

A new chemistry for managing soybean aphid

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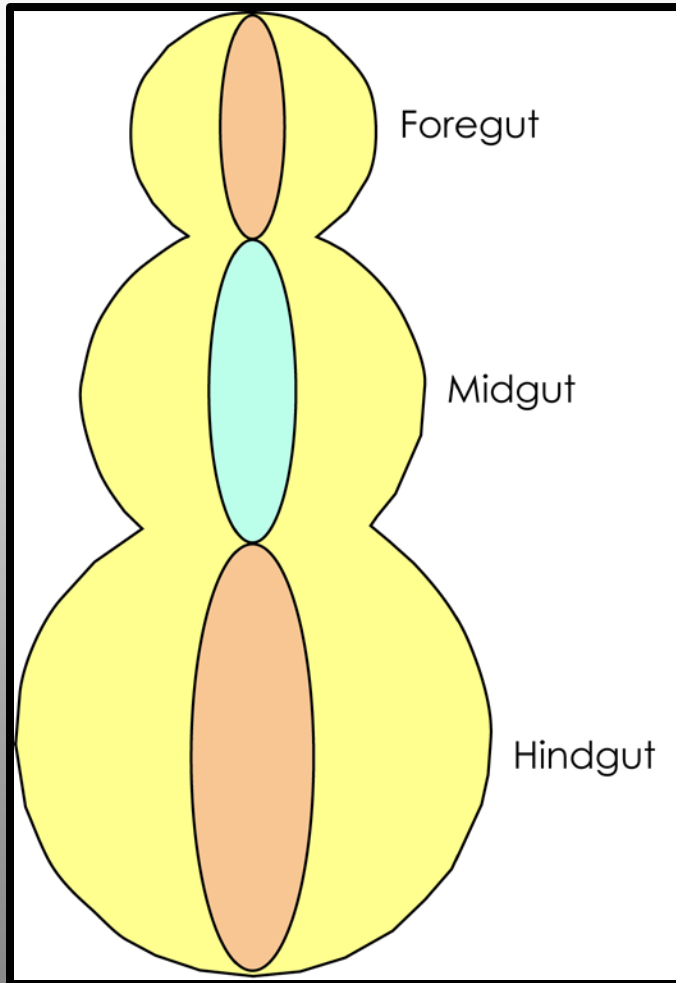
Iowa State University

Outline

- How we fight against pests
- Review of new products
- 2003-2008 efficacy results
- Profit analysis – *are they worth it?*

Insects:
*What do we know
about them?*

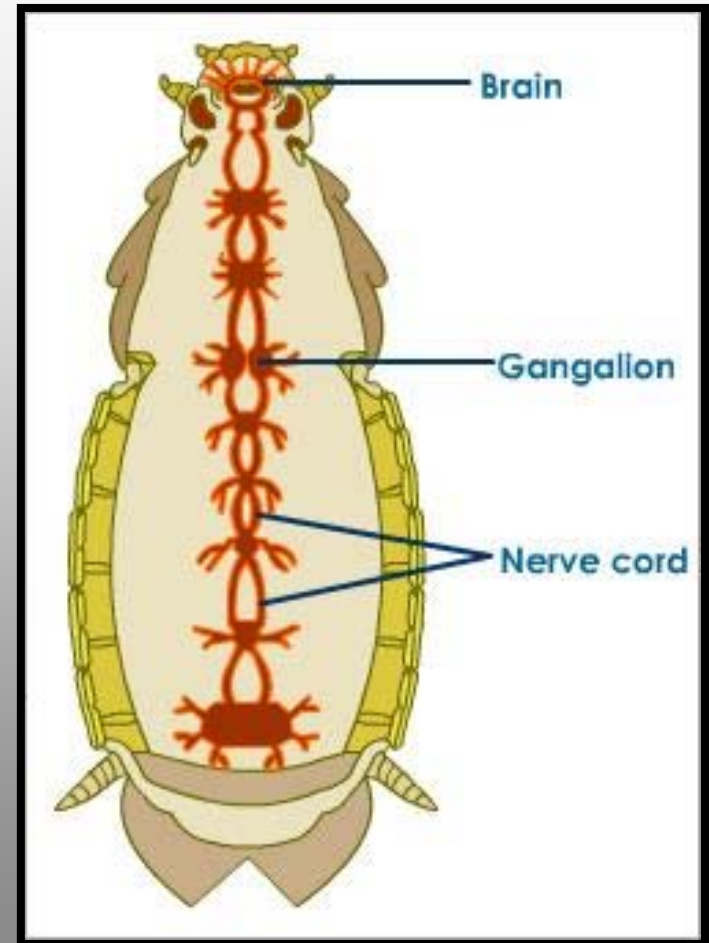
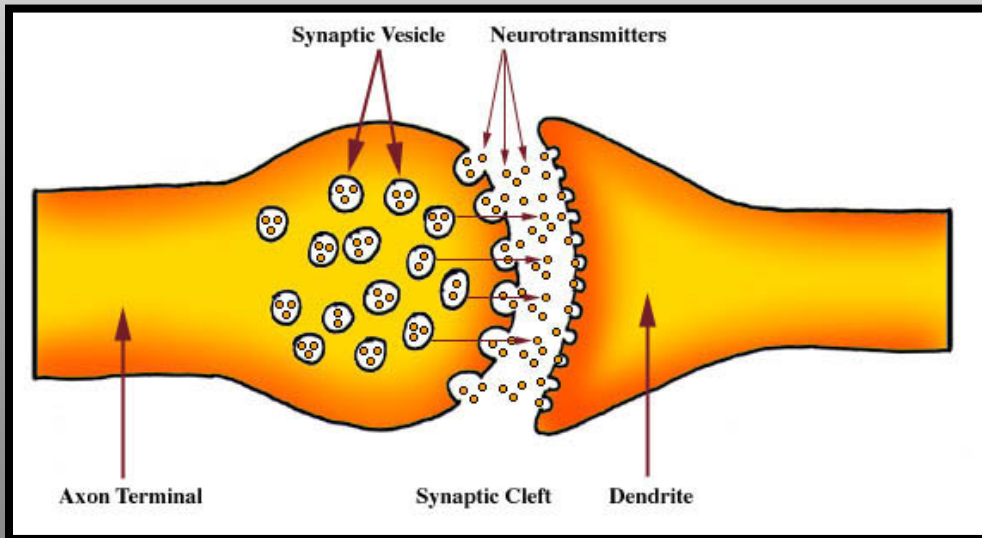
All insects eat (at some point)



- Similar to ours
- Eat treated foliage as immature or adult
- Penetrates and spreads in the body
- We can take advantage!

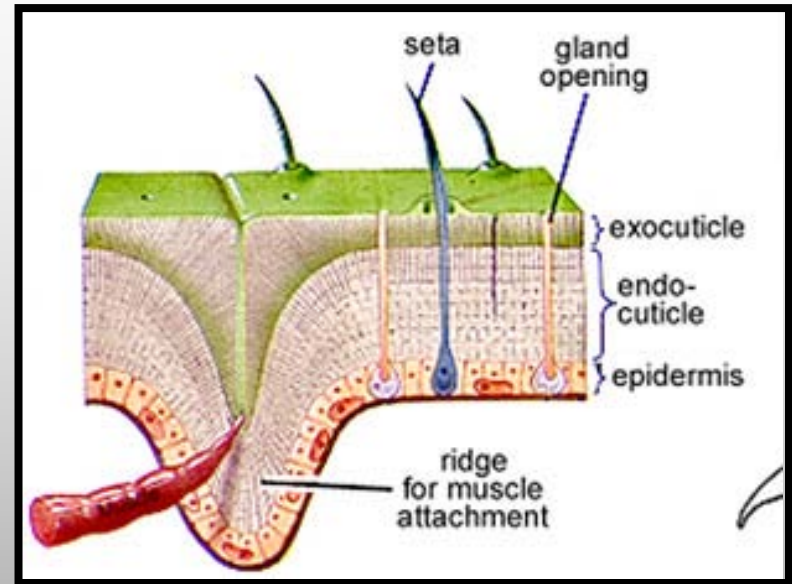
Insects have a nervous system

- Similar to ours
- Signals for movement
- We can take advantage!



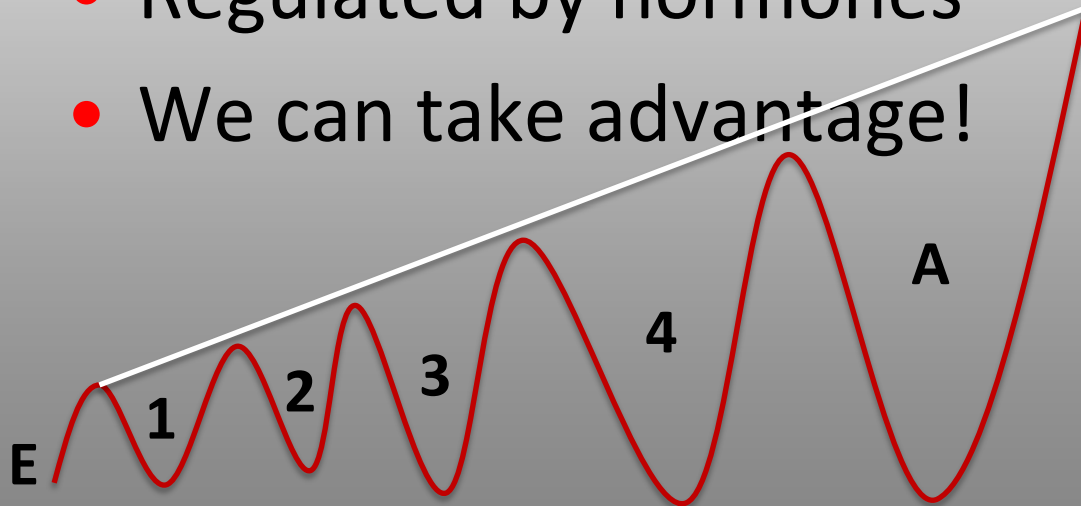
Insects have an exoskeleton

- Different from us
- Made up of many layers
 - Muscle attachment
 - Protection from enemies
 - Waxy cuticle holds water
- We can take advantage!



All insects molt

- Must molt between immature stages (instars)
- One final molt to become an adult
- Regulated by hormones
- We can take advantage!



Insects have to breathe

- Take in O_2 through spiracles
- Release CO_2
- We can take advantage!



Insecticides:

How do they work?

Insecticides usually...

- **KILL:** target the nervous system, growth and development, or energy production
- **REDUCE:** life expectancy, offspring capability and general success
- **REPEL:** deter or severely limit

How do products get inside?

- **Contact** – needs to penetrate cuticle to reach target site
- **Ingestion** – sometimes called stomach poisons, can include contact poisons
- **Respiration** – enters the spiracles

IRAC (Insecticide Resistance Action Committee)

- Uses Mode of Action (**MoA**) labels
- Based on target site
- Rotate classes to preserve utility and diversity; promote safety
- Avoid over/miss-use of certain products



Nerve/muscle targets

- Carbamates/Organophosphates (**1**)
 - Methomyl, Chlorpyrifos
- Cyclodiene organochlorines (**2**)
 - Endosulfan, Fipronil
- Pyrethroids (**3**)
 - Cypermethrin, λ -cyhalothrin

Nerve/muscle targets

- Neonicotinoids (**4**)
 - Thiamethoxam, Imidacloprid, Acetamiprid
- Pymetrozine (**9**)
 - Pymetrozine, Flonicamid
- Indoxacarb (**22**)

Growth/development targets

- Pyriproxyfen (**7**)
- Benzoylureas (**15**)
 - Novaluron, Bistrifluron
- Buprofezin (**16**)



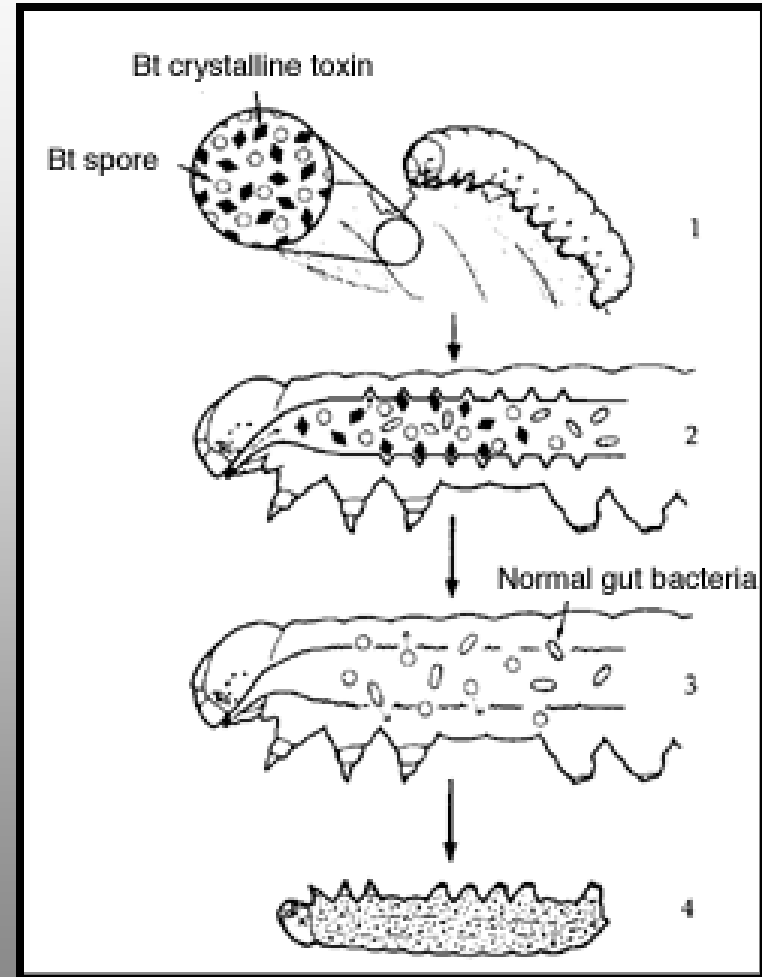
Respiration/Digestion targets

- Diafenthiuron (**12**)
- METI acaricides (**21**)
 - Tolfenpyrad, Pyridaben
- Microbial disruptors (**11**)
 - *Bacillus thuringiensis*



How Bt works...

1. insect consumes foliage
2. toxin binds to gut
3. gut breaks down, allows normal bacteria to enter body cavity
4. insect dies in 1-2 days



New chemistry

- Tetramic acid derivatives, ketoenole (**23**)
 - Lipid synthesis inhibitors
 - Immatures can't grow; adults can't reproduce
 - Spirotetramat (Movento™, Ultor™)
- Systemic activity
 - Targets fluid-feeding insects
 - *Should be available in 2010 with imidicloprid*

New products in soybean

- Hero™ (PY + PY)
ζ-cypermethrin + Bifenthrin
- Cobalt™ (PY + OG)
Chlorpyrifos + γ-cyhalothrin
- Centric® 40WG (NI)
Thiamethoxam
- Endigo ZC® (NI + PY)
Thiamethoxam + λ-cyhalothrin
- Leverage® 360 (NI + PY)
Imidacloprid + β-cyfluthrin

Stewardship:
*Can IPM and insecticides
work together?*

Definition of Integrated Pest Management

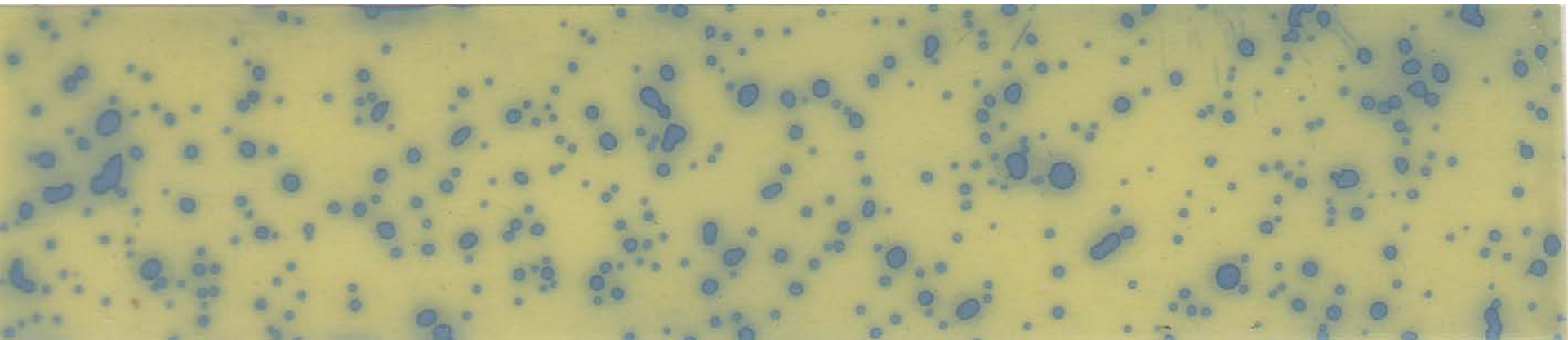
“IPM is a *sustainable approach* to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health, and environmental risks.”

Keystone concept: thresholds

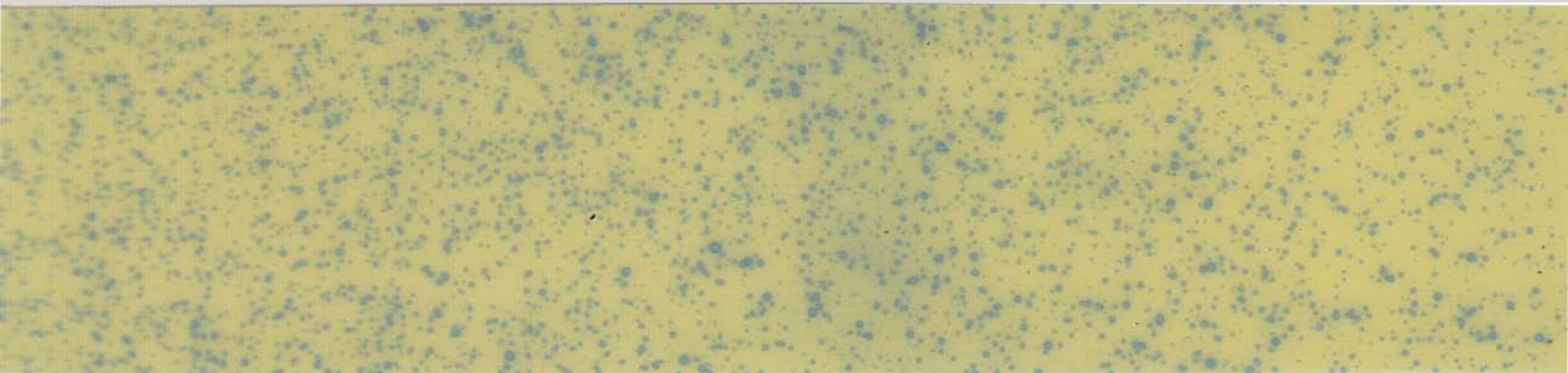
- Be 'ok' with some insects
 - Avoid calendar-based sprays
 - Use a cut-off point to suppress insects
- Extend insecticide effectiveness
 - Saves money!
 - Delay genetic resistance
 - Preserves natural enemies

Thoughts on aphid control

- Know if populations are going up or down
 - Don't spray too early
 - Sample every 7-14 days
- Aim for 100% control with a treatment
 - Get the maximum coverage possible
 - Use sufficient volume and pressure



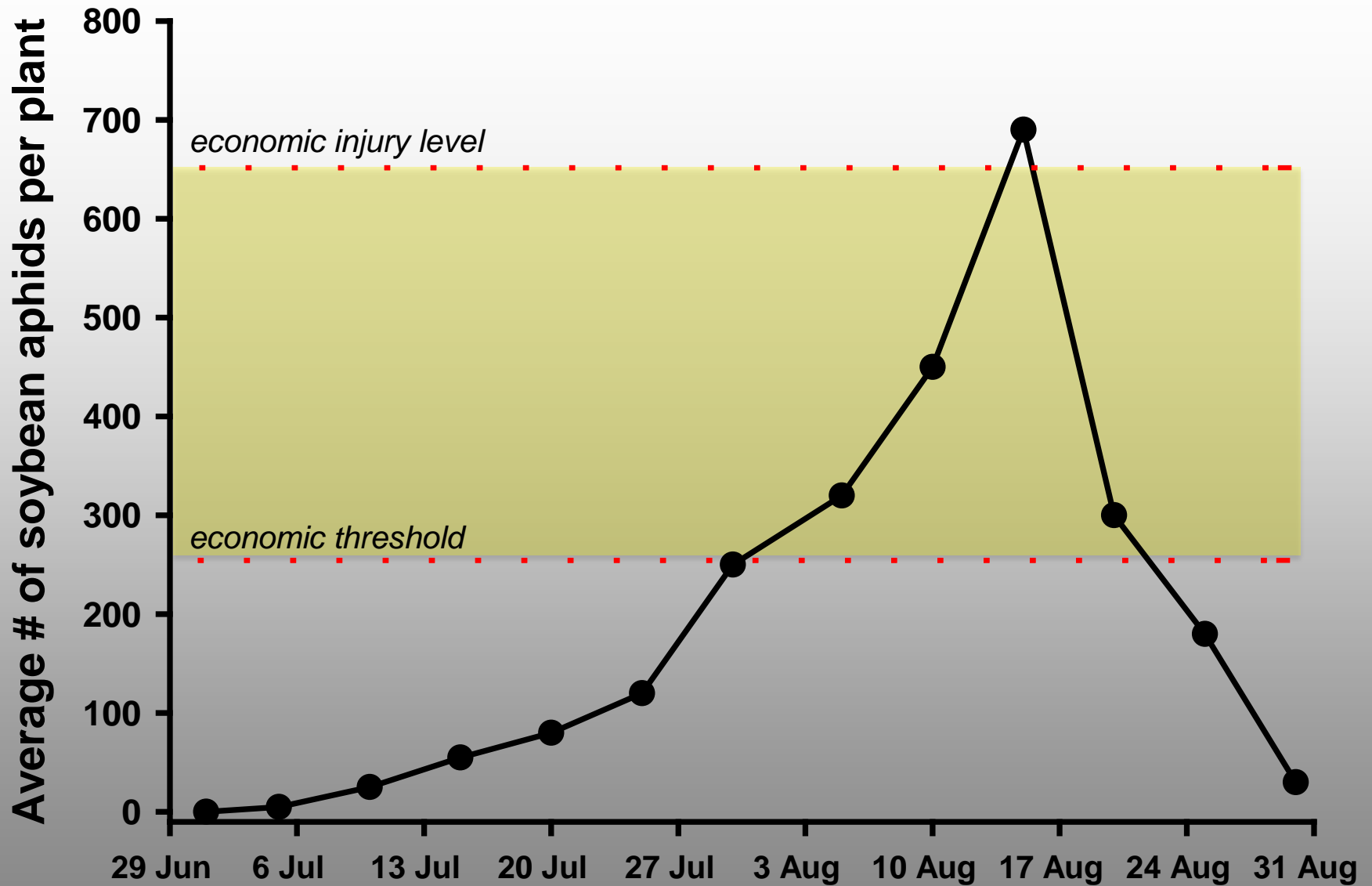
Turbo flat fan *TT11002* at 30 psi (10 gpa at 5 mph)



Hollow cone *TX-3* at 60 psi (10 gpa at 5 mph)

Soybean aphid

- Use the economic threshold
 - *An average of 250 aphids per plant in 80% of the field with increasing populations from flowering (R1) through seed set (R5.5)*
- One well-timed treatment will protect yield



Cumulative aphid days (CAD)

- Look at seasonal aphid pressure

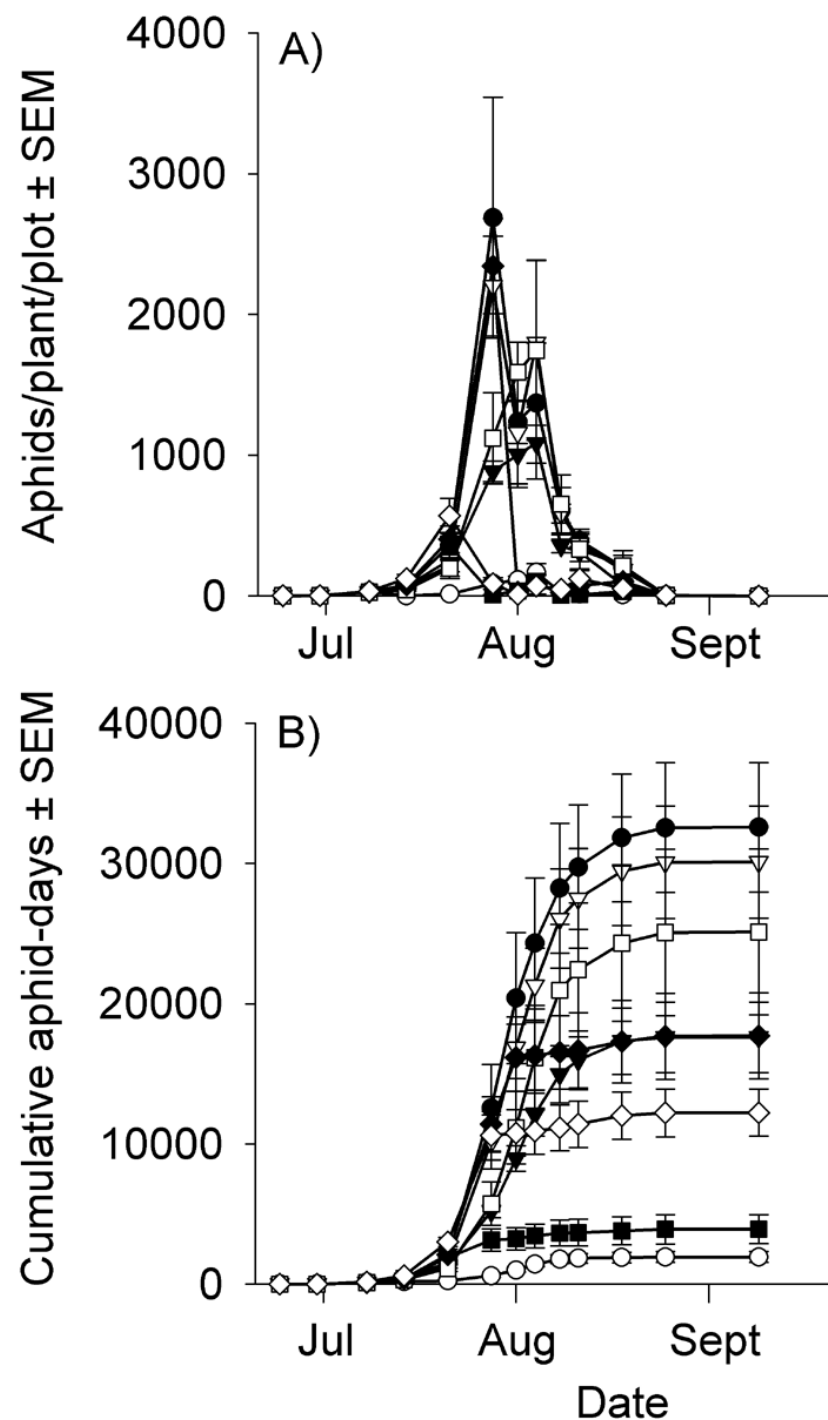
Examples

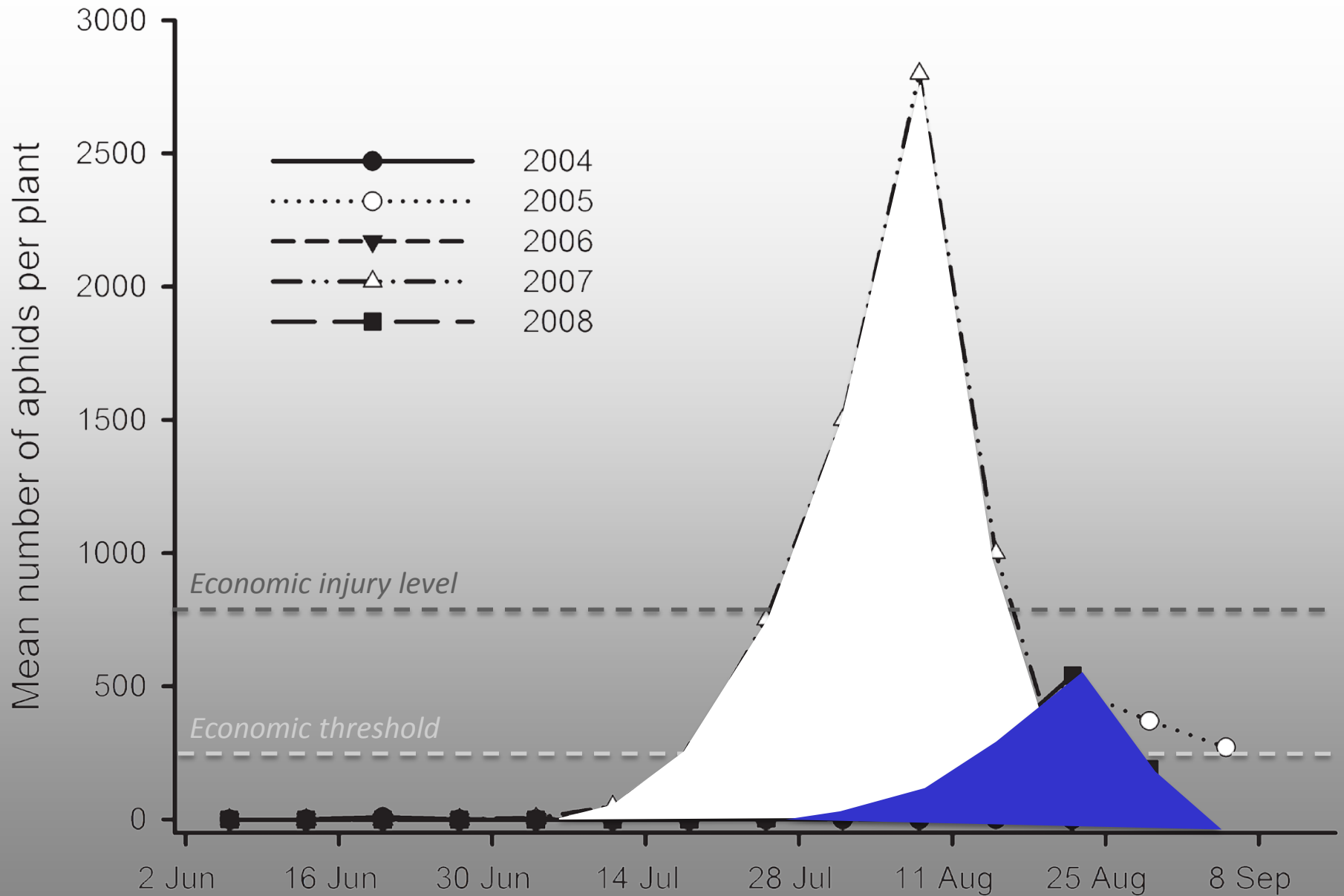
10 aphids for 10 days = 100 CAD

100 aphids for 10 days = 1000 CAD

1,000 aphids for 10 days = 10,000 CAD

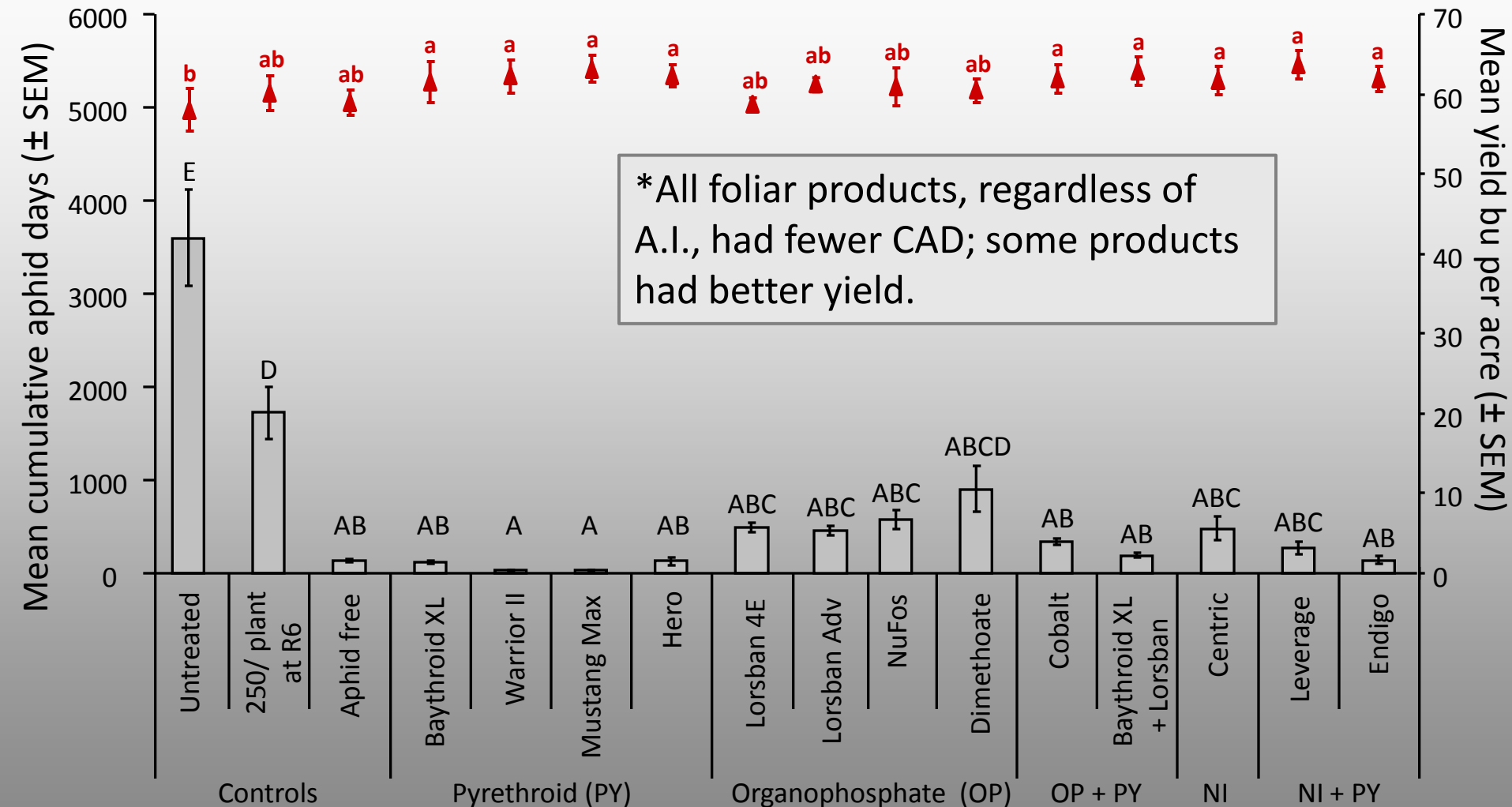
- Helps visualize treatment differences





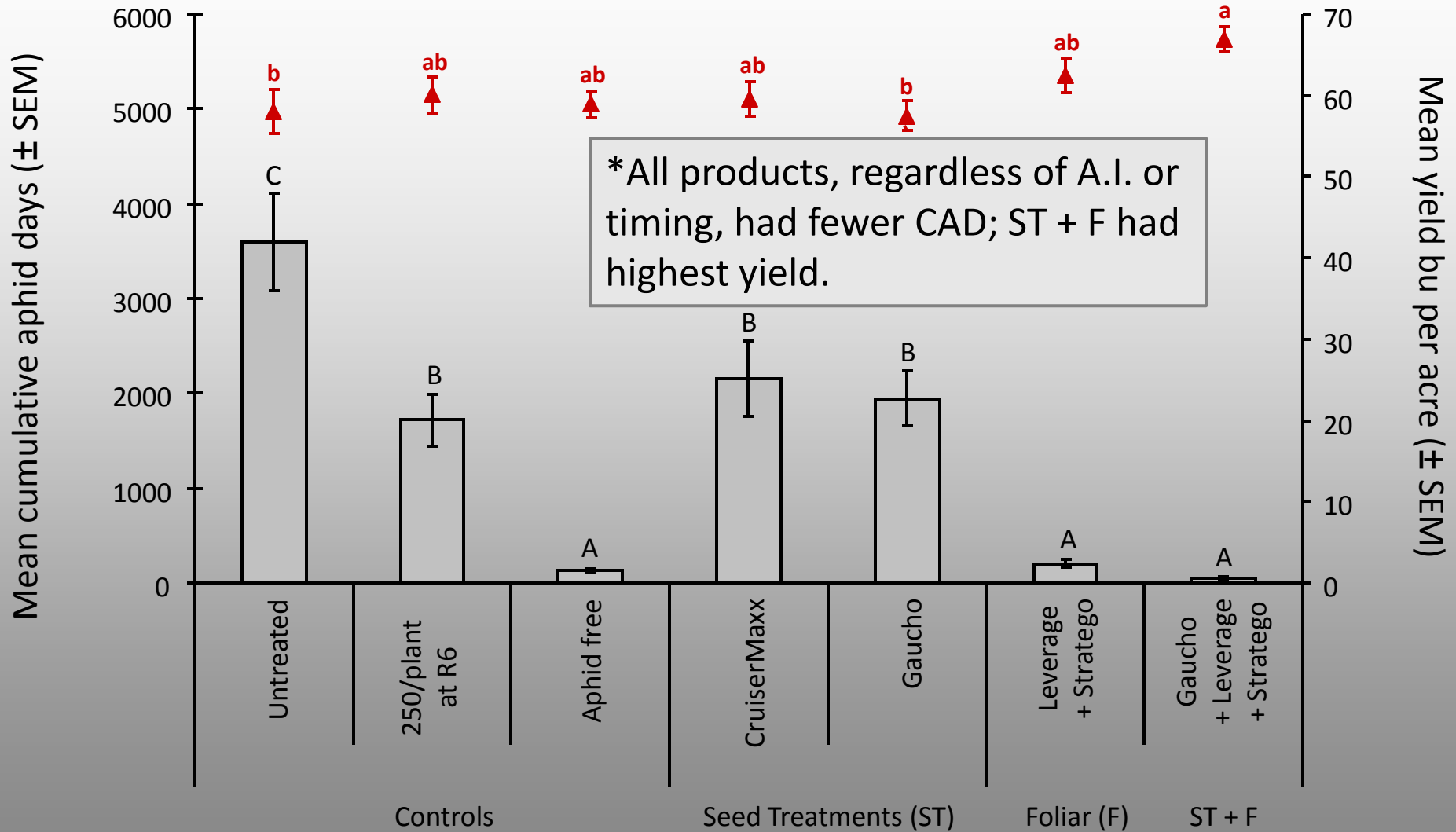
Insecticide efficacy:
Do the products work?

Foliar product comparison

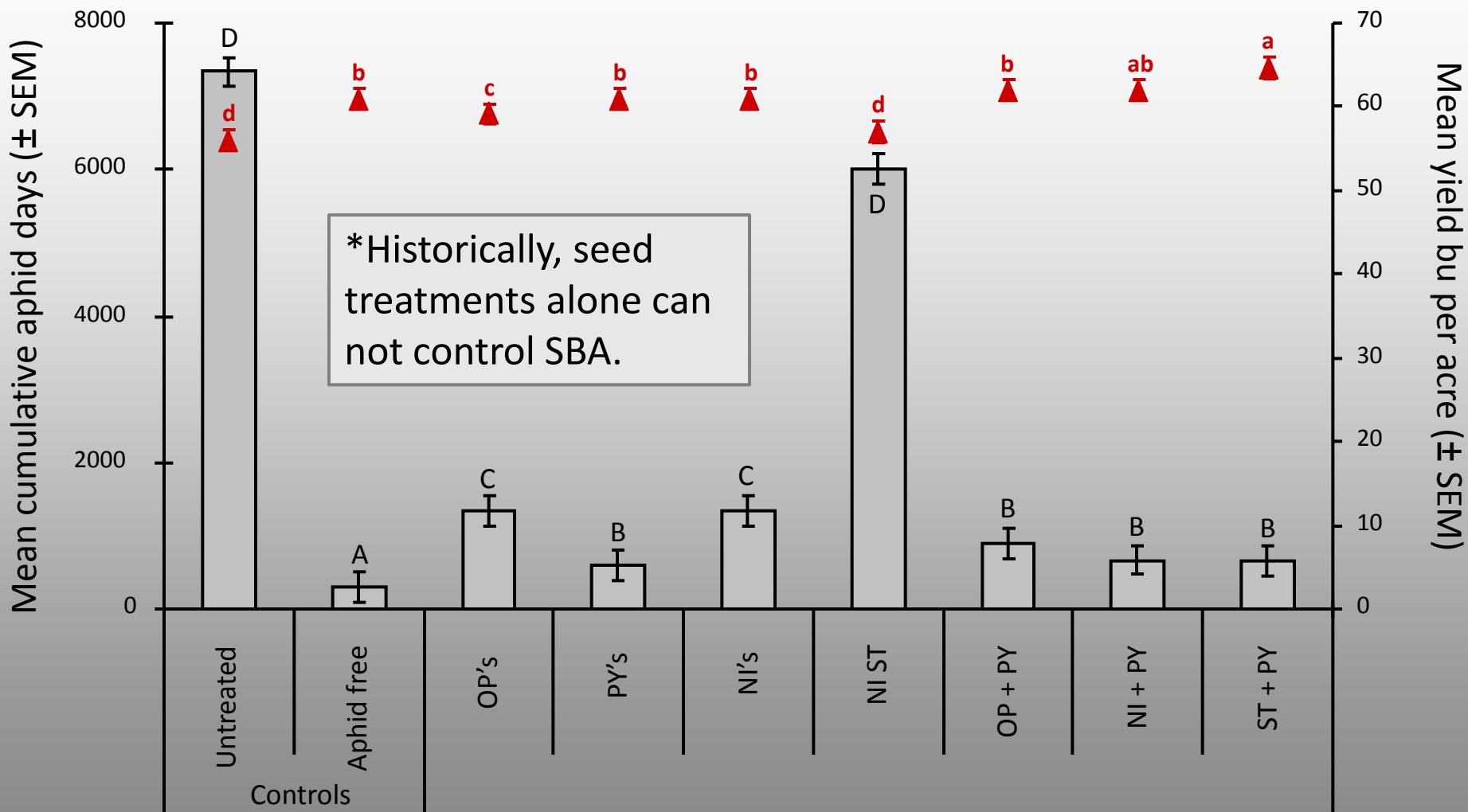


*All foliar products, regardless of A.I., had fewer CAD; some products had better yield.

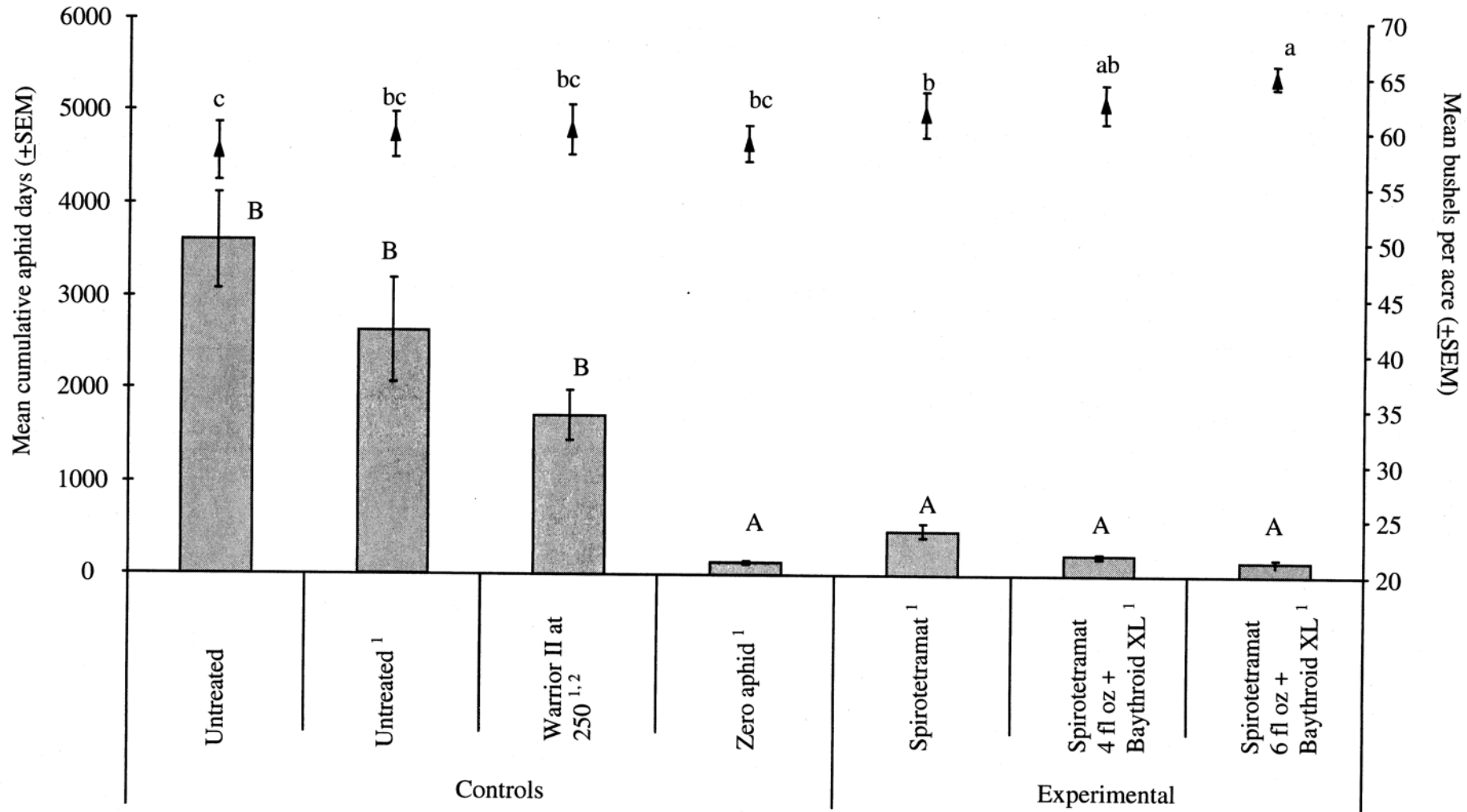
Seed treatment comparison



Insecticide performance (2003-2008)



Spirotetramat performance



Conclusions

- Labeled products are effective if coverage is sufficient, no genetic resistance (yet)
- Insecticides applied at threshold provides consistent yield protection
- Multiple applications did not improve yield but reduce CAD

Conclusions

- Tank-mixing did not reduce CAD
- Seed treatments alone lack residual activity to control aphids under heavy pressure, may require foliar to protect yield
- Seed treatment plus foliar provided slightly higher yield

Where to get more information

- ICM News

www.extension.iastate.edu/CropNews

- Soybean Insects Guide

www.ent.iastate.edu/soybeaninsects

- Soybean Aphid

www.ent.iastate.edu/soybeanaphid/

Where to get more information

- Regional Suction Trapping Network
www.ncipmc.org/traps/
- IRAC
www.irac-online.org/
- CDMS Chemical Database
www.cdms.net

Thank you!

