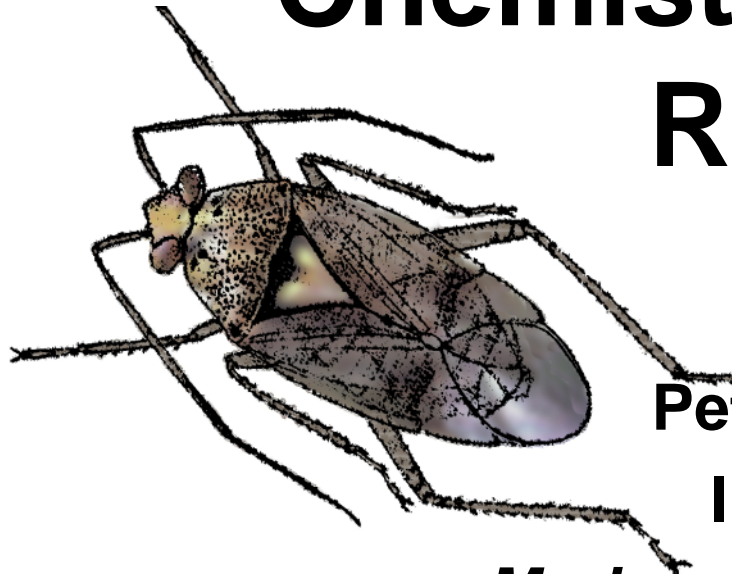


# Lygus Control, New Chemistry & Crop Loss Reporting



**Peter C. Ellsworth**  
**IPM Specialist**

***Maricopa Agricultural Center***  
***University of Arizona***

**Desert Ag Conference**  
**12 May 2004**



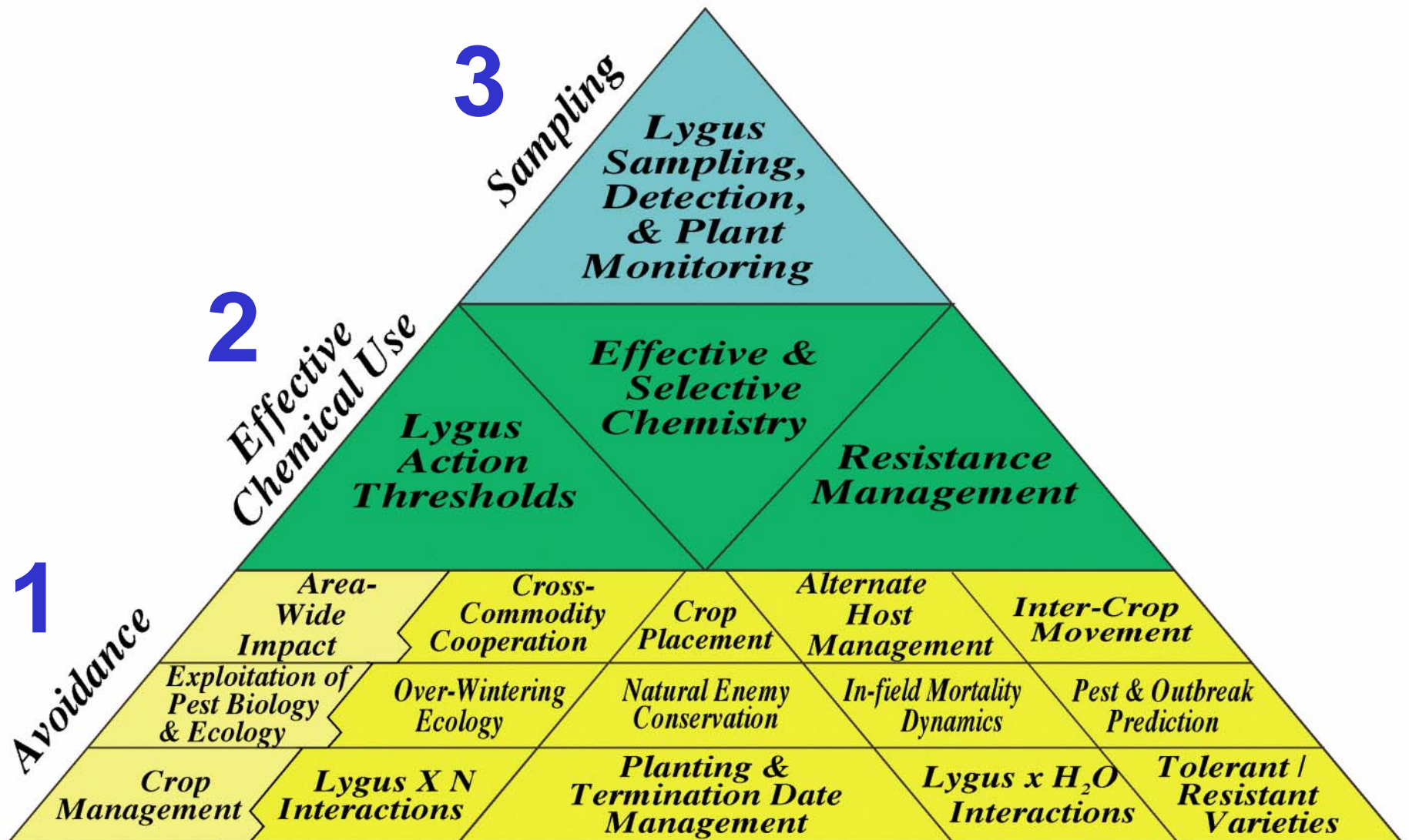
# Lygus Management

- **Review of status of Lygus IPM**
  - What do we know & need to know?
- **Ask and answer (?) two questions**
- **Review chemical control**
- **Introduce new chemistry**
  - Selective options for Lygus control?
  - Big impact?
- **Crop Loss Reporting**
  - Insecticide use trends, historical review
  - Focus of breakout in afternoon



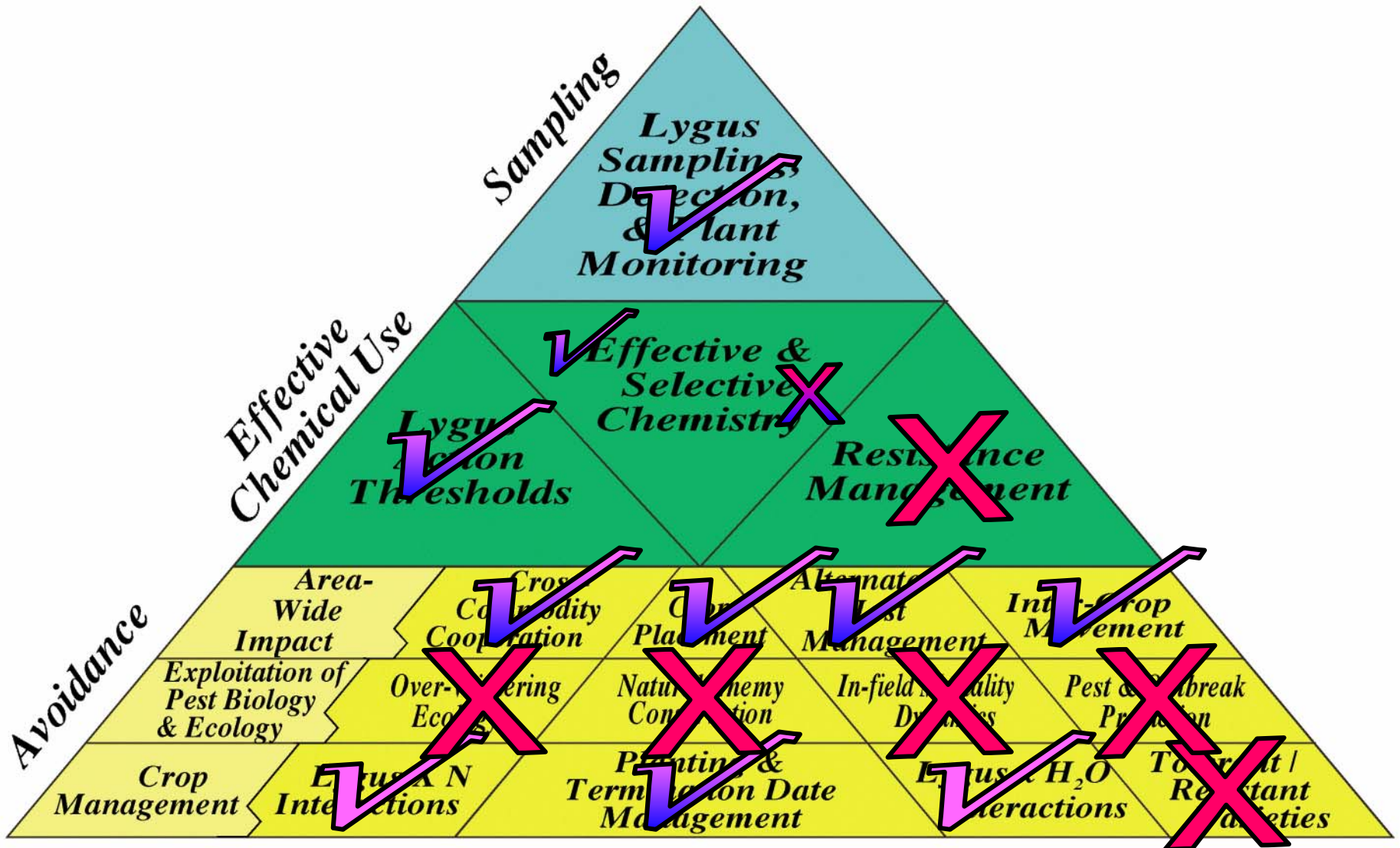
# Lygus IPM...

...depends on 3 basic keys



# Key Elements...

...what have we got?





# Lygus Can Be Managed!

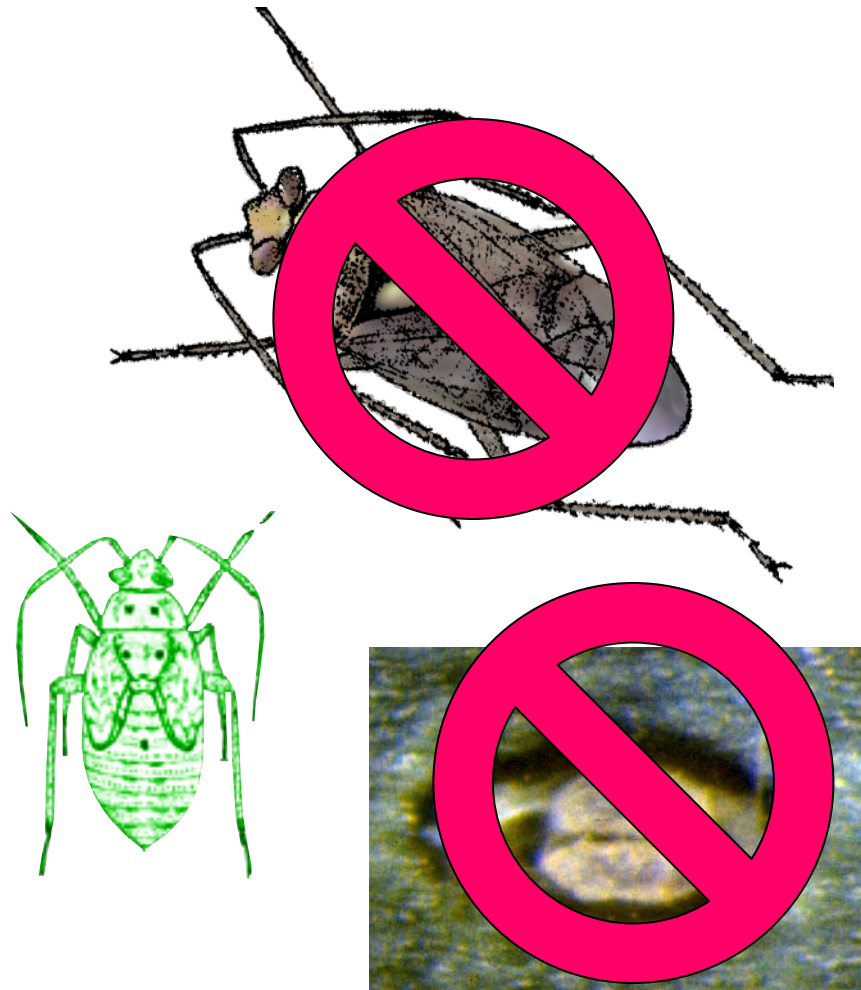


**Even side-by-side**

*Ellsworth/UA*



# Lygus Can Be Managed Better!





# *Lygus hesperus* Adult

- Can cause damage
- Cannot be reliably controlled
- Key to movement & reproduction

# Two Scales for Questions in Lygus Management

**Field**

- When should managers discontinue any further Lygus chemical controls in cotton?

**Landscape**

- Can we estimate & characterize inter-crop effects of Lygus spatially?



## Cooperative Extension

# Community-Wide Lygus Action Plan<sup>No. 1</sup>

The University of Arizona • College of Agriculture

May 18, 2000

*Our goal is to manage Lygus populations over a large, local area in as many crops as possible so as to maximize each grower's ability to profitably produce their crops.*

After agreeing to the above goal, the working group settled on a number of objectives, activities, and actions that would be taken this spring. This note is to update the group on the progress that has been made so far in monitoring *Lygus* activities in the local area.

After receiving and verifying crop maps (courtesy of ACRPC), we identified strategic areas that represent the types, diversity and distribution of crops typical of the western Pinal County area. Starting in March, two trained scouts have been monitoring pre-selected fields/areas for the presence and numbers of *Lygus* bugs. Our intent is to monitor focal areas of production (for seed-alfalfa, forage alfalfa, weeds, and cotton) and the areas immediately adjacent to these fields. Once cotton is available to us for sweeping, we will monitor fields at fixed distances from each of these focal areas.

We are currently monitoring over 50 locations in about 35 fields. All sweeps are standardized on a row-type sweeping pattern (cotton-style) for a total of 25 sweeps per sample. At least 100 sweeps are made in each focal area, and all numbers are standardized on a per 100 sweeps basis. The relatively dry winter has not provided for much in the way of large stands of weeds. Further, those weeds that are present change in composition, size, and even presence over time. Thus, the "weeds" numbers do not necessarily track the same number of sites each week. Similarly, no sweeping is conducted in sprayed fields (while posted), nor in cut or recently-watered fields.

Interpretation of this highly summarized data must be guarded. For now, they depict generalized trends of *Lygus* presence and abundance. If the patterns begin to deviate significantly among fields, it will be necessary to examine individual field responses.

### General Observations to Date

*Lygus* are present in most of the areas surveyed. Most of the weed species examined have not harbored large numbers of *Lygus*. One exception, Alkali Heliotrope (*Heliotropium curassavicum* var. *oculatum*), was found to be an excellent reproductive host for *Lygus*. This weed has white flowers and grows along some ditch banks, though it has not been abundant in our area. Lesquerella, an experimental crop, was found this past week to harbor large numbers of *Lygus* adults and nymphs (> 150 / 100 sweeps). *Lygus* numbers have steadily increased in seed alfalfa and have or will likely reach densities that require control.



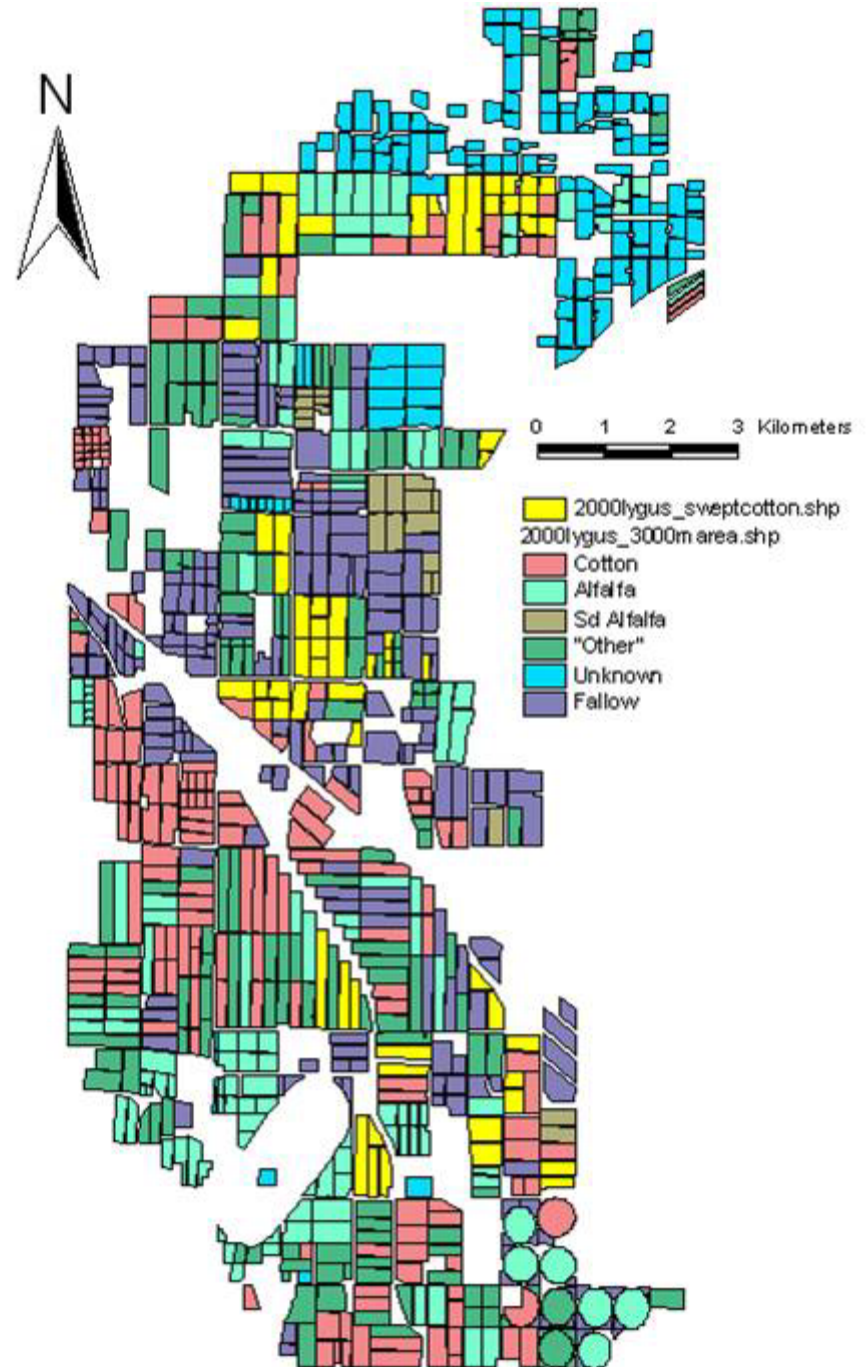
Figure 1: Alkali heliotrope (*Heliotropium curassavicum* var. *oculatum*).

# Extension Program

- Initiated in 2000 in response to extreme and negative interactions among producers of different crops
- Communication / Awareness
- Education
- Systematic Survey / Research

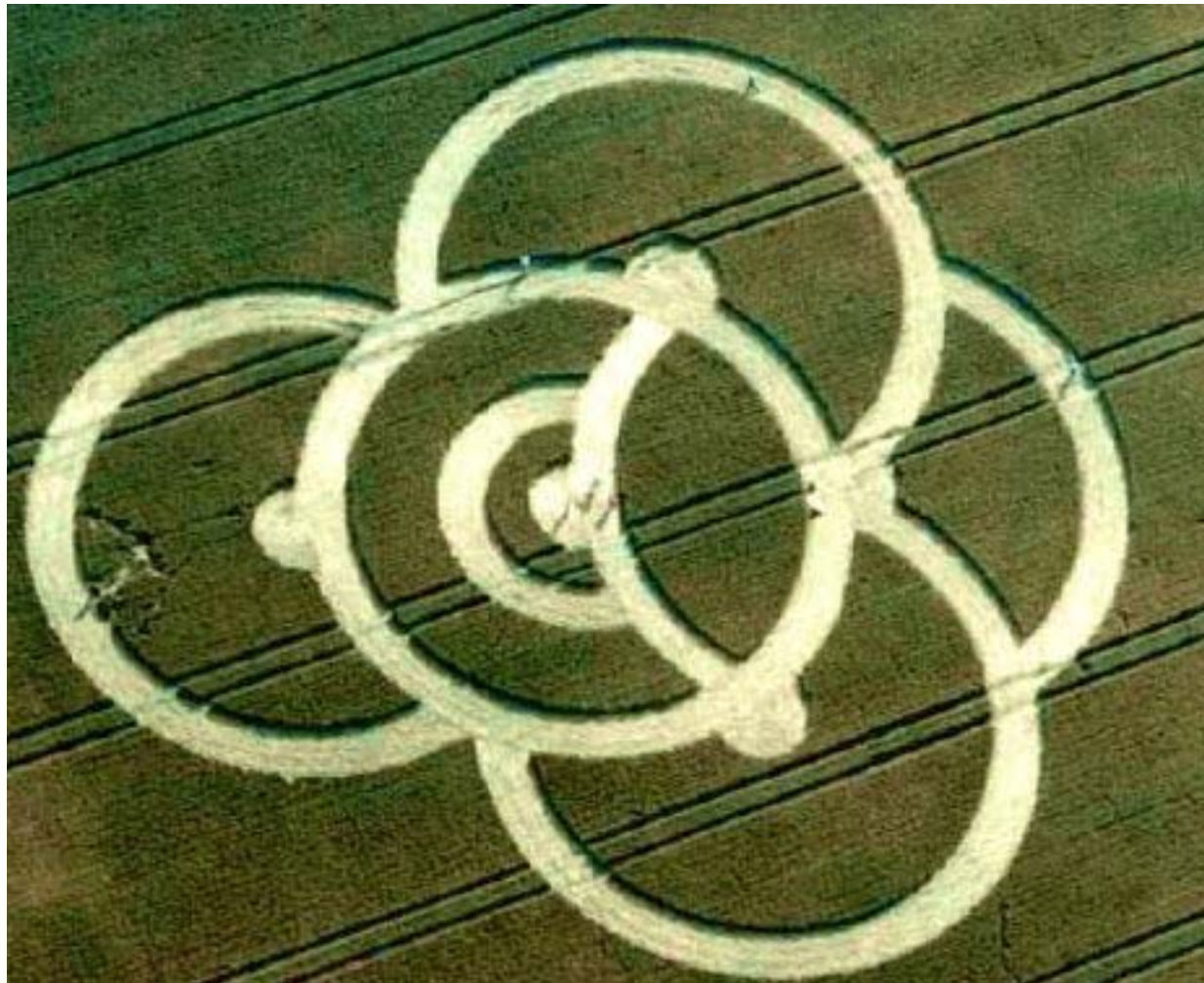
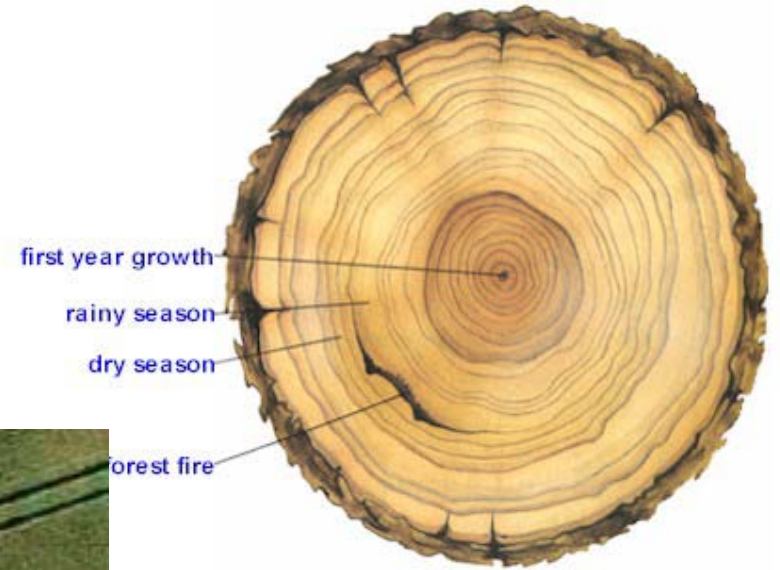
# Spatial Study

- Two townships, spring & early summer hosts (April - July)
- Cotton, alfalfa, seed alfalfa, fallow, weeds, and small grains; georeferenced
- Sweeps (15 in. diam.) from each potential host weekly
- Examine source / sink relationships among crops





# Ring Analysis?



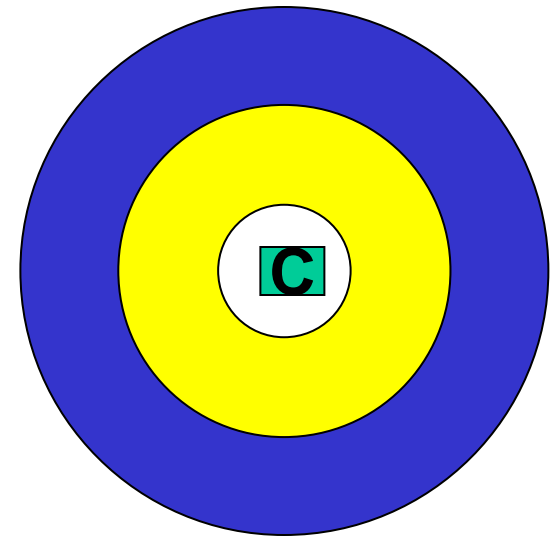
**Tree Rings?**

**Crop Circles?**

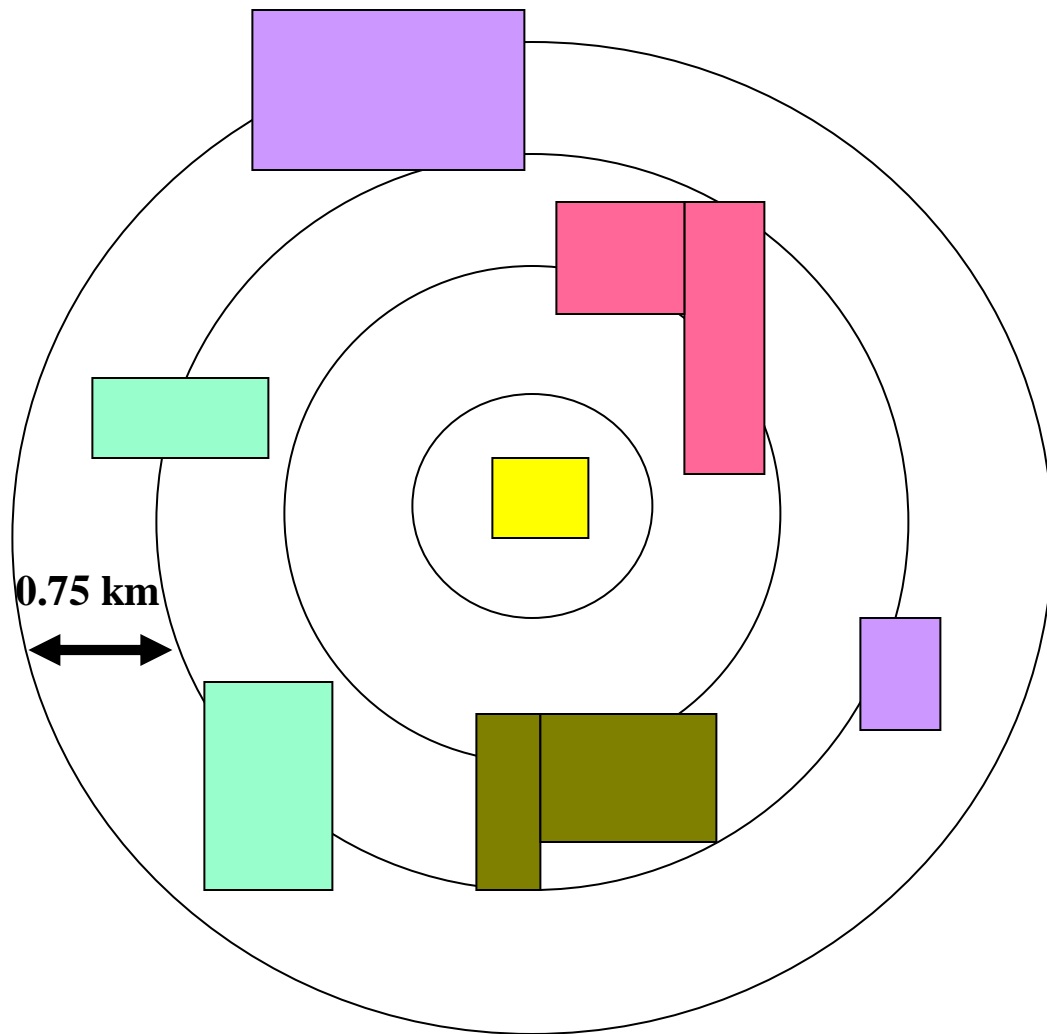


# Ring Analyses to Determine Range of Impact of Lygus

- Around each focal cotton fields, calculate crop densities in concentric rings
- Multiply that crop density by the mean density of Lygus in each ring = Estimate of source potential
- How are Lygus densities in focal fields related to source potential of surrounding crops?



# Focal Cotton Fields (50)



-  Focal cotton field
-  Seed alfalfa
-  Forage alfalfa
-  Cotton
-  Fallow



# Spring Lygus Densities

(adults & nymphs)

- **Significantly more Lygus were found in Seed Alfalfa, Forage Alfalfa, and fallow fields (weeds), than in cotton**

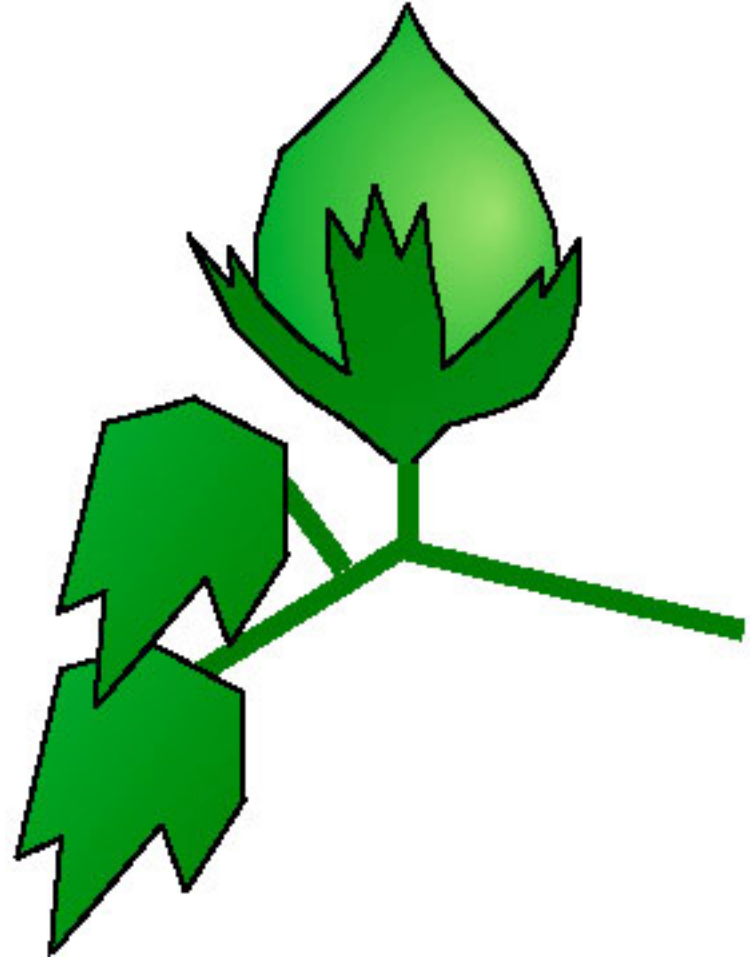
Crop Type	N	Lygus Density (log D + 1)*
Seed Alfalfa	9	1.50a
Forage Alfalfa	34	1.45a
Fallow	3	1.44a
Cotton	72	0.69b

\* Values fb same letter not significantly different (P > 0.05)

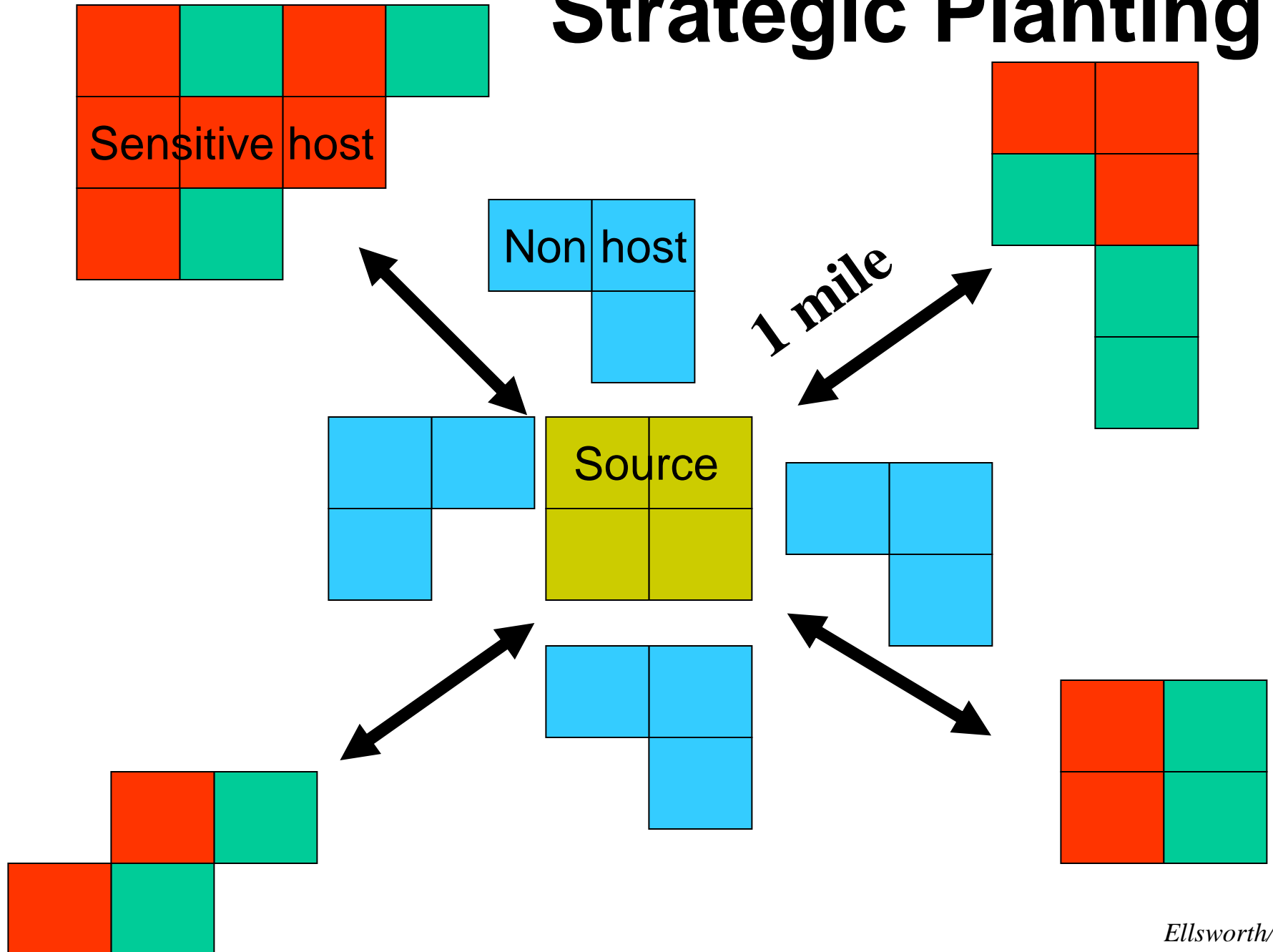


# Lygus Associations

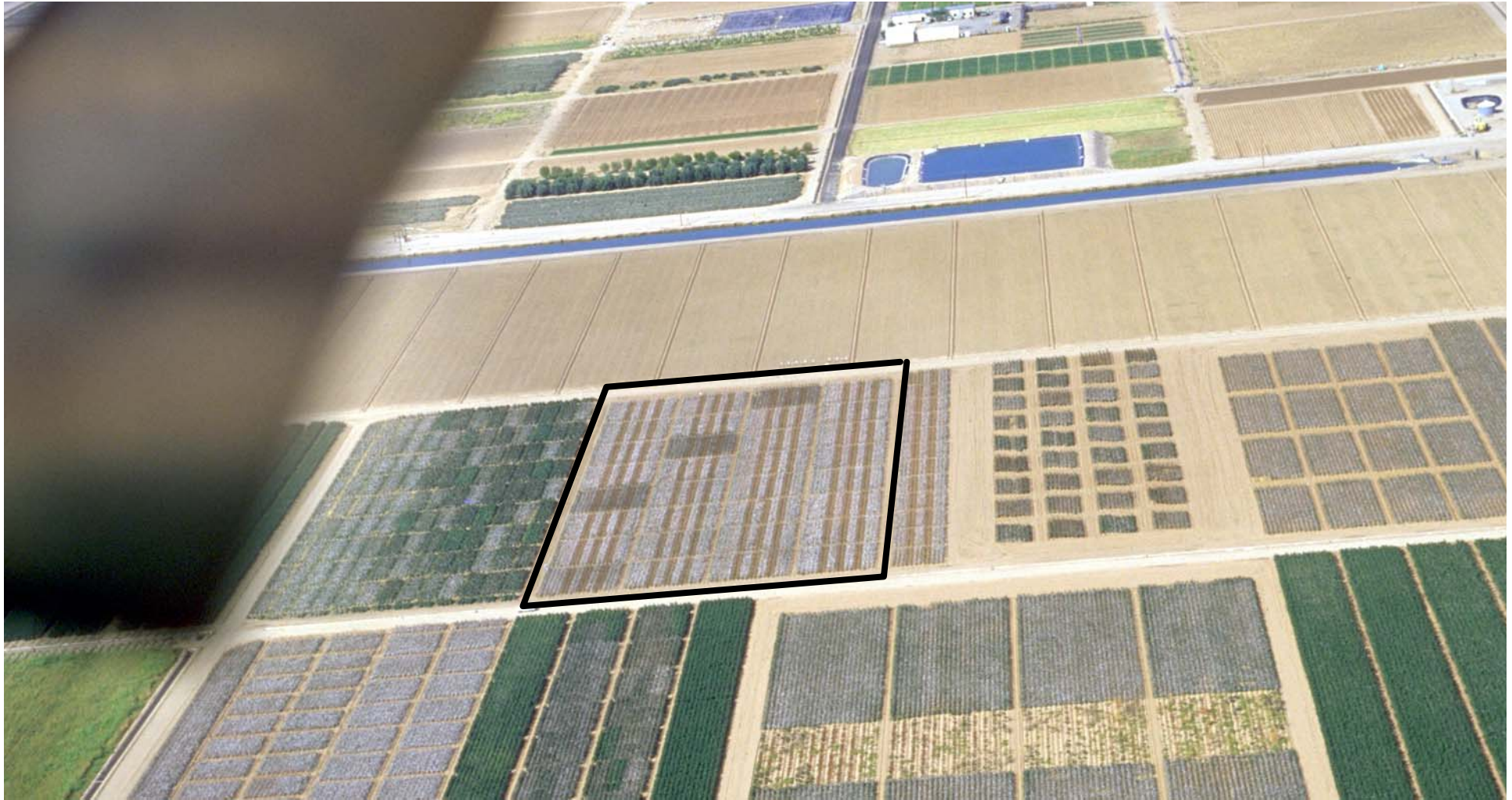
- **Seed alfalfa fields are sources of Lygus for cotton fields. This effect does not extend beyond 1 mile.**
- **Cotton fields are sinks for Lygus. This effect disappears beyond 0.5 miles.**
- **Strategic placement of crops could help alleviate Lygus problems.**



# Strategic Planting

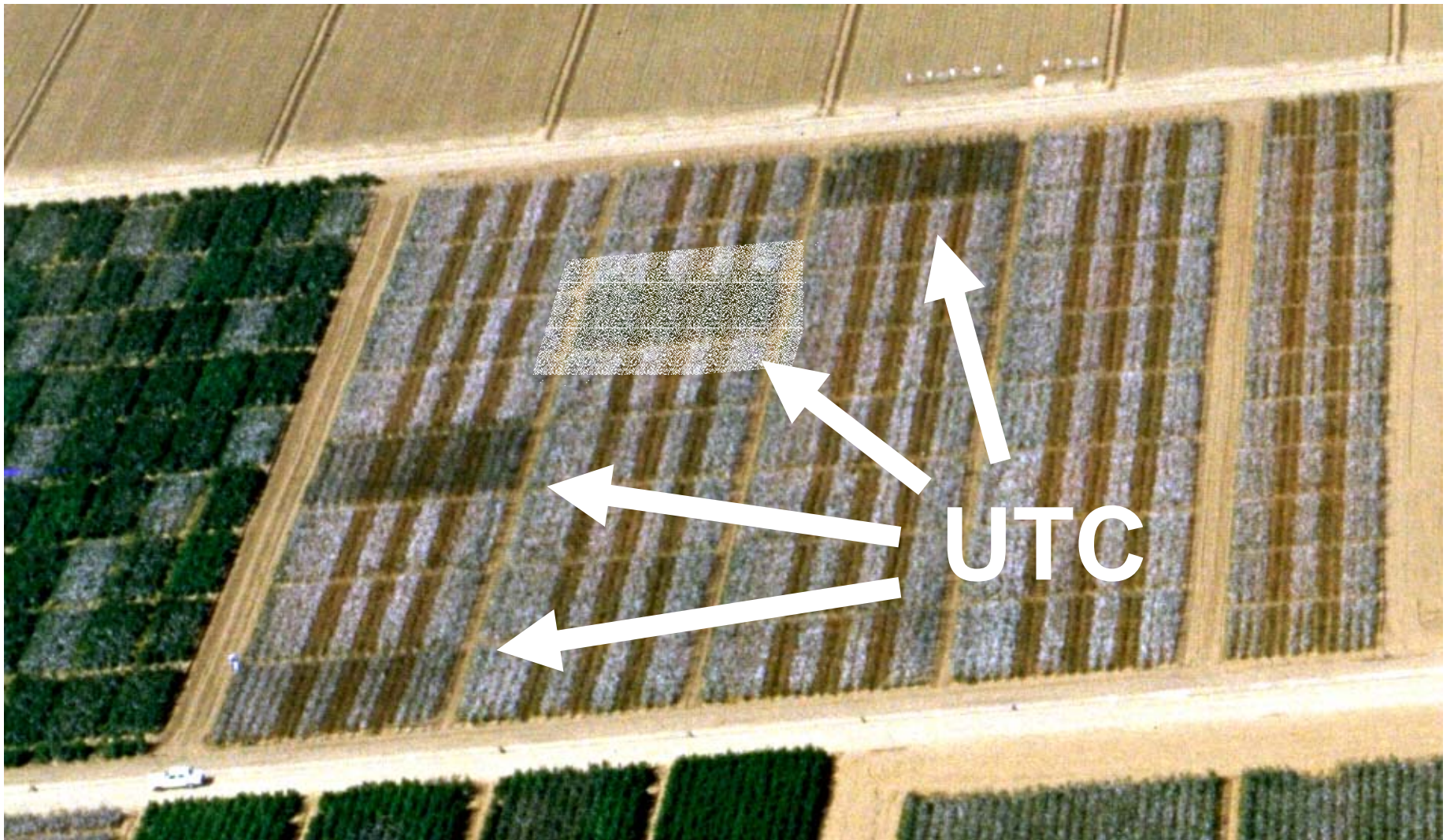


# Adults move; Nymphs don't





# Adults move; Nymphs eat!

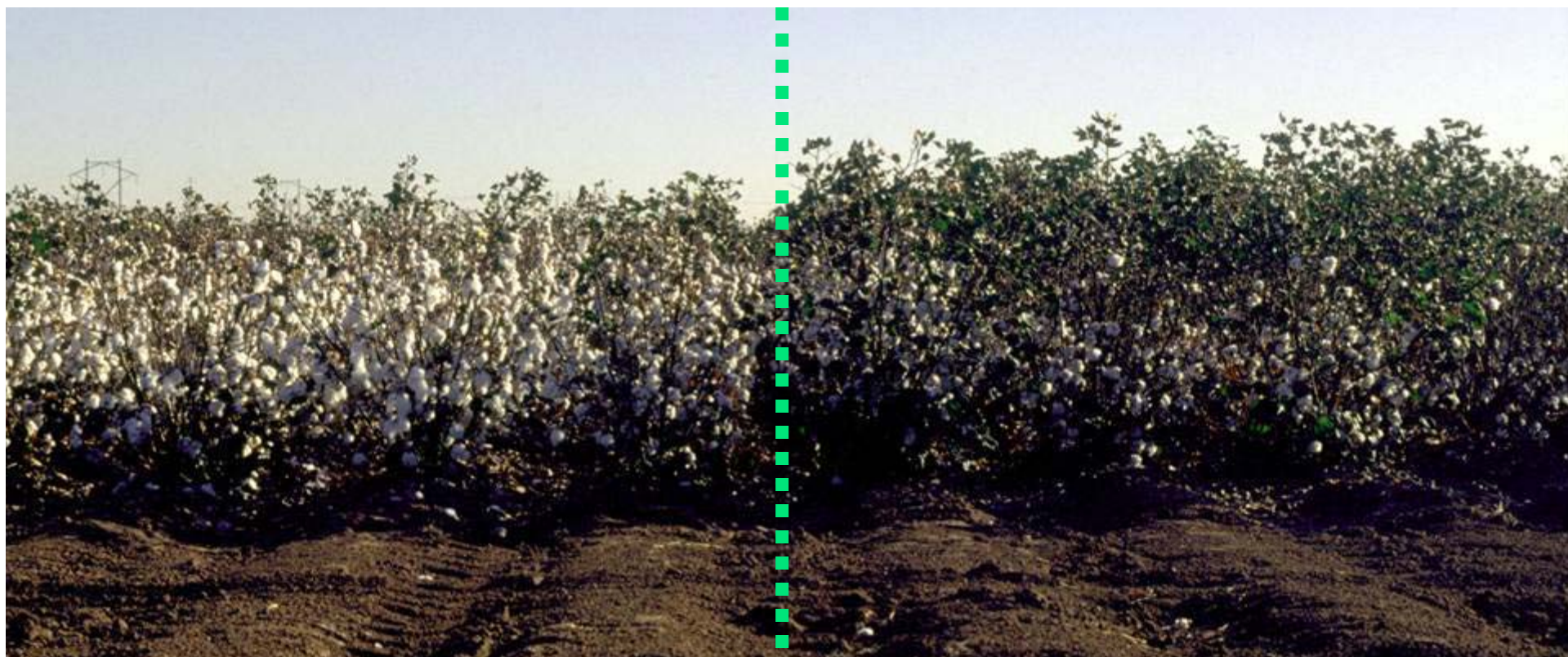






**3 Sprays**

**0 Sprays**



***Note height difference***

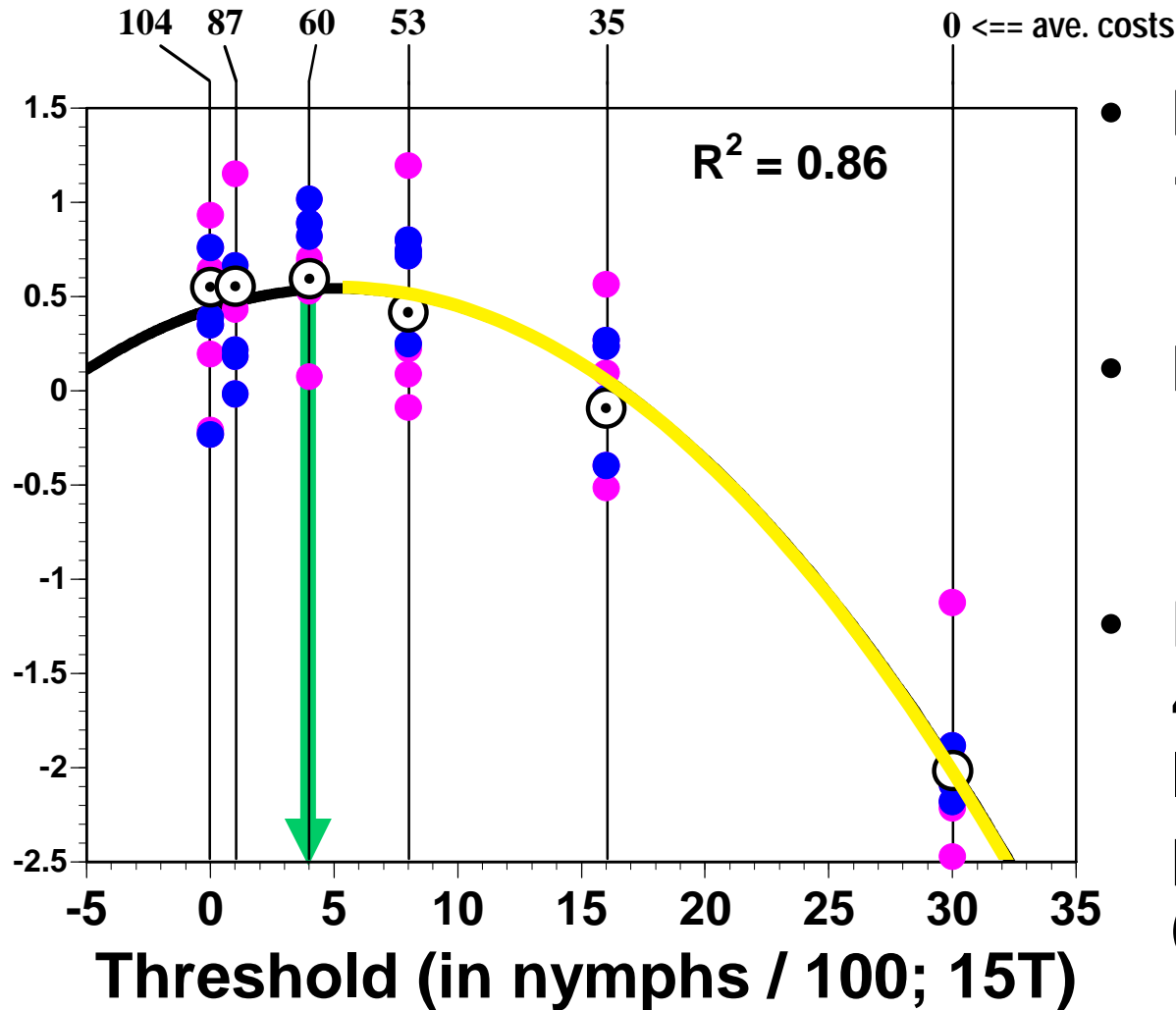


***Avoid Adults; Control Nymphs!***





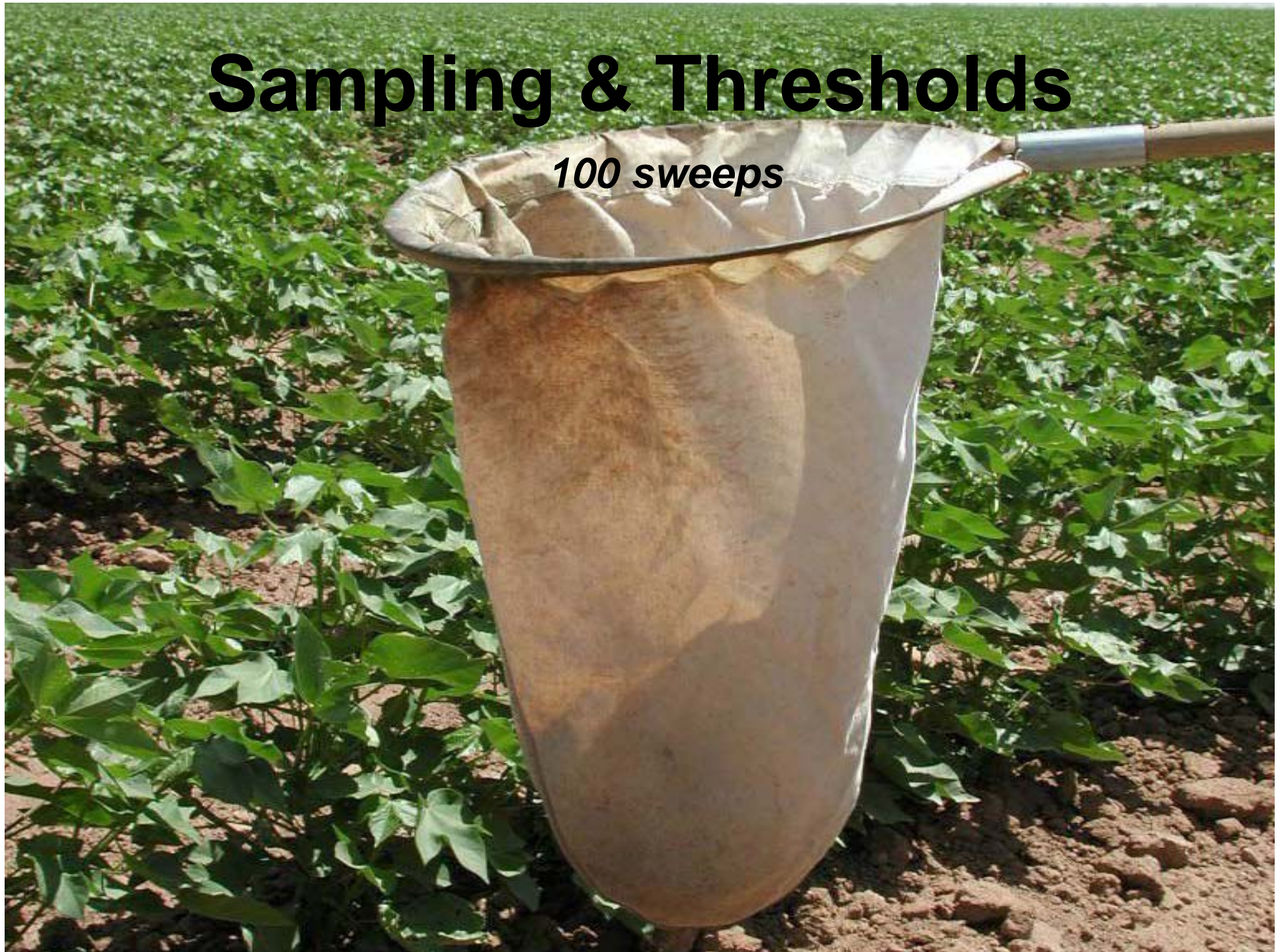
# Yield & Revenue : Density



- **Maximum Yield @ 1.7 nymphs / 100**
- **Maximum Revenue @ 5.2 nymphs / 100**
- **Recommendation: 4 nymphs with at least 15 total Lygus per 100 sweeps ('15:4')**

# Sampling & Thresholds

*100 sweeps*





# Sampling & Thresholds

13 Adults

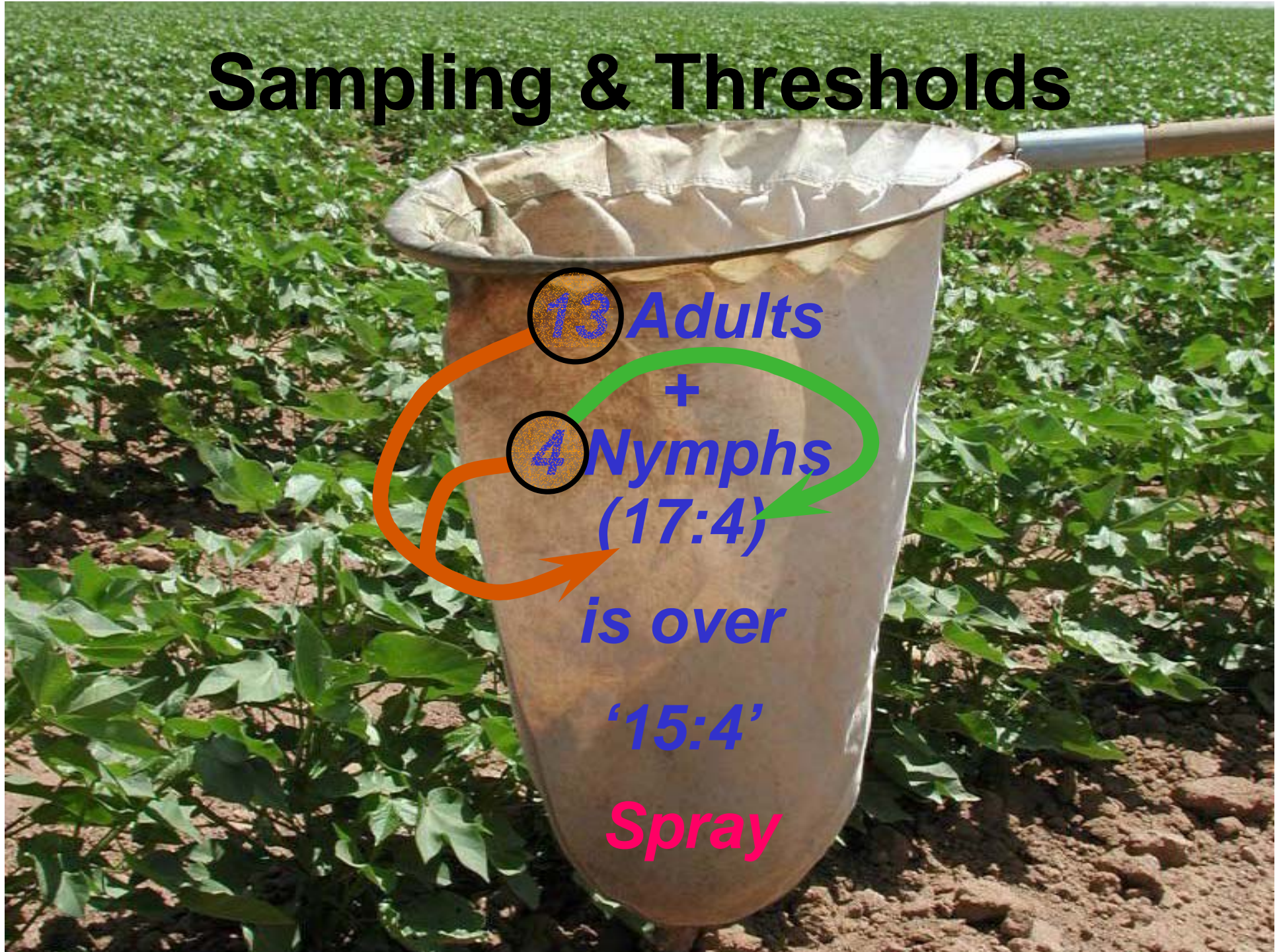
+

4 Nymphs  
(17:4)

is over

'15:4'

Spray





# Sampling & Thresholds



*13 Adults  
+  
3 Nymphs  
(16:3)*

*is under  
'15:4'*

*Not Yet!*



# Two Scales for Questions in Lygus Management

**Field**

- When should managers discontinue any further Lygus chemical controls in cotton?

**Landscape**

- Can we estimate & characterize inter-crop effects of Lygus spatially?
  - Seed alfalfa can be a source for Lygus in cotton
  - Lygus can apparently move from a source and affect fields up to 1 mile away

# Timing Late Season Controls

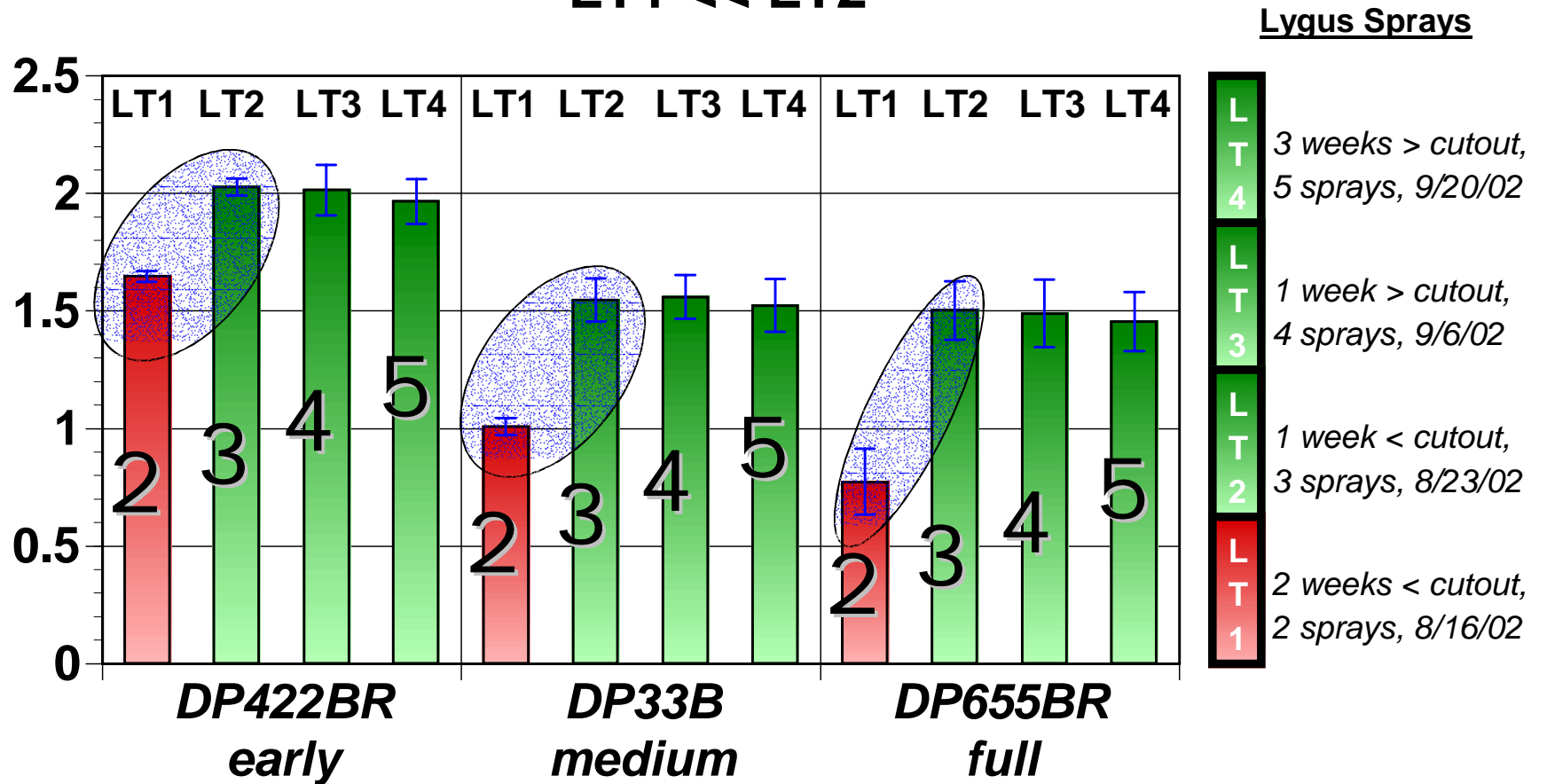
(when should you stop spraying?)

Lygus Termination (LT)	Spray Dates				
	5-Aug	16-Aug 2 wk < c.o.	23-Aug 1 wk < c.o.	6-Sep 1 wk > c.o.	20-Sep 3 wk > c.o.
LT4	●	●	●	●	●
LT3	●	●	●	●	
LT2	●	●	●		
LT1	●	●			

*c.o. = cut-out or nodes above white flower = 5*

# Large Yield Difference

LT1 << LT2



Lygus Chemical Termination X Variety

# ***Every Year is Different!***

**You should  
have quit  
while you  
were ahead!**



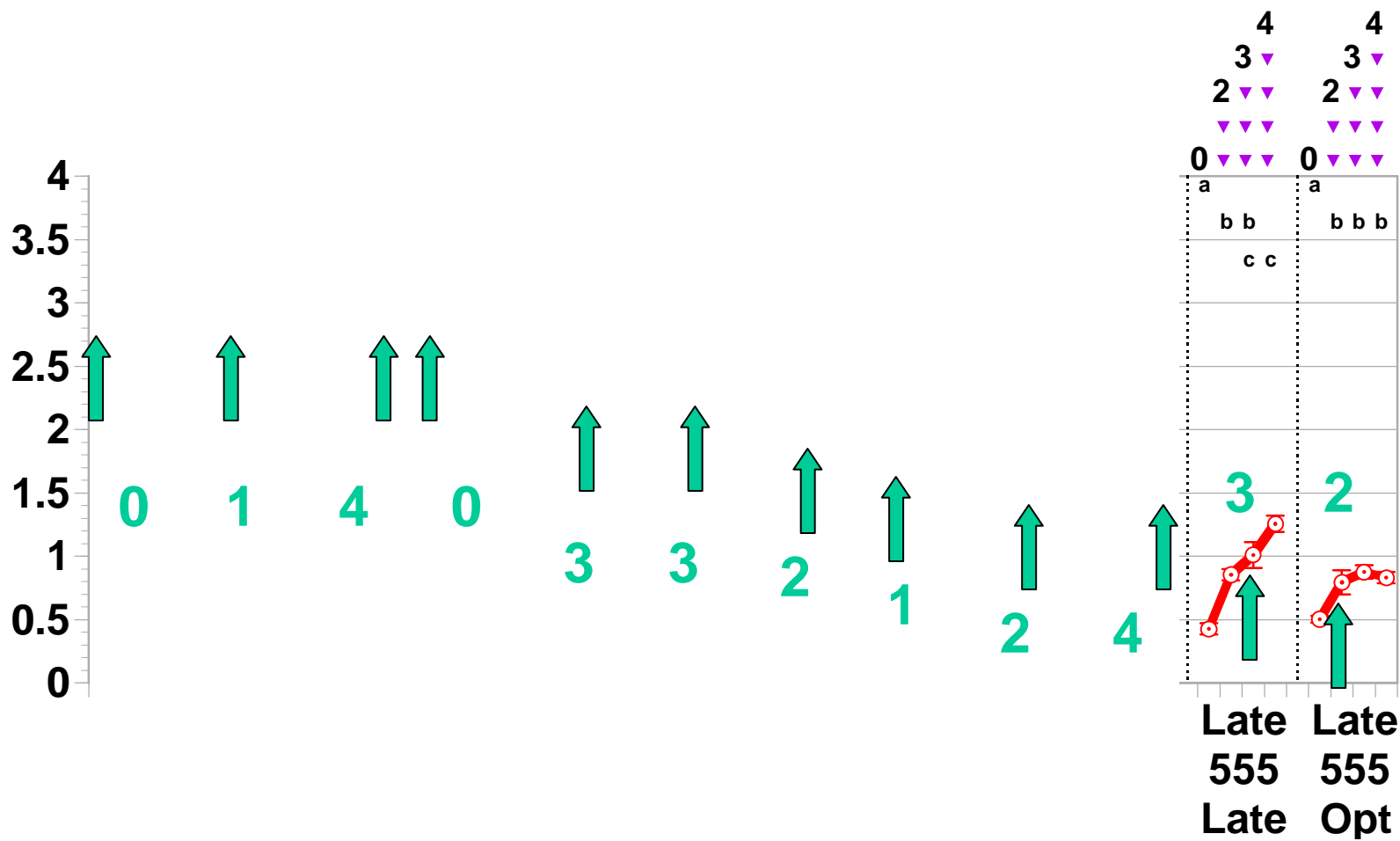


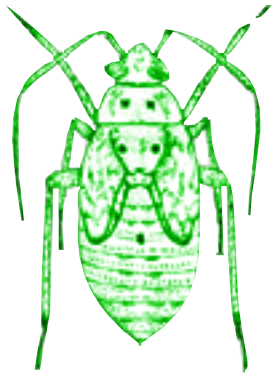
# 2003 Experiment

- **Two planting dates: April 30 & May 28**
- **Three varieties: SG215BR, DP449BR, DP555BR**
- **Two irrigation termination timings: Aug. & Sept.**
- **Four Lygus chemical control terminations**

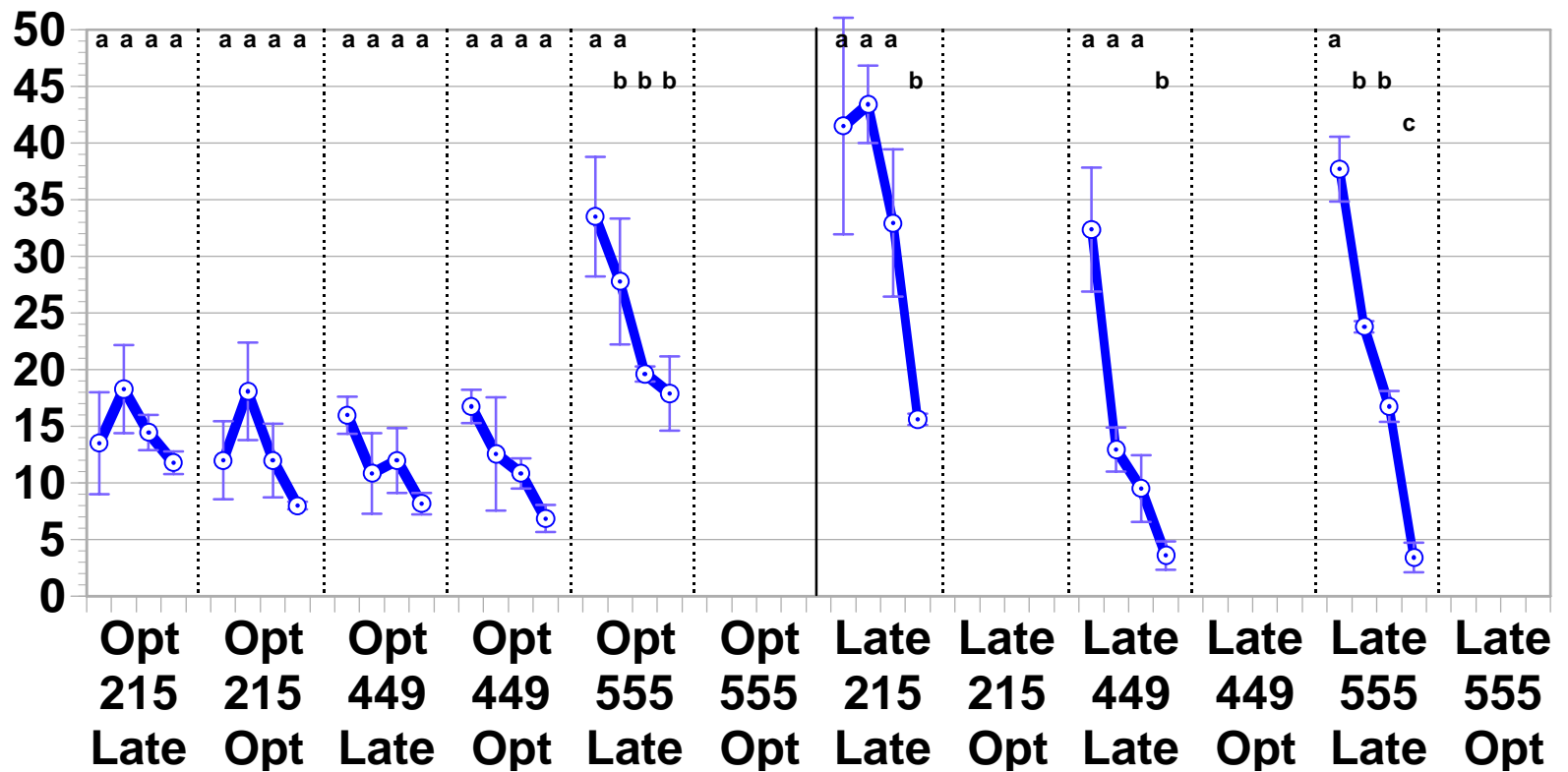
**High heat stress & fruit shed July-August**

**Extremely productive “fall”, long, open and dry**

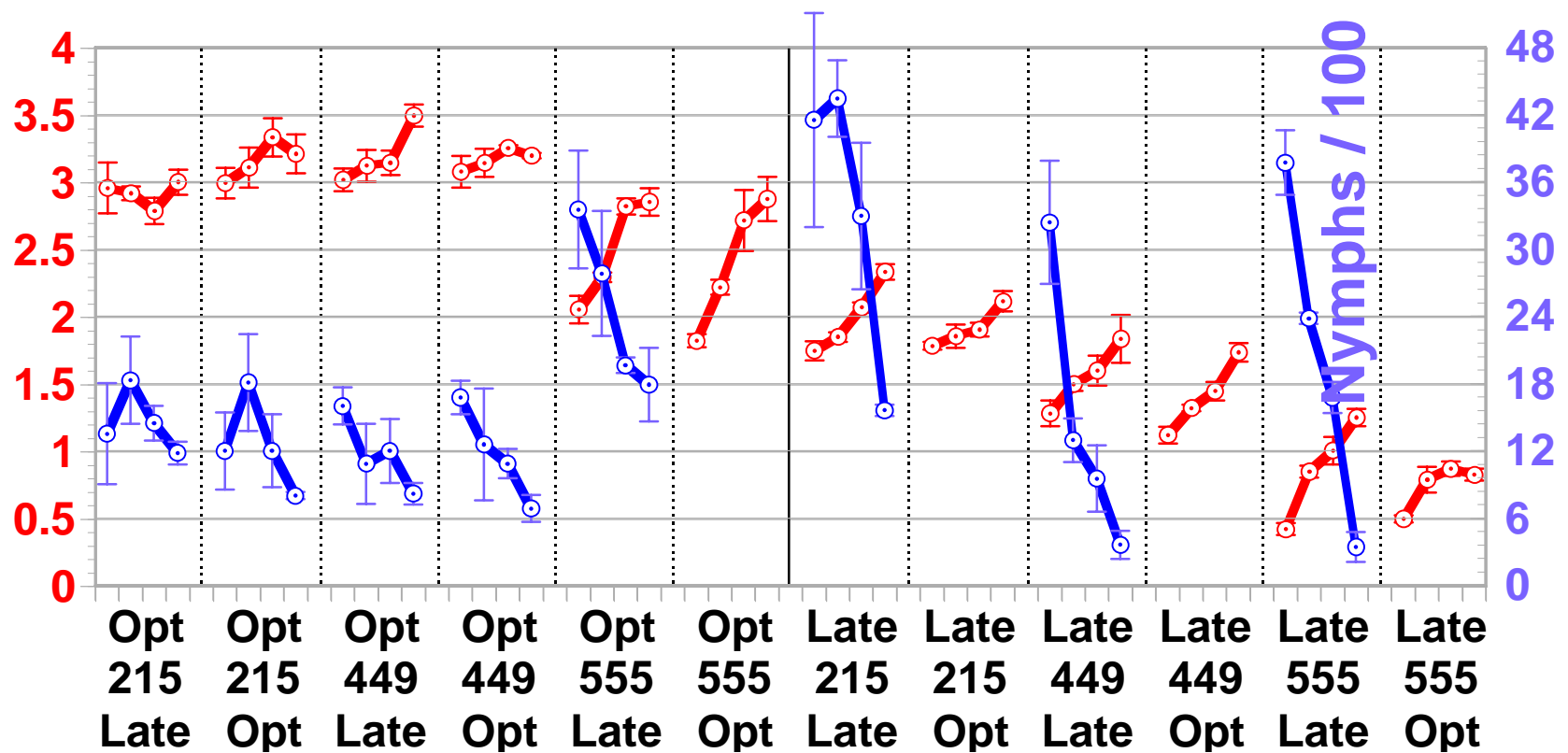




# High Populations Late Season

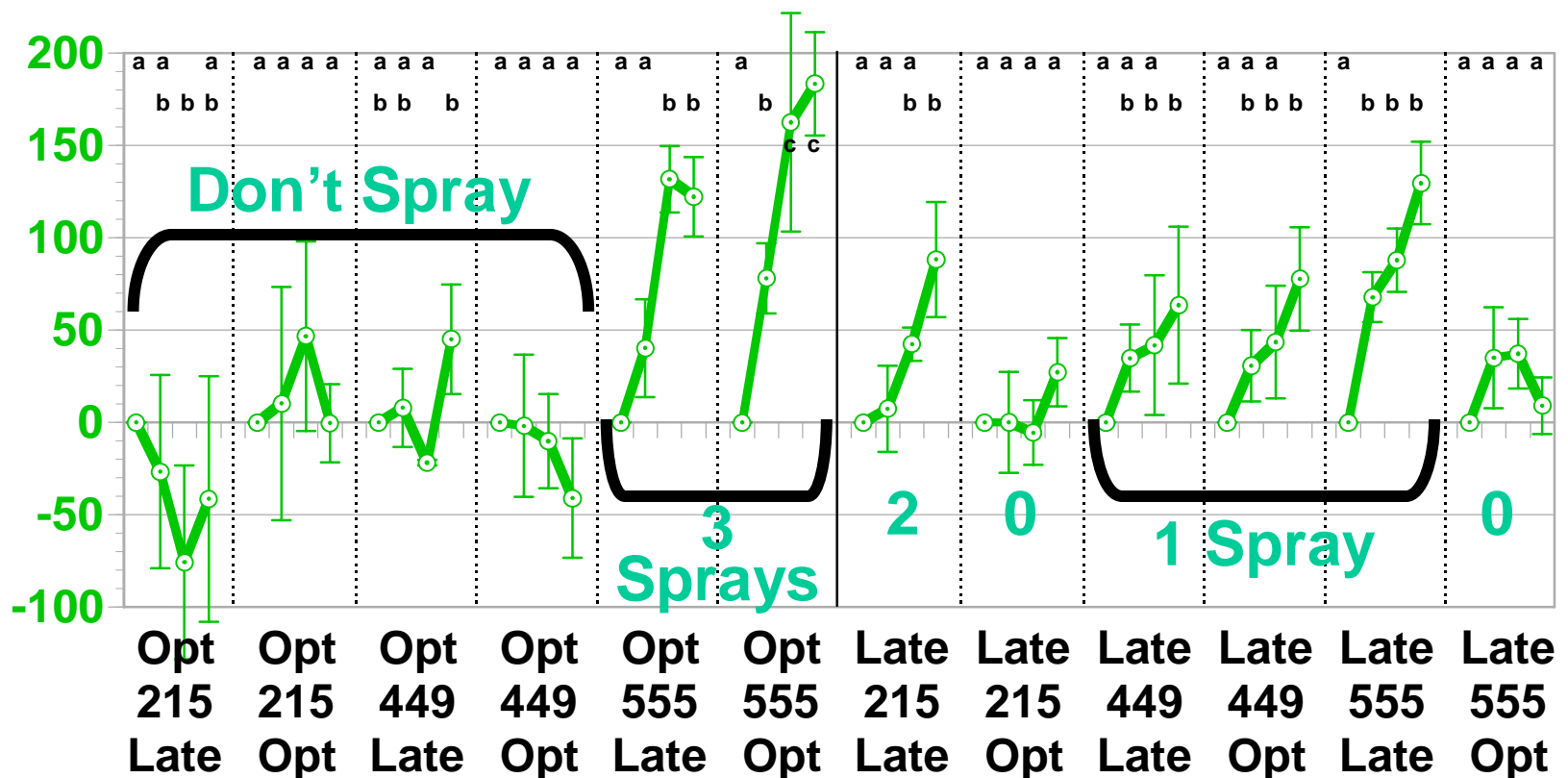


# Yield : Nymphs Relationship





# 50¢ Cotton Returns



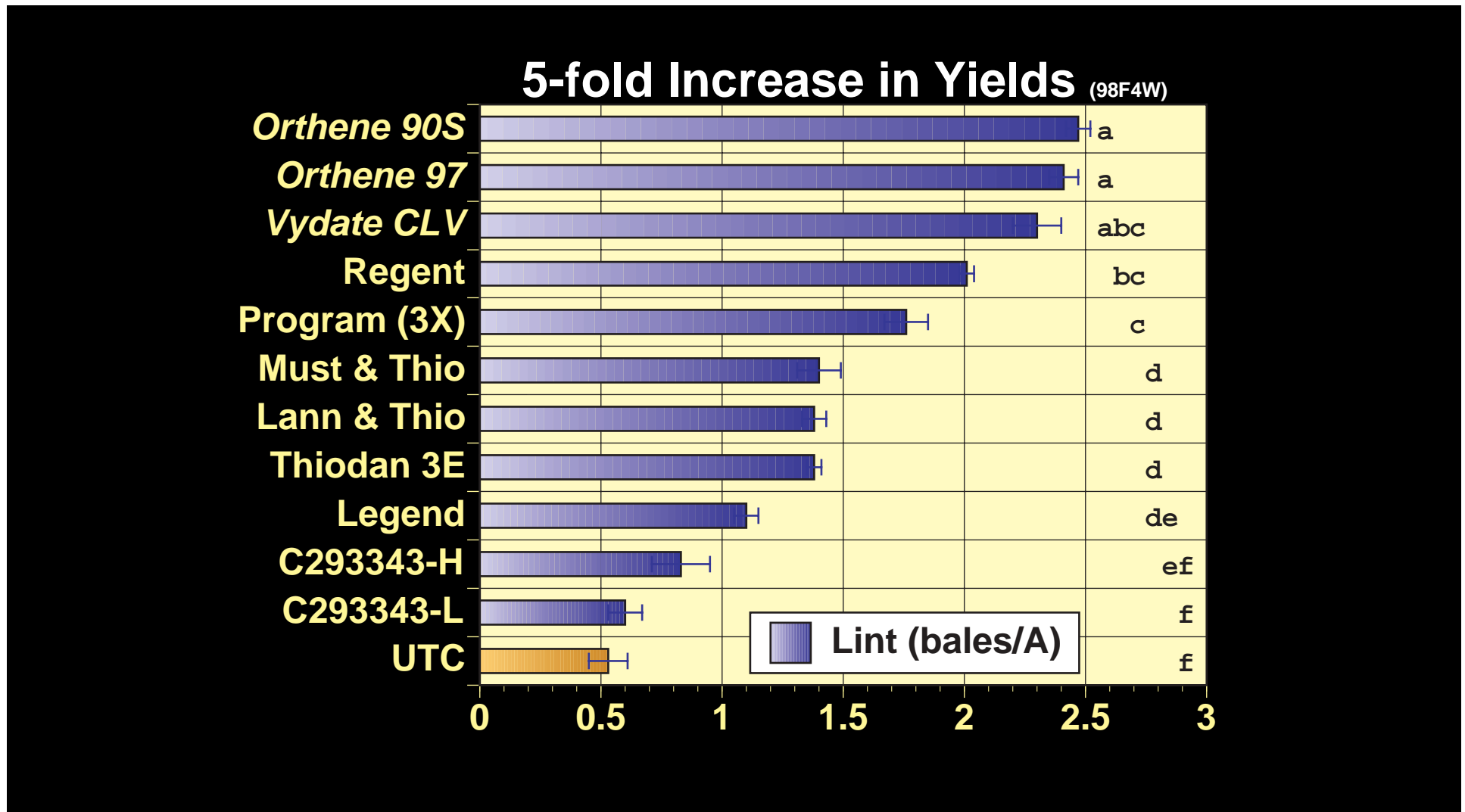
# Effective & Selective Chemistry

- **Effective chemistry is available, but limited to broad spectrum materials (I.e., Orthene or Vydate)**
- **Selective technologies have been key to managing whiteflies and pink bollworm**
- **Can selective agents be found for Lygus?**



# Studies Identified Effective Compounds

(5-fold increase in yield)

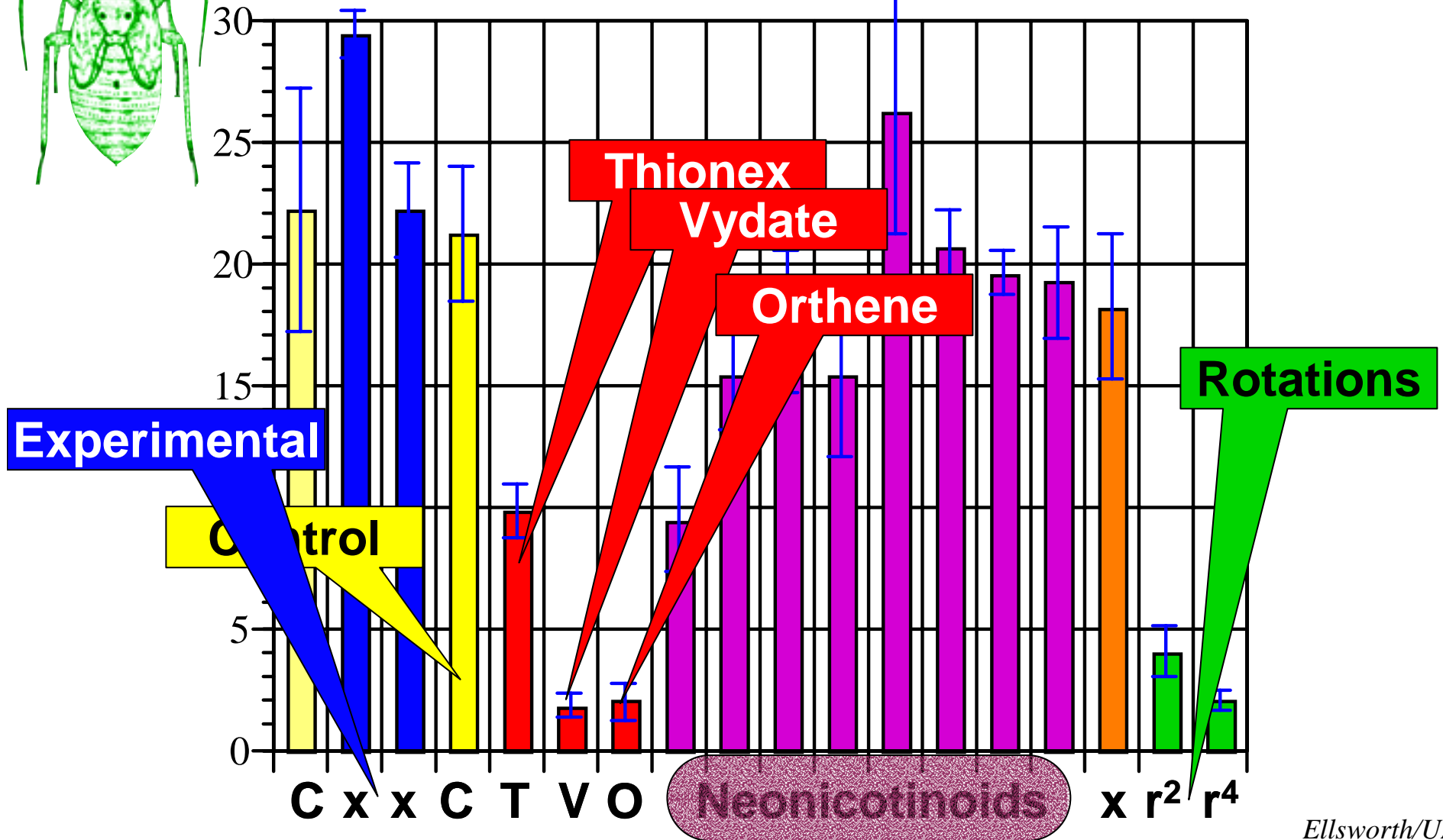




# 2002 Lygus Screening Trial (02F4L)



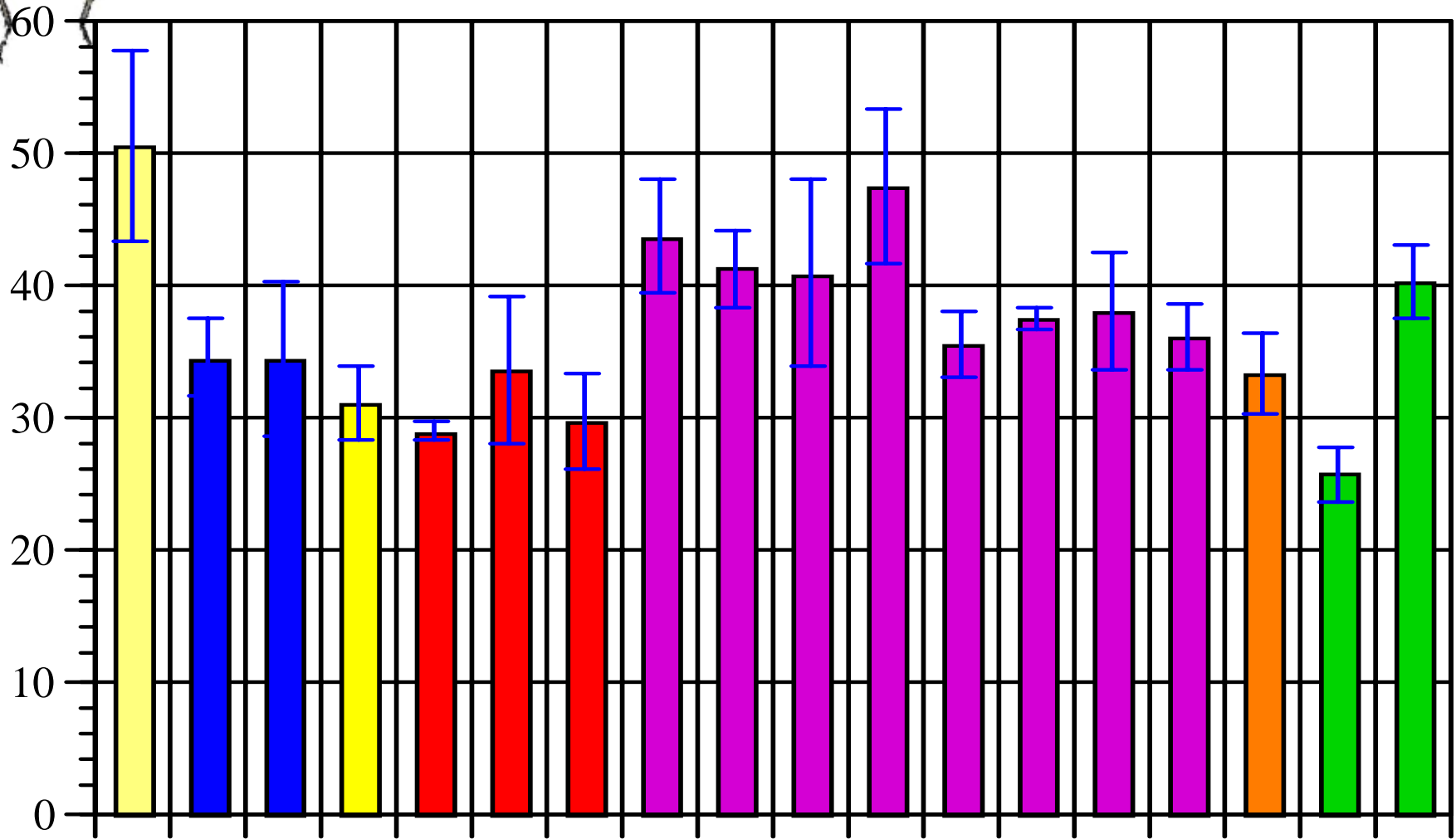
Large nymphs per 100 sweeps (seasonal ave.)





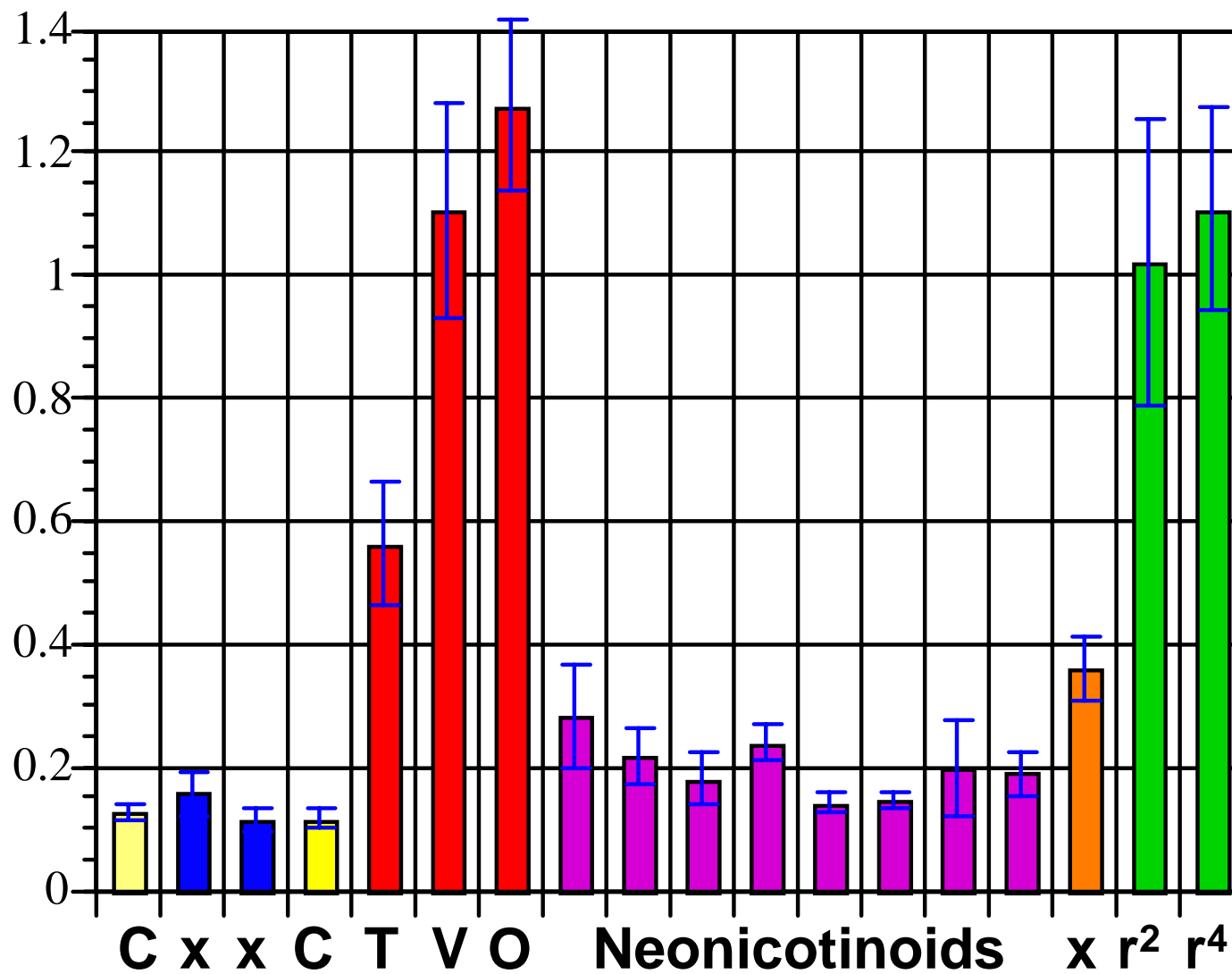
# Adults Unaffected (02F4L)

Adults per 100 sweeps (seasonal ave.)



# 2002 Lygus Screening Trial (02F4L)

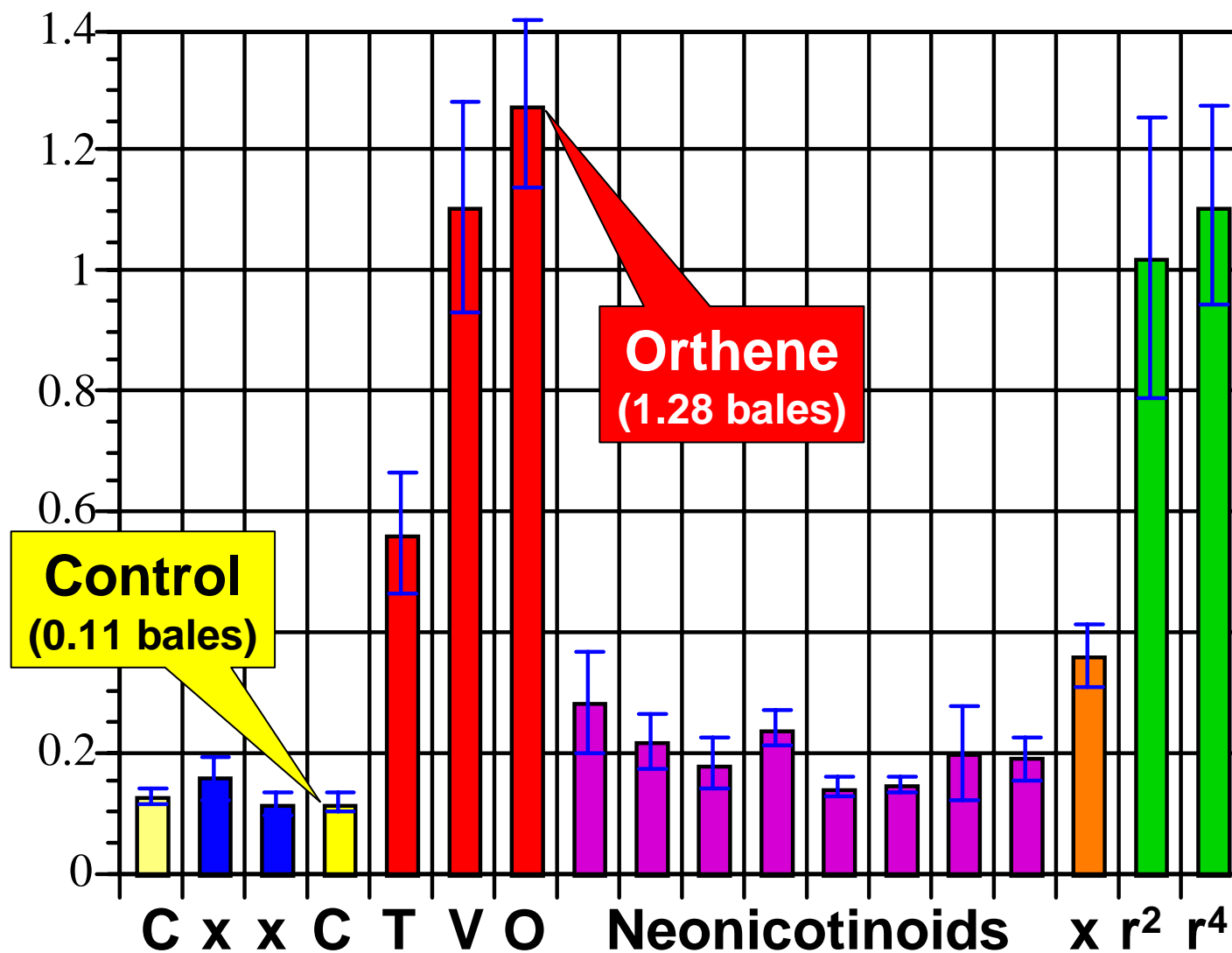
Yield in bales per acre



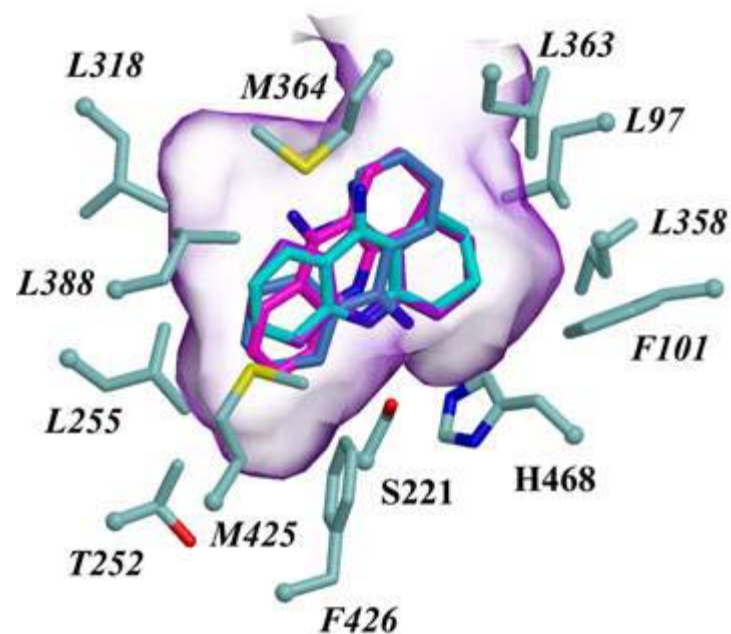
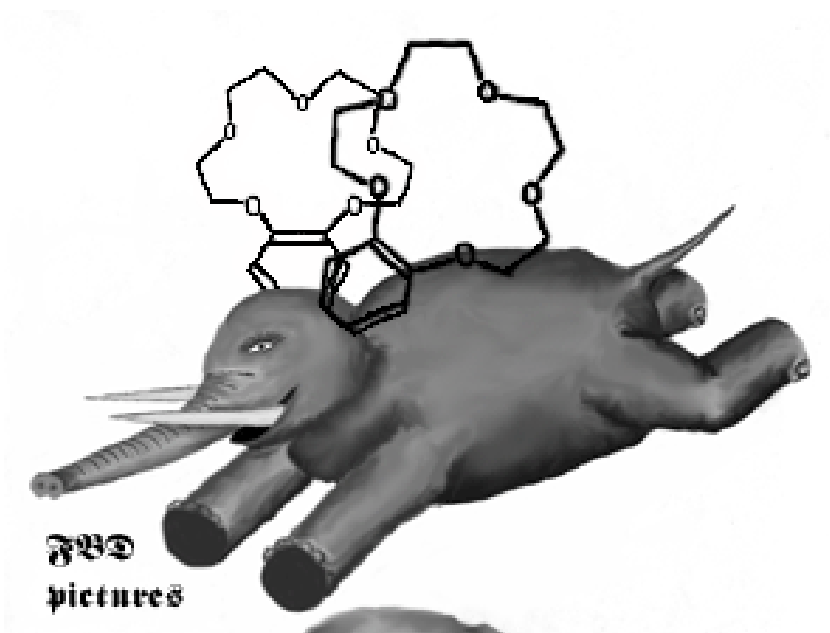


# > 10-fold Increase in Yields (02F4L)

Yield in bales per acre



# Selective Chemistry?

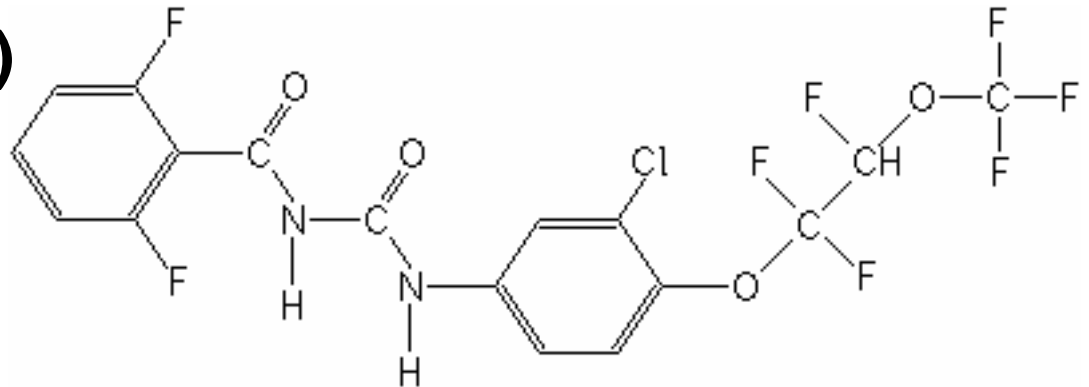


Carboxylesterase : tacrine

# New Chemistry: Selective Options for the Future?

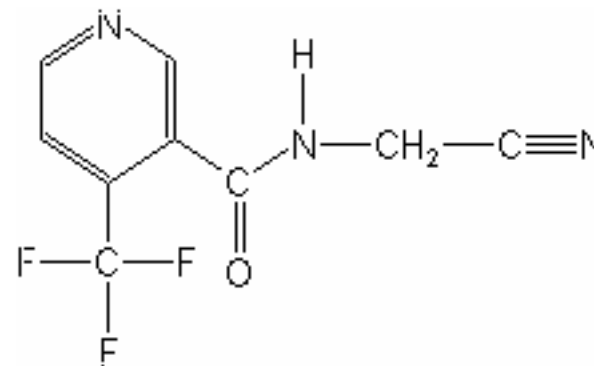
- **Novaluron (Diamond)**

- Makhteshim-Agan
- Uniroyal / Crompton
- Benzoylurea
- Chitin inhibitor
- Contact only



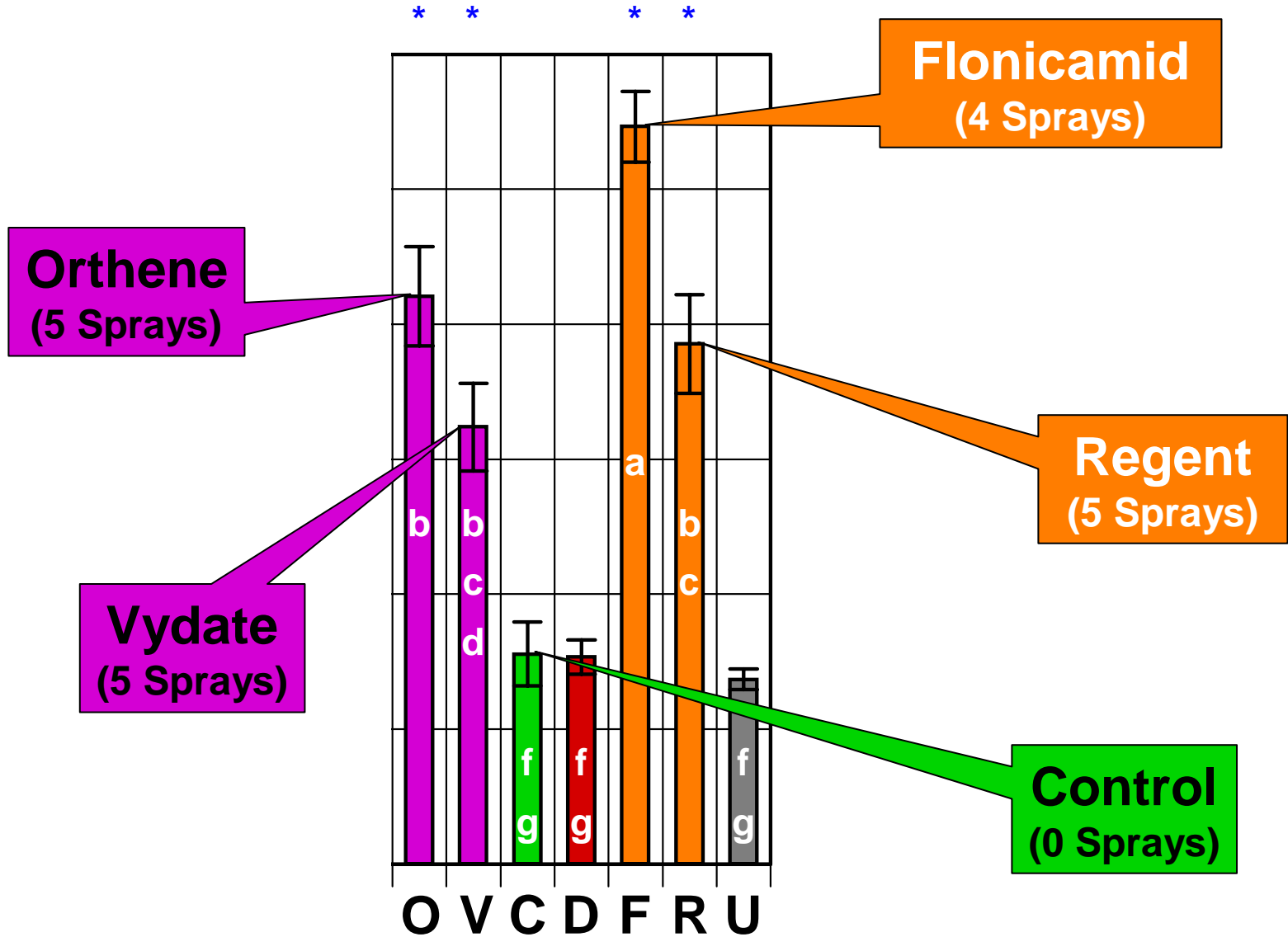
- **Flonicamid**

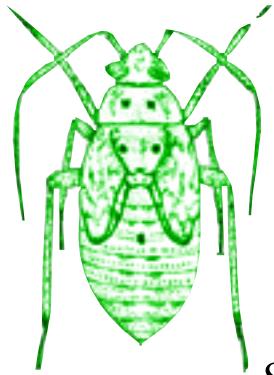
- ISK Industries
- FMC Corporation
- Pyridine carboxamide
- Feeding inhibitor
- Systemic



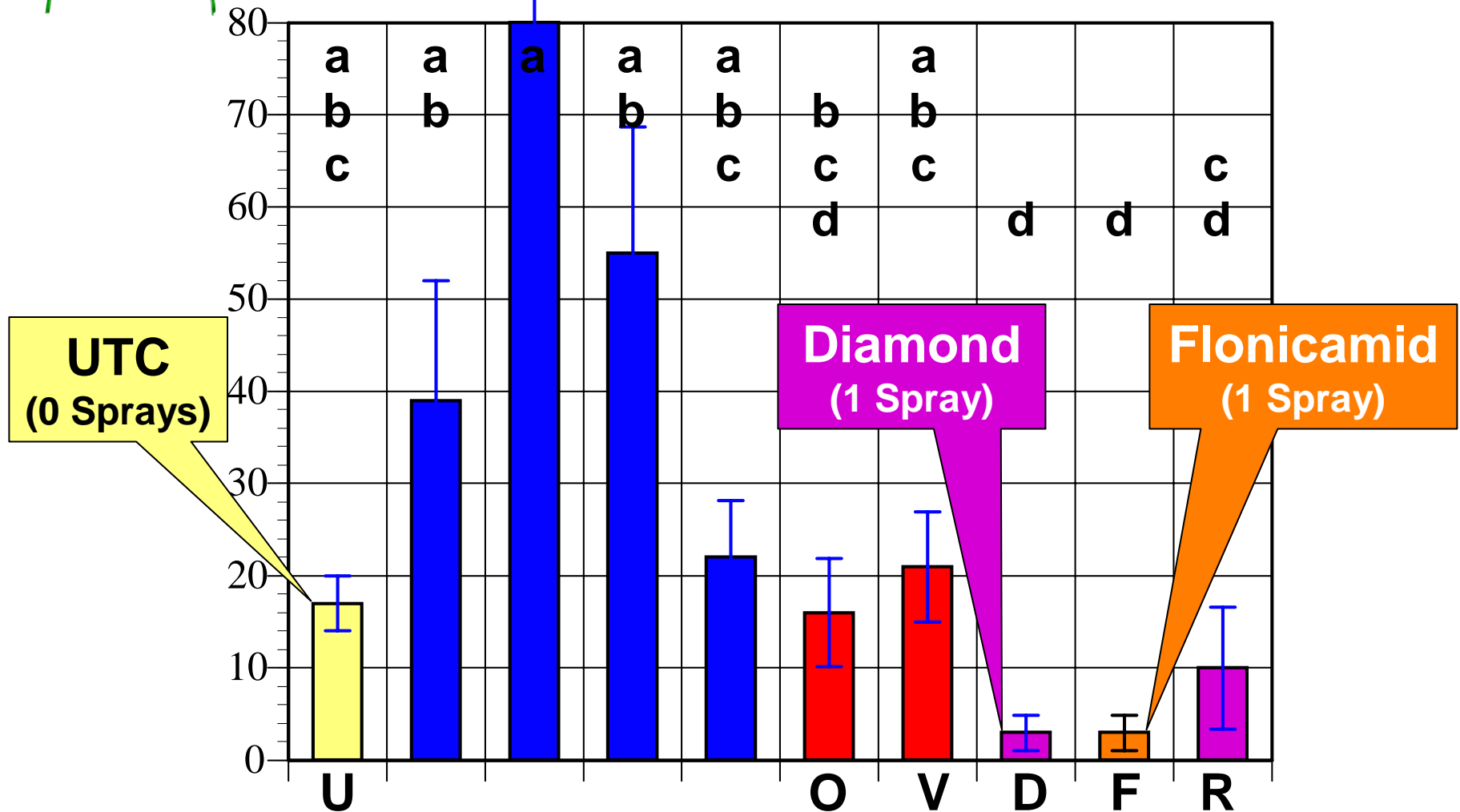


# Yield (03F4Eff)



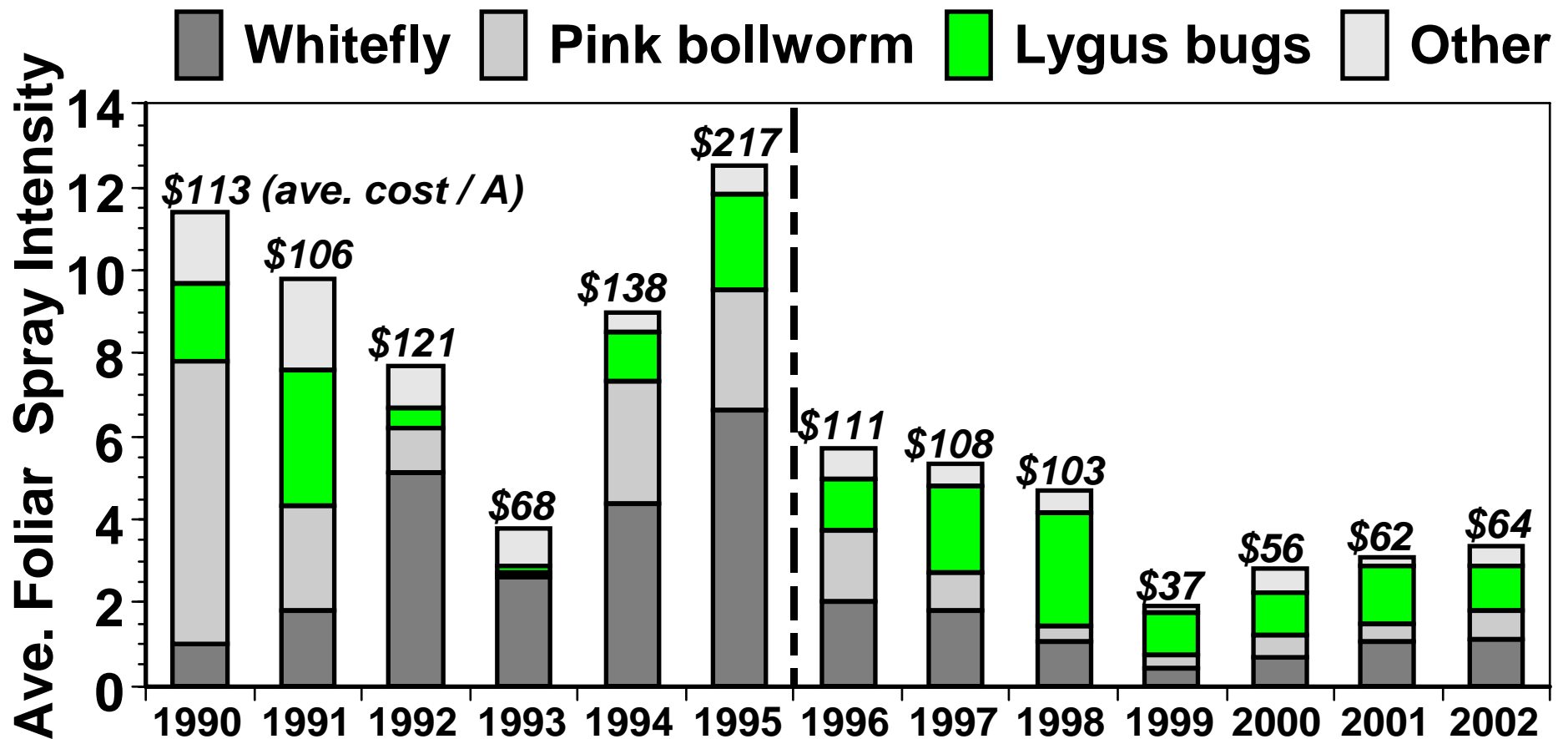


# Lygus Nymph Control, 7DAT (03F4Eff)



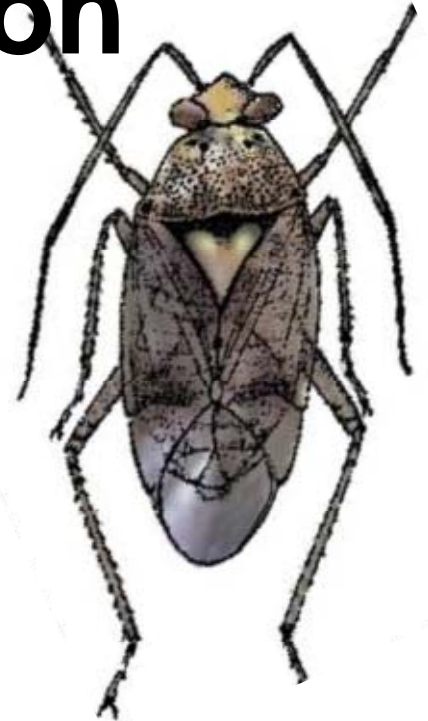
# Insecticide Use in AZ Cotton

- Selective technologies stabilized usage (i.e., Bt & IGRs)
- However, current usage reflects the importance of Lygus



# Major Threat to Cotton Production in AZ

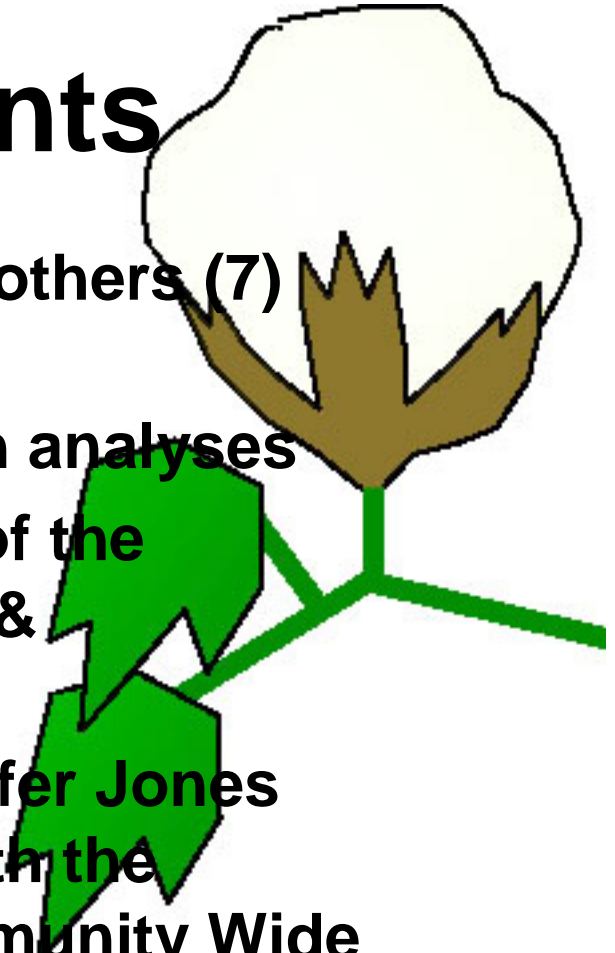
- Over the last 5 years...
- 45% of all insecticide sprays have been targeted at Lygus
- 41% of the entire insecticide budget has been invested against Lygus
- 66% of the yield loss has been attributed to Lygus





# Acknowledgments

- **Virginia Barkley who supervised and others (7) who conducted the sampling**
- **Christa Eilers-Kirk for assistance with analyses**
- **Larry Antilla, Jerry Kerr and the rest of the ACRPC staff who provide crop maps & coordinates**
- **Steve Husman, Dave Langston, Jennifer Jones and cooperating growers involved with the implementation of the Maricopa Community Wide Lygus Action Plan**
- **ACGA and Cotton Incorporated who supported (pce) the Lygus termination studies**



# Information

- All University of Arizona crop production & crop protection information is available on our web site,
- Arizona Crop Information Site (ACIS), at
- <http://ag.arizona.edu/crops>

