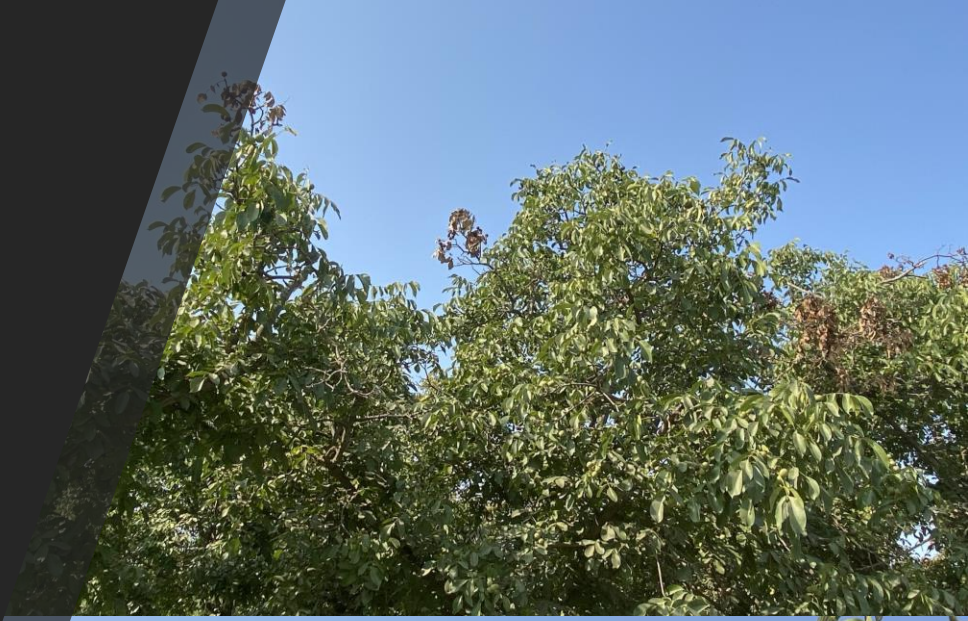
Walnut Scale: an insidious pest of English walnut

Walnut Scale *(Quadraspidiotus juglansregiae)*

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Elizabeth Fichtner, Farm Advisor
UCCE Tulare and Kings Counties

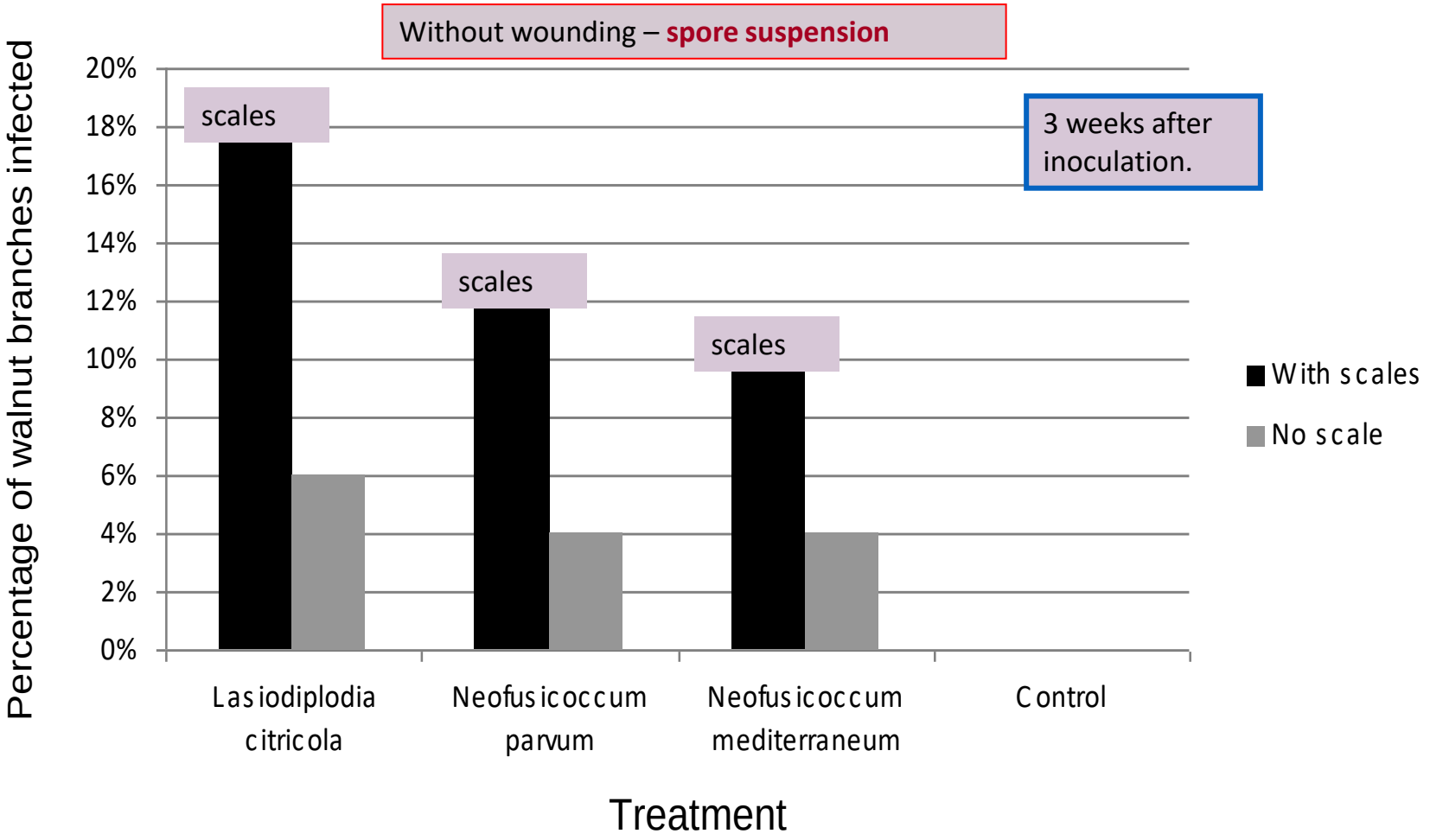
August 2021 flagging and thinning in upper canopy



Association of scale and canker disease

- Direct association
- Indirect association

Effect of walnut scales on infection of walnut shoots by Botryosphaeriaceae (cv. Vina)



✓60-75% more infected shoots with scales than those without scales.

T. Michailides

Scales Found in Walnut

Frosted Scale and European Fruit Leucanium

- Same genus, different species
- Immature stages look similar
- Frosted scale exhibits waxy coating in March/April

Frosted scale: waxy cover


Adult: brown 'helmet'


Overwintering nymphs

Italian Pear Scale

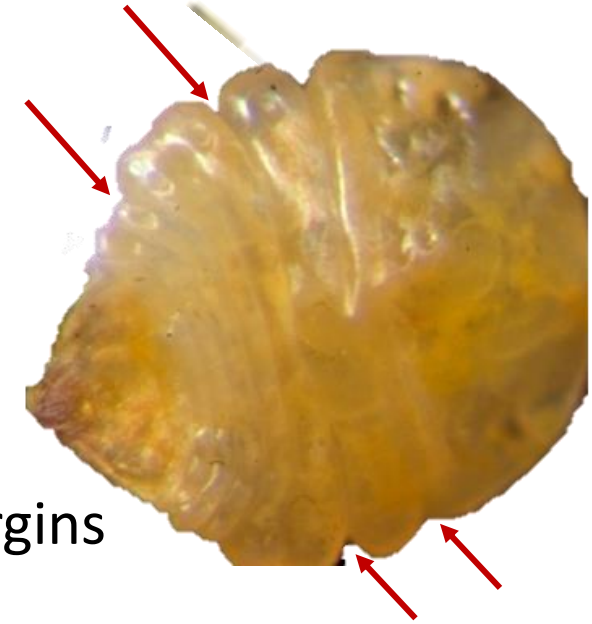
Associated with moss and lichens

San Jose Scale

· non-native
· smooth body (‘city slicker’)
· circular, with nipple
· one lifecycle per year

Walnut Scale

· native
· ridged body
· daisy- shaped, scalloped margins



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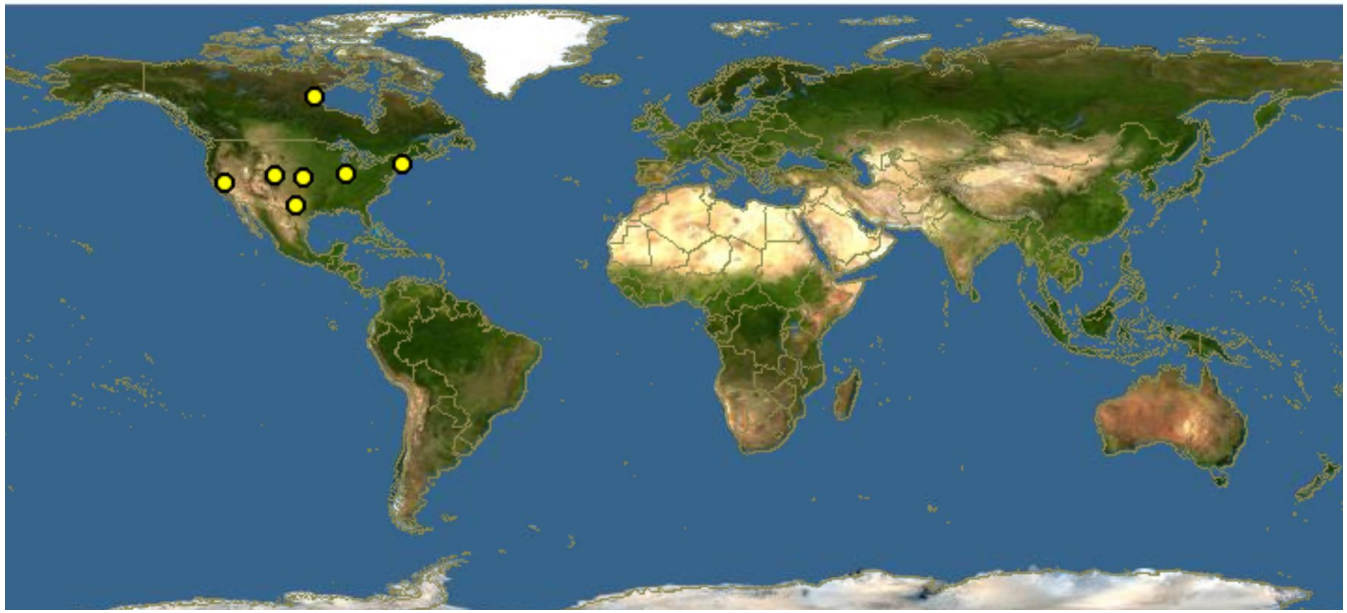


Walnut Scale

· native to North America

· wide host range (woody shrubs, deciduous plants, conifers)

· single species on *Juglans regia* in California

Soft Scales Infesting Walnut

chemical control required when natural mortality factors are disturbed by treatments directed against other insect pests

A. E. Michelbacher, Howard L. McKenzie, and C. Q. Gonzales

Four species of soft scales—a complex of two species of frosted scale, European fruit lecanium, and the calico scale—can inflict serious damage on walnuts unless controlled, either by natural factors or through the use of insecticides.

Practically all the trouble with soft scales on walnut has developed since the advent of DDT and other newer insecticides which have interfered with the effective action of natural enemies.

Often all four species occur together but the frosted scale probably is the most abundant. Each species has only one generation a year. The eggs are laid in April and early May and hatch from May through June. The number of eggs laid by each female probably averages well in excess of 2,000 and highly destructive populations can develop rapidly when conditions are favorable for their activity. However, natural mortality is high and where natural factors have no interference they usually hold the scale population below an economic level. Parasites and birds are particularly important but individuals die shortly after hatching because they fail to settle in suitable localities although scales are capable of free movement except in the latter part of their life. When the developing scales move to twig growth in the fall the chance for survival is greatly reduced unless they settle on the twigs of the current season. The older the bark the greater the mortality. Even on new bark the mortality may be high under crowded conditions.

Treatments with insecticides for the control of soft scales are not necessary unless there is evidence that natural factors will not reduce the population below a destructive level. When treatments are made, the materials must be applied thoroughly—because of the high reproductive potential of the scales—to reduce the scale population to an exceedingly low level. This is especially true if the insect control program is one which has strong tendencies toward inducing an increase in the scale population.

DDT probably has been the greatest

There are two periods when soft scales can best be controlled. The first is in the summer when the eggs have all hatched and the second in the winter.

Summer control treatments—applied in July and August—of parathion 25% wettable powder, at 2–3 pounds, plus three fourths gallon of summer oil emulsion per acre and applied with an air carrier sprayer, in from 100 to 200 gallons of water have given effective control. Malathion, 25% wettable powder at six pounds per acre has given promising results. Trithion at 1.0 pound—one quart four pound emulsion—per acre has exerted a good suppressing action. Ethion and Guthion—not yet released for use on walnuts—show considerable merit with ethion, at the present time, the more outstanding.

Winter control treatments should be limited to the dormant period. Best results have been obtained with parathion-oil treatments—parathion 25% wettable powder at five pounds plus 2–4 gallons of oil emulsion per acre—applied with

"Practically all the trouble with the soft scales on walnut has developed since the advent of DDT…(that has) interfered with the effective action of natural enemies."

California Agriculture, 1959

Frosted Scale on Walnuts

codling moth treatment, DDT drift from adjacent crops interfere with control of the pest by natural enemies

A. E. Michelbacher and Stephen Hitchcock

Frosted scale *on walnuts*—held in check by natural enemies—was almost an unknown problem in northern California until after DDT was used to control the codling moth.

Soon after DDT was first used on walnuts an increase in the frosted scale population became apparent and the rate of increase was associated with the amount of DDT applied. The dividing point—between nondestructive and highly destructive DDT induced scale populations—occurred when DDT 50% wettable powder was applied in amounts exceeding five to eight pounds per acre. Some increase did occur at the five- to eight-pound dosage, but was of little importance when compared to the mass outbreaks brought about by higher applications.

Outbreaks of the frosted scale following applications of DDT result from the adverse effect the chemical has on the parasites of the scale. Any treatment that

The frosted scale produces quantities of honeydew during the period of rapid development, from mid-March through April.

if the treatments responsible for the increase are discontinued. However, a year is needed for the parasites to bring this about. Parasites have several generations each year and the scale has but one so the parasites have a number of opportunities to attack the scale and reduce its numbers.

All increases in the frosted scale population induced by DDT are not because of direct application of the insecticide

the orchard to play havoc with the parasites of the frosted scale. Unchecked the frosted scale developed until the twig growth was almost caked with them. The infestation was heaviest on the side of the orchard adjacent to the treated corn field.

Where walnuts are interplanted with other trees there is an opportunity for the development of a destructive frosted scale population if the interplanted trees are treated with DDT.

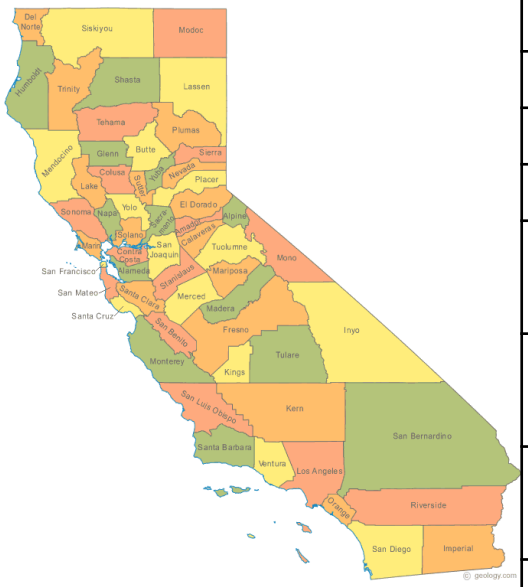
In some orchards the frosted scale has increased even when the amount of DDT 50% wettable powder used to control the codling moth has not exceeded eight pounds per acre. This has occurred at Linden where most of the experimental orchard has received the same codling moth treatment, but the scale population has varied considerably.

The variation in the scale population can be explained in a large measure by the different aphicides used in combina-

Disturbances or changes in ecosystems may cause pests and diseases to emerge and regress in importance

Examples: climate, cultural practices, genotypes, chemical inputs

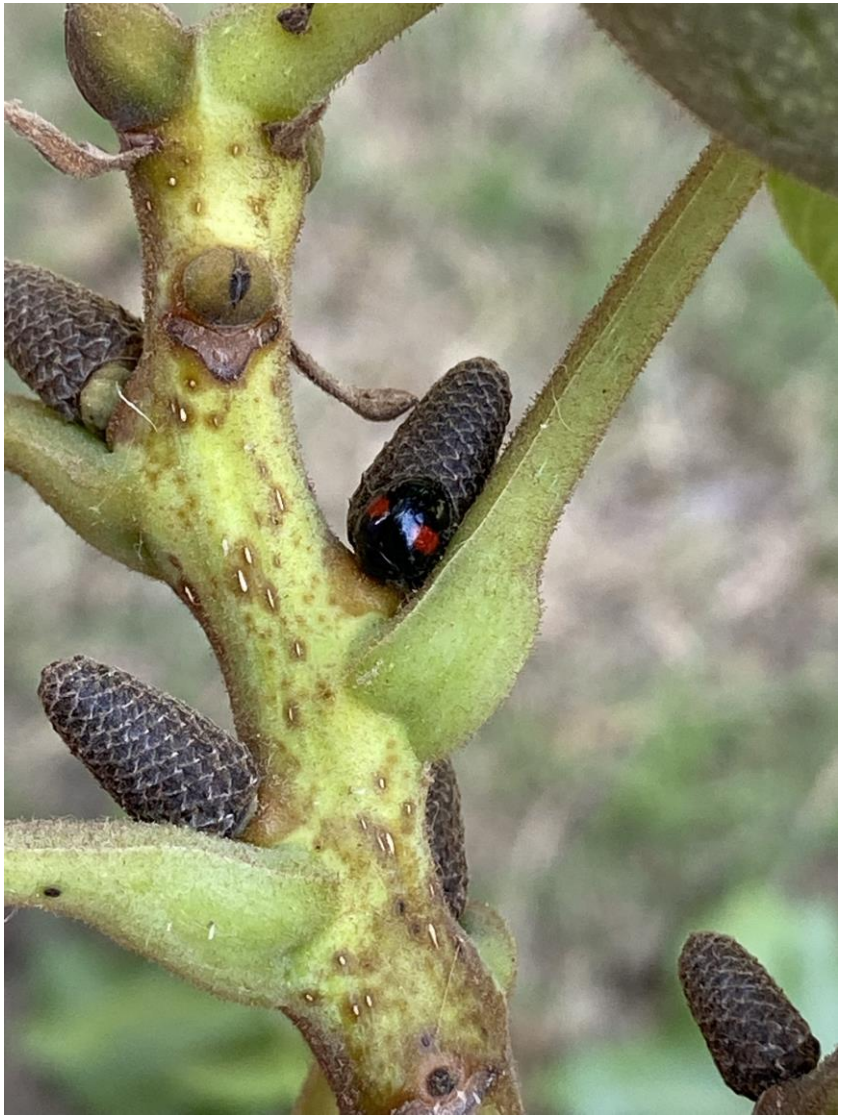
2015 Phenology Study



Site	Cultivar	Scale species	Number of replicate tapes (total trees)	Parasitoid activity detected
Tehama 1	Howard	WS	4 (4)	Yes
Tehama 2	Chandler	FS	4 (4)	Yes
Butte 3	Chandler	WS	10 (5)	Yes
Butte 4	Howard	WS	10 (5)	Yes
Yuba 5	Vina	WS	12 (6)	Yes
		FS	2 (1)	Yes
Yuba 6	Chandler	WS	18 (6)	Yes
		FS	4 (4)	Yes
Solano 7	Chandler	WS	12 (9)	Yes
		FS	7 (7)	Yes
San Joaquin 8	Chandler	IPS	21 (6)	No
San Joaquin 9	Chandler	IPS	20 (6)	No
Contra Costa 10	Chandler	WS	12 (6)	Yes
Contra Costa 11	Chandler	WS	12 (6)	Yes
Tulare 12	Chandler	WS	10 (5)	Yes

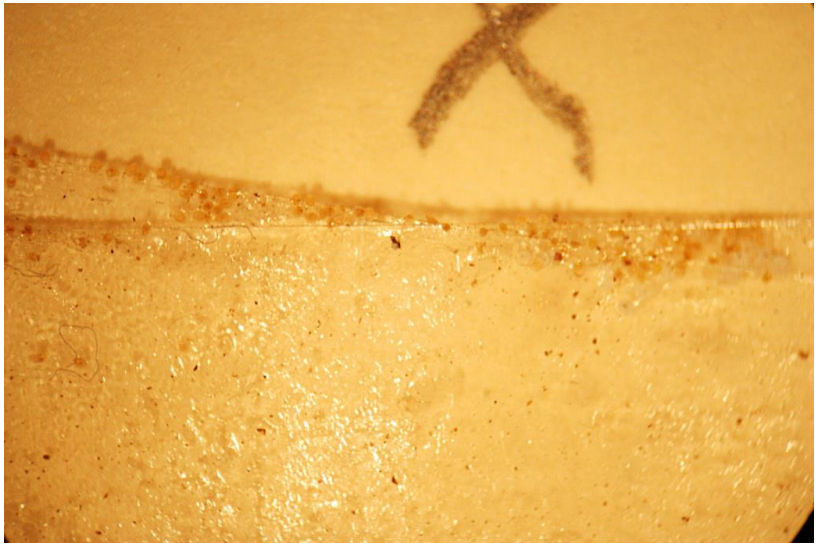
E. Symmes

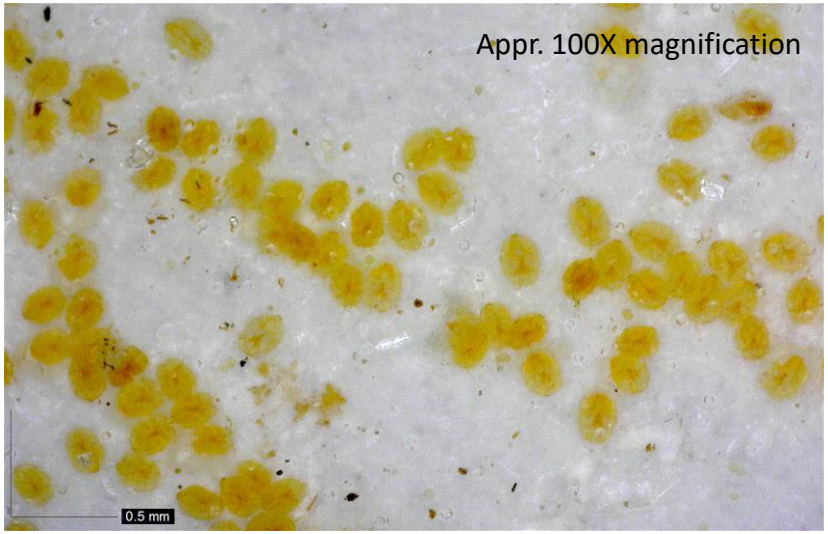
Twice-stabbed ladybug, a predator of walnut scale



August 2021

2015 Phenology Study – Crawler Monitoring





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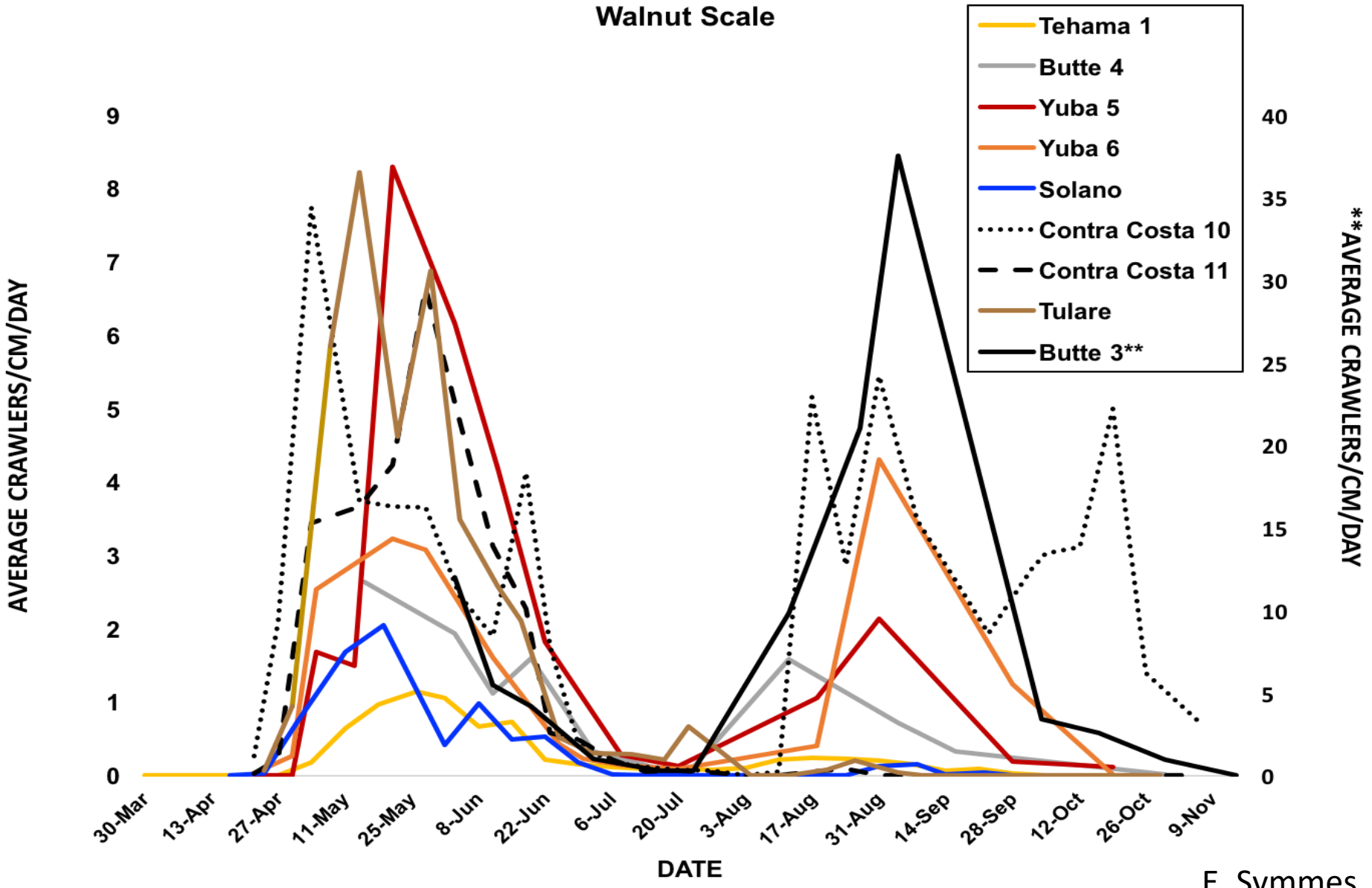
2015 Phenology Study – Walnut Scale



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2015 Phenology Study – Walnut Scale

Site	First Generation (G1) Crawlers		Second Generation (G2) Crawlers		G1-G2 Overlap	Total G1 Crawlers	Total G2 Crawlers
	Emergence	Peak Activity	Peak Activity	Last Crawler Detected			
Tehama 1	4-May	26-May	24-August	28-September	Yes	2,523	570
Butte 3	< 3-June	No data	4-September	30-October	Yes	No data	78,405
Butte 4	< 15-May	No data	12-August	30-October	Yes	No data	4,702
Yuba 5	5-May	21-May	31-August	> 19-October	Yes	22,468	6,085
Yuba 6	24-April	21-May	31-August	> 19-October	Yes	4,937	30,425
Solano 7	24-April	19-May	8-September	22-September	No	21,545	1,170
C. Costa 10	< 22-April	4-May	31-August	> 14-November	No	24, 391	48,185
C. Costa 11	< 22-April	28-May	24-August	31-August	No	19,165	153
Tulare 12	< 24-April	14-May	26-August	4-September	No	13,869	123

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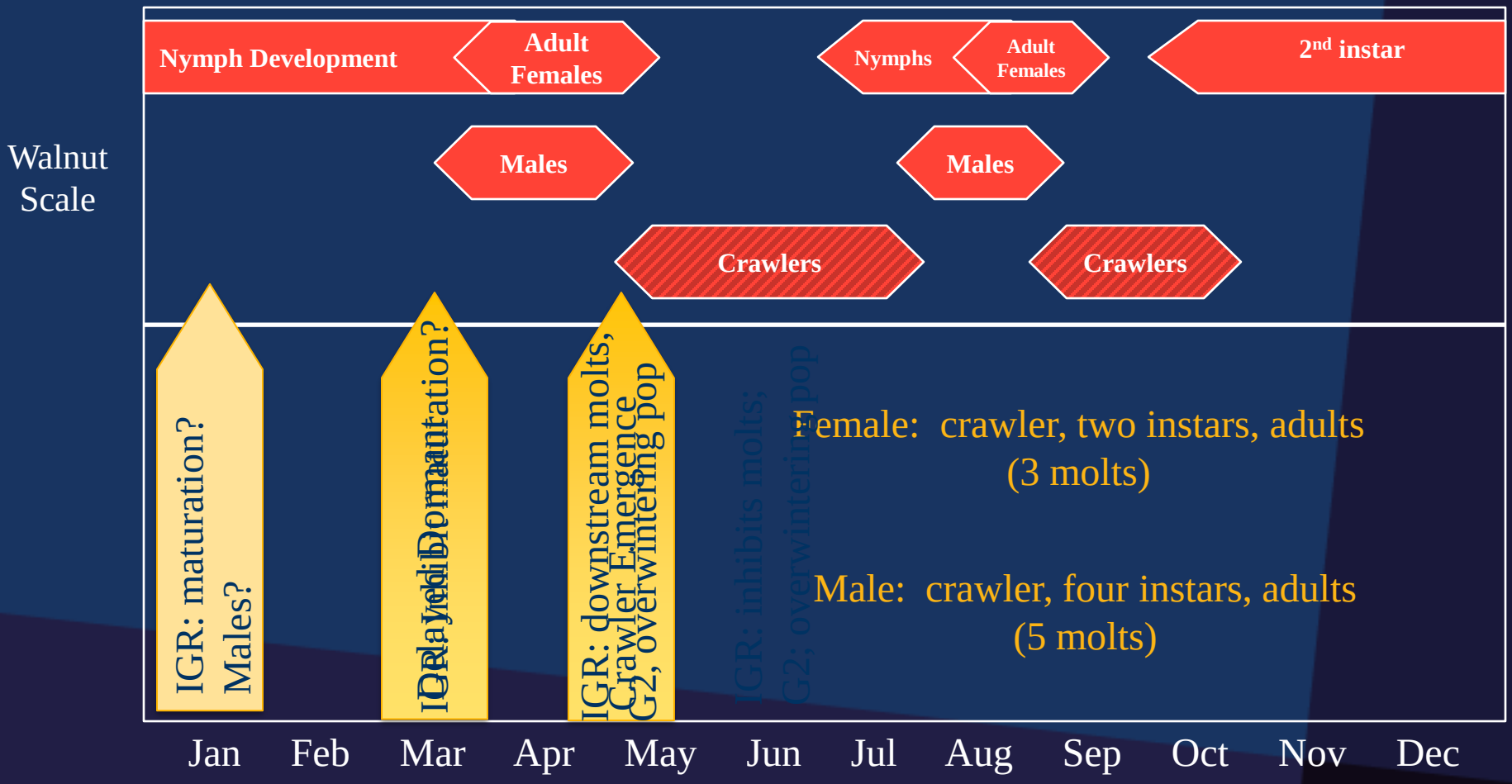
Walnut Scale and Frosted Scale Seasonal Phenology

Dani Lightle, Orchard systems advisor, UCCE, Glen, Butte, & Tehama Counties



Scale phenology was pieced together from many sources and surveys conducted state-wide and are **approximate timings only**.

Control of Walnut Scale in Walnuts – 2014

Methods:

- 9 treatments replicated 4 times in RCB design
- Each replicate was an individual tree
  - Two limbs per replicate smoothed with sand paper and wrapped with double-sided sticky tape

Van Steenwyk

Control of Walnut Scale in Walnuts – 2014

Methods:

- Treatments were applied on 8 April (post delay dormant) and 6 May at first crawler emergence
- WS evaluated weekly from 5 May to 2 June
- Number of crawlers/cm of sticky tape counted weekly in the laboratory under magnification

Van Steenwyk

Control of Walnut Scale in Walnuts – 2014

Treatments:

Treatment[a]		Rate Form/ac.
Movento 2SC	Systemic; ingestion	9.0 fl. oz
Assail 30SG	Neonic; contact and ingestion	9.6 oz
Assail 30SG		5.3 oz
Brigadier 2EC	Pyrethroid + Neonic	12.8 fl. oz
Sequoia 2SC	Sulfoxafluor, New chemistry; subgroup 4C; systemic	5.75 fl. oz
Seize 35WP (Dormant)	IGR	5.0 oz
Centaur 70 WDG	IGR	46.0 oz
Centaur 70 WDG (Dormant)	IGR	46.0 oz
Untreated check		--

[a]Treatments include 0.25% v/v Latron B-1956

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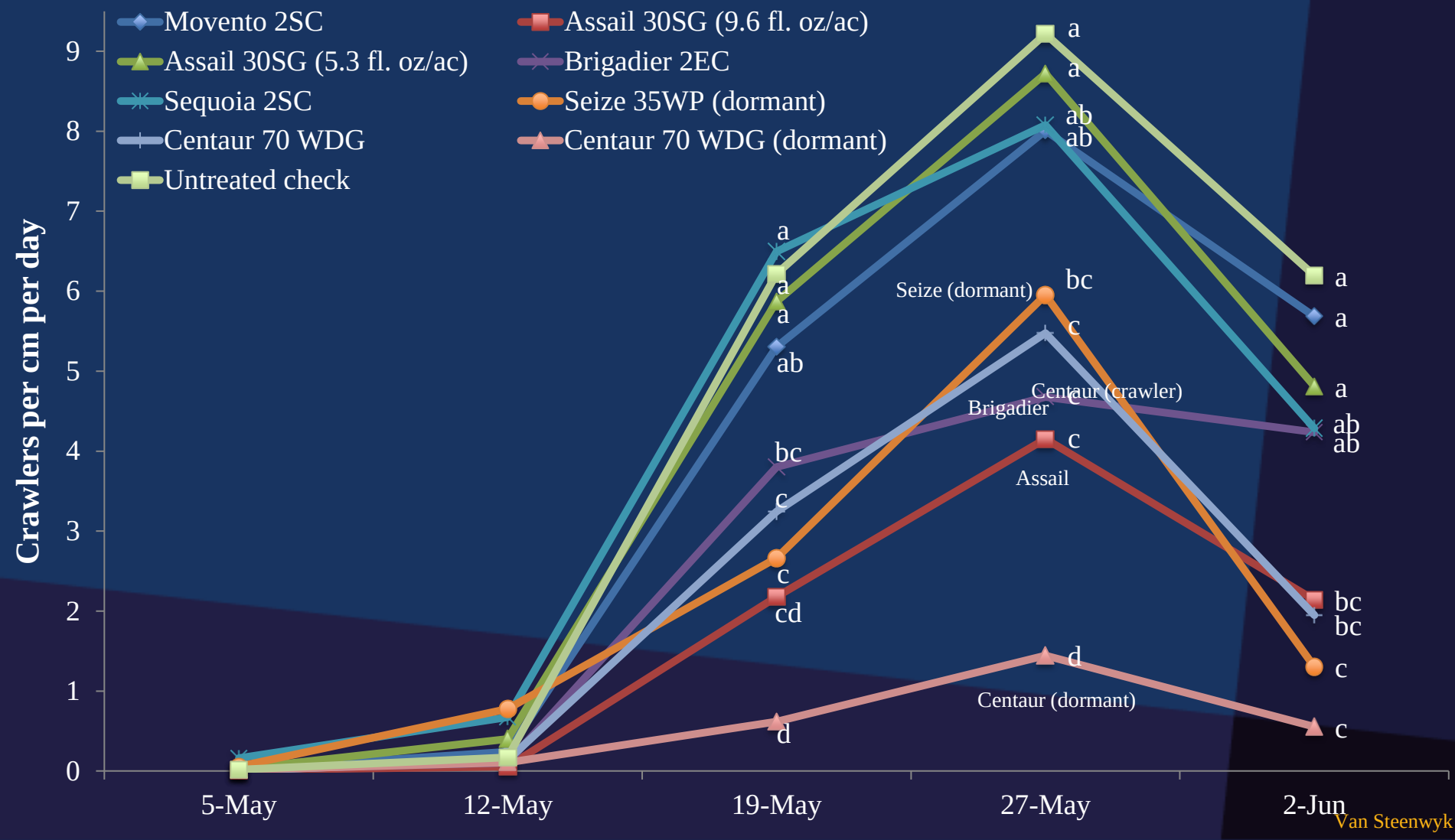
Control of Walnut Scale in Walnuts – 2014



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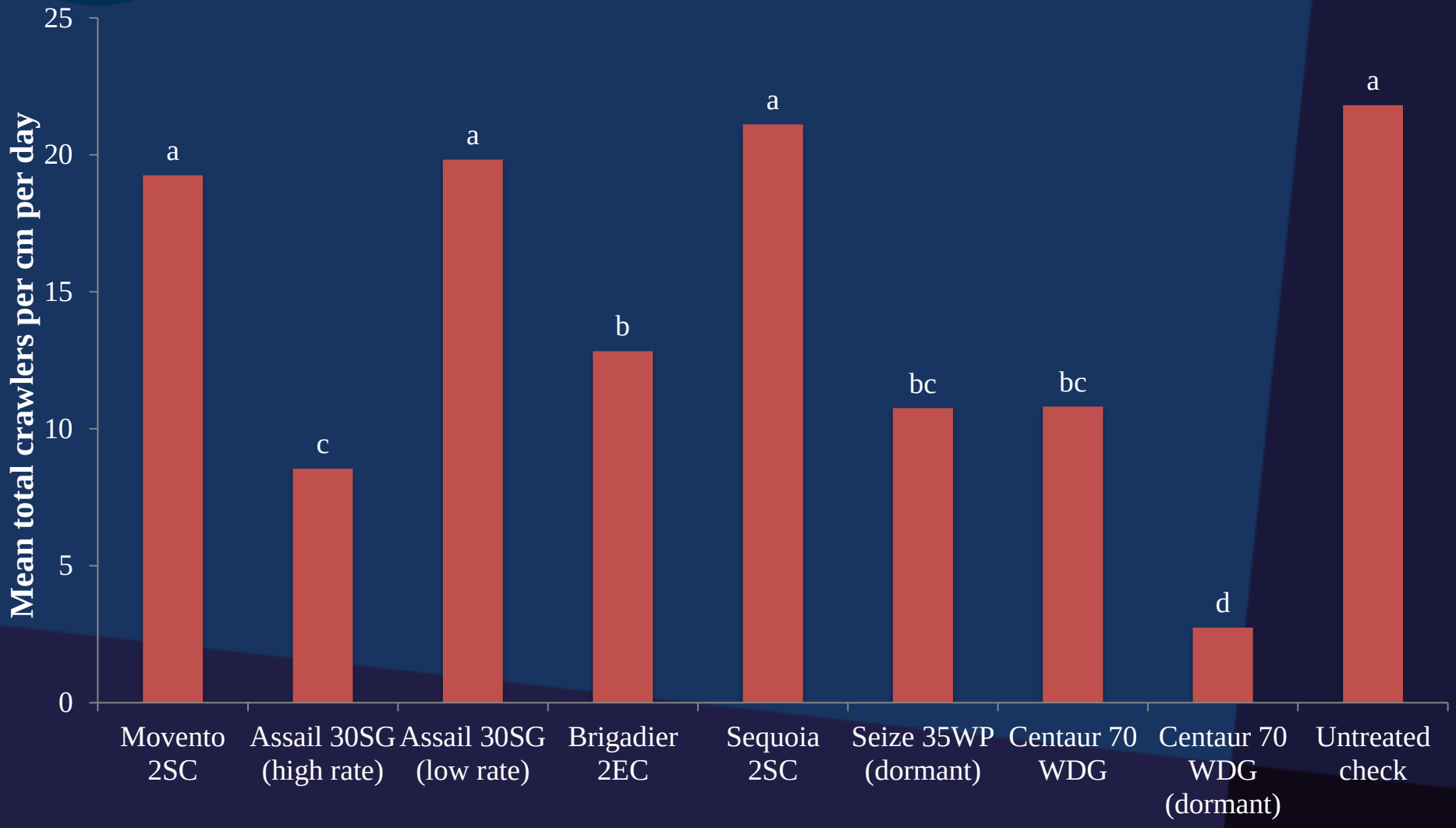
Control of Walnut Scale in Walnuts – 2014



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Control of Walnut Scale in Walnuts – 2014

Discussion:

- Centaur 70WDG (delayed dormant) provided excellent control
- Assail 30SG (high rate), Centaur 70 WDG, Brigadier 2EC and Seize 35WP provided acceptable control
- Assail 30WG at the low rate, Movento 2SC and Sequoia 2SC were not significantly different from the untreated control.

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Control of Walnut Scale in Walnuts – 2015 Follow Up

Methods:

- Follow up to determine delayed effects
- Returned to plot and removed ~50 cm sections of branches per replicate on 1/21/15
- Number of alive 2nd instars and adults per cm counted under magnification

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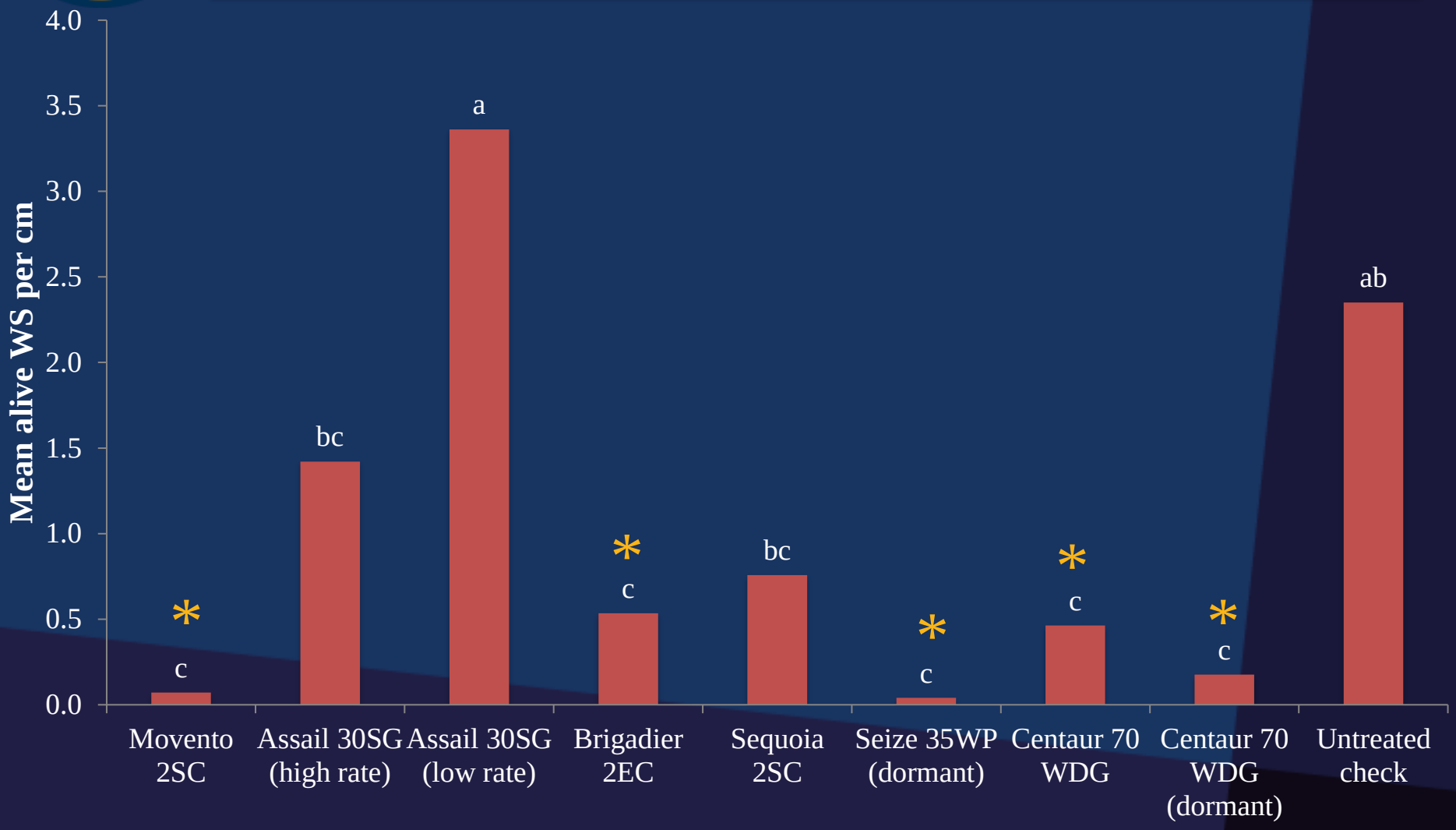
Control of Walnut Scale in Walnuts – 2015



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Control of Walnut Scale in Walnuts – 2015

Discussion:

- Centaur 70WDG and Seize 35WP (delayed dormant appl.) and Movento 2SC (crawler appl.) provided excellent long-term WS control at eight months after application

- Brigadier 2EC, Sequoia 2SC and Assail 30SG at the high rate provided acceptable control

- Assail 30WG at the low rate was not significantly different from the untreated check.

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www.fruitsandnuts.ucdavis.edu

Key Points

· pest in its own right
· Orchard ecosystem changes may impact scale
· Exacerbates canker diseases
· Chemical control is a long-term strategy
· Results of IGR applications may take time

Acknowledgements

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