Insecticide Efficacy for Pecan Aphids

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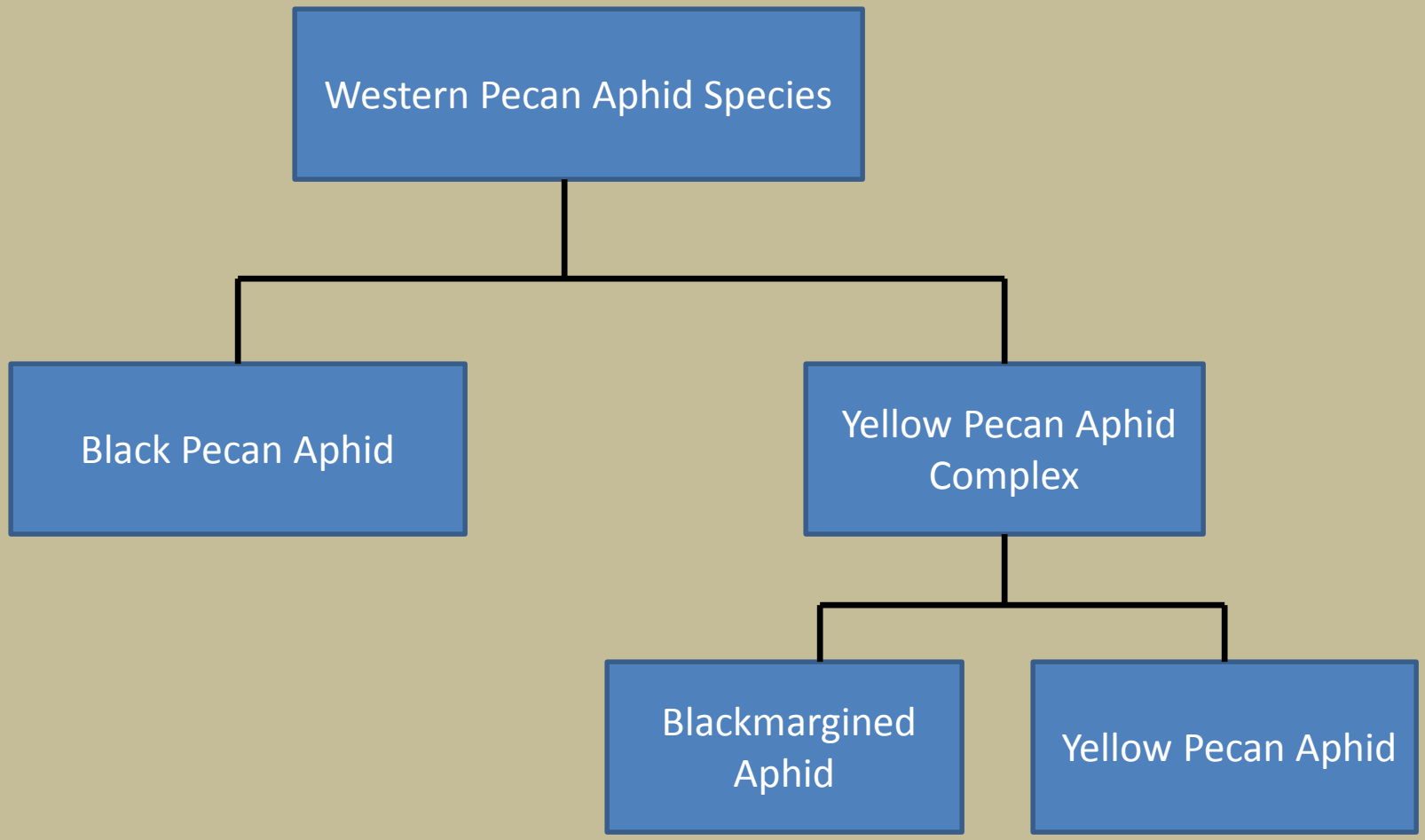
Western Pecan Aphids



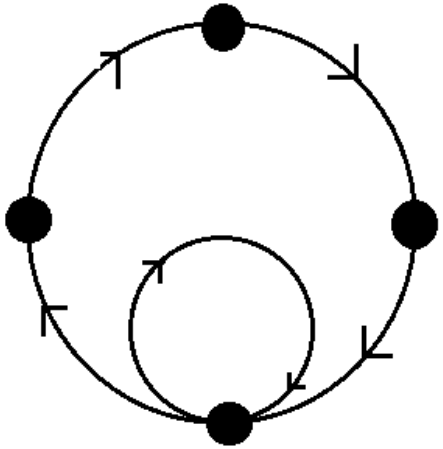
Aphid Lifecycle

Eggs

Over-winter in tree bark

Winged Adults

Male and female
Sexual reproduction
Lay eggs in late Fall



Nymphs

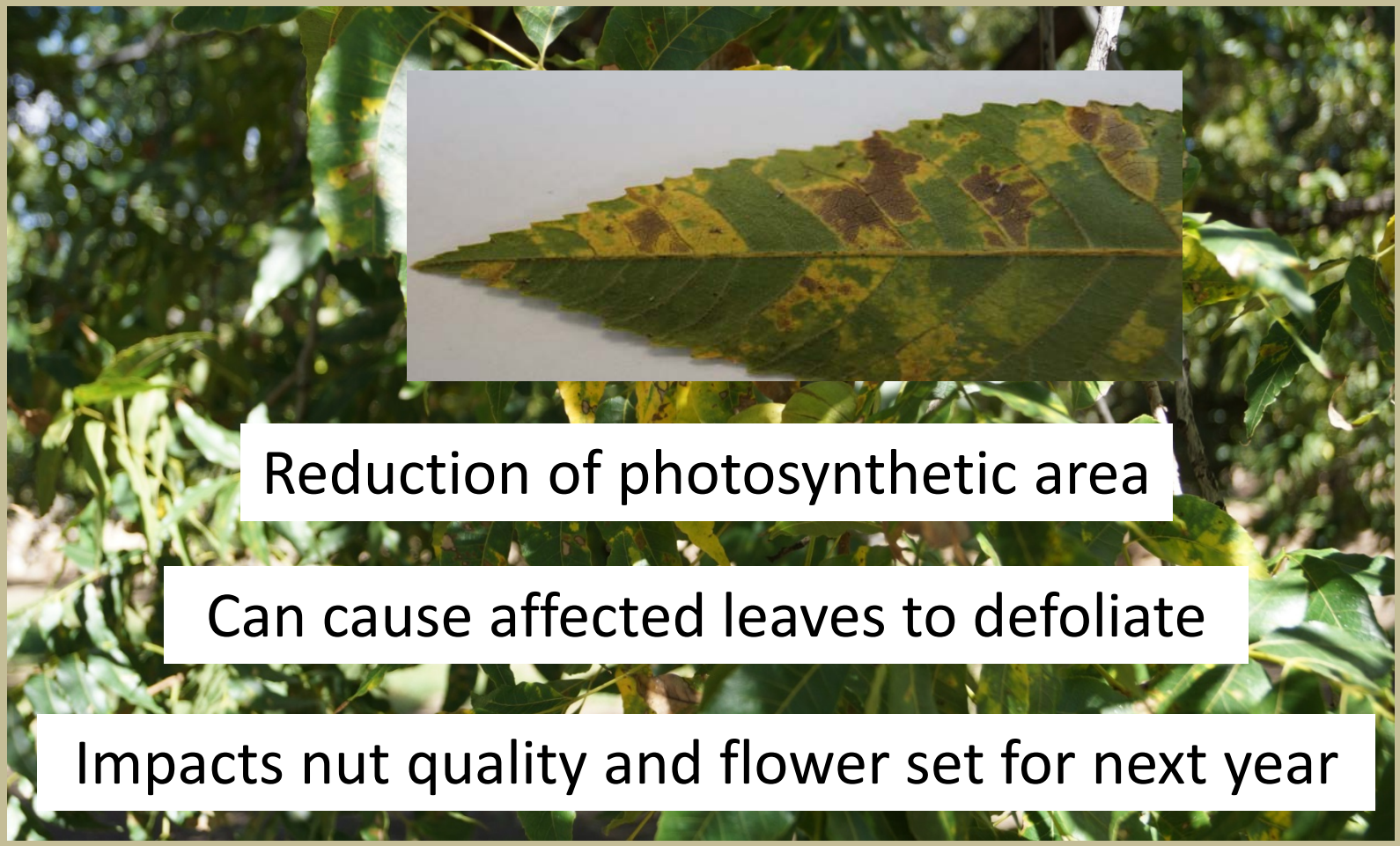
Emerge in Spring
Feed on leaves
4 instars

Stem Mothers

Wingless adult
Clones
Produces winged adults in Fall

10-14 Day Egg => Egg
100+ Nymphs

Black Pecan Aphids



Reduction of photosynthetic area

Can cause affected leaves to defoliate

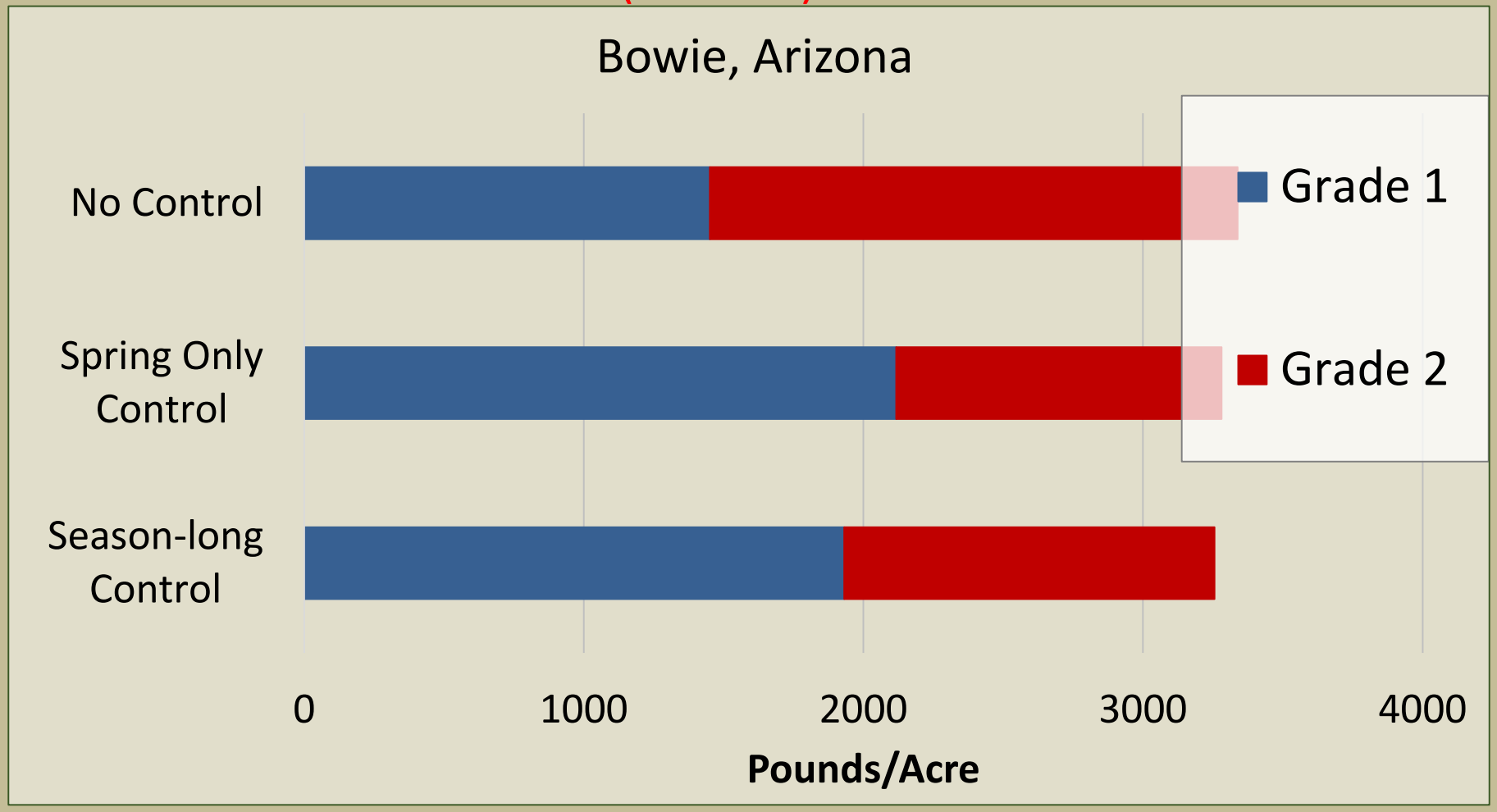
Impacts nut quality and flower set for next year

Blackmargined Aphid Biology

- Fecundity
  - Average 18 reproductive days
  - Average 125 nymphs/adult
- Abundant Predators
- Inefficient feeder
  - 400% more honeydew
- Crop Damage
  - Large amount of phloem lost (sink)

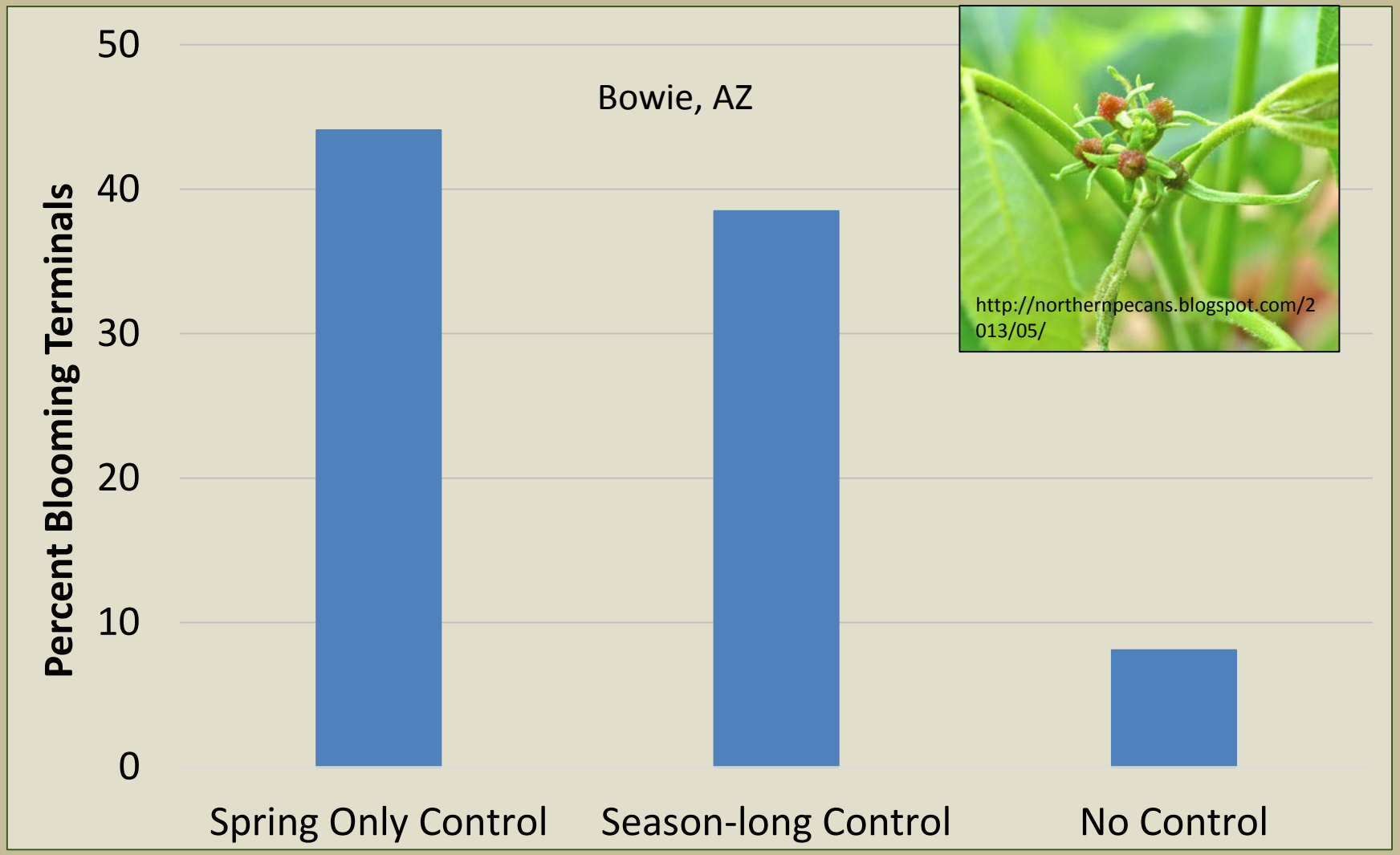
Impact of Blackmargined Aphid on In-Shell Pecan Yield (Whiteaker, 2001)

(On Year)



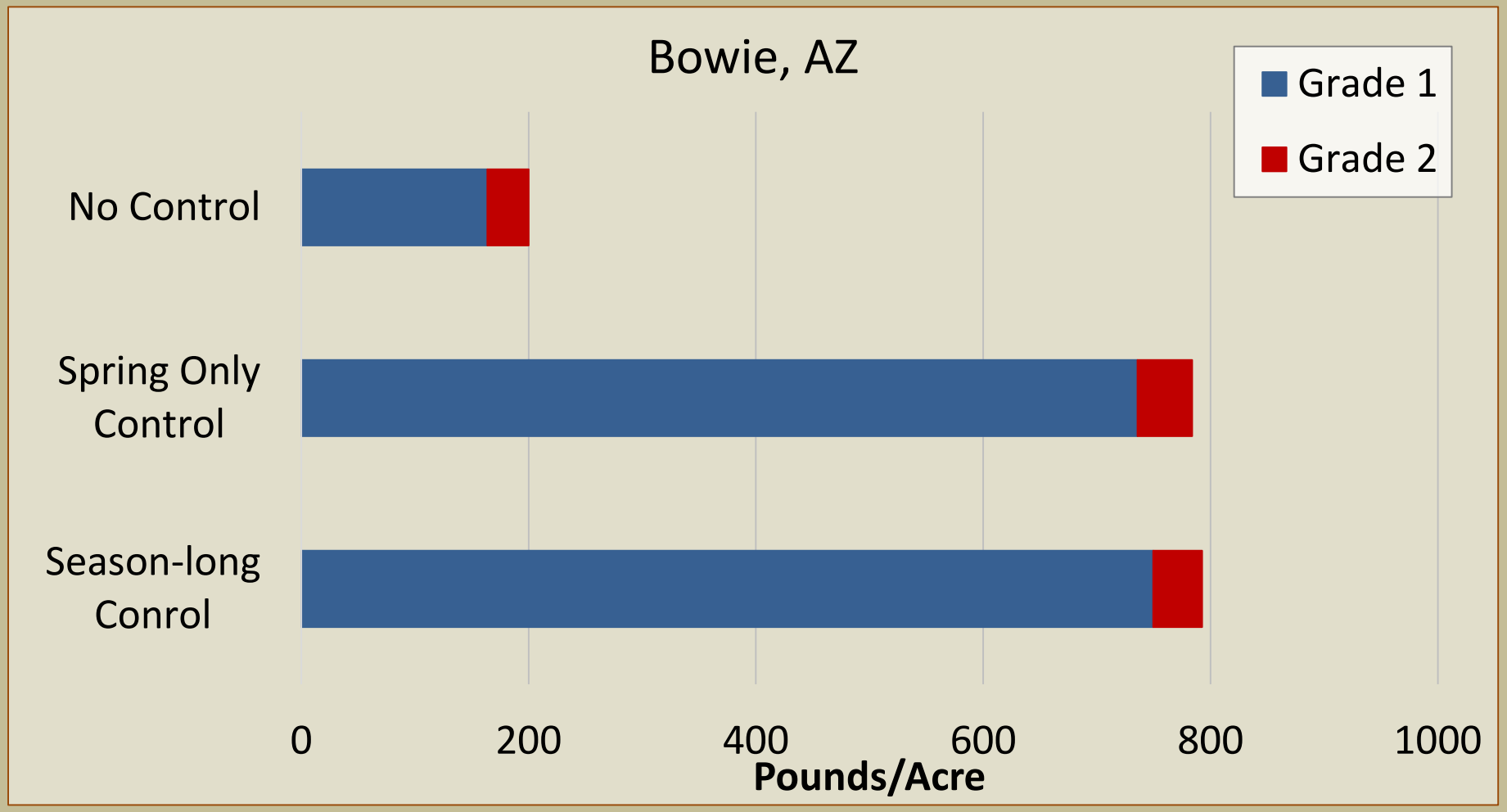
Percent Flowering-Terminals Following Specific Aphid Treatments the Previous Year (Whiteaker, 2001).

(Off Year)



In-Shell Pecan Yields Following Specific Aphid Treatments the Previous Year (Whiteaker, 2001)

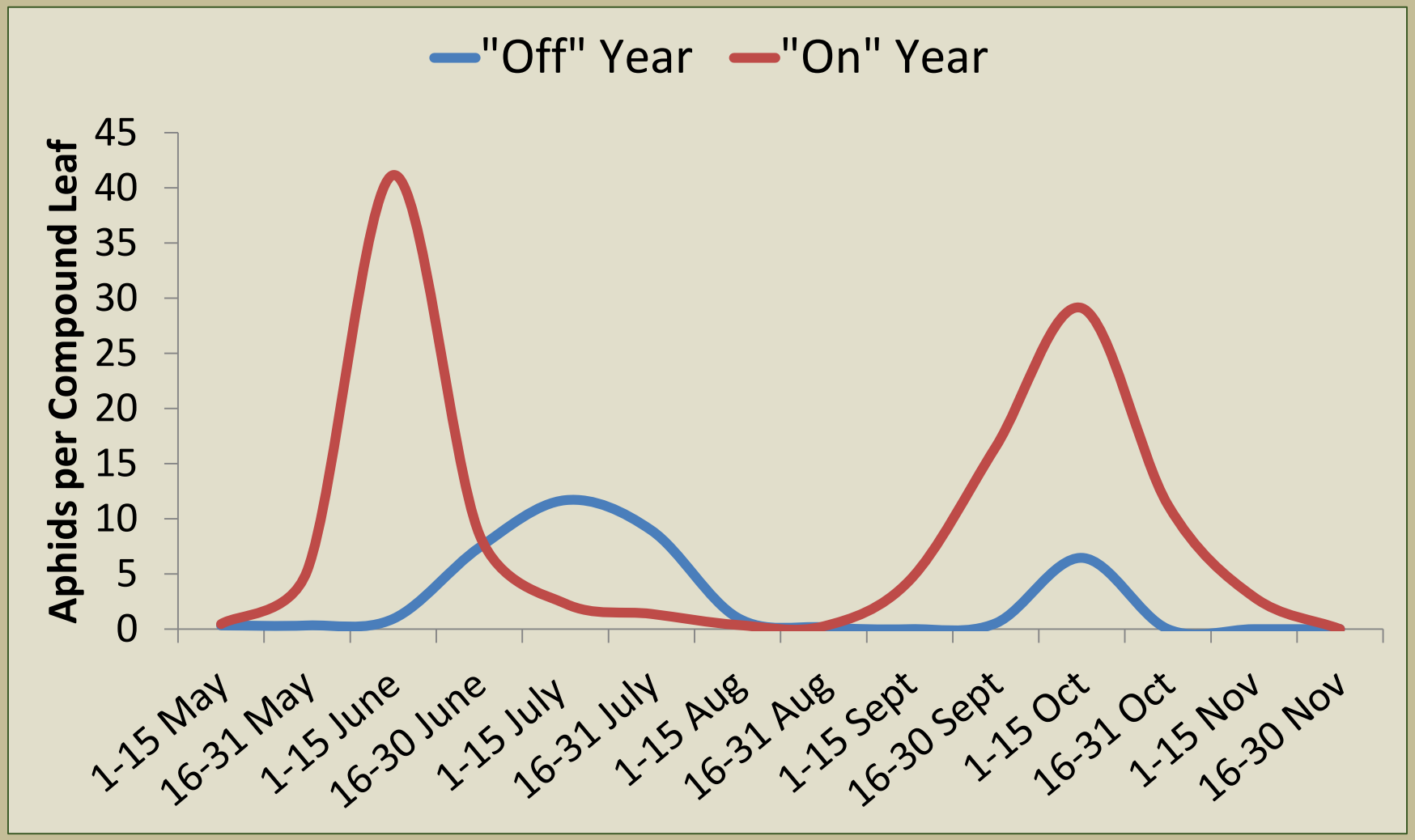
(Off-Year)



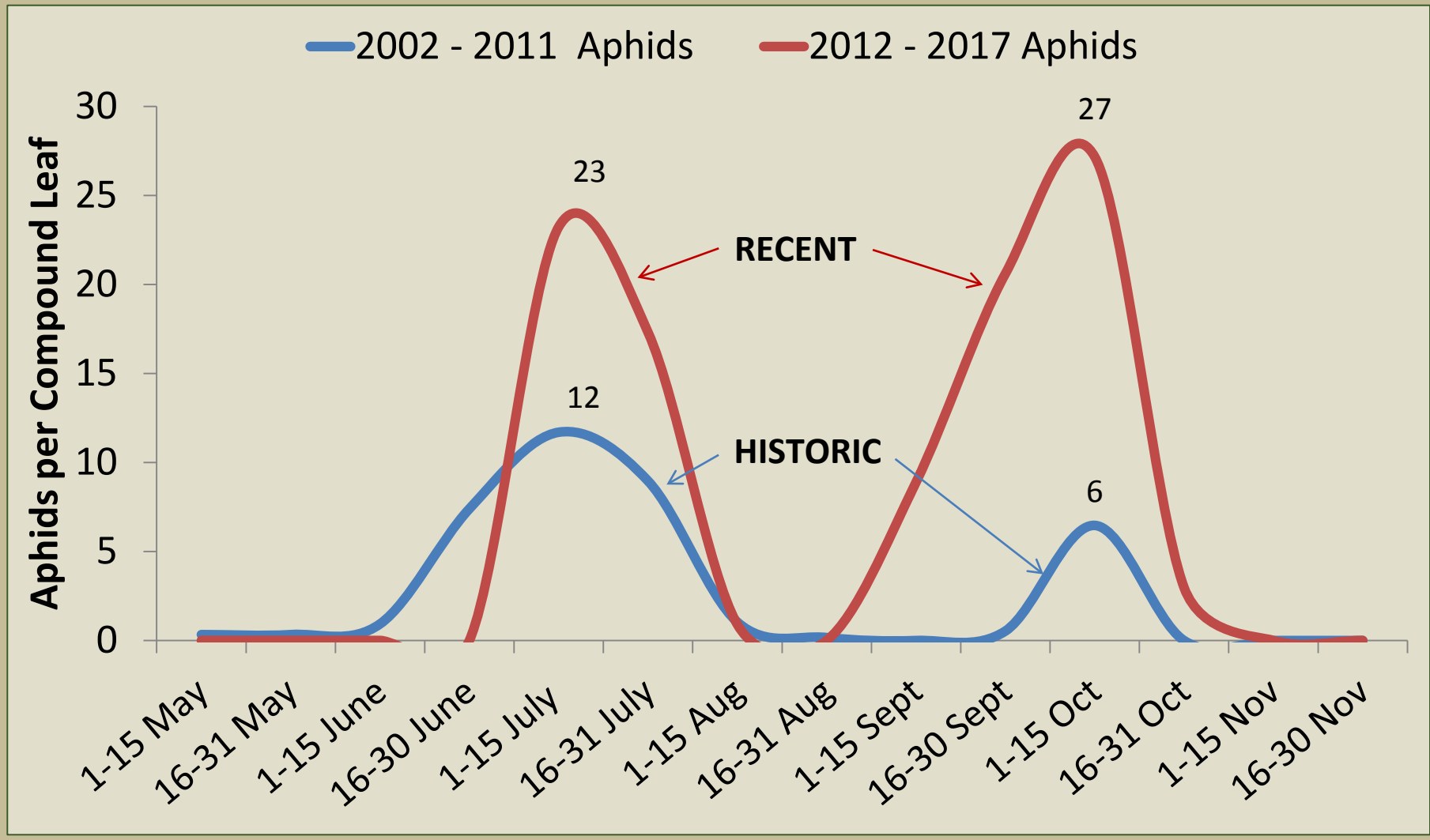
Blackmargined Aphid Damage
(Summary)

- Decrease in nut quality during an On-Year
  - Increase likelihood of #2 nut meats
- Significant reduction in blooming terminals and yield in the next growing season

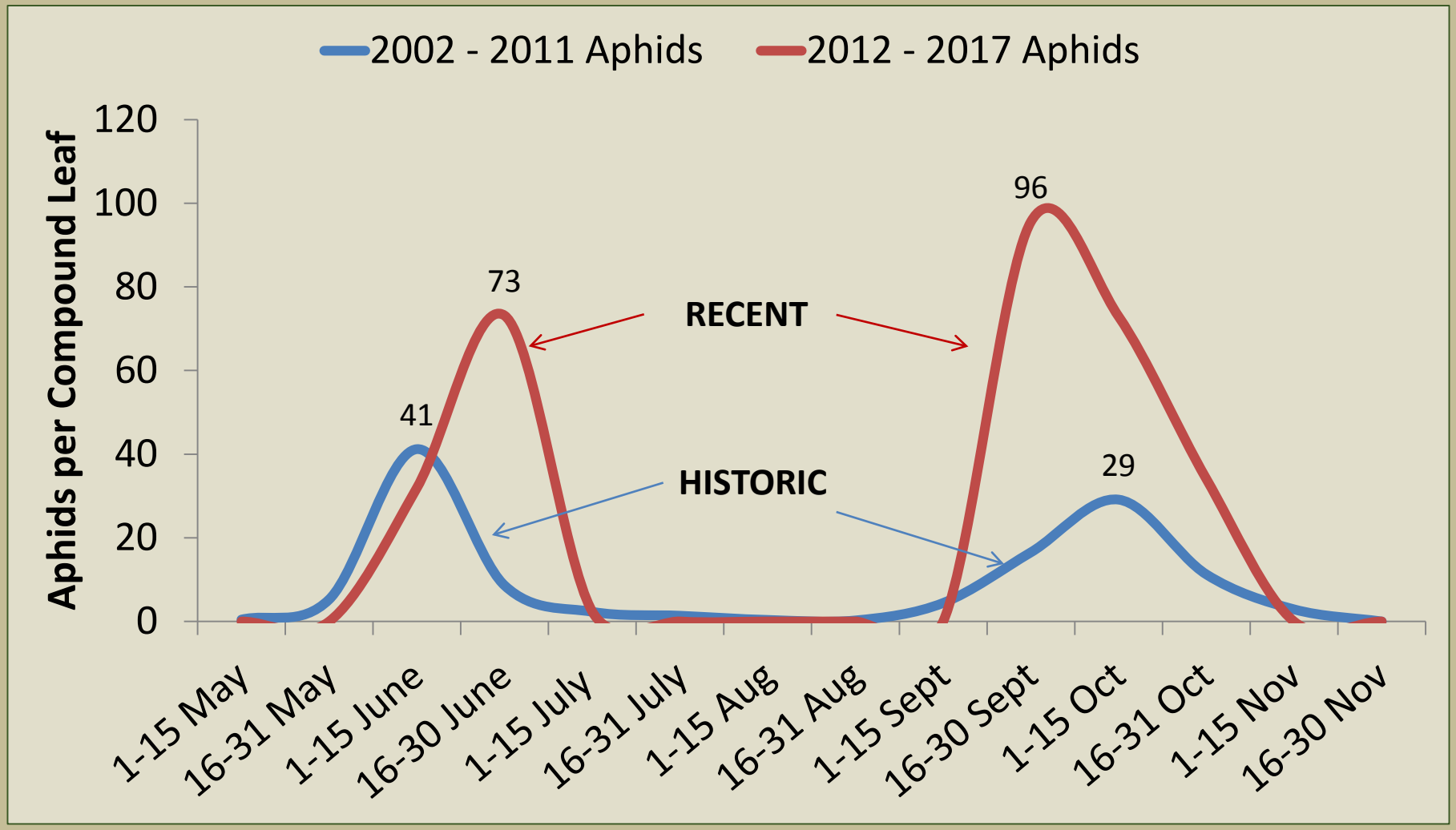
Historic Blackmargined Aphid Population Dynamics (2002 – 2011)



Changes in Blackmargined Aphid Population Dynamics (Off Years)



Changes in Blackmargined Aphid Population Dynamics (On Years)



Trends in Aphid Populations

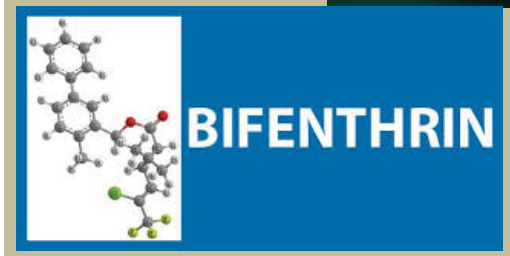
- Higher densities
- Populations are lasting longer

http://northernpecans.blogspot.com/2015/08/late-season-aphids.html

Dynamics of Insecticide Chemistries

- Over the decades, previous aphid insecticide classes have included primarily contact and several with contact plus translaminar activity

- Legacy products:
  - Zolone
  - Cygon
  - Pyrethroids
  - Metasystox-R
  - Malathion
  - Supricide



Legacy vs Current Generation Products

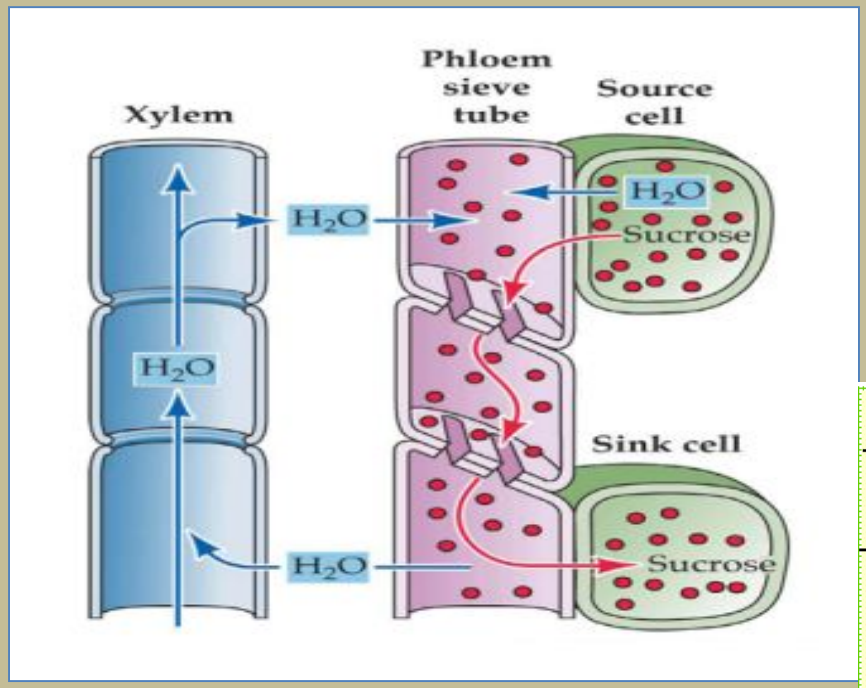
Legacy

- Primarily contact
- Little or no residual
- Some translaminar
- Broad-spectrum
- Effective on black pecan aphid or yellow pecan aphid complex, but not on both

Current Generation

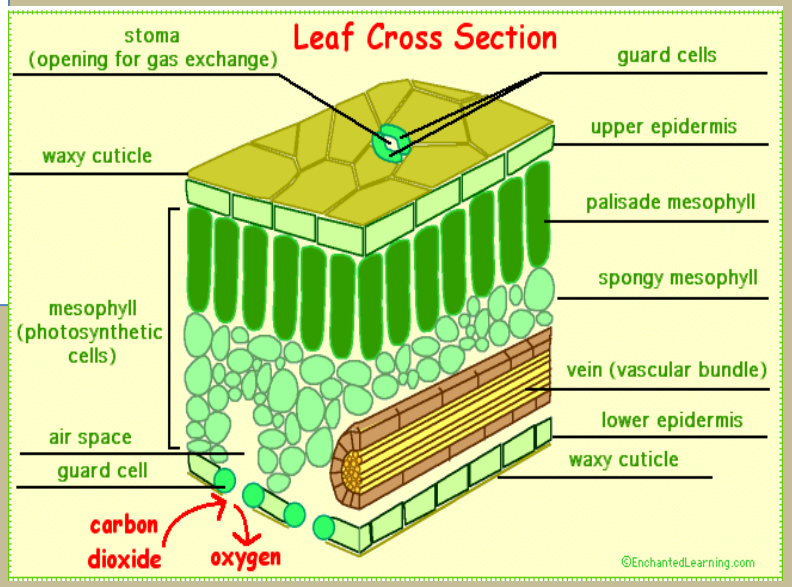
- Systemic – mobile in xylem, phloem or both
- Translaminar
- Narrower spectrum – largely preserves beneficial insects
- longer residual
- Effective on both black pecan aphid and the yellow pecan aphid complex

Systemic Mobility



Xylem and Phloem Mobility

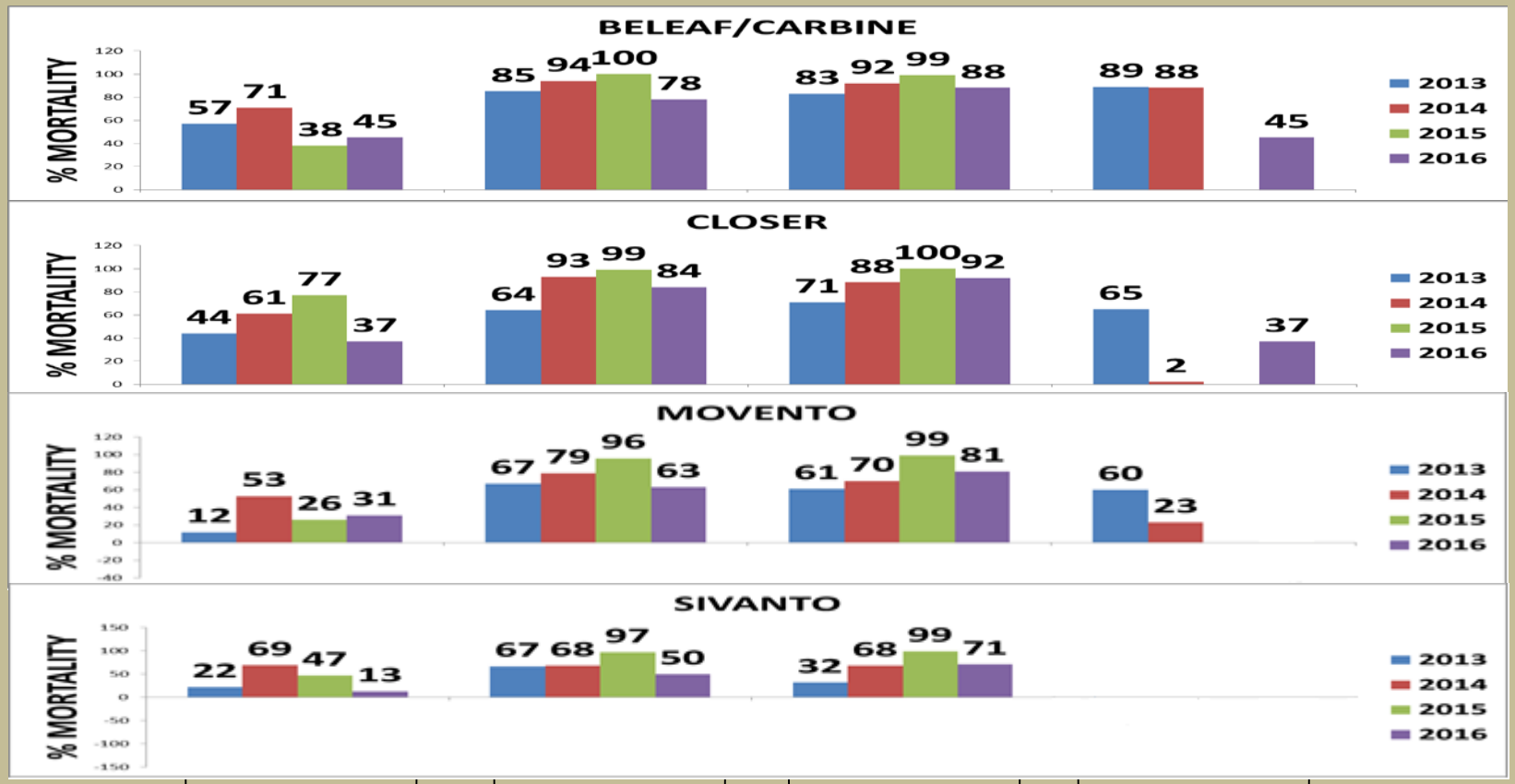
Translaminar Mobility



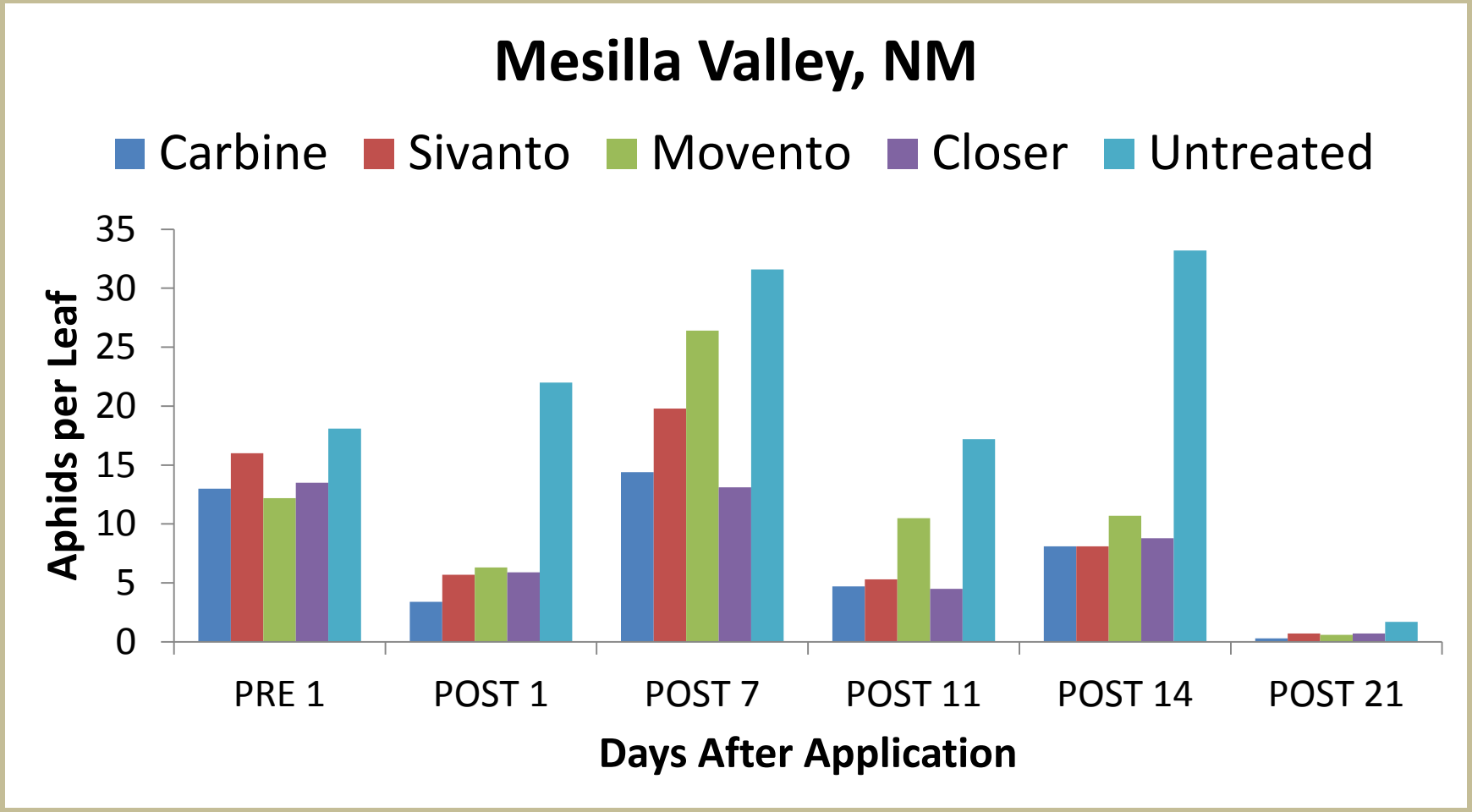
Translaminar Systemic Insecticides

Trade Name	Common Name	Mode of Action	Plant Movement	Max No. Apps per Season
Beleaf/ Carbine	Flonicamid	9C	Translaminar/Xylem	3
Closer	Sulfoxaflor	4C	Translaminar/Xylem	6
Movento	Spirotetramat	23	Translaminar/ Xylem/limited Phloem	2
Sivanto	Flupyradifurone	4 D	Translaminar/Xylem	2

Blackmargined Results 2013 – 2016



2017 Efficacy Trial



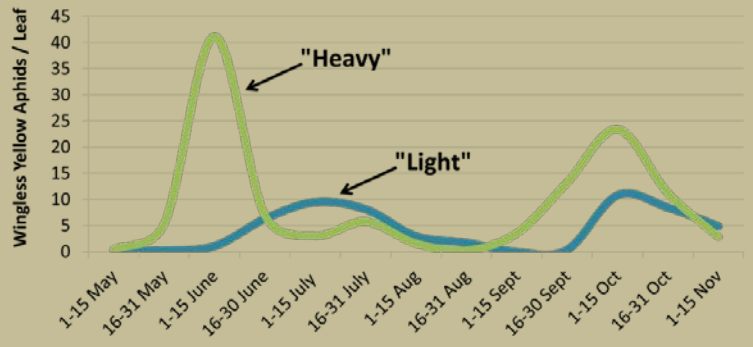
Performance Inconsistencies

- Environmental Factors
  - Temperature
  - Rain and Humidity
  - Wind
- Plant and Pest Factors
  - Leaf physiology
  - Resistance

- Application Factors
  - Timing
  - Mixing
  - Speed
  - Spray Volume
  - Surfactants

Application Timing

- Primary control from translaminar, mobile insecticides is from INGESTION
- Aphid populations increase exponentially
- Early application generally results in better control



Rotation and Resistance

All four chemistries are from different IRAC Classes

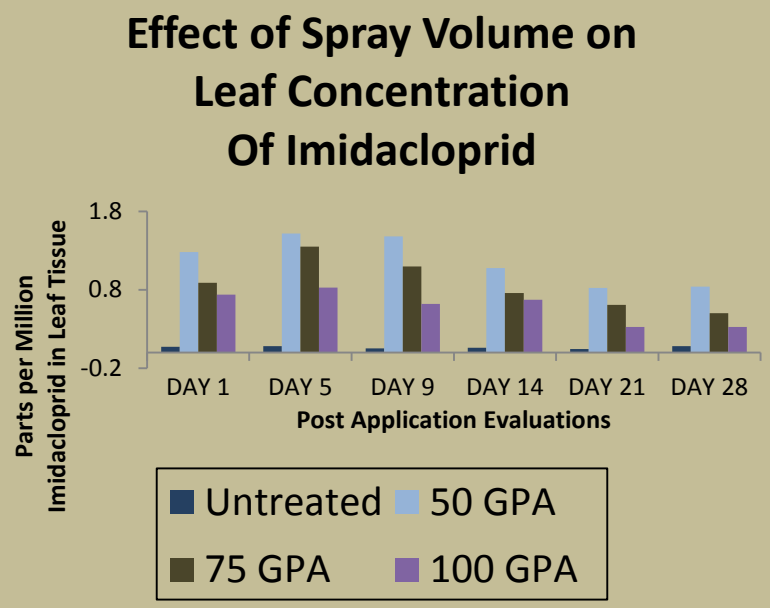
- Beleaf/Carbine: 9C
- Closer: 4C
- Movento: 23
- Sivanto: 4D

Rotation IS **KEY** to resistance **MANAGEMENT**

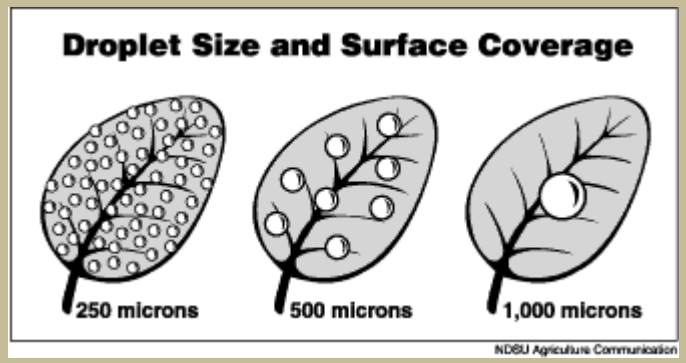
Failing to rotate **WILL** lead to resistance which reduces the number of tools in our toolbox

Spray Volume

- Coverage needed depends on tree architecture and canopy.
- Evidence that a more concentrated solution can produce better results



Impact of Spray Volume



http://www.ext.nodak.edu/extnews/newsrelease/1999/052799/droplet.gif

- Legacy products required high spray volumes to achieve coverage of both sides of the leaves
- Current generation products may benefit from a higher concentration application

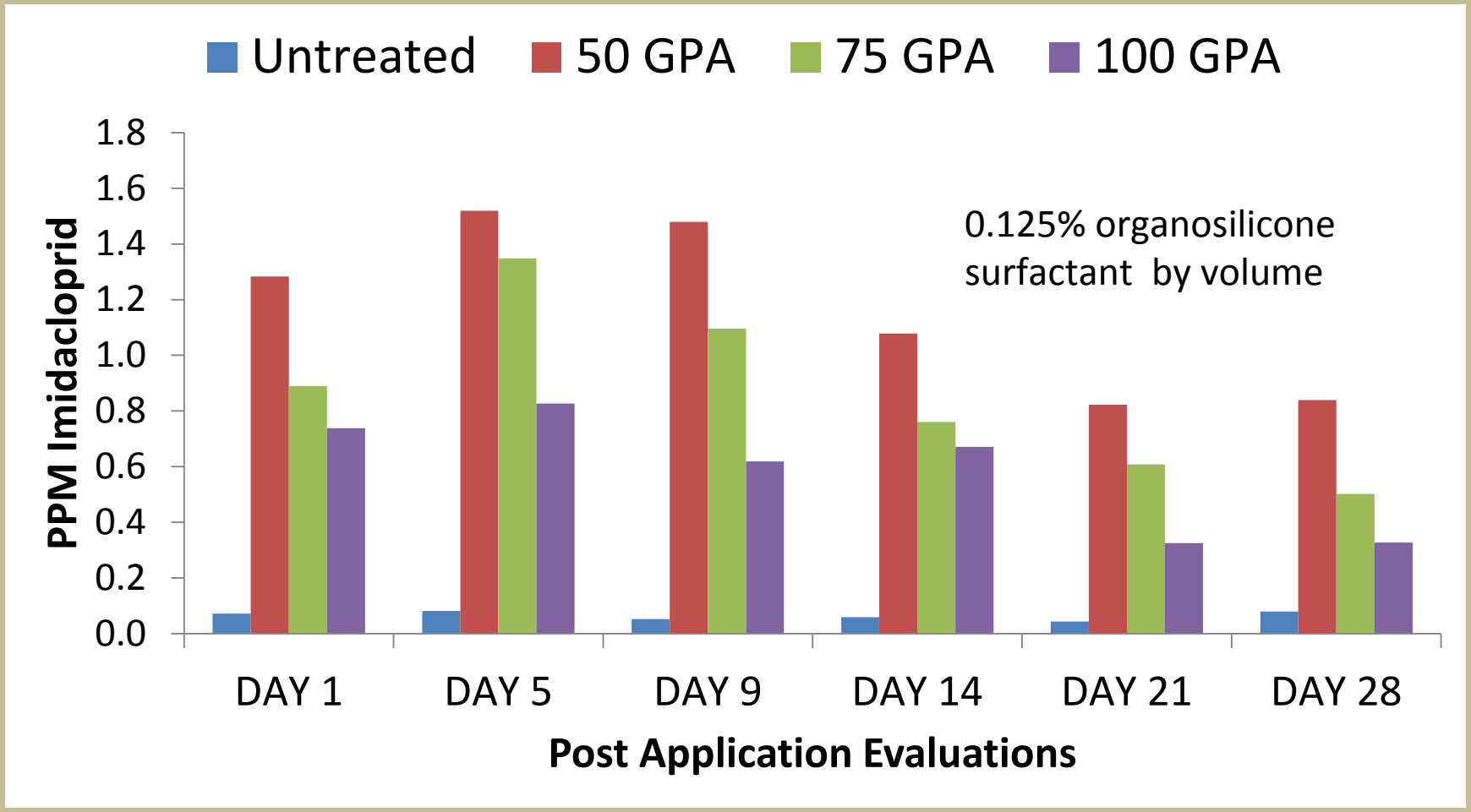
Pesticide Label Volume Recommendations

Product	Spray Volume (Gallons/Acre)
Admire Pro Systemic	50+
Beleaf 50 SG	50+
Closer 2 SC	No recommendation made
Movento 240 SC	50+
Sivanto 200 SL	25+

Volume Study

- Objective
  - Compare leaf concentration of imidacloprid at three spray volumes
- Treatments
  - Admire Pro Systemic at 1.2 fl oz/A in
    - 50 gallons per acre
    - 75 gallons per acre
    - 100 gallons per acre
- Methodology
  - Small airblast sprayer
    - Changed flow rate NOT speed to vary spray volume

Spray Volume Results



Spray Volume Results

- Highest leaf concentration in the 50 GPA treatment
- Significantly more imidacloprid at 28 days in the 50 GPA treatment

Surfactants

- Typical labels allow between 0.0625% and 0.375%
- Most commonly stickers, spreaders, and penetrants
- Improved insecticide performance with increased concentration

Characteristics of Common Surfactants Used in Pecan

- Spreaders – decrease water surface tension, improving the cover of water droplets
- Penetrants – improve product penetration of leaf
- Stickers – Increase adhesion of the pesticide to the leaf
- URAN – Used as a carrier for herbicides, insecticides and other fertilizers

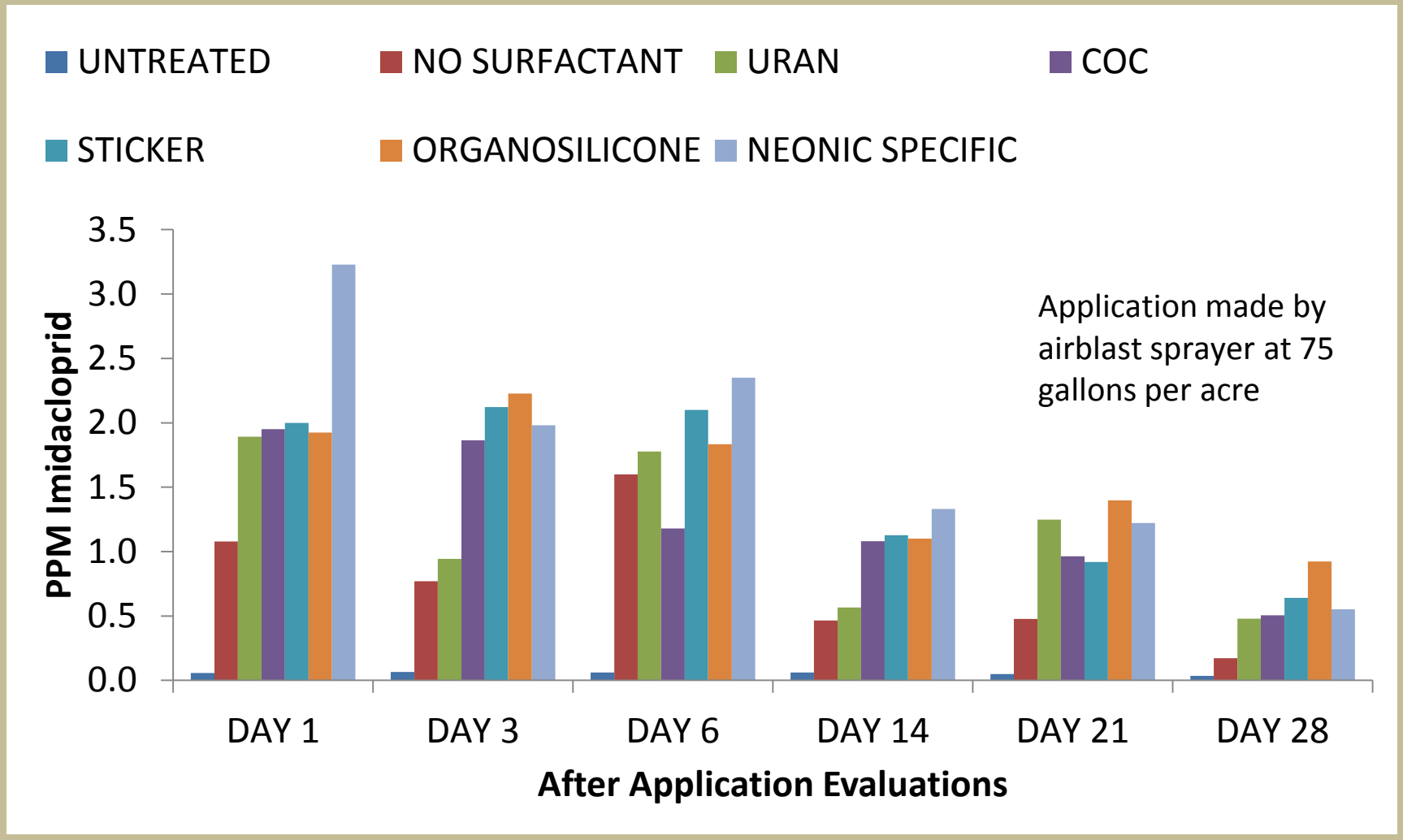
Pesticide Label Surfactant Recommendations

Product	Recommendations
Admire Pro Systemic	Organosilicone when spraying for aphids
Beleaf 50 SG	No mention on label
Closer 2 SC	May improve initial spray deposits, redistribution and weatherability.
Movento 240 SC	Spreader/Penetrator required; Sticker forbidden.
Sivanto 200 SL	No mention on label

Surfactant Study

- Objective
  - Compare common surfactants used in the pecan industry to using no surfactant at all
- Treatments
  - Untreated Check
  - Imidacloprid without a surfactant
  - URAN
  - Crop Oil Concentrate (COC), a common inexpensive Spreader
  - Sticker
  - 100 % Organosilicone Spreader
  - Methylated Vegetable Oil Spreader/Penetrant designed for use with neonicotinoid insecticides

Surfactant Results



Surfactant Results

- Very little statistically significant differences between surfactants
- Any surfactant was better than none

Summary of Both Studies

- Surfactant
  - Any better than none
- Volume
  - Highest leaf concentration in 50 GPA
  - Significantly more imidacloprid at 28 days in 50 GPA

Take Home Message

Always use a surfactant
Try lowering spray volume to improve results

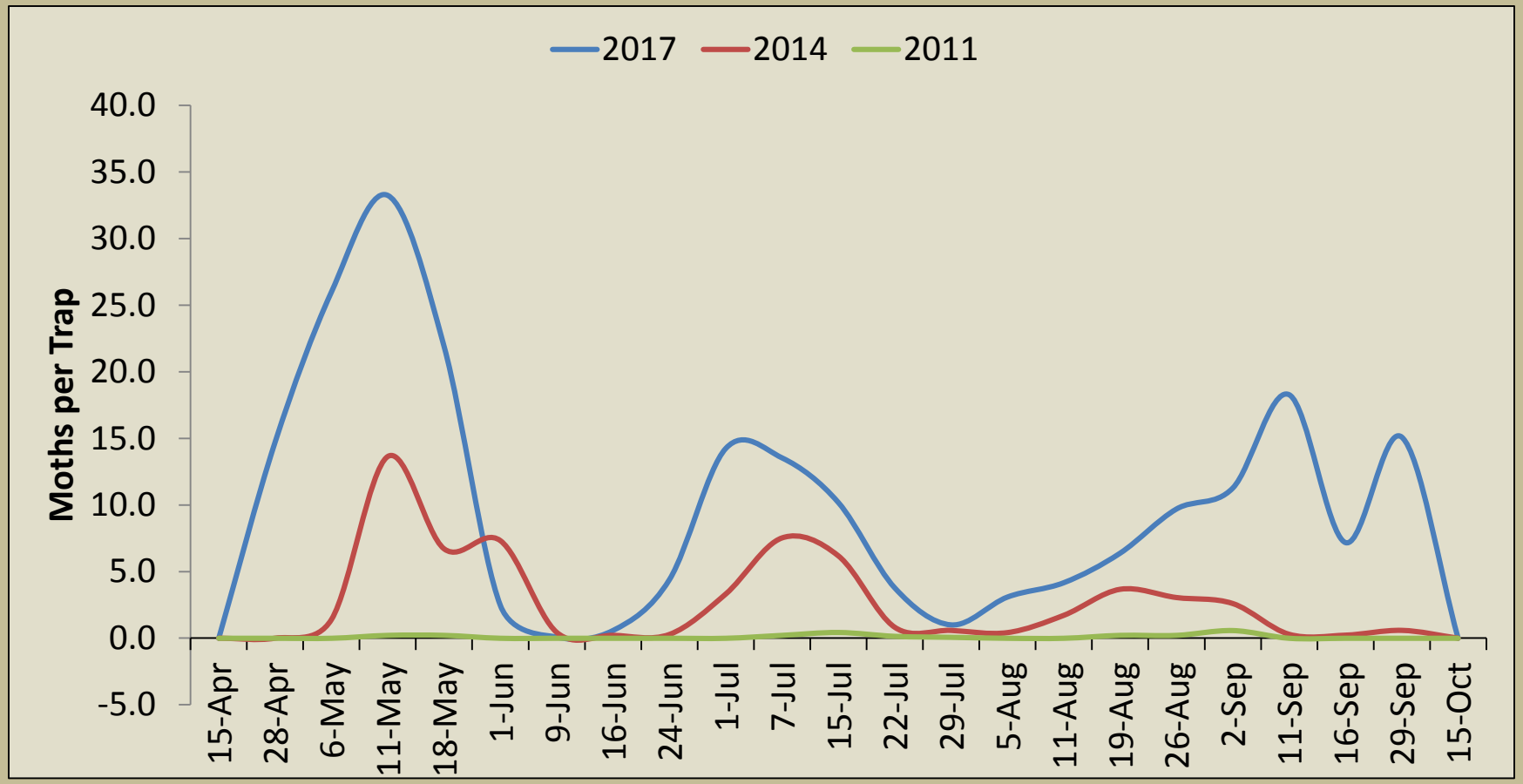
Imidacloprid

- Sold under Admire, Provado, Trimax and 20+ other labels
- Very popular until widespread resistance developed
- Lab trialed 2013 through 2016
- Resistance the Mesilla Valley is still high

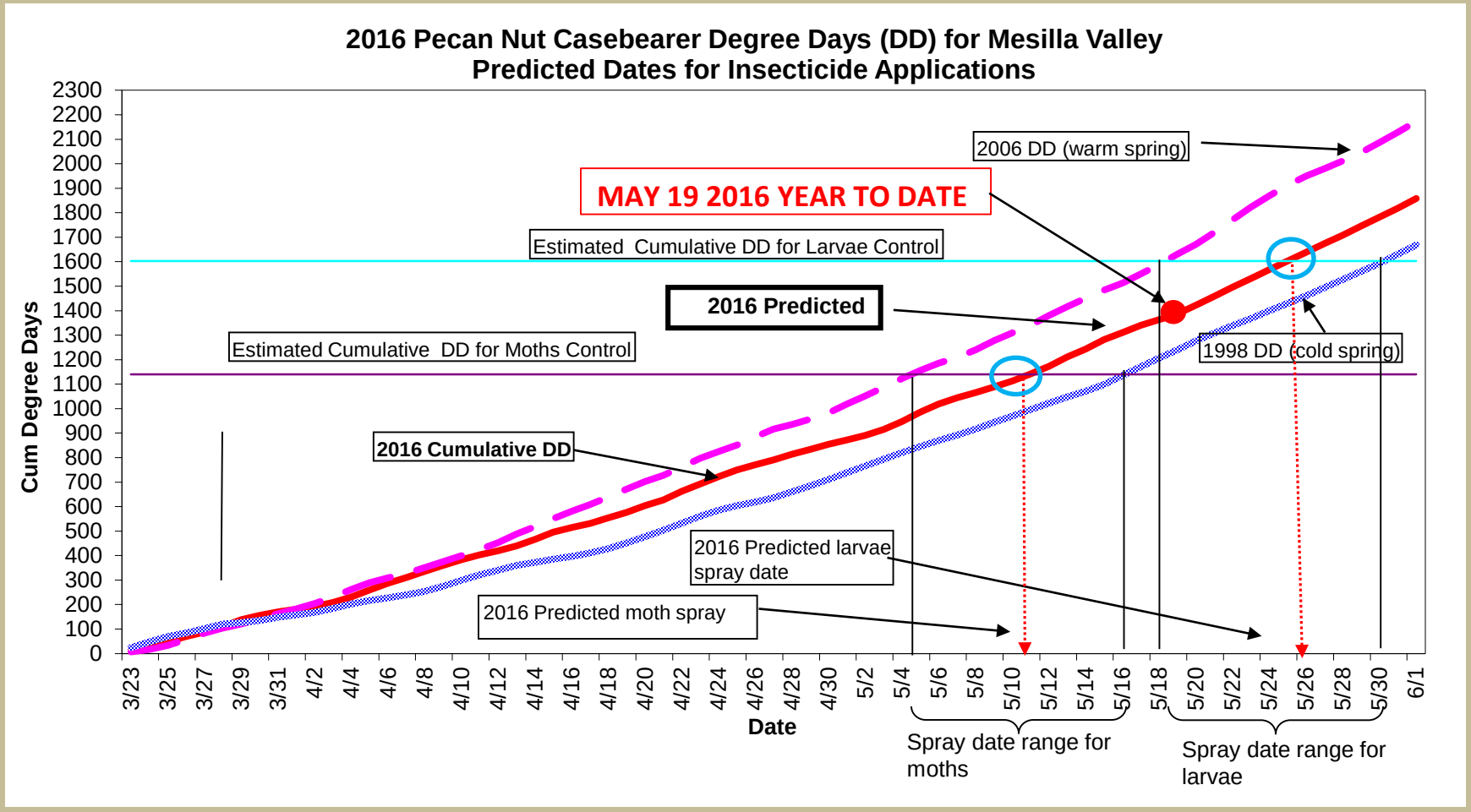
Pecan Nut Casebearer

- Overwinter as larvae
- Emerge in Late May
- Second generation about 6 weeks after the first
- Third and (sometimes) Forth generation

Casebearer Populations
Mesilla Valley



Growing Degree Days 2016



Conclusion

- Translaminar systemic insecticides provide long lasting, effective control
  - Performance may be improved with surfactants and lower spray volumes
- Pecan nut casebearer populations have returned to pre-2011 freeze levels

Questions?

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