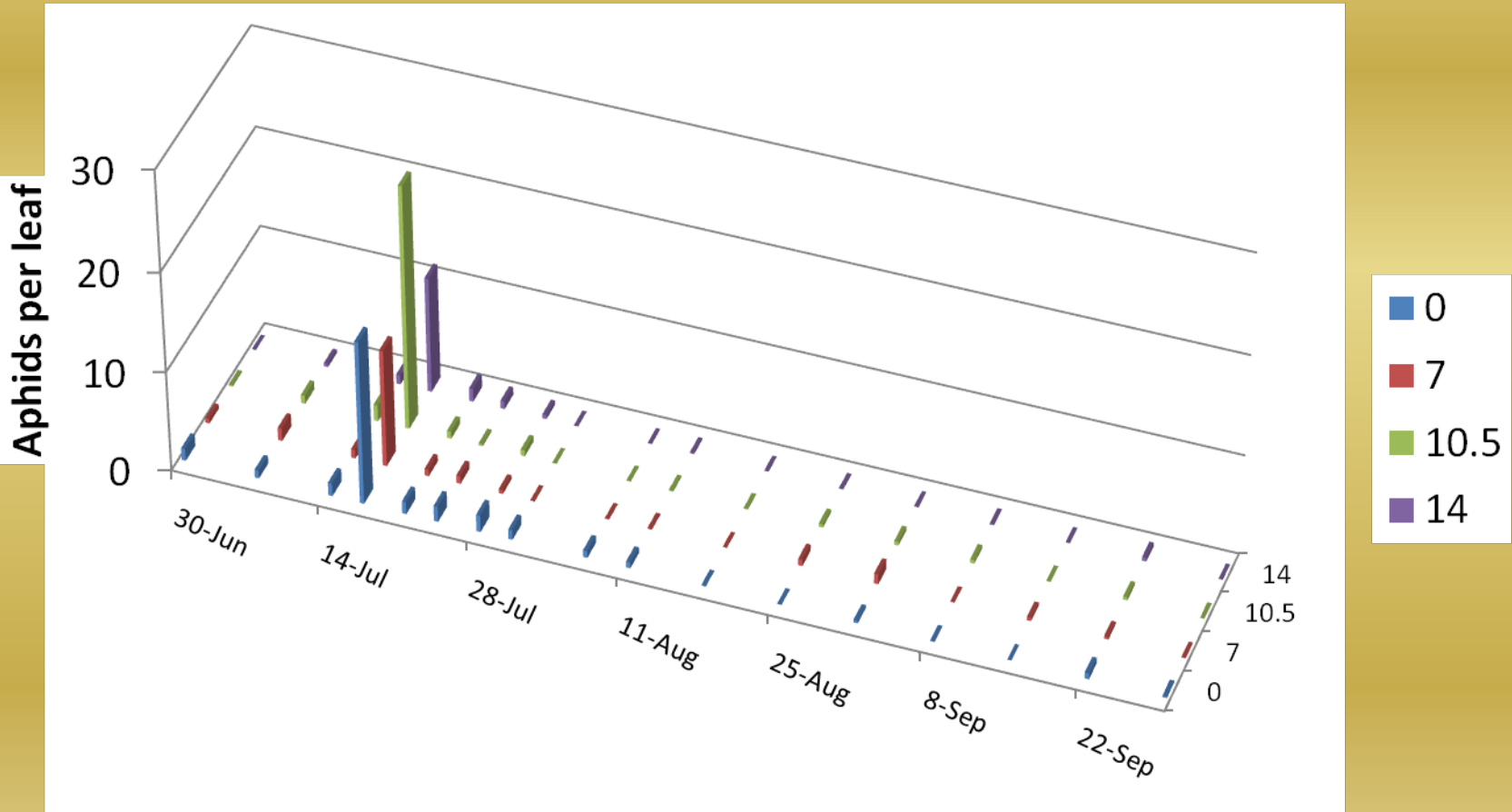
2010 Trials with pheromones plus attractants in above ground traps



Black Pecan Aphids per leaf in Admire Pro treated and nontreated pecan trees - 2009



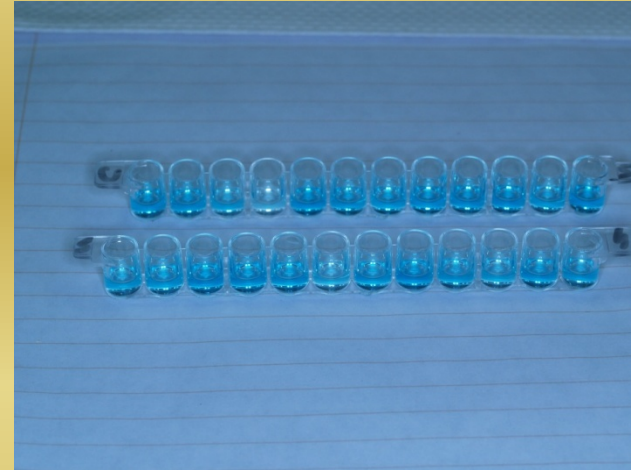
Yellow Aphids per leaf in Admire Pro treated and nontreated pecan trees - 2009



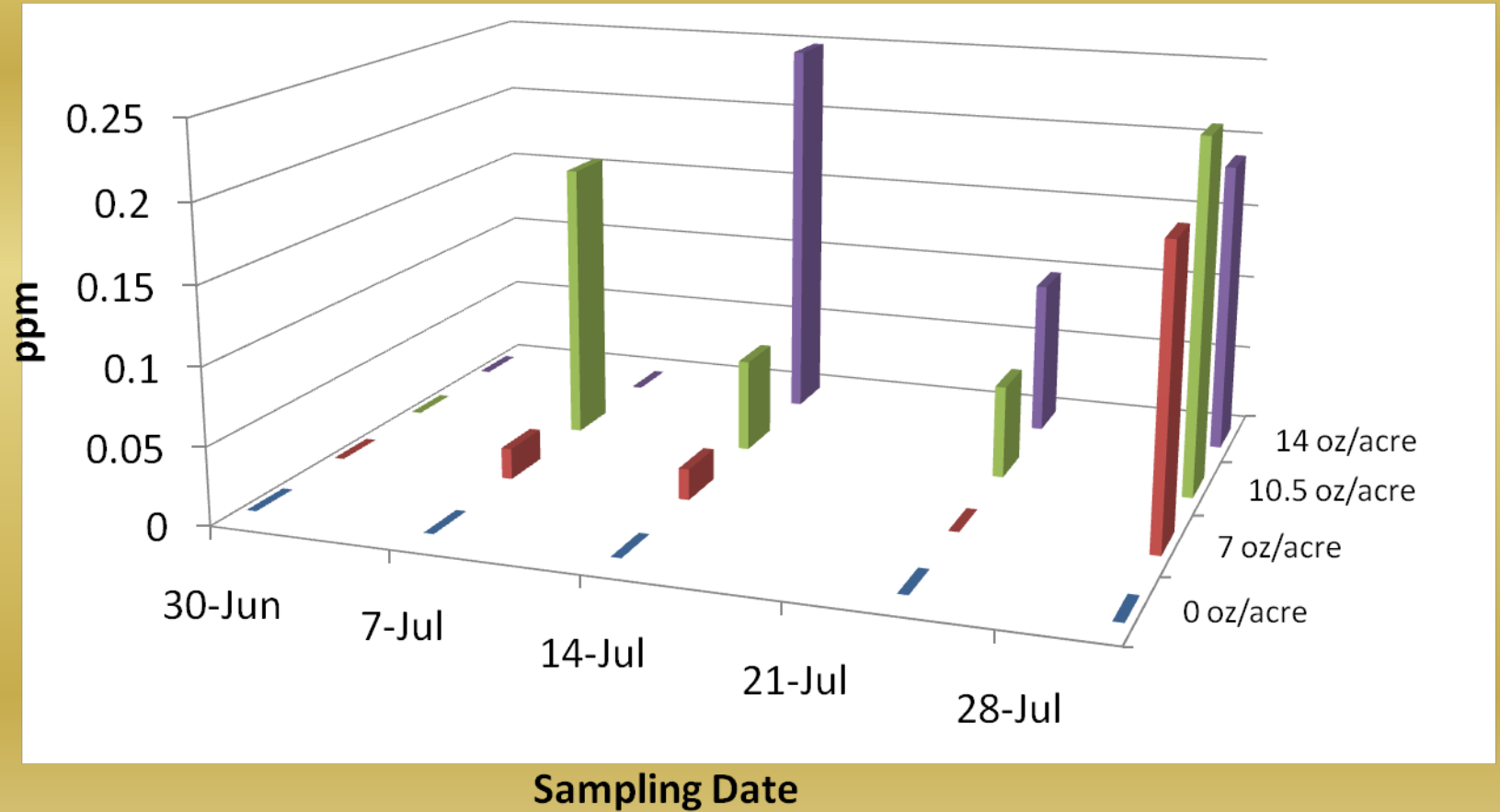
Admire Trial 2009

The test is a Enzyme-Linked ImmunoSorbent Assay where:

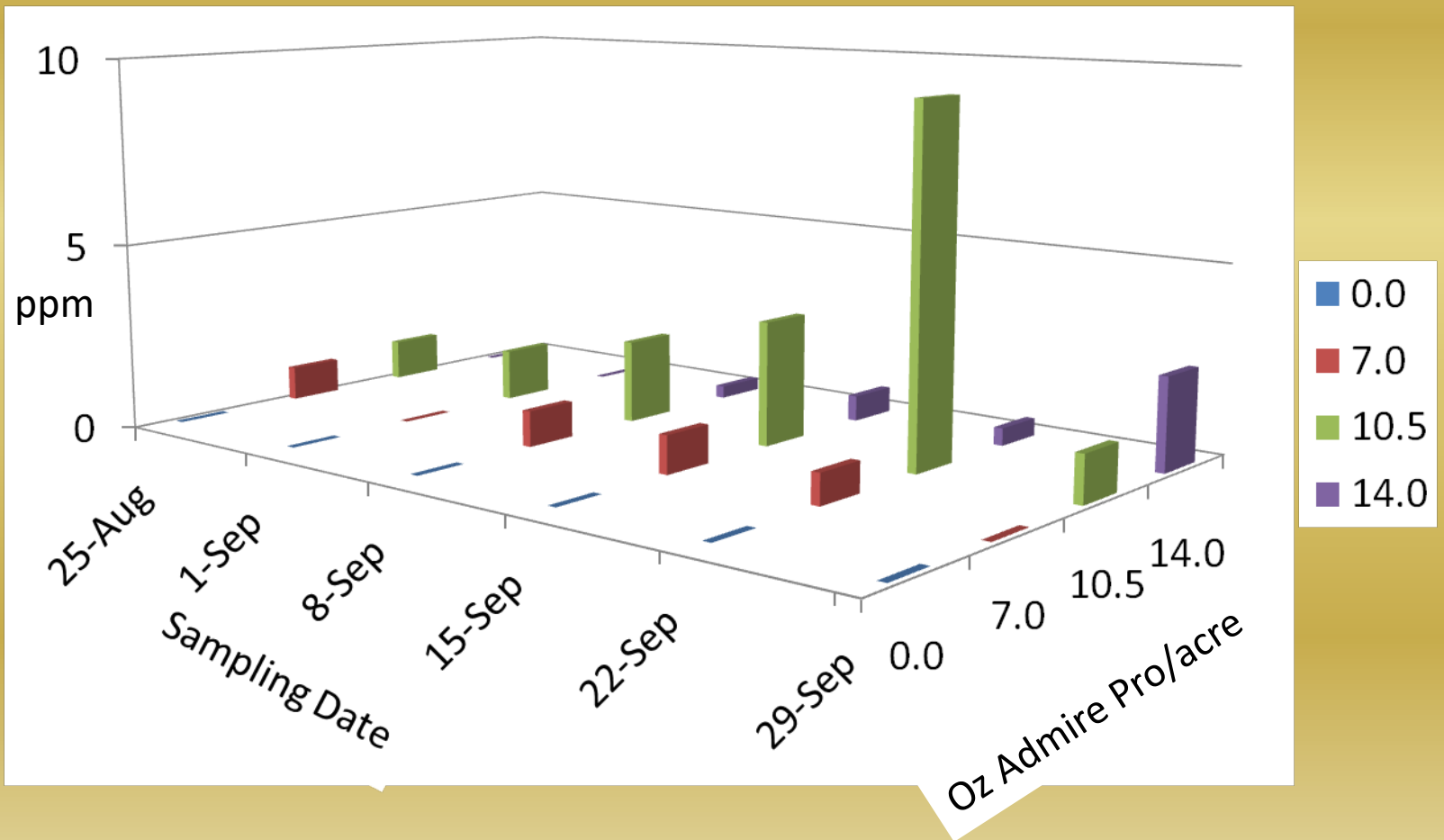
- Pesticide residue in the leaf is extracted with methanol
- The actual pesticide molecules compete with enzyme labeled pesticide molecules for a limited number of antibody binding sites on the inside surface of the test wells.
- The reaction is stopped after one hours and the outcome of the competition is visualized with a color development reaction.
 - Darker Color = Lower Concentration
 - Lighter Color = Higher Concentration



Concentration of Imidacloprid (ppm) in Pecan Leaves Following EA Treatment with Admire Pro on July 1, 2009



Concentration (ppm) of imidacloprid in pecan leaves -2009



Admire Trial 2009

Population Peaks of Pecan Aphids in Pecan Trees Treated with Emitter Adjacent Imidacloprid

