



Control of CM and WHF

Using Reduced Risk Pesticides



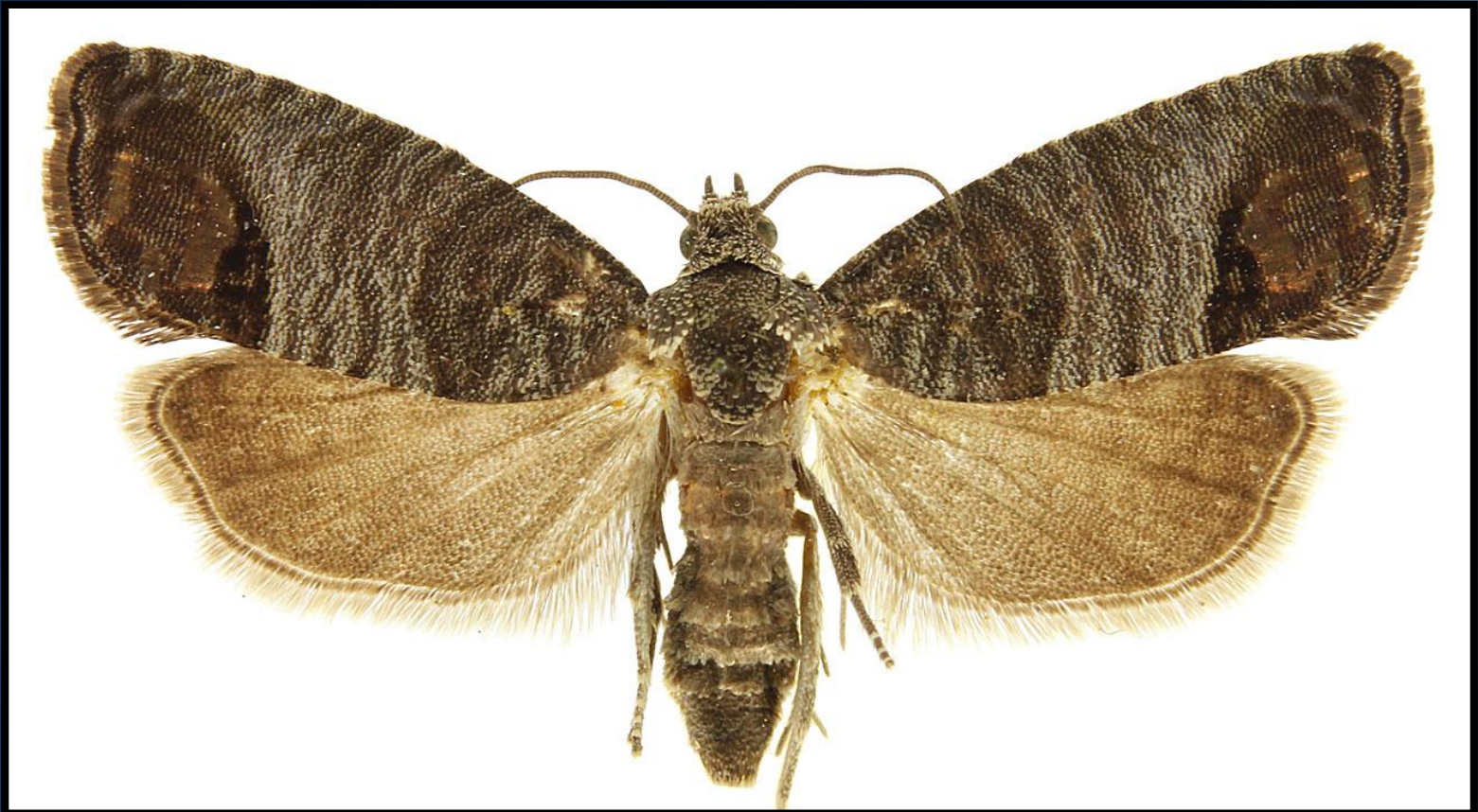
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Codling Moth

Cydia pomonella





CM Efficacy Research

CM Trials in Hollister and Tracy

- All treatments replicated 4 times
- Single tree applications
- Applied using hand-held orchard sprayer at 250 psi & 250 gal/ac
- Inspected 400-500 nuts per treatment

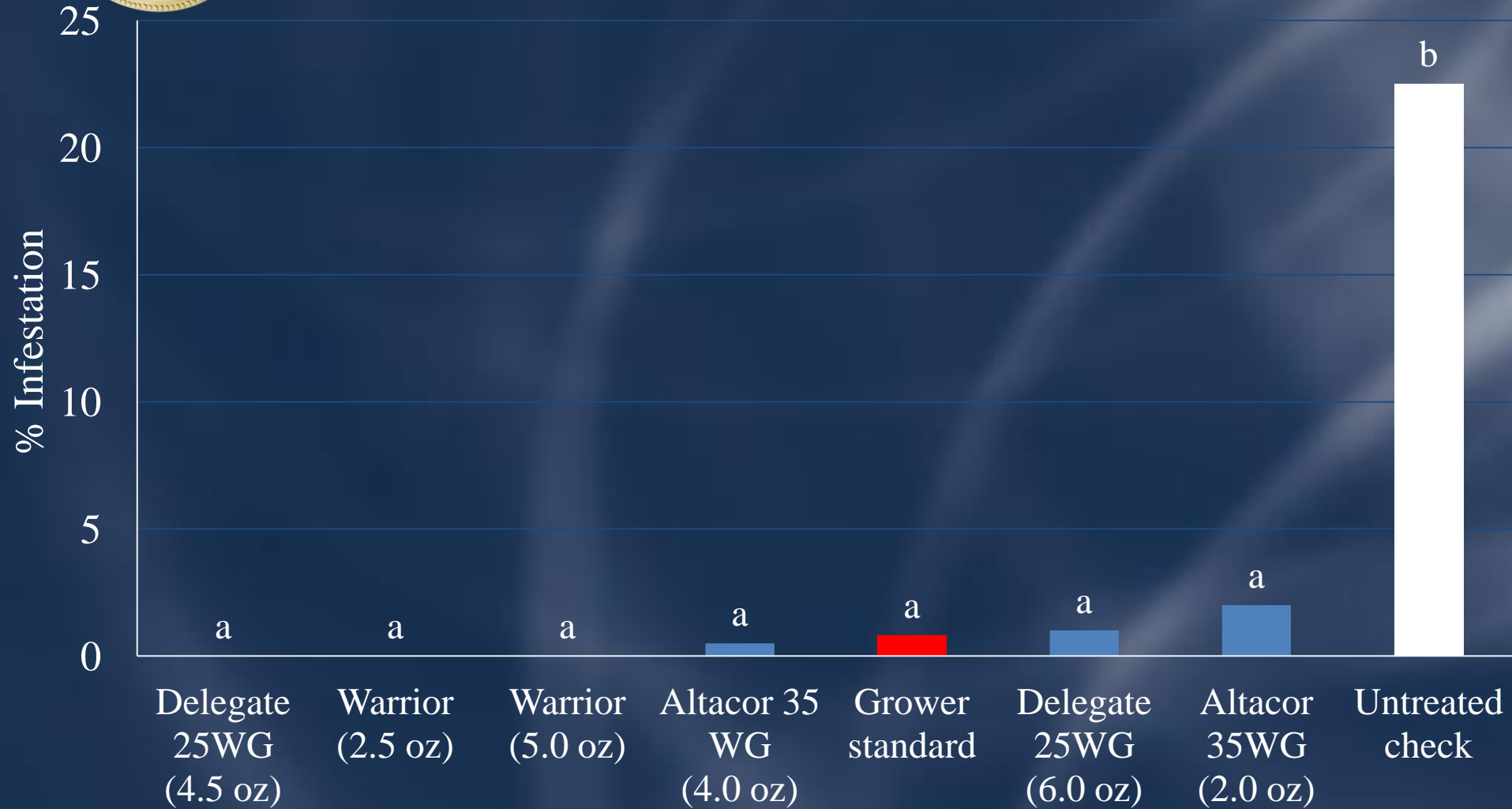


CM Efficacy Research

Year	Timing	Grower Standard
2005	May 2 May 31 July 12 August 4	Lorsban (2x) and Penncap (2x) alternating
2007	April 27 July 12	Lorsban (2x)
2009	April 28 May 19 June 23 July 8	Lorsban (2x) and Penncap (2x) alternating
2012	May 9 July 3	Lorsban + Agri-Mek Imidan



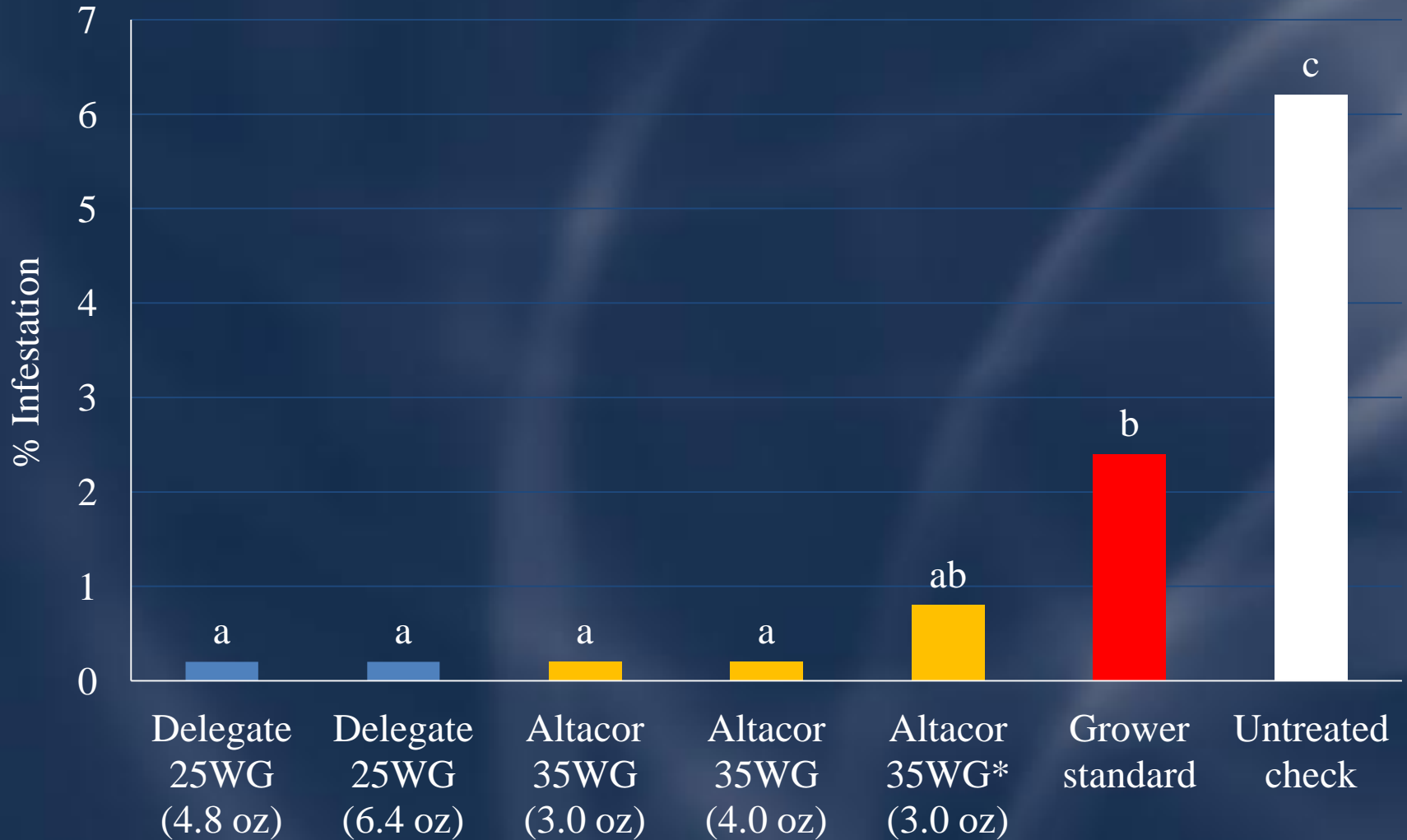
CM Efficacy 2005



Treatments applied 4 times throughout the season



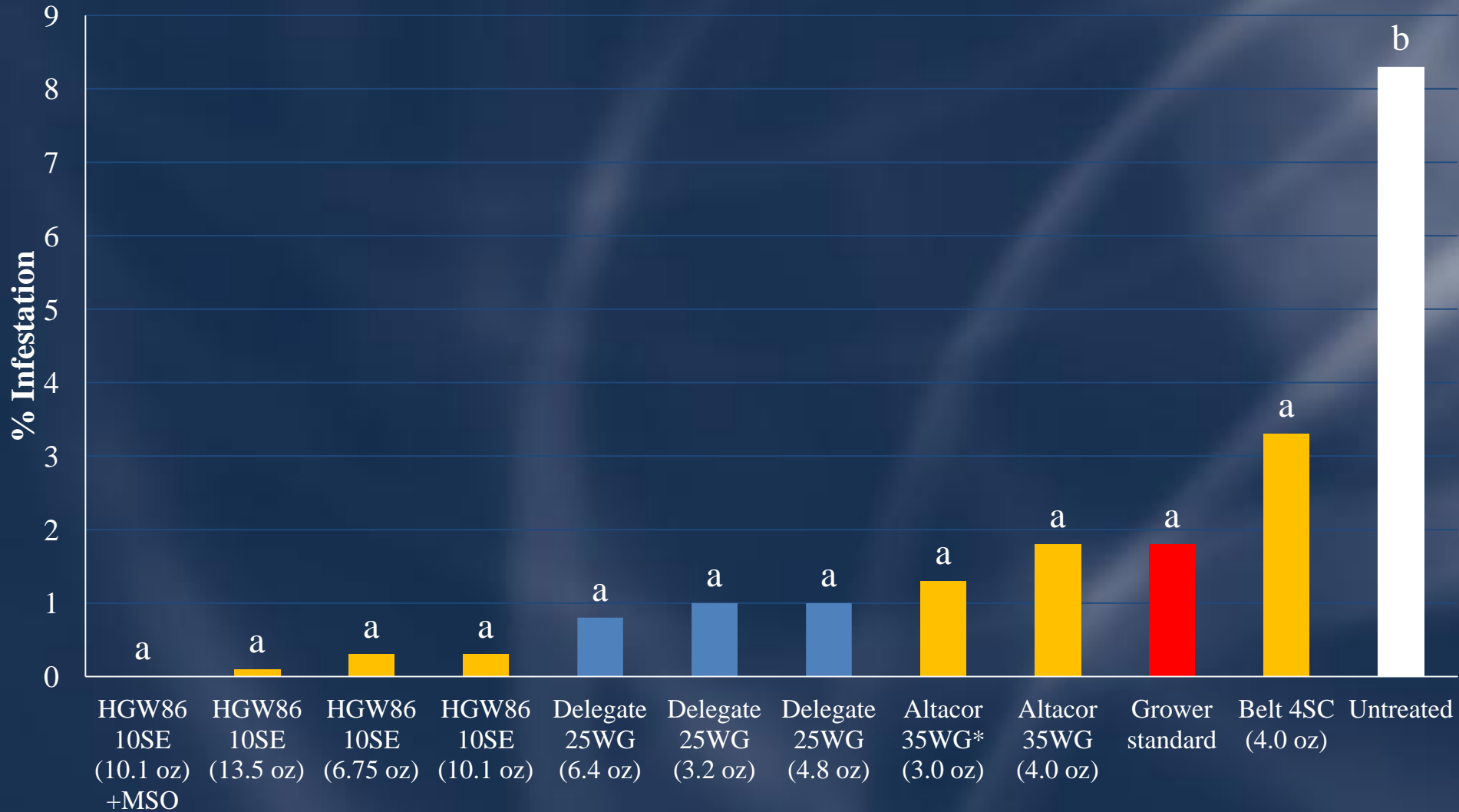
CM Efficacy 2007



Treatments applied 2 times throughout the season

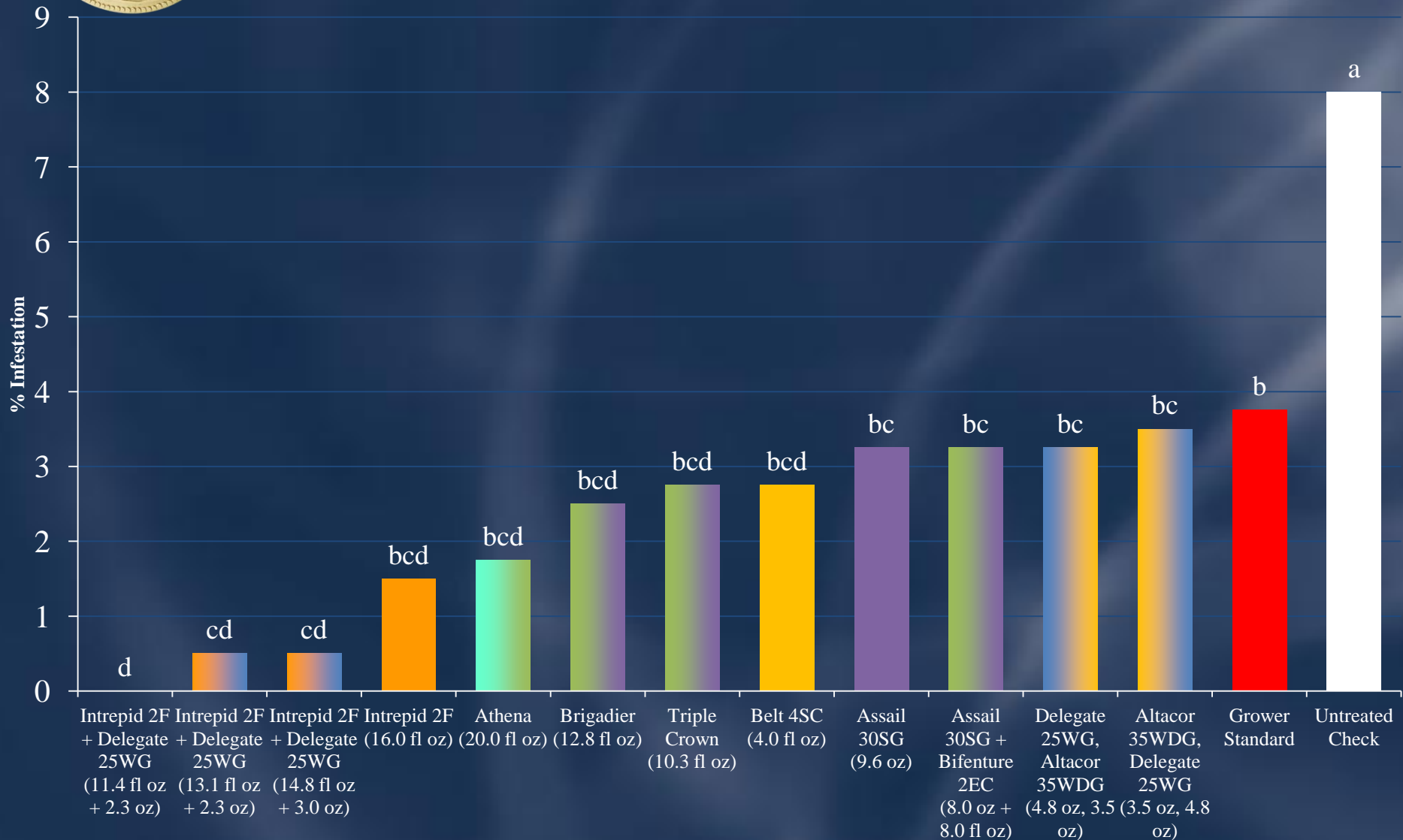


CM Efficacy 2009





CM Efficacy – 2012



San Joaquin County "Expansion" Puffer Trial



37°10'01.00" N 121°09'19.44" W

Image © 2008 DigitalGlobe
© 2008 Tele Atlas
Locke, CA
elev 77 ft

©2008 Google™

Mar 20, 2006

Eye alt 15218 ft

'08 & '09: 0% CM all blocks except at edges of some blocks

Locke Ranch Puffer Trial
San Joaquin County
T4N R7E

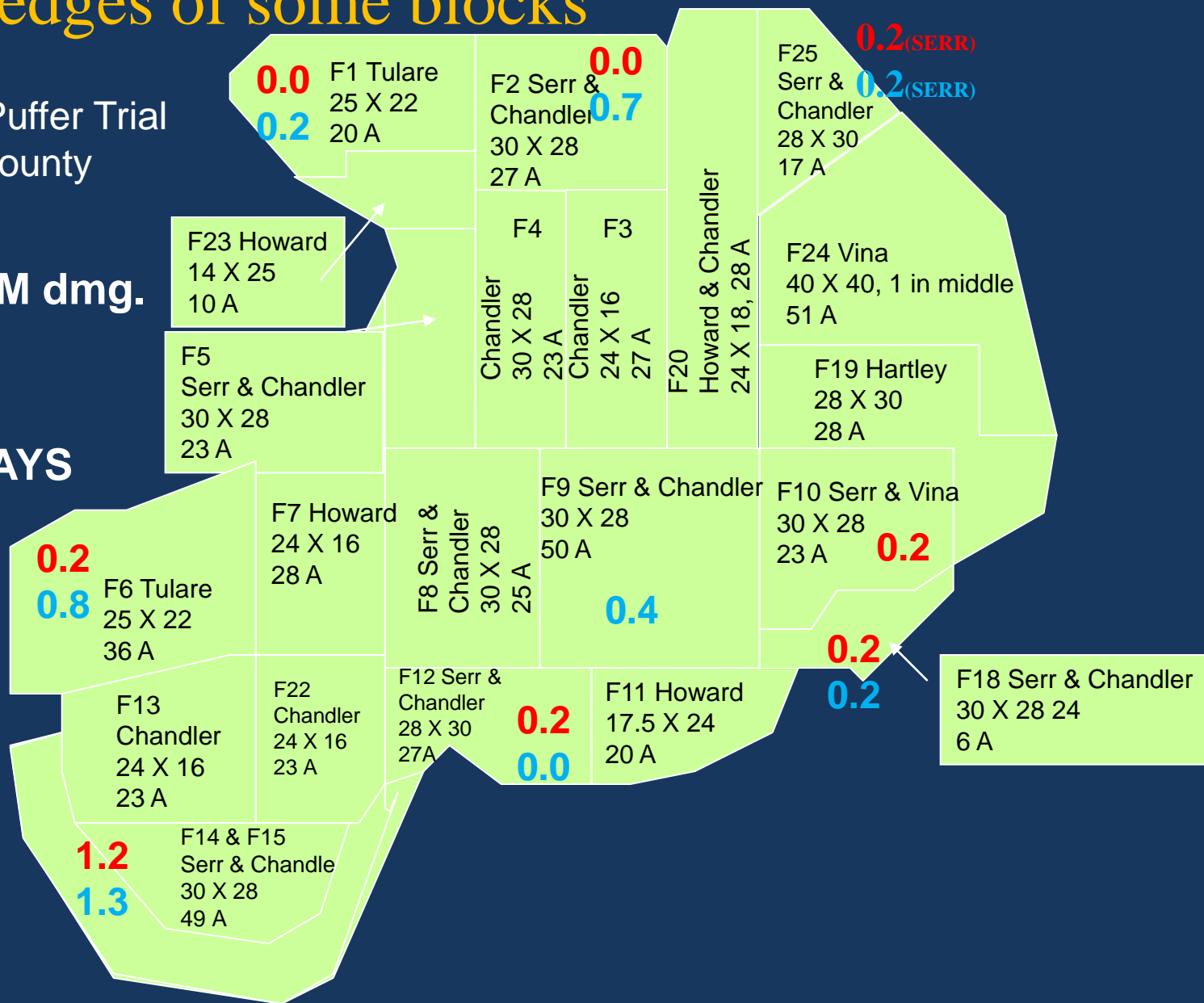
Harvest % CM dmg.

2008

2009

NO CM SPRAYS

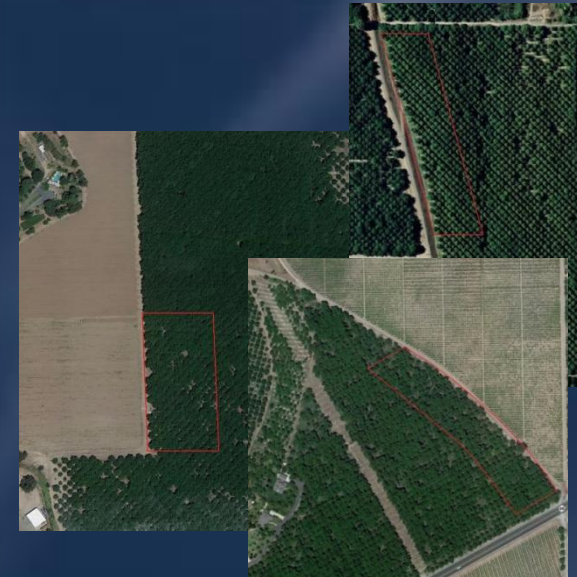
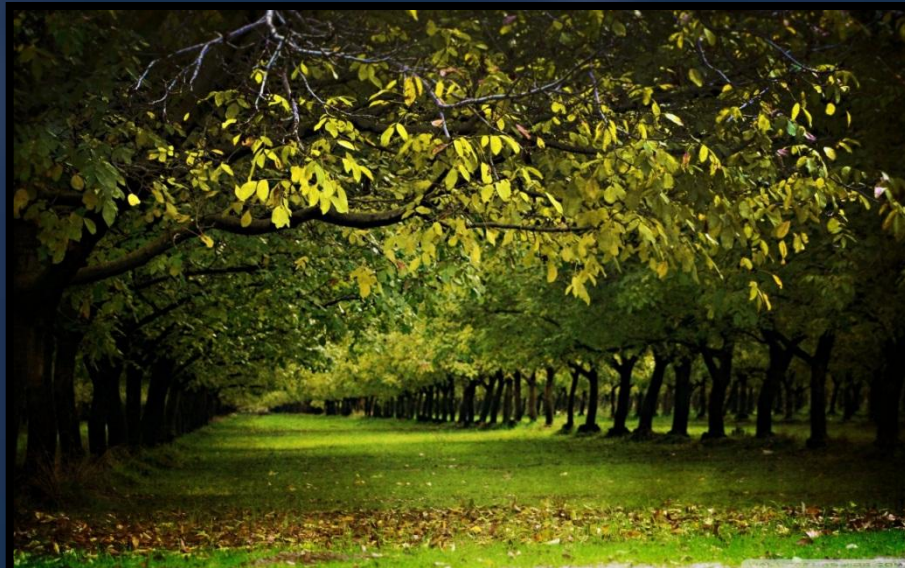
Either year





Problematic Edges 2010

- Orchards under PMD (0.5 puffer/ac)
- 5 Treatments replicated 3-4 times
 - Within & across orchards
- 1.25 ac plots along edge of orchard



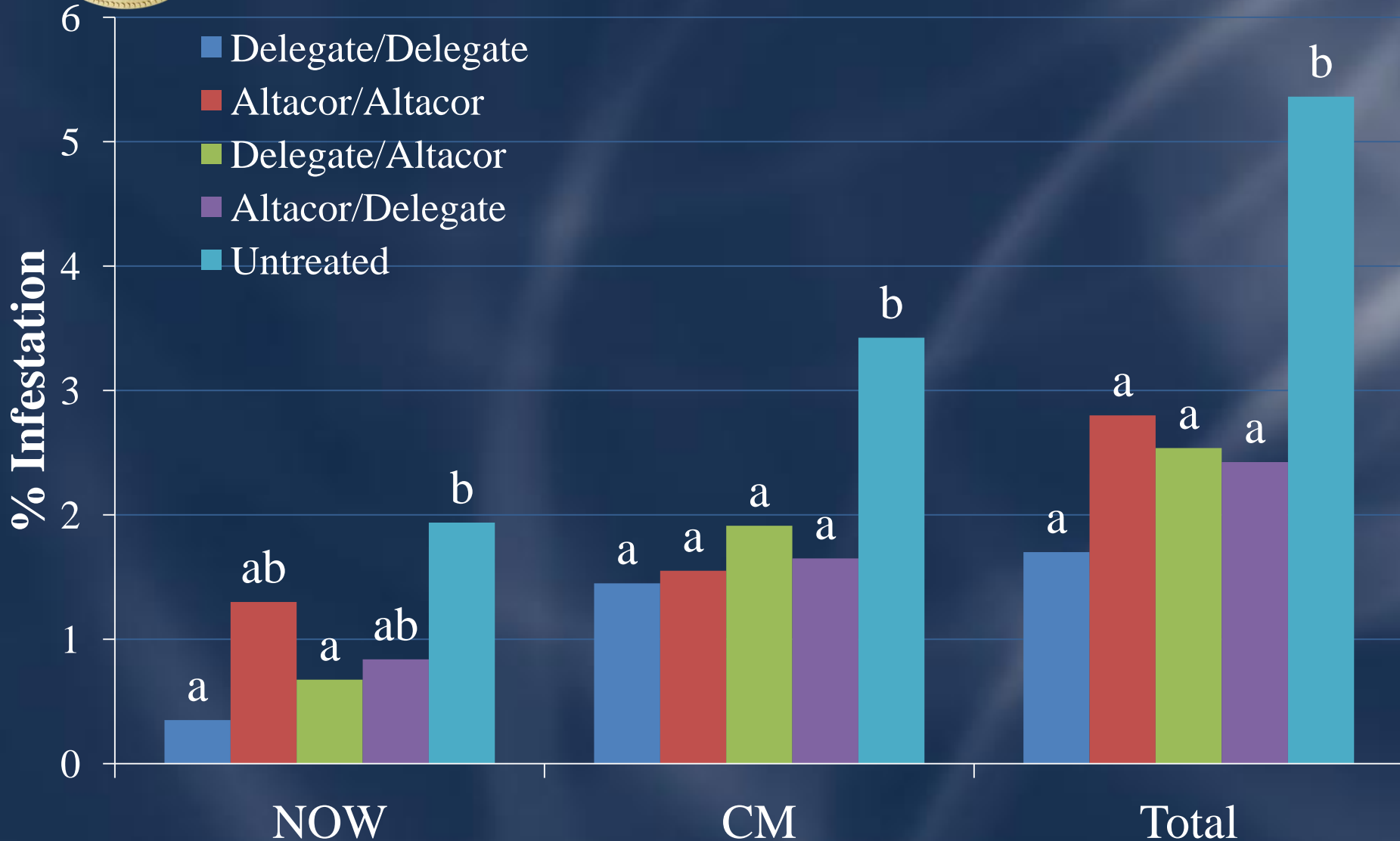


Spray Schedule 2010

Treatment/ Formulation	Rate Form/ac		Timing	Date
Delegate 25WG	4.8 oz	1B	525DD 1 st	4 June
Delegate 25WG	4.8 oz	2A	185DD 2 nd	7 July
Altacor 35WDG	3.0 oz	1B	525DD 1 st	4 June
Altacor 35WDG	3.0 oz	2A	185DD 2 nd	7 July
Delegate 25WG	4.8 oz	1B	525DD 1 st	4 June
Altacor 35WDG	3.0 oz	2A	185DD 2 nd	7 July
Altacor 35WDG	3.0 oz	1B	525DD 1 st	4 June
Delegate 25WG	4.8 oz	2A	185DD 2 nd	7 July
Untreated	---			



Infestation at Harvest 2010





1st Year Pheromone 2010

- Puffers placed 0.5/ac in 2010
- 4 treatments replicated 4 times
- Plots were 1.3 acres 8 trees x 8 trees



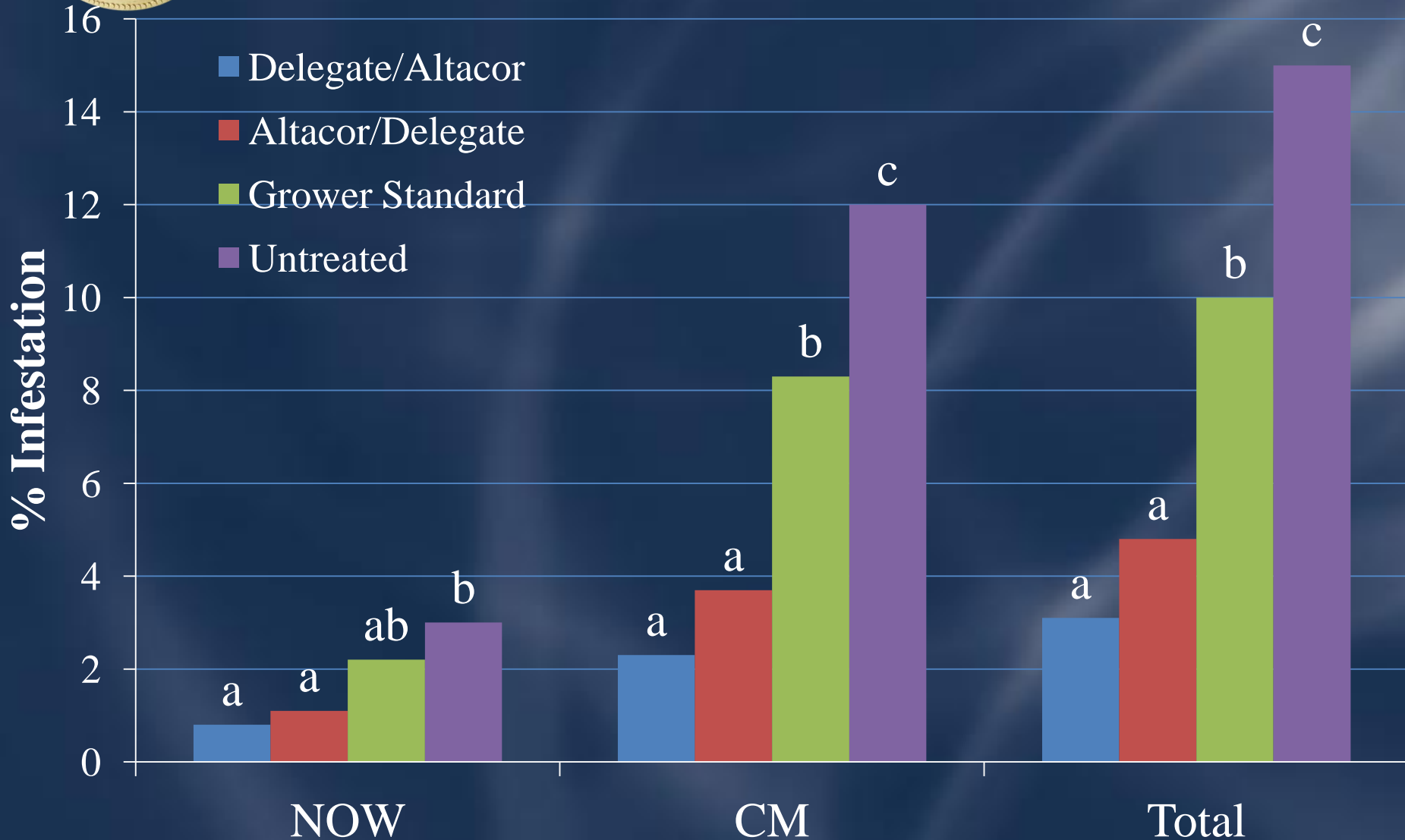


Spray Schedule 2010

Treatment	Rate Form/ac	Timing (DD)	Date
Delegate 25WG	4.8 oz	614 1 st	8 June
Altacor 35WDG	3.0 oz	185, 532 2 nd	7 July, 20 July
Altacor 35WDG	3.0 oz	614 1 st	8 June
Delegate 25WG	4.8 oz	185, 532 2 nd	7 July, 20 July
Grower Standard:			
Asana XL	6.0 oz	628 2 nd	24 July
Untreated	---		



Infestation at Harvest 2010





High Populations 2011

- 4 treatments replicated 3 times
 - split plot design.
- Plots were 8 or 10 trees wide ~25.3 ac/tr
- Plots split into east (10 trees long) and west (remainder)

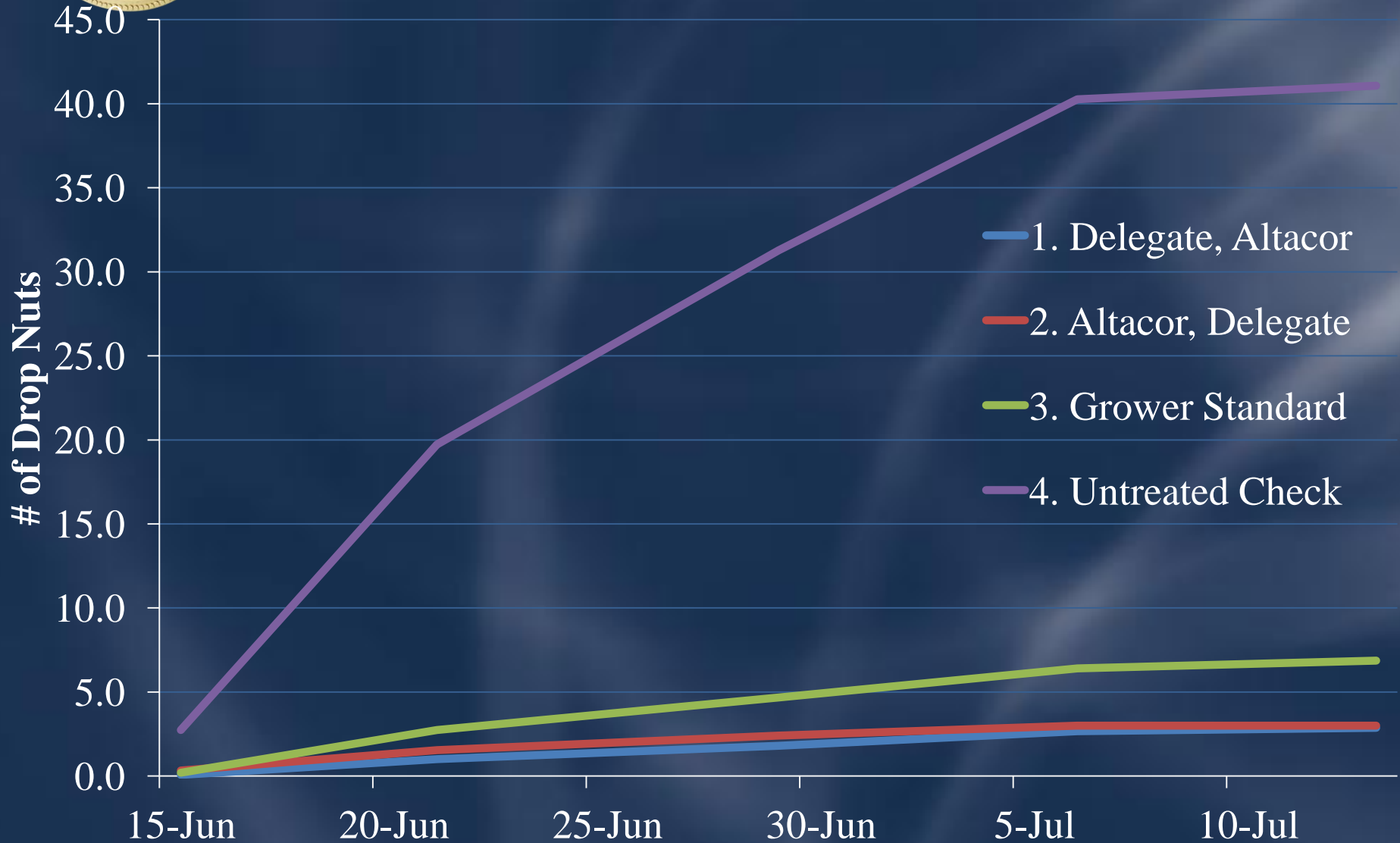


Spray Schedule 2011

	Treatments	Rate (Form./ac)		Timing & Date	
		Air	Ground		
1.	Delegate 25WG	4.0 oz	3.0 oz	189DD 1 st	3 May
	Delegate 25WG	---	7.0 oz	719DD 1 st	15 June
	Altacor 35WDG	2.5 oz	2.0 oz	245DD 2 nd	19 July
2.	Altacor 35WDG	2.5 oz	2.0 oz	189DD 1 st	3 May
	Altacor 35WDG	---	4.5 oz	719DD 1 st	15 June
	Delegate 25WG	4.0 oz	3.0 oz	245DD 2 nd	19 July
3.	Grower Standard:				
	Lambda-Cy EC	3.12 fl oz	2.0 fl oz	249DD 1 st	6 May
	Bifenture 10DF +	---	10.0 oz	631DD 1 st	11 June
	Abamectin 0.15EC	---	16.0 fl oz		
	Lambda-Cy EC	5.12 fl oz	---	894DD 1 st	22 June
	Warhawk 4EC	4.0 pt	---	245DD 2 nd	19 July
4.	Treated Check:				
	Warhawk 4EC	4.0 pt	---	245DD 2 nd	19 July

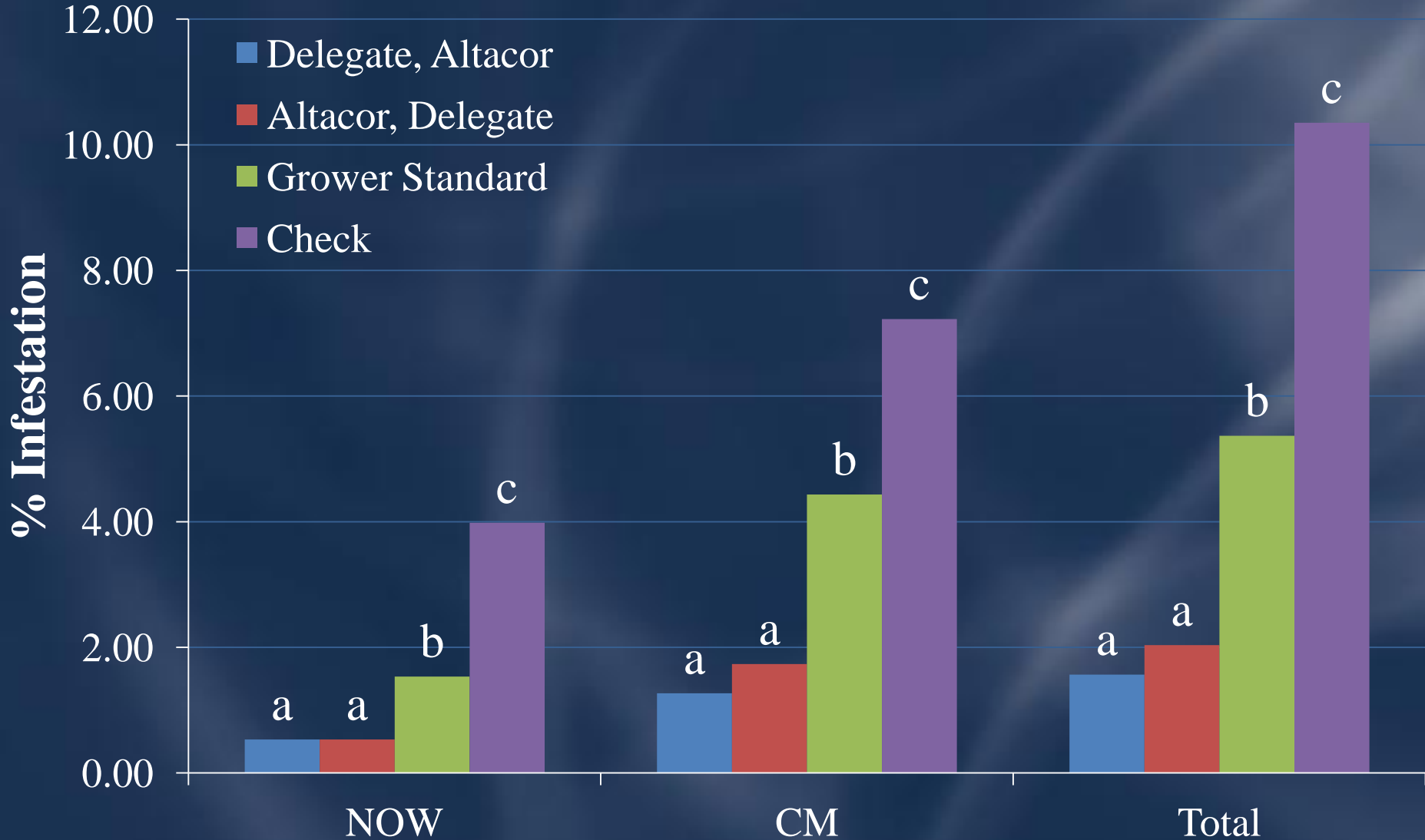


Cumulative CM Infested Dropped nuts per tree – 2011





Infestation at Harvest 2011





Walnut Aphid

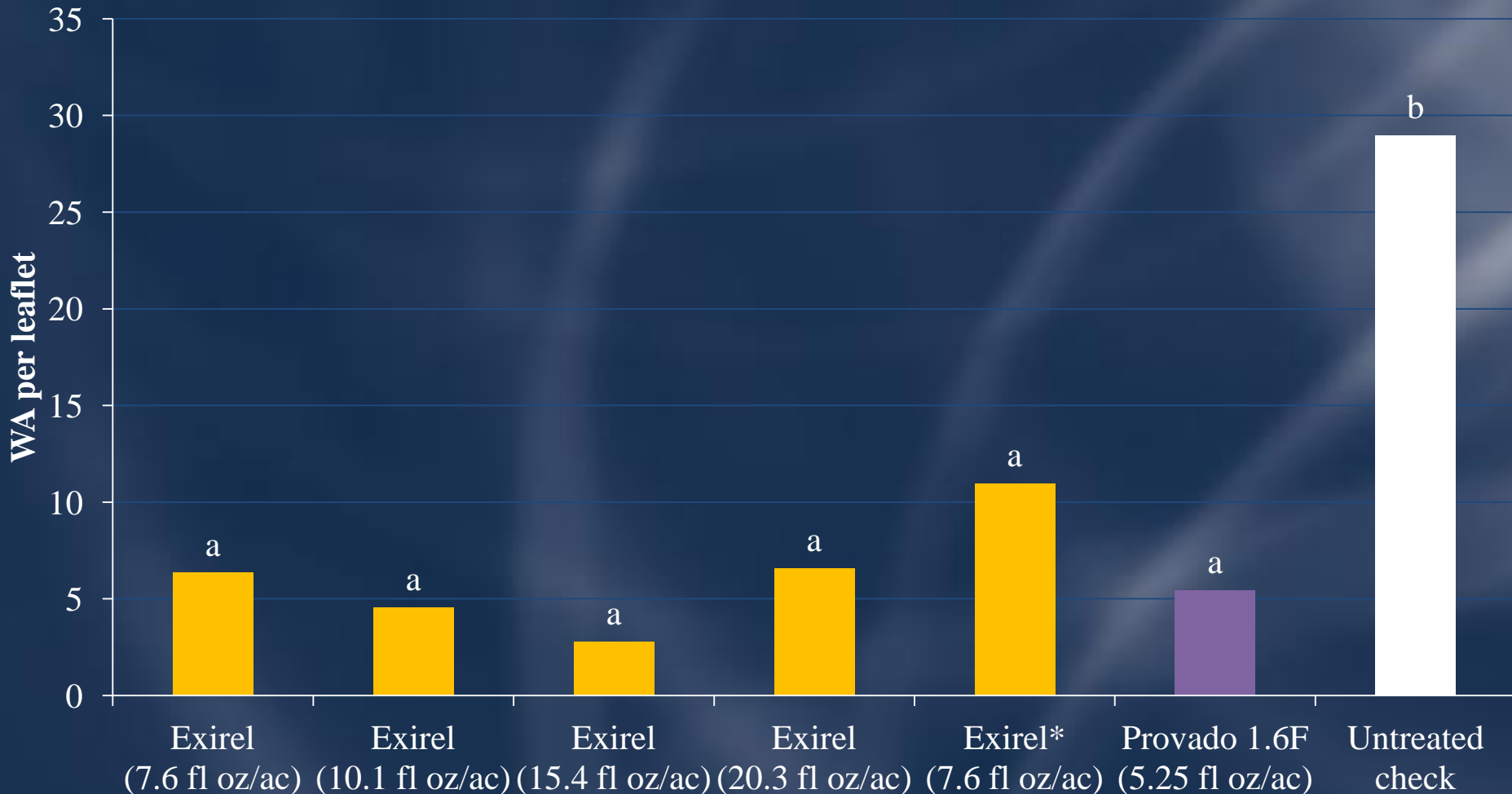
Chromaphis juglandicola





Walnut Aphid – 2009

Season Total aphids/leaflet



* Treatment contained 0.5% Dyne-Amic v/v



Walnut Husk Fly

Rhagoletis completa





Trap Improvement

- Trap comparisons:
Trécé and Alpha Scents
- Bait Comparisons:
 - Ammonium carbonate v. bicarbonate
 - GL alcohol & caryophyllene
 - Commercial lures: Trécé and Alpha Scents
- Trap Height





Experimental Design

- 10 trap-lure combinations were replicated 4 times in three orchards
 - Rio Oso, (Sutter Co.), Linden (San Joaquin Co.), Hollister (San Benito Co.)
- Traps hung in top 5 feet of canopy or ~6 ft. off ground
- Trap positions were rotated weekly to account for position effects
- 3-5 buffer trees between replicates; high-low traps of each treatment hung in adjacent trees

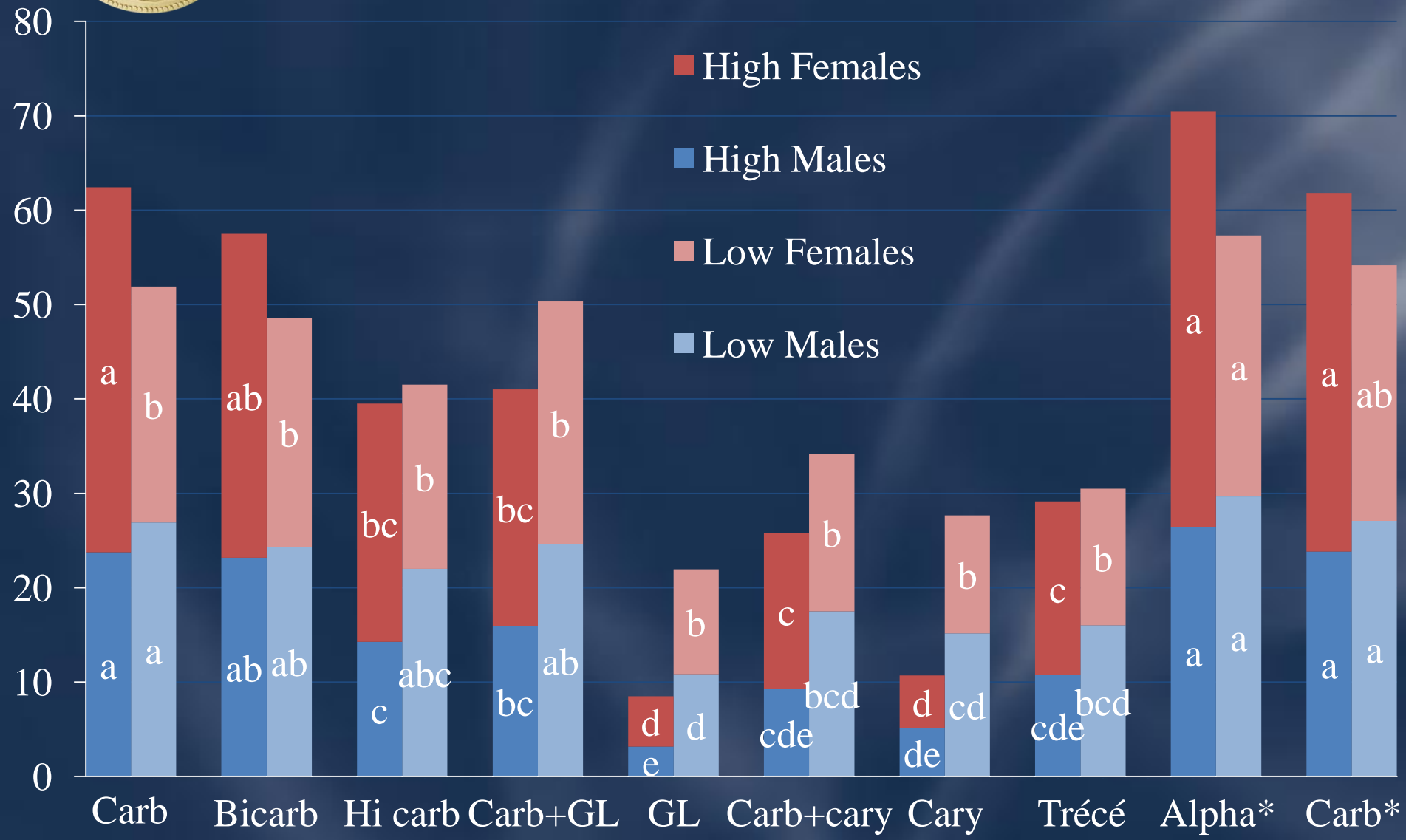


Trap & Lure Combinations

Trap	Lure	Abbr.
1. Trécé	Ammonium carbonate (3.9 g)	Carb
2. Trécé	Ammonium bicarbonate (3.9 g)	Bicarb
3. Trécé	Ammonium carbonate (3.9 g in a high output bag)	Hi carb
4. Trécé	Ammonium carbonate (3.9 g) + GL alcohol blend	Carb + GL
5. Trécé	GL alcohol blend	GL
6. Trécé	Ammonium carbonate (3.9 g) + Caryophyllene	Carb + cary
7. Trécé	Caryophyllene	Cary
8. Trécé	Trécé (2.2 g total)	Trécé
9. Alpha Scents	Alpha Scents (7.7 g total)	Alpha*
10. Alpha Scents	Ammonium carbonate (3.9 g)	Carb*

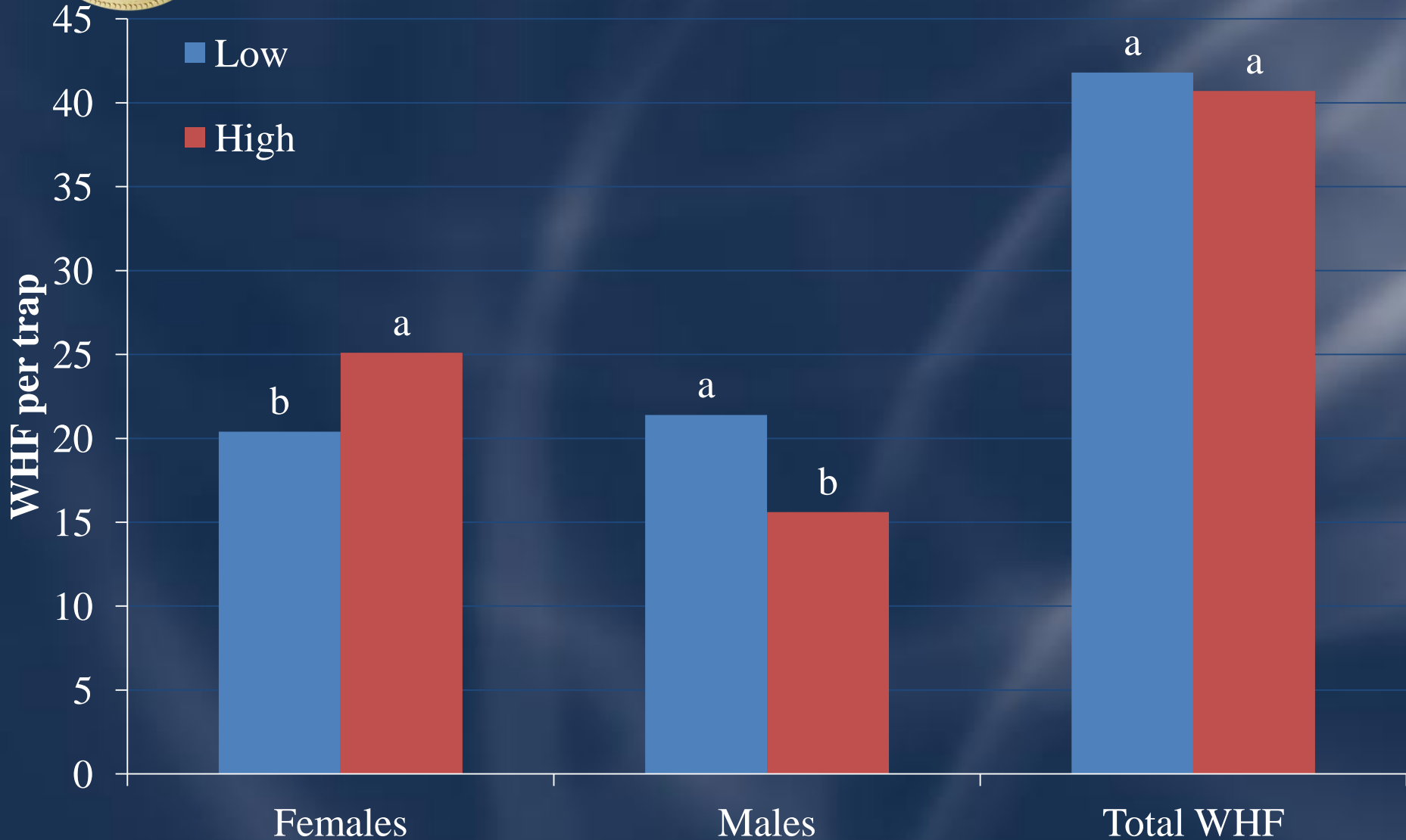


Mean # WHF per Trap Season Total – 3 Orchards





Mean # WHF per Trap by Height Season Total – 3 Orchards





Trapping Conclusions

- No difference between trap types
- No apparent difference between Alpha Scents lure, ammonium carbonate and bicarbonate
- GL alcohol & caryophyllene decrease attractiveness of ammonium carbonate





Trapping Conclusions

- Mixed results with trap height efficacy:
 - More females caught in low traps
 - More males caught in high traps
 - Canopy conditions were a confounding factor





Low Volume Techniques – 2012

- Treatments were applied using a hand-gun orchard sprayer or grower operated speed sprayer (in GS)
 - Grower standard: 100 gal/ac
 - Low volume: 10 gal/ac
- Plots sprayed every other row with 2 oscillating streams on either side of the drive row
 - Rows sprayed in a W pattern hitting the top of the tree



Low Volume Techniques – 2012

Treatment	Rate	Material
1. Grower standard (GS)	3 pt/ac	Malathion 57%
	3 pt/ac	NuLure
2. High concentration	3 pt/ac	Malathion 57%
	3 pt/ac	NuLure
3. Low concentration	0.3 pt/ac	Malathion 57%
	0.3 pt/ac	NuLure
4. Treated check	3 pt/ac	NuLure



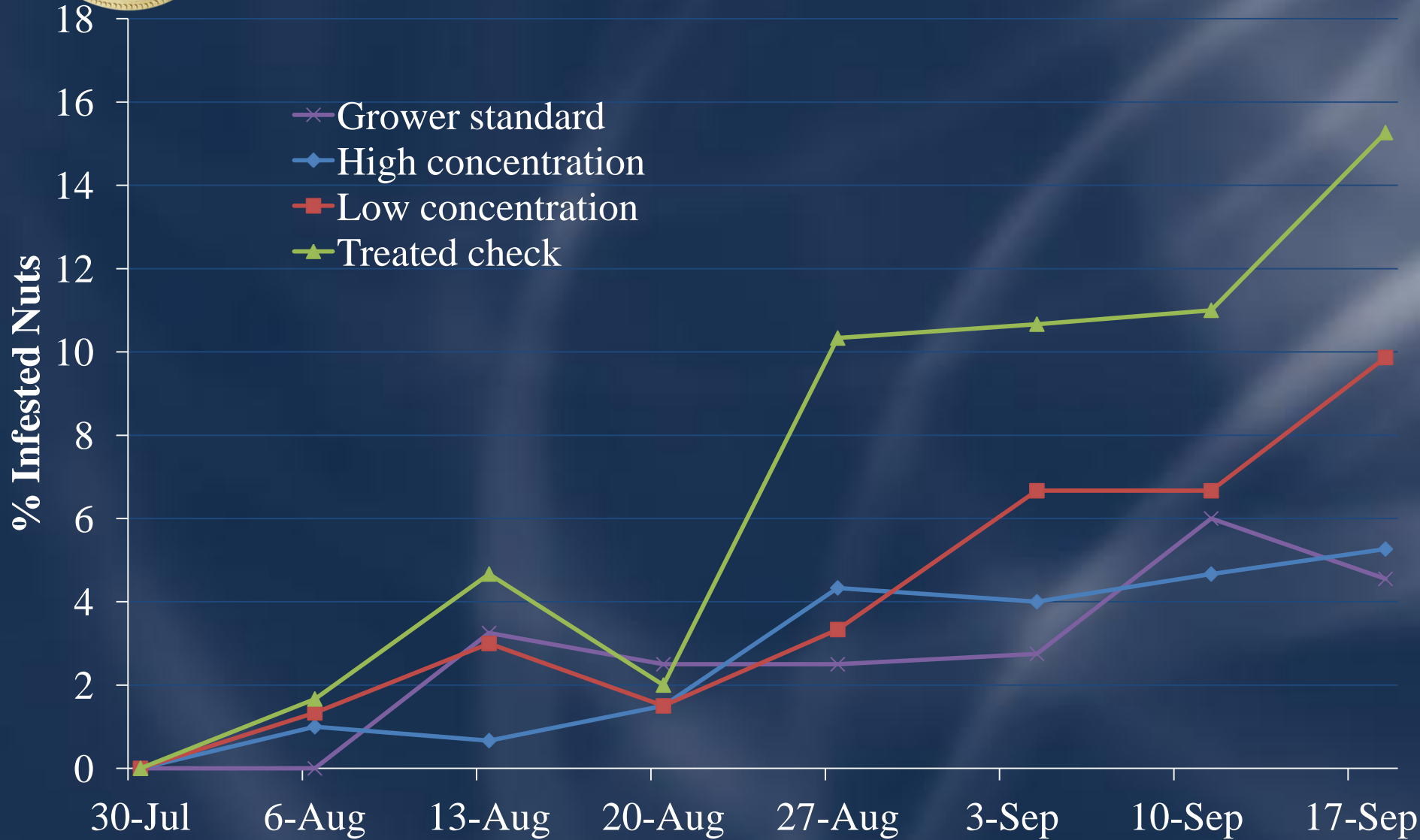
Low Volume Techniques – 2012

- High concentration and grower standard treated 2x between 7/25 and 8/15
- Low concentration treated every 2 weeks
 - 4-5 times between 7/6 and 9/12
- Treated check treated at same time as other applications with the highest rate of NuLure applied in the orchard that day





Low Volume Techniques – 2012





Field Efficacy – Methods

- Orchard of ‘Hartley’ walnuts near Hollister, CA with an historically high WHF population
- Treatments applied with hand-gun orchard sprayer
 - Operated at 250 psi, final spray volume of 250-300 gal/ac

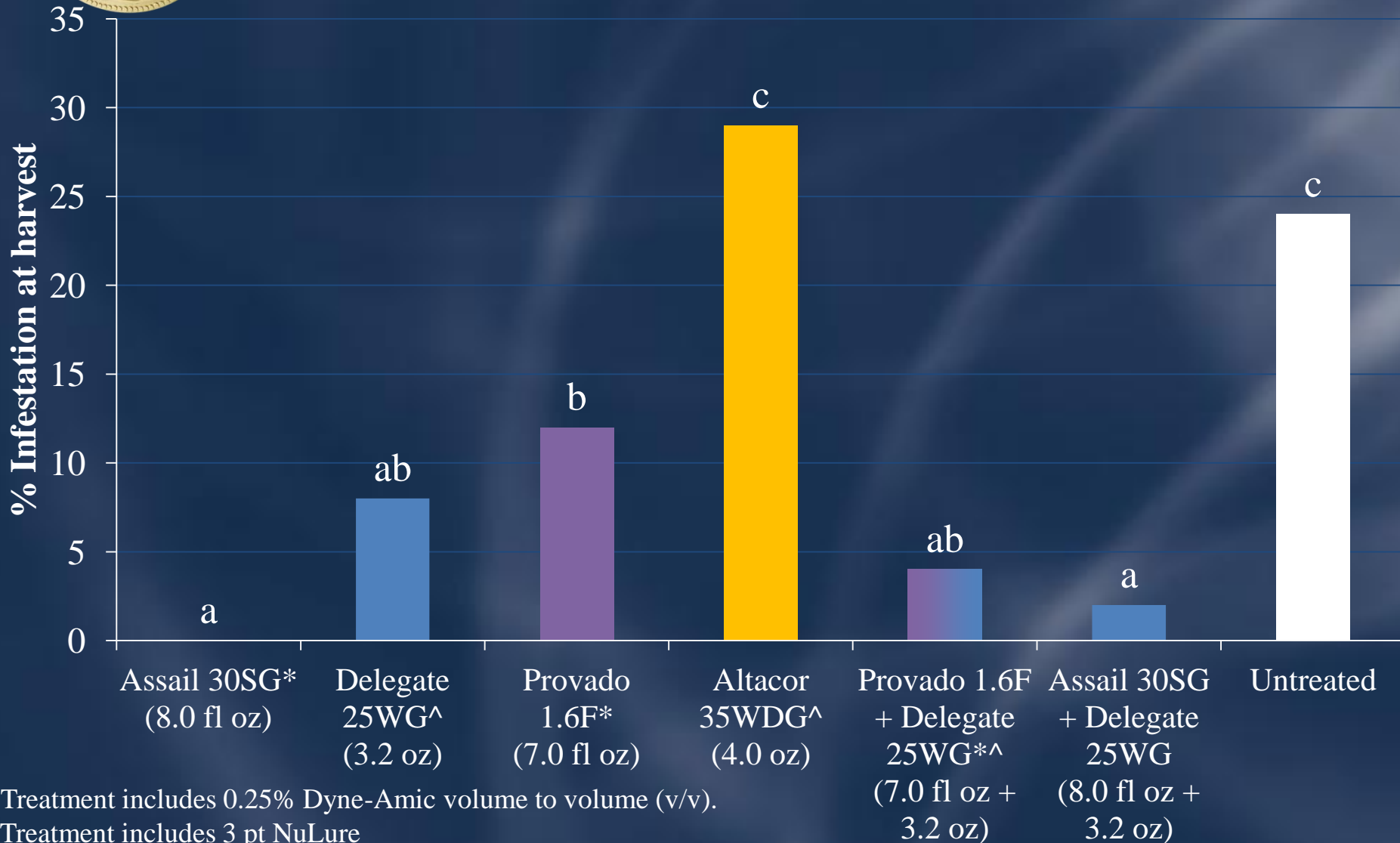


Field Efficacy – Methods

- 2 – 3 applications each year
 - Mid-late July, mid-August, late-August/early September
- Treatments replicated 4 times in RCB design
 - Replicates consisted of a single tree
- Evaluations of 100 or 250 nuts/replicate before commercial harvest (mid-Sep)

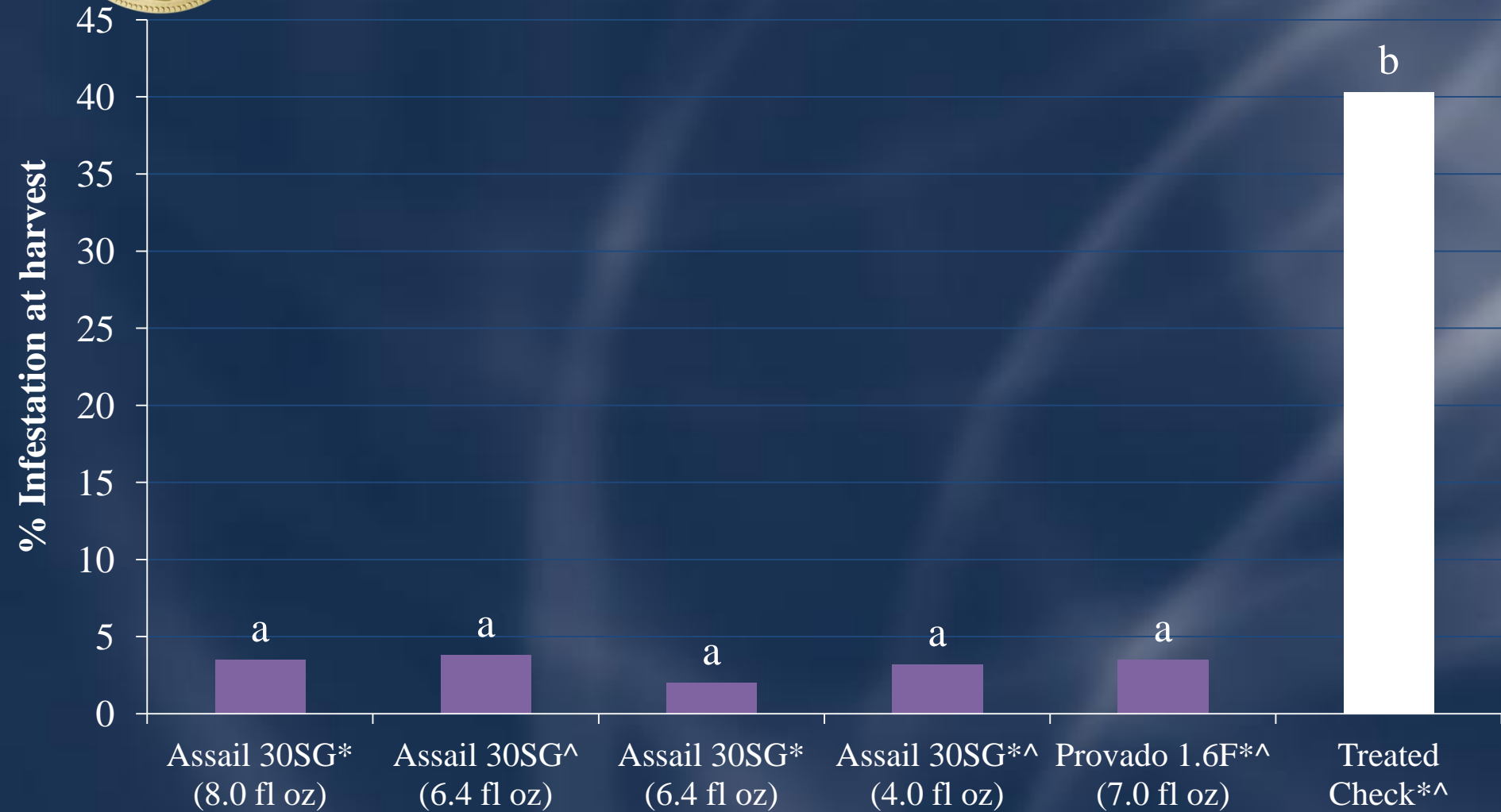


WHF Efficacy – 2008





WHF Efficacy – 2009

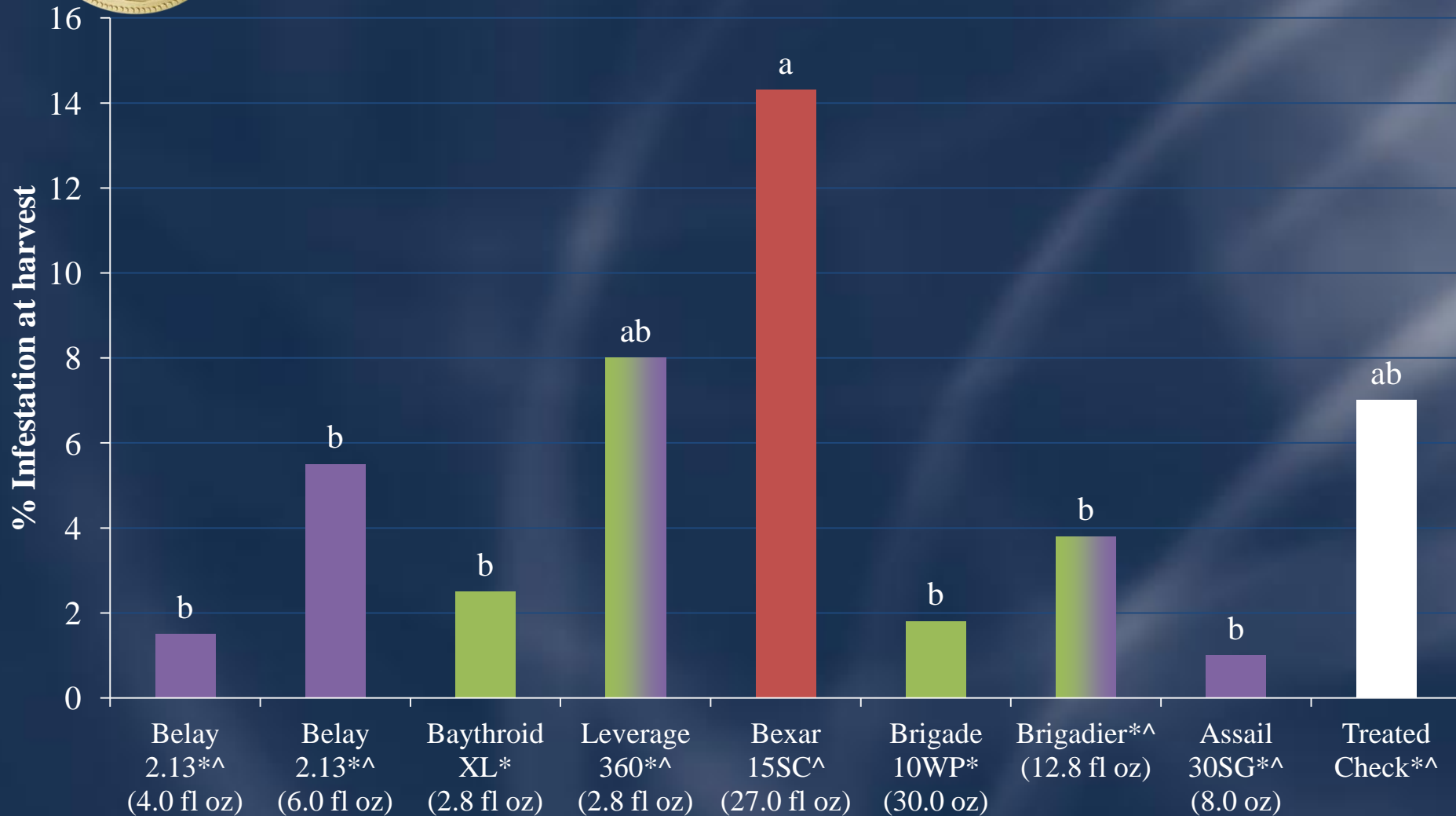


*Treatment includes 0.5% Dyne-Amic volume to volume.

^Treatment includes 3 pt NuLure

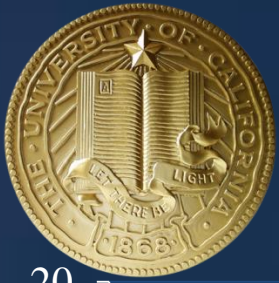


WHF Efficacy – 2011

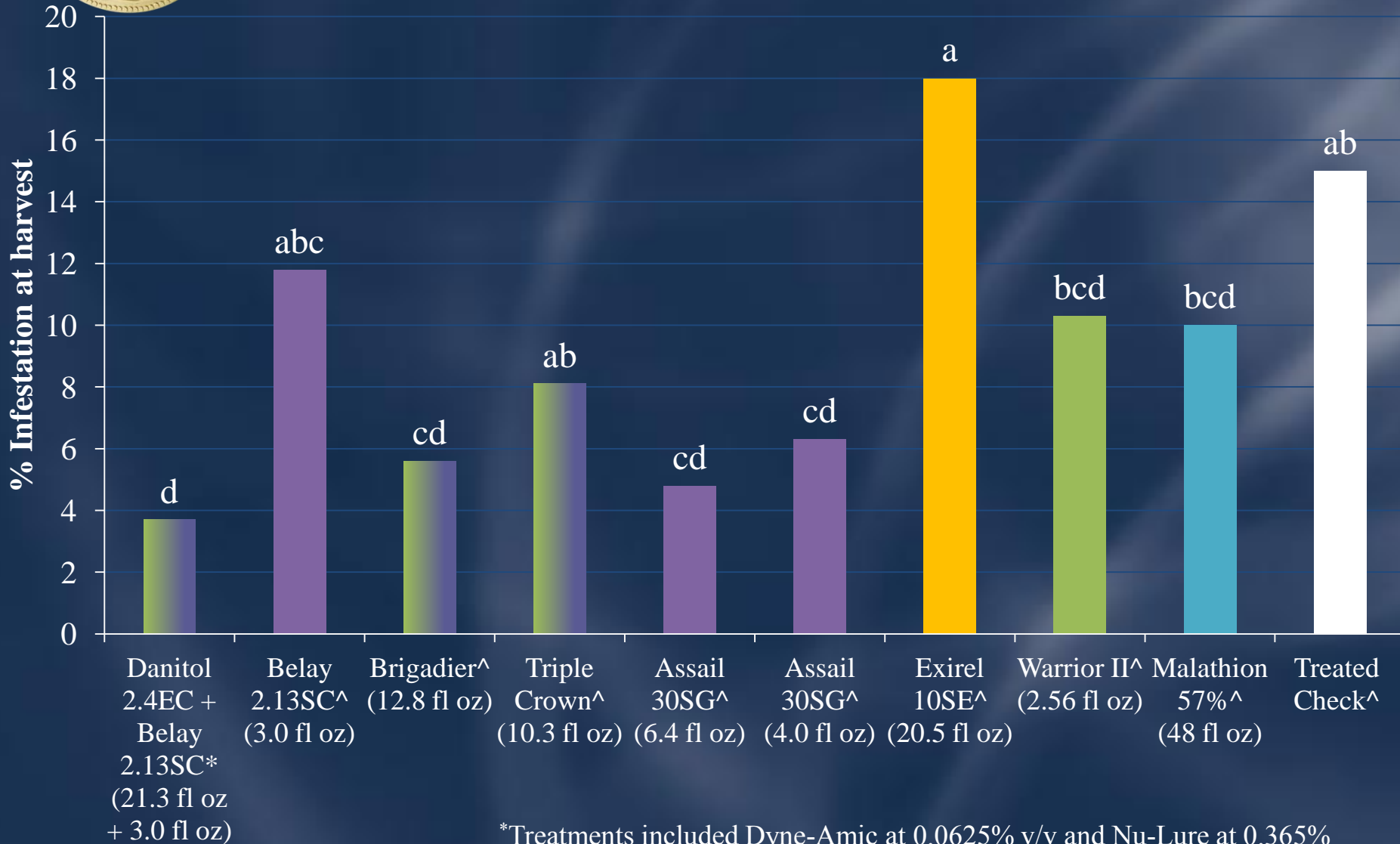


*Treatment includes 3 pt NuLure

^Treatment includes 0.25% Dyne-Amic volume to volume.

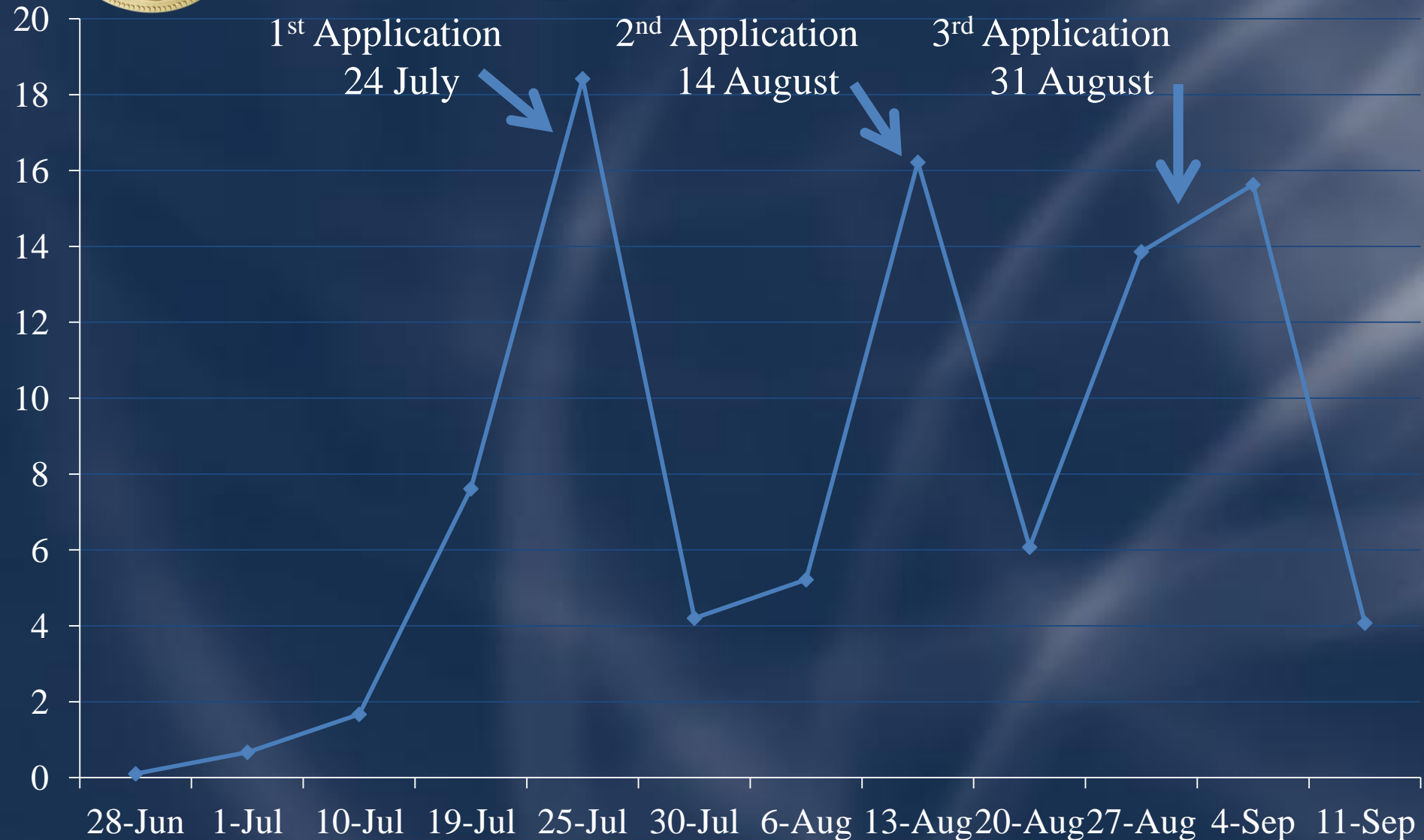


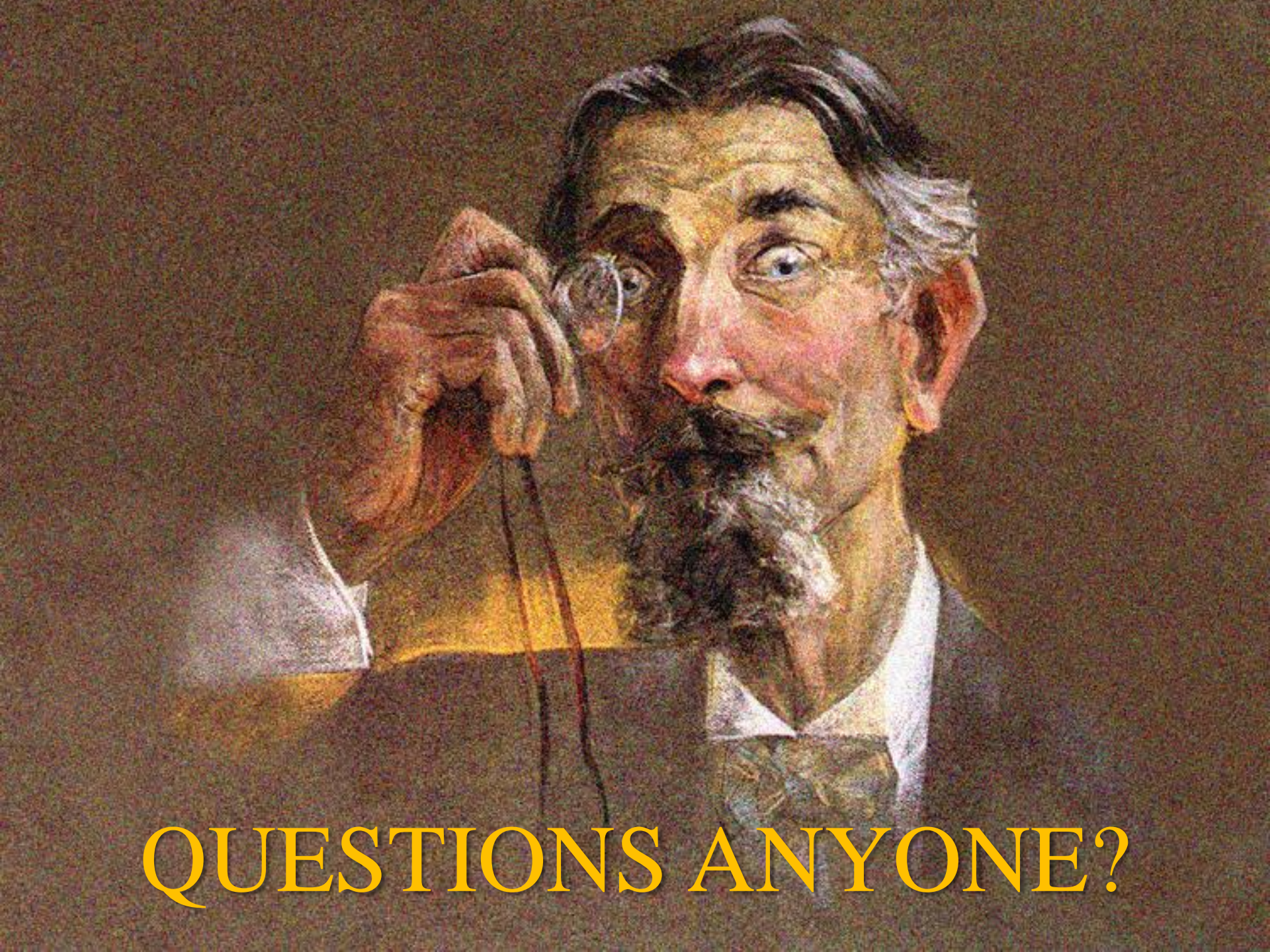
WHF Efficacy – 2012





Mean Number WHF per day – 2012





QUESTIONS ANYONE?