

Alternative Effects of Shade Netting Over Apple Orchards



Photo: J. Brunner



Photo: E. Beers



Photo: A. Marshall



Photo: E. Beers

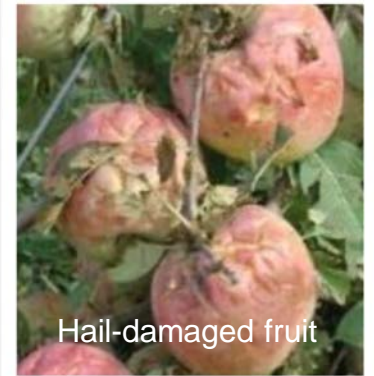
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Hilton Waikoloa Village, Hawaii

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History of Nets in Orchards

- ✓ Hail nets
- ✓ Shade nets



Hail-damaged fruit



Sunburned fruit



Types of Net Structures

Drive-in enclosure



Tree wrap



Top-cover only



Multiple Functions



- ✓ Minimize heat stress
- ✓ Eliminate overhead cooling
- ✓ Improve fruit size, skin color
- ✓ Reduces worker exposure to UV and heat stress
- ✓ Excludes vertebrate (birds/deer)
- ✓ Exclude insects



Cage Construction



Photo: A. Marshall

12- 10'x10'x5' Cages
3 trees/cage

4- 40'x50'x15' Cages
48 trees/cage



Photo: A. Marshall



Ability to exclude direct pests

codling moth

Photo: Jay Brunner



Photo: Doug Wilson

leafrollers



Photo: H. Reidl



Moth Exclusion

- Large resident population
- Remove populations within cages
- Traps deployed in netted and non-netted areas





Effects on indirect pests and natural enemies

- Do cages affect predator/prey population dynamics?
- Indirect Pests: Woolly apple aphid
- Natural Enemies: Lacewings, Syrphids, *Aphelinus mali*

Photo: E. Beers



Photo: A. Marshall



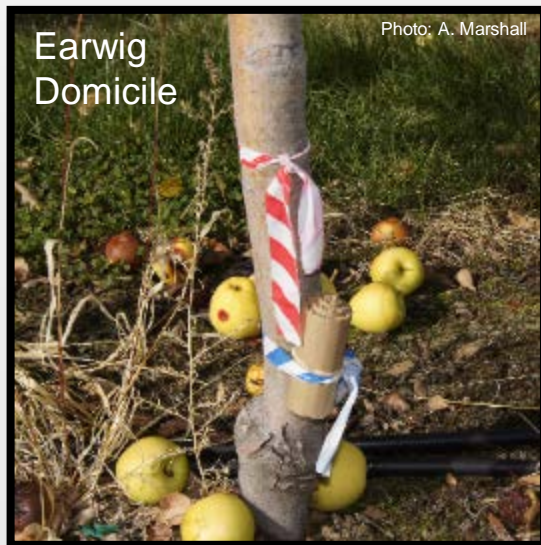
Photo: E. Beers





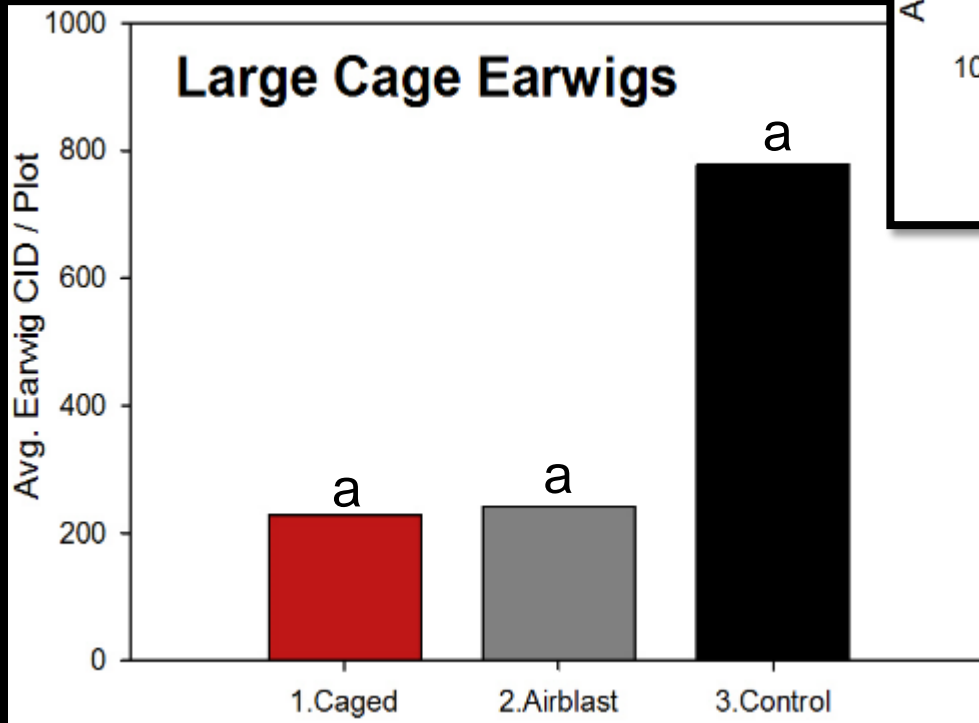
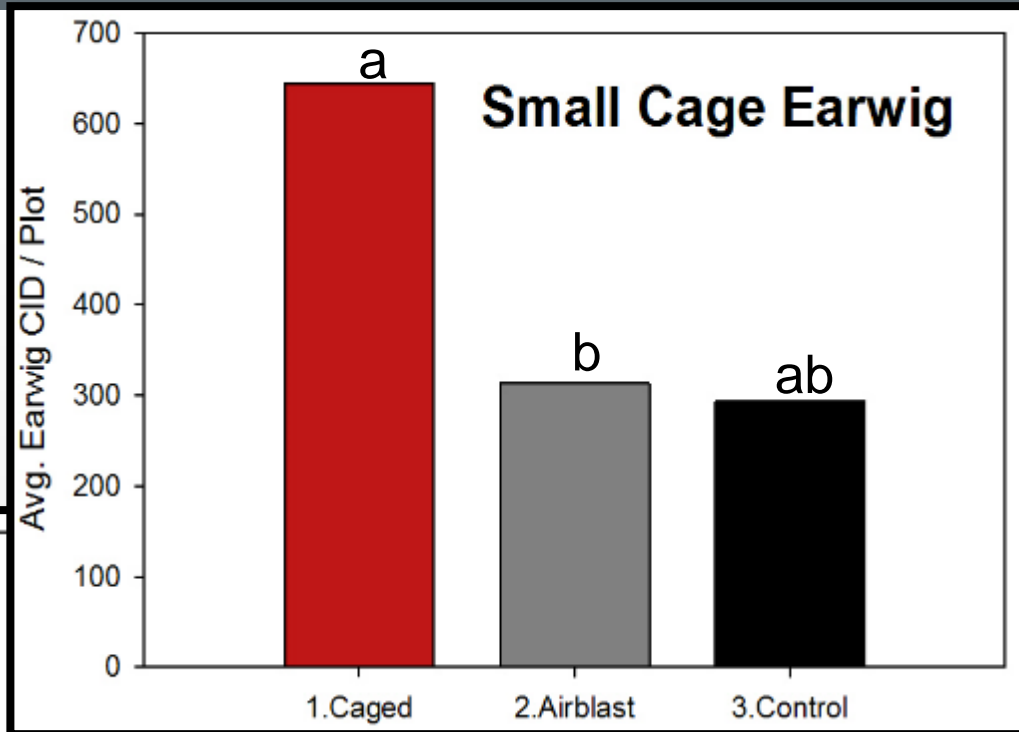
Density Tracking

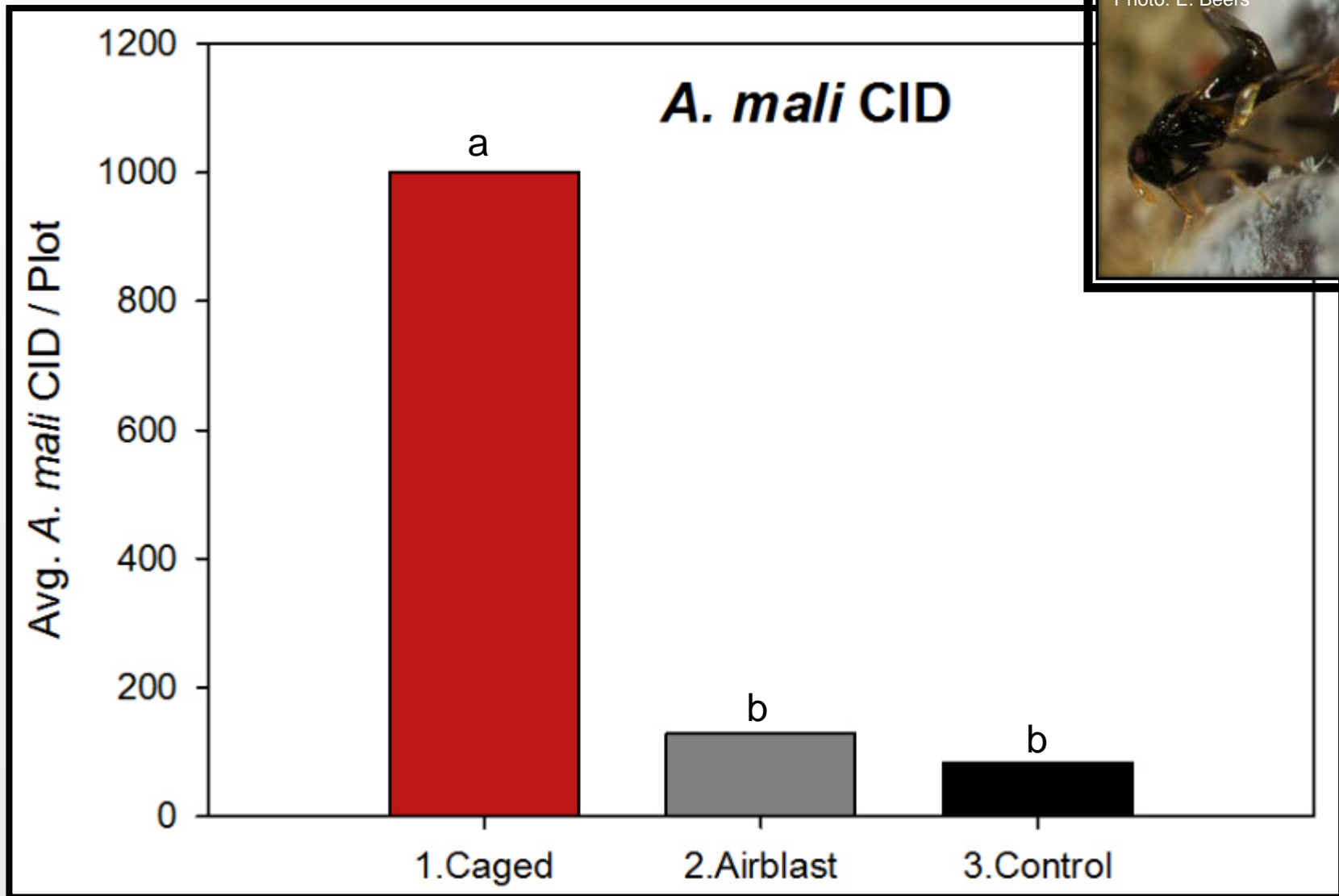
- Deploy traps to monitor densities throughout growing season
- Determine treatment effects on seasonal abundance of pests and natural enemies

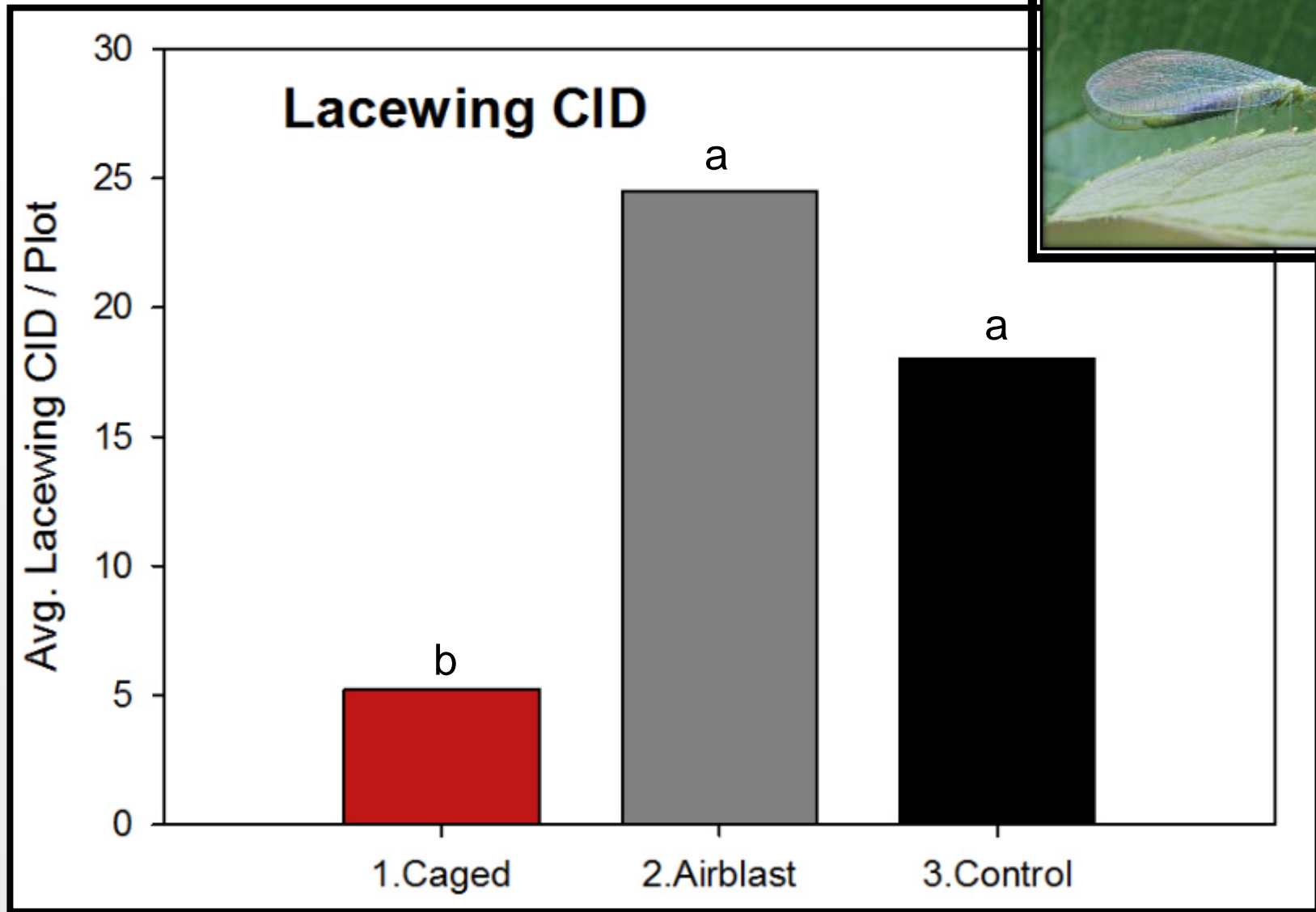


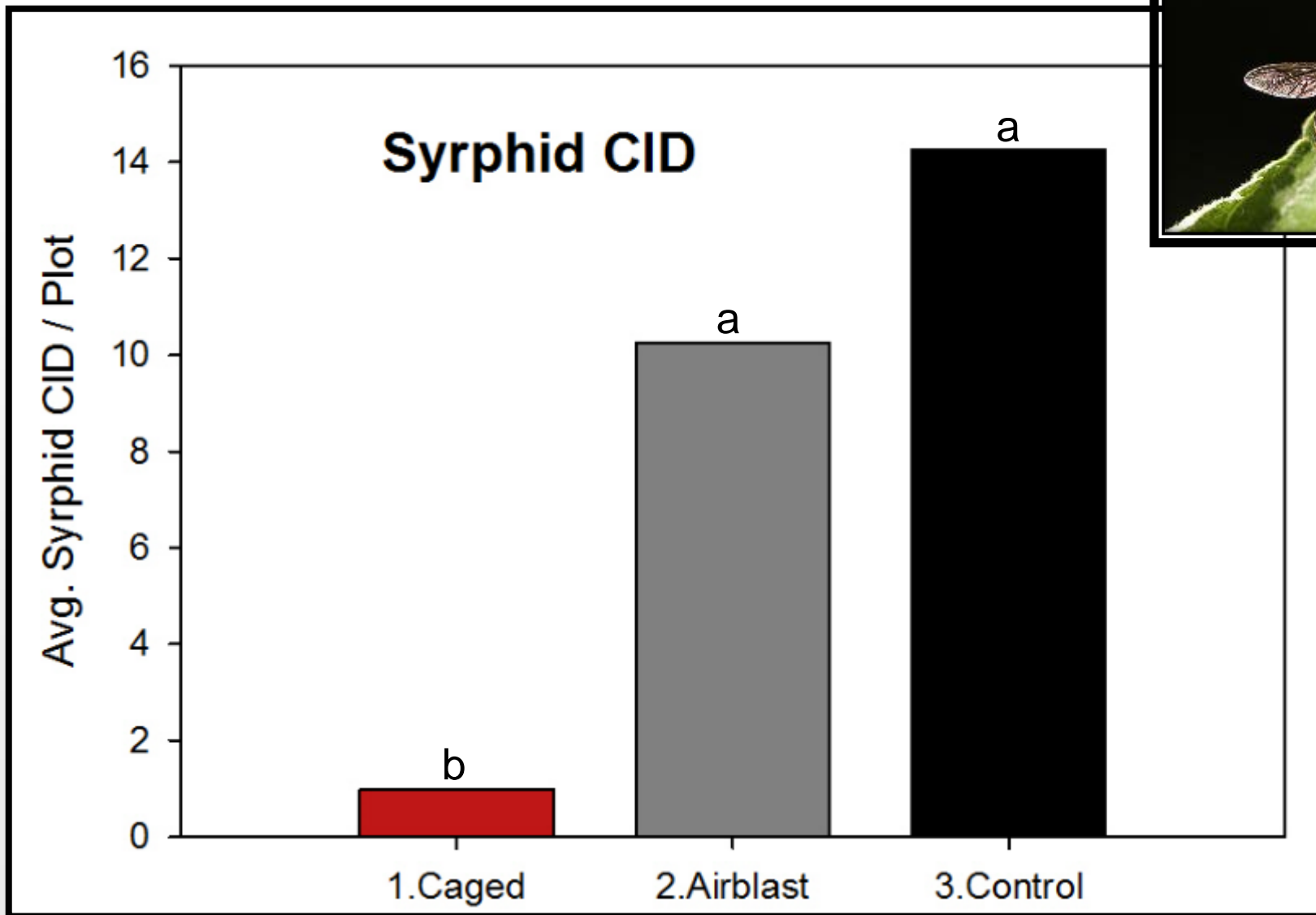


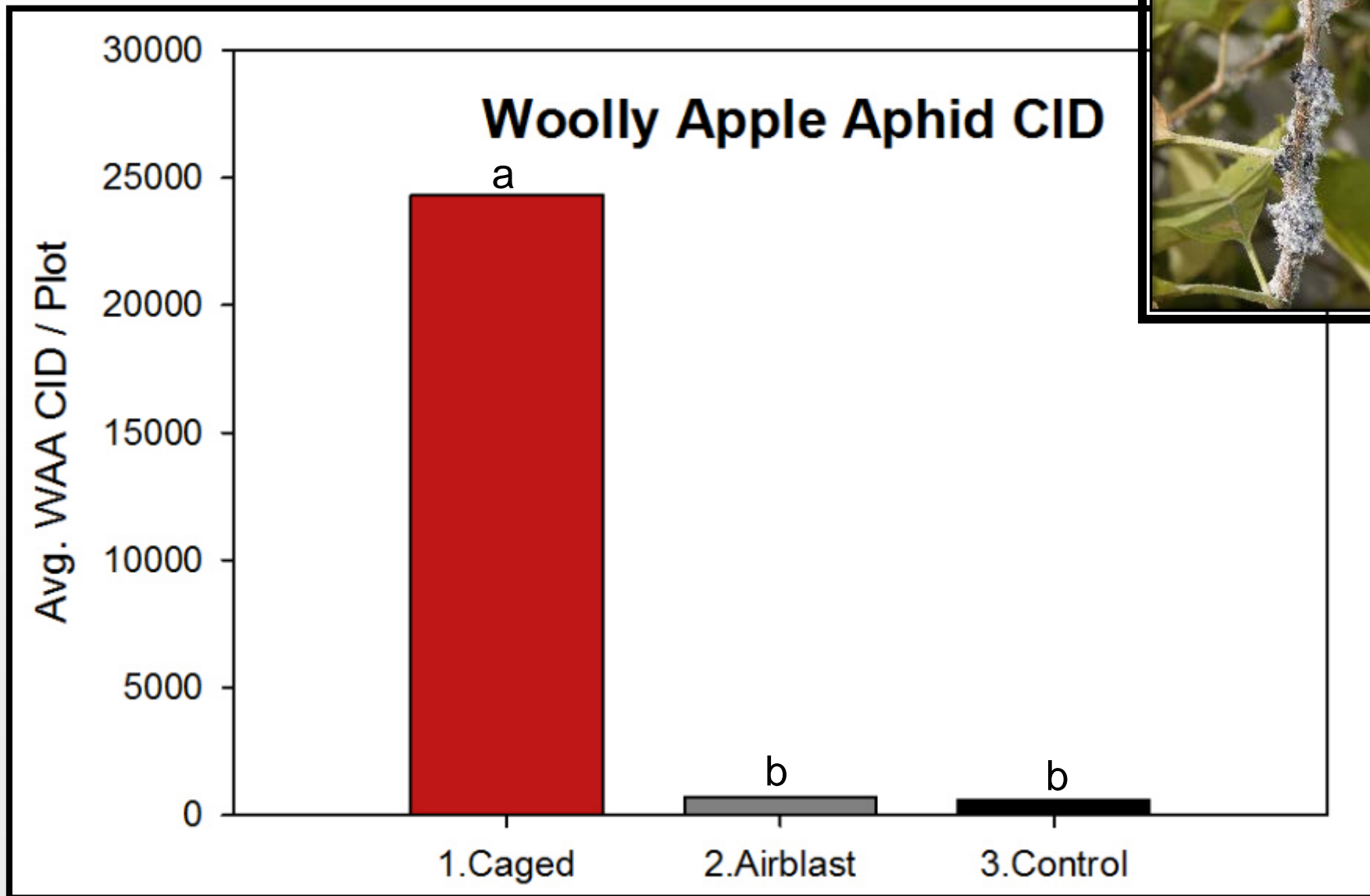
2016 Results





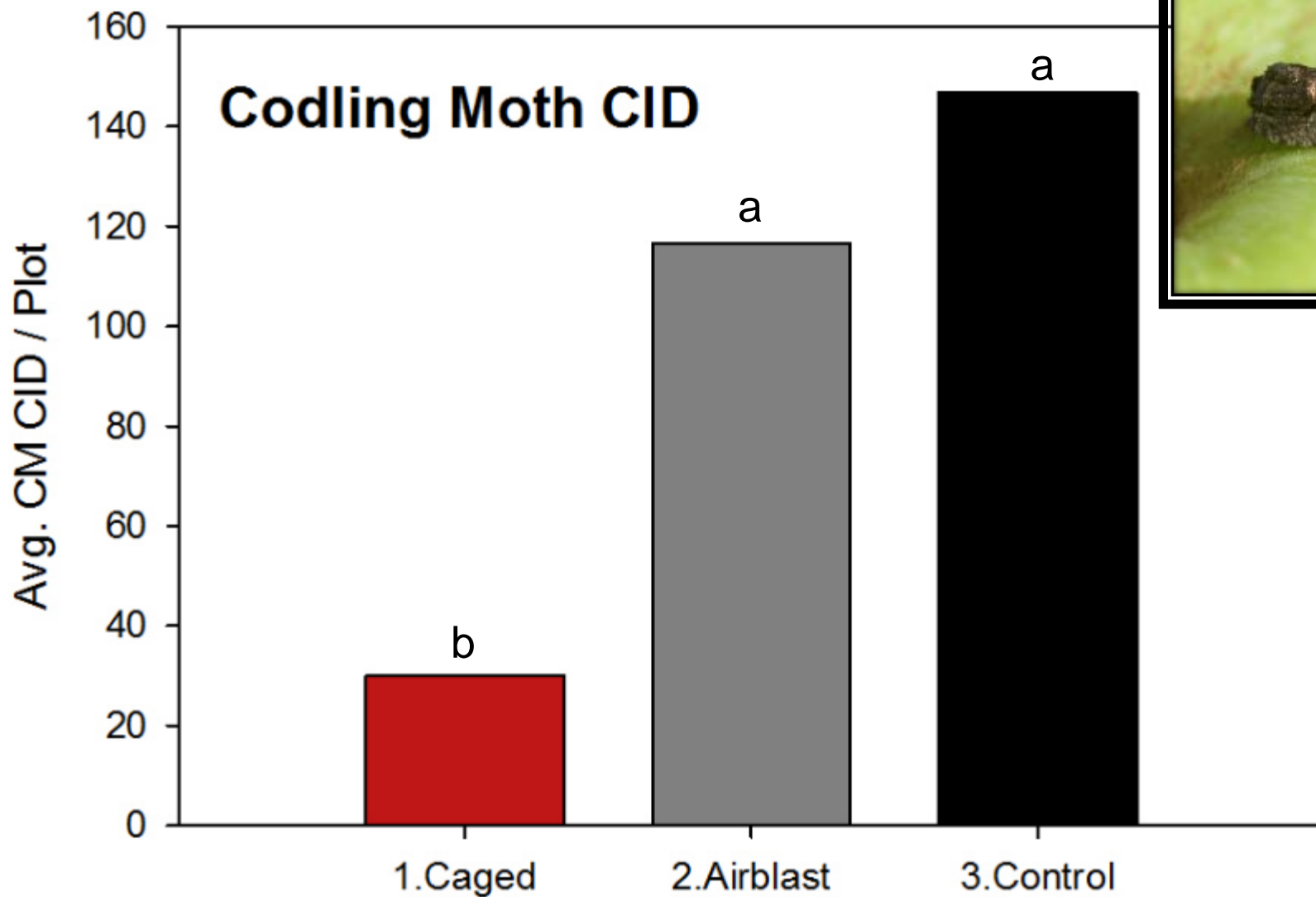






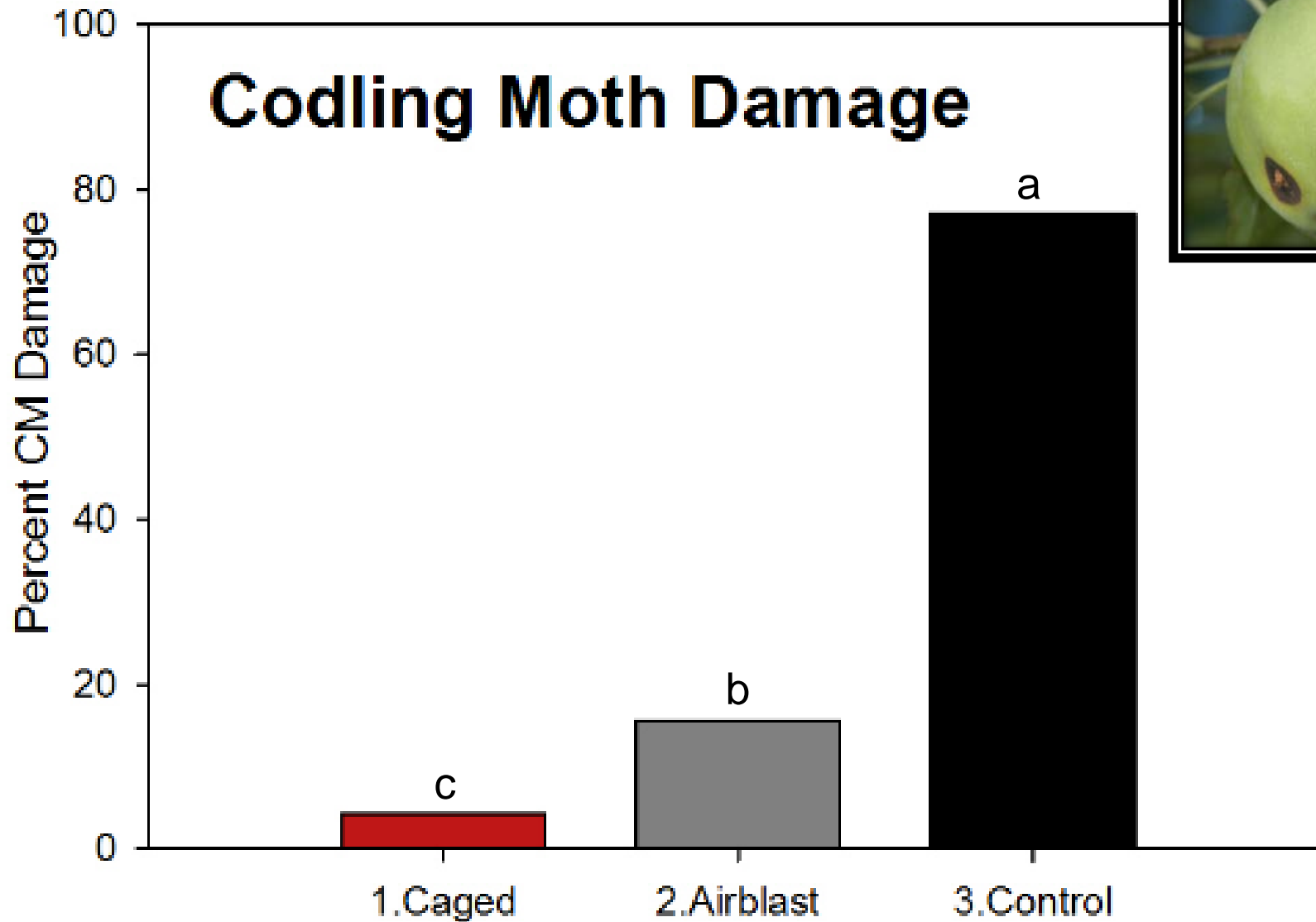


Codling Moth CID





Codling Moth Damage





What about other applications?

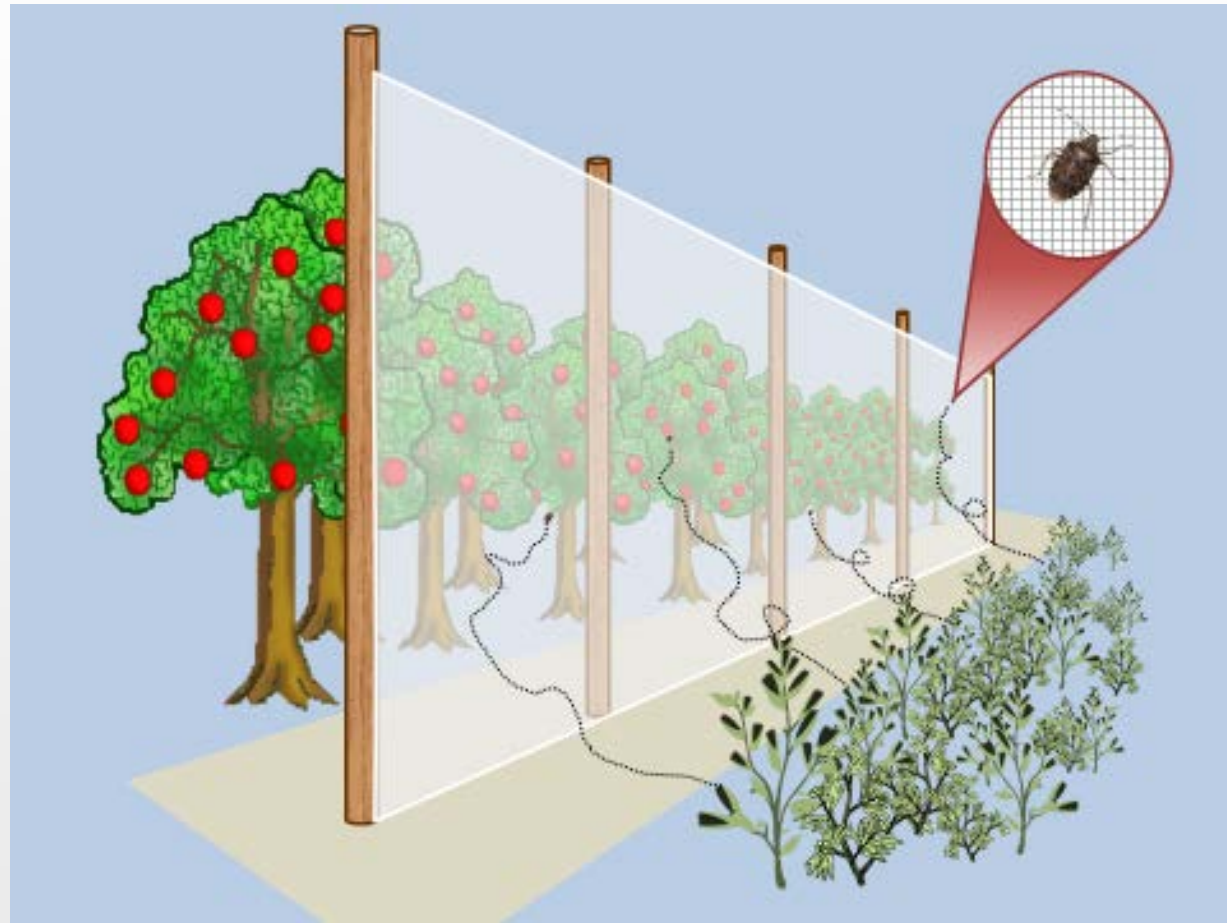
- Full enclosure requires a significant upfront investment
- Other direct pests?





Efficacy of a barrier at orchard border

- Will a barrier reduce migration into the orchard?
- Will insecticide infused netting be more effective?





Making Dreams a Reality





Success!!!





Acknowledgements



Crew of 2016

Back, l. to R: Josh Milnes, Thomas Smytheman, Ross Martin, Bruce Greenfield, Jim Hepler, Adrian Marshall
Middle: Retsy Beers, Daria Gausman, Chris Sater, CJ Squires, Peter Smytheman
Front: Alix Whitener, Andrea Bixby-Brosi, Ali Everhart, Matt Giannandrea



Questions?

