
Western Tarnished Plant Bug, *Lygus hesperus*
Knight, Management in the San Joaquin Valley:
Trends and Implications



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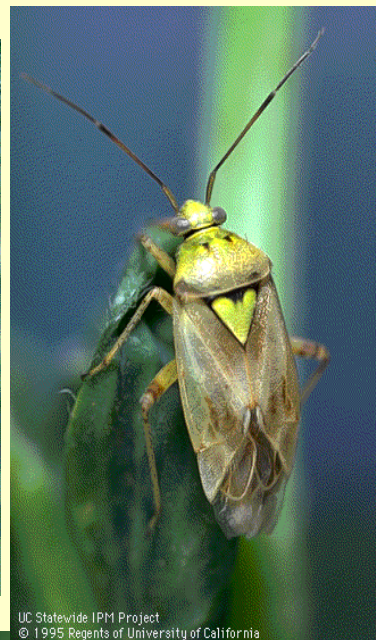
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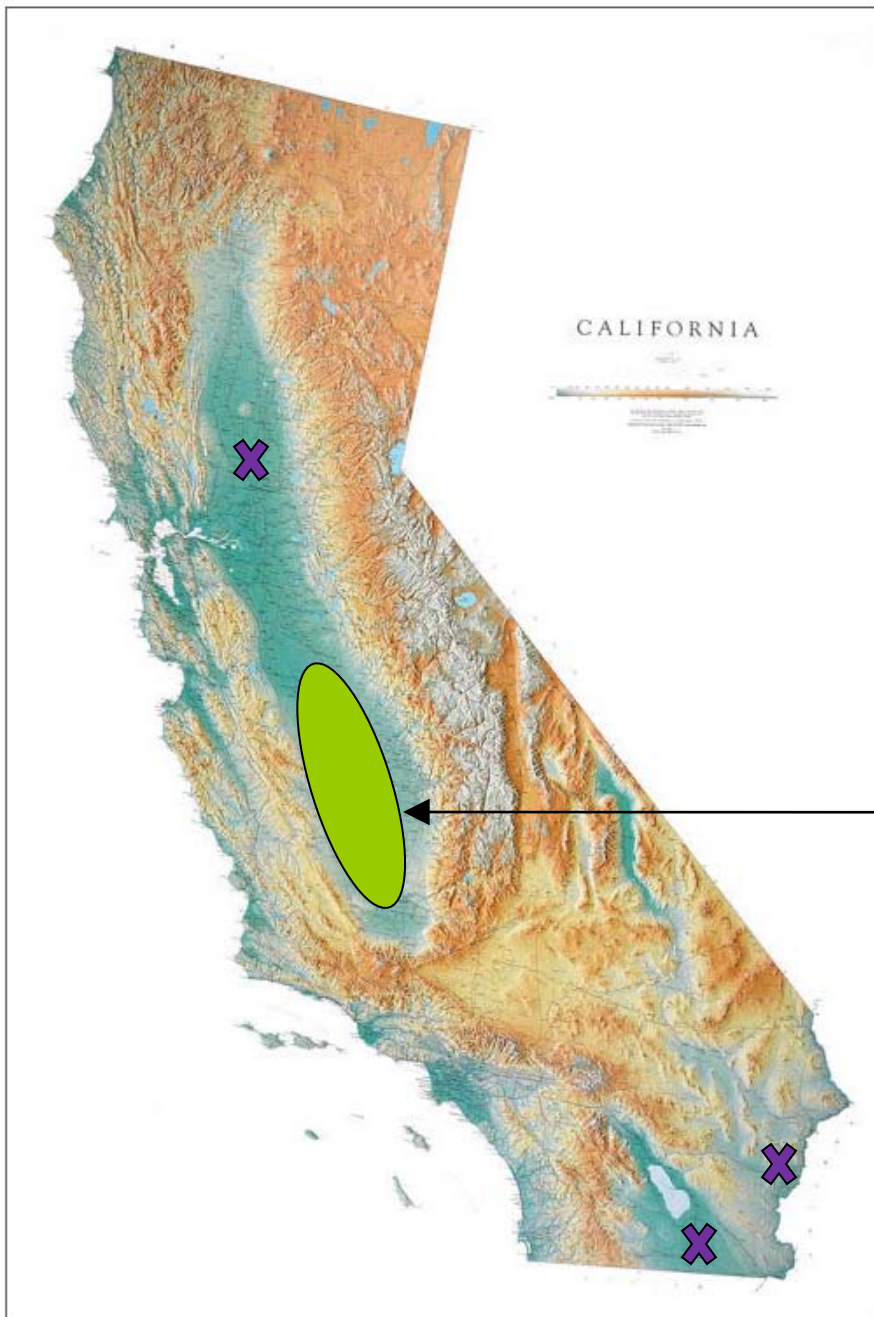
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Cotton Arthropod Pests

California Seasonal





San Joaquin Valley – 95% of California cotton acreage

2012

345,000 acres

65-70% - Pima

30-35% - Acala and Uplands

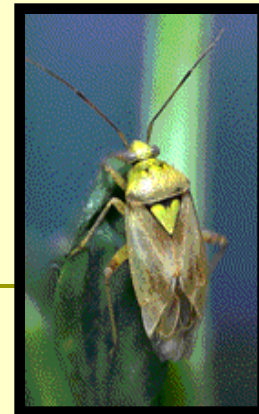
Lygus Bugs in SJV

- ❑ Key pest in cotton IPM system
- ❑ Lygus management affects mites, aphids, worms
- ❑ Not an annual problem in every field
- ❑ Severity depends on:
 - Location, weather, hosts
 - Sustained migrations
- ❑ Fields need inspection twice a week
- ❑ Small squares most sensitive



Lygus Bugs

Long History in CA



Research Topics in 1961

Bacon

- Lygus species breakdown
- insecticide tolerance

Stern

- alfalfa intercropping

van den Bosch

- biological control
- *Geocoris*

Reynolds

- new carbamates

Middlekauf

- control in beans

Carlson

- economic thresholds on vegetable seed crops, safflower

Shorey

- insecticide efficacy on central coast area

Allen

- Lygus in strawberries

Leigh

- Lygus in cotton
- host plant resistance
- Lygus biology

Pest Status of Lygus

Crops

- ❑ Alfalfa
- ❑ Safflower
- ❑ Cotton
- ❑ Pistachios
- ❑ Common beans
- ❑ Lima beans
- ❑ Lettuce
- ❑ Strawberries
- ❑ Apples/Pears
- ❑ Blackeye beans
- ❑ Seed alfalfa

Pest Status

- ❑ Non-pest, sink/source
- ❑ Non-pest, source
- ❑ Pest, 2-10/50 sweeps^x
- ❑ Pest, No A.T.
- ❑ Pest, 1-2/sweep⁺
- ❑ Pest, 1-1.5/sweep
- ❑ Pest, No A.T.
- ❑ Pest, 1/10 plts
- ❑ Pest; 1 dmg fruit/100
- ❑ Pest, 0.5 -1/sweep
- ❑ Pest, 4-10/sweep^{*}

Weed Hosts for Lygus Bugs

Foothills/natural areas



Russian Thistle

Dock

Shepherd's Purse

Wild Radish

London Rocket

Tarweed

UC Statewide IPM Program
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Management Options for Lygus Bugs

□ **Biological Control:**

- Highly migratory insect, control must be immediate following migration
- Off-site biological control – being investigated

□ **Environmentally soft approaches**

- Mating disruption not available
- Selective, biological materials not available (Bt, microbial)

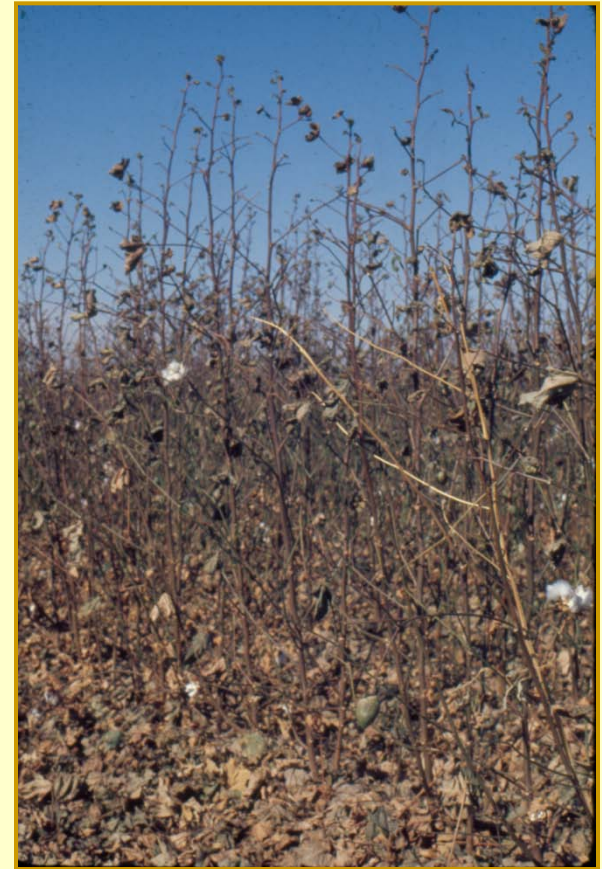
□ **Cultural control**

- Host plant resistance not available (breeding or transgenic)
- Vigorous well-managed cotton plant
- Management of regional populations – some success

□ **Chemical Control**

- Important to prevent damage

Cotton - Damage



Chemical Options for Lygus

❑ Organophosphates/carbamates

- Somewhat effective but limited residual
- Orthene more effective but use limited due to mite flares
- Vydate used

❑ Pyrethroids

- Use ramped up in the mid-1990's and has continued
- Primary tool from ~1995-2005
- Good control, better residual control – initially 10-14 days, now ~5 days
- Associated with aphid outbreaks, also spider mites
- Resistance an increasing issue, one application per season usable (probably)

Chemical Options for Lygus

- **Imidacloprid and other neonicotinoids**
 - Suppressive at best[®]
 - Clothianidin – Belay[®] - more effective
 - Use limited now due to honey bee concerns
- **Other materials**
 - Indoxacarb - Steward[®] - suppressive
 - Novaluron - Rimon[®] - ineffective
 - Flonicamid - Carbine[®] - standard since 2007

Chemical Options for Lygus

➤ Cotton Insecticides

- Carbine

- Pyrethroids

 - Warrior, Capture, Baythroid, Leverage, other mixtures, etc.

- Carbamates

 - Vydate

- Steward

- Organophosphates

 - dimethoate, others

- Neonicotinoids

 - Provado, Centric, Assail



~ effectiveness

Management of Lygus Bugs in Cotton

Sampling

Begin sweep net samples for lygus at first square, sampling twice a week in each field.

Thresholds

Suggested thresholds :

Early Squaring (before 1st flower): **2-4 lygus/50** sweeps

Mid-Squaring (1st flower - 1st boll): **7-10 lygus** (at least 1 nymph) per 50 sweeps and expected or better fruit retention. If retention is higher than expected you may be able to wait and monitor again that week before making a treatment decision. If retention is lower than expected and lygus bugs are present, consider treating.

Late Squaring (after 1st boll): **10 lygus/50** sweeps, including the presence of nymphs

Management of Lygus Bugs in Cotton

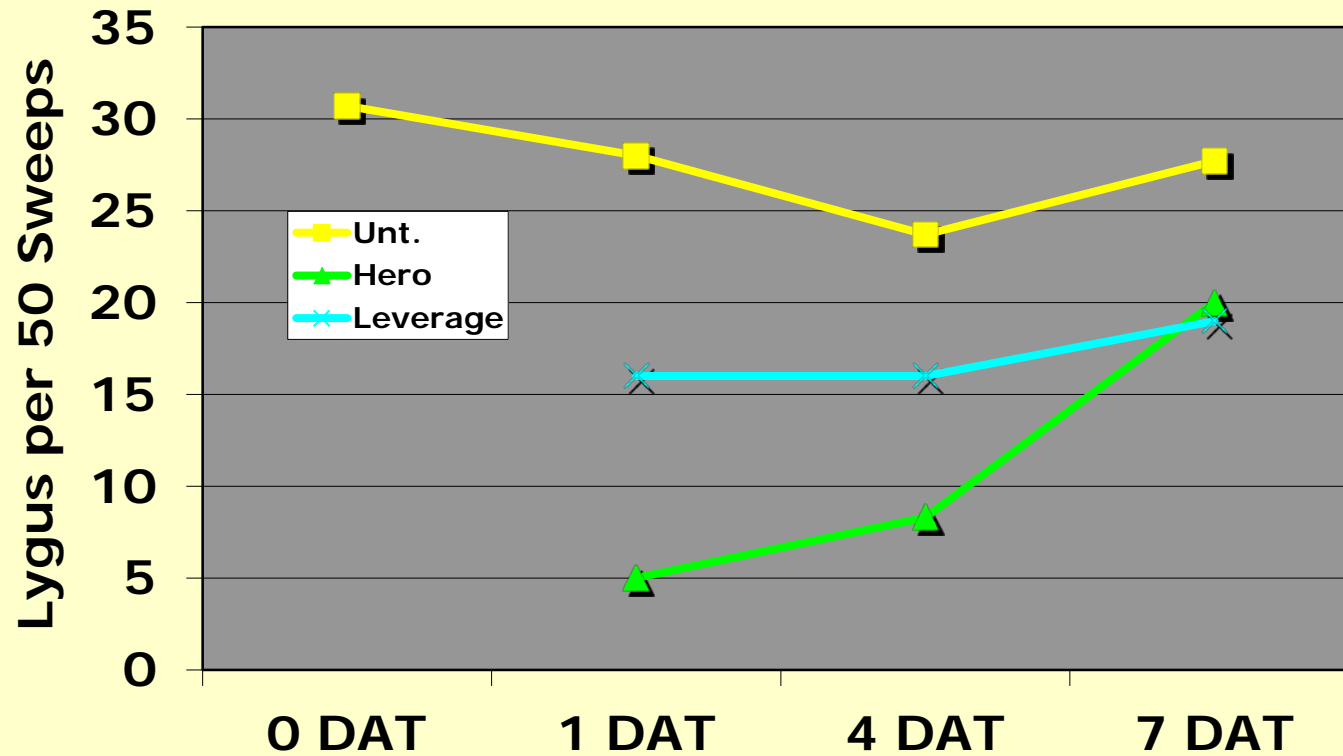
Expected retention (%) of the first position fruit on the top 5 fruiting branches, from data for Acala cotton.

Total Fruiting Branches	Percent retention of the first position fruit on the BOTTOM 5 fruiting branches									
	10	20	30	40	50	60	70	80	90	100
Less than 5	The expected retention of the top 5 first fruiting positions is 73%. The retention on the first fruiting branch is erratic and at least 3 branches should be present before lygus decisions are made.									
5	73	73	73	73	73	73	73	73	72	71
6	73	73	73	73	73	73	72	72	70	69
7	73	73	73	73	73	72	71	70	68	65
8	73	73	73	73	72	71	69	66	63	60
9	73	73	72	71	70	68	65	62	58	53
10	73	72	71	69	67	65	60	56	51	46
11	71	70	68	66	62	58	54	49	44	39
12	69	67	64	61	56	51	46	41	37	32
13	66	63	59	54	49	44	39	35	30	27
14	61	57	52	47	42	37	33	29	25	22
15	55	50	45	40	35	31	27	24	21	18
16	48	43	38	33	29	25	22	20	18	16
17	40	36	31	28	24	21	19	17	15	14
18	34	29	26	23	20	18	16	14	13	12
19	28	24	21	19	17	15	14	13	12	11
20	23	20	18	16	15	13	12	11	11	10

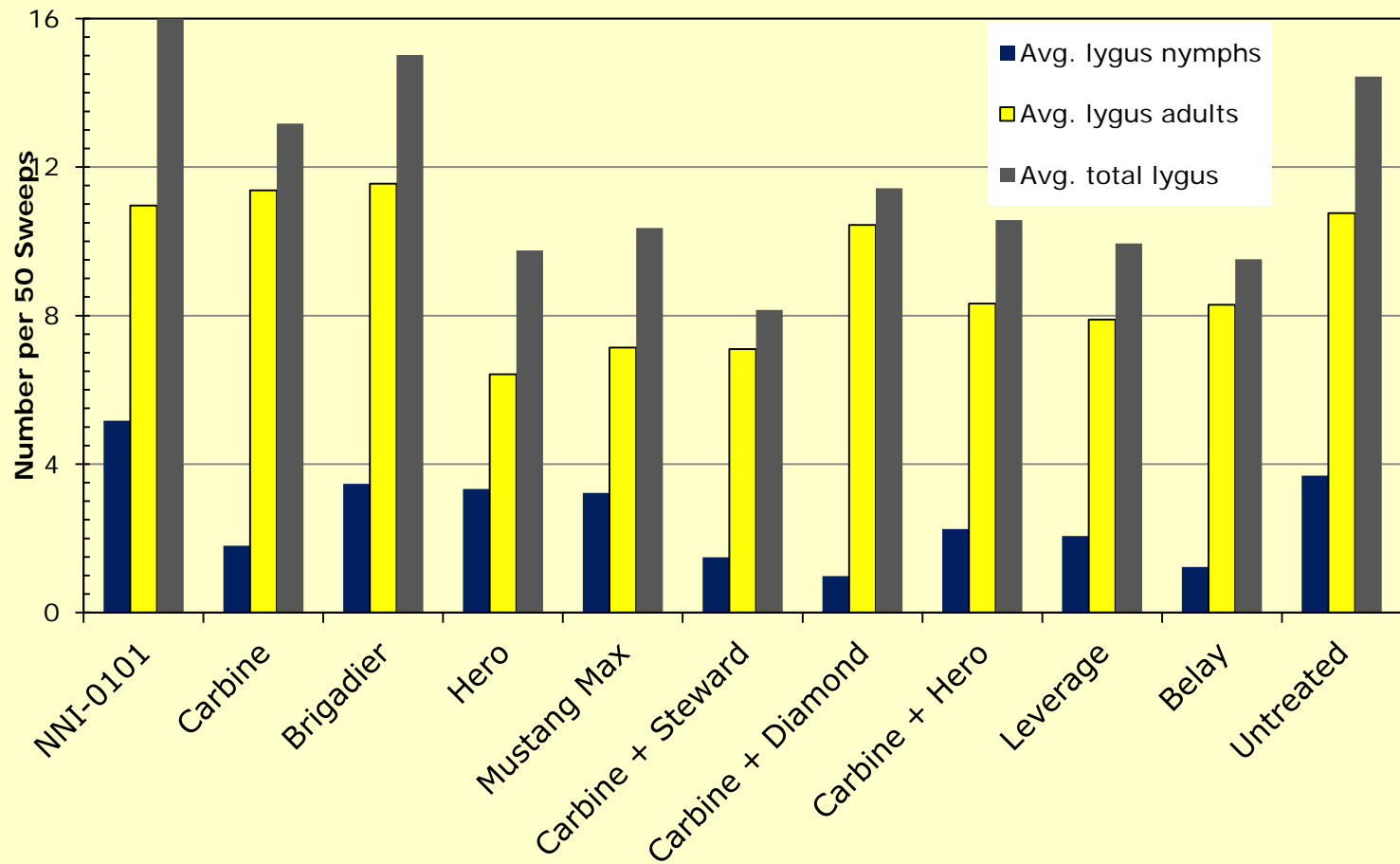
Lygus Bug Management

- ❖ West Side Research and Extension Center or Shafter Cotton Station
- ❖ Applications as populations approach threshold – generally early to mid July; two to three applications
- ❖ Plots measuring 10 rows by 75' with four replications
- ❖ Efficacy was assessed with sweep net samples (50 sweeps per plot) ~ twice per week
 - ❖ lygus bugs
 - ❖ natural enemies
- ❖ Sampled for secondary pests (cotton aphids, spider mites) twice per season with leaf samples
- ❖ In-season and end-of-season plant mapping
- ❖ Yield

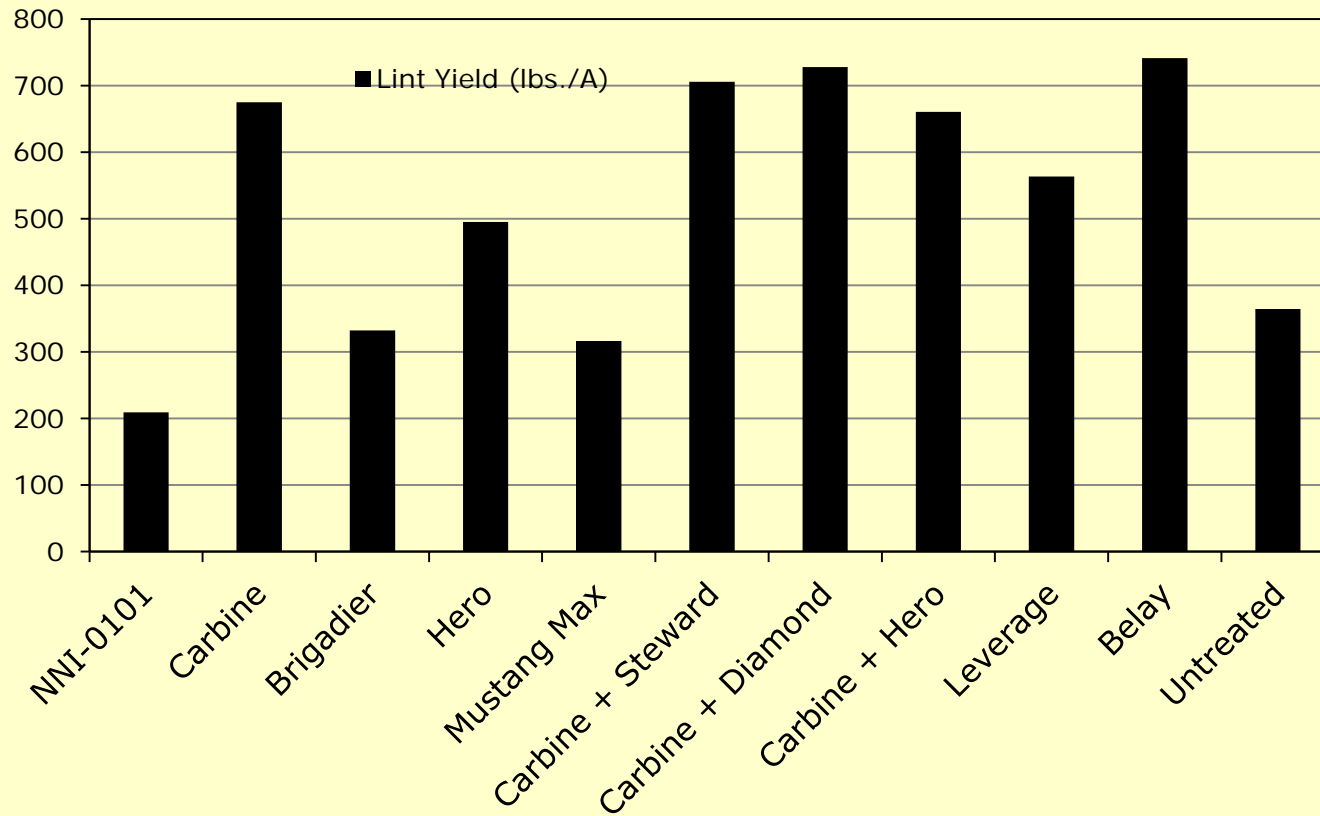
Lygus Bug Management 2008



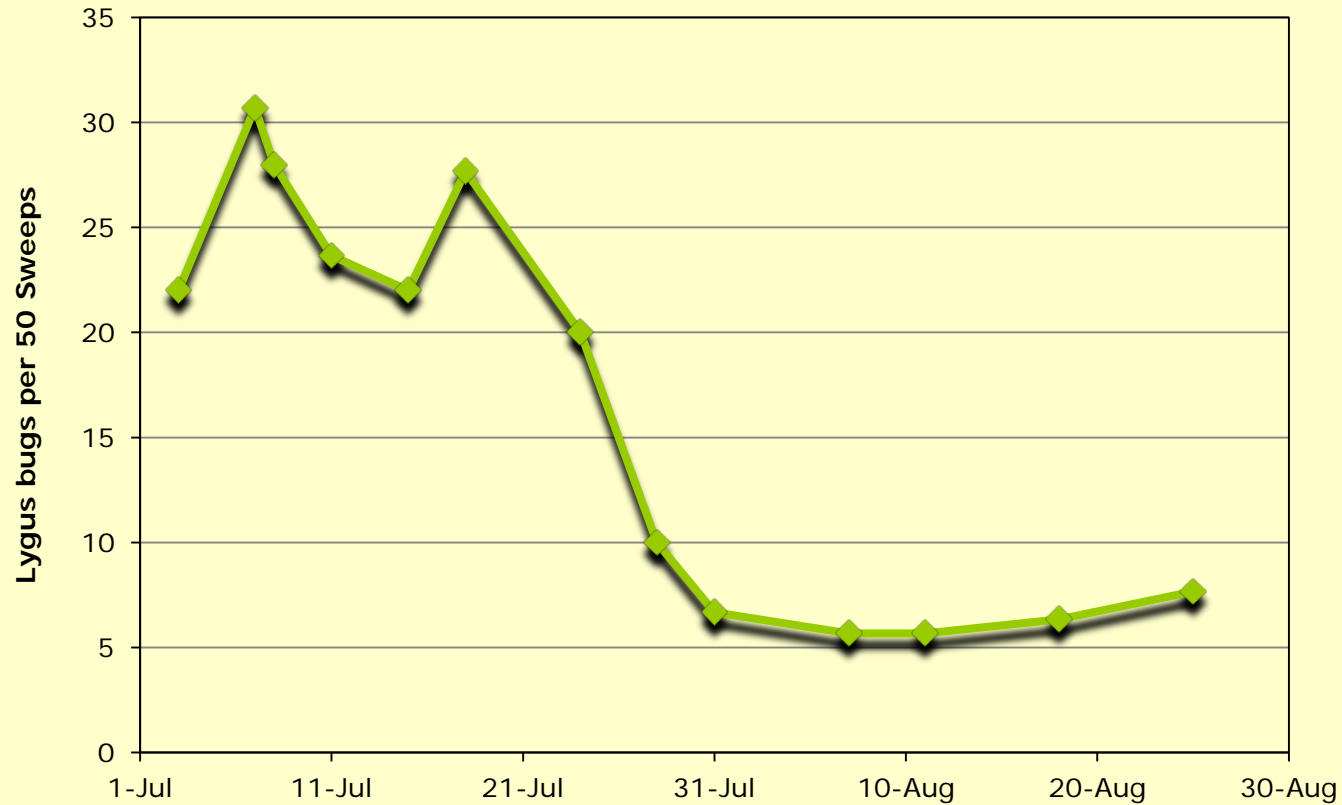
Lygus Bug Management 2008



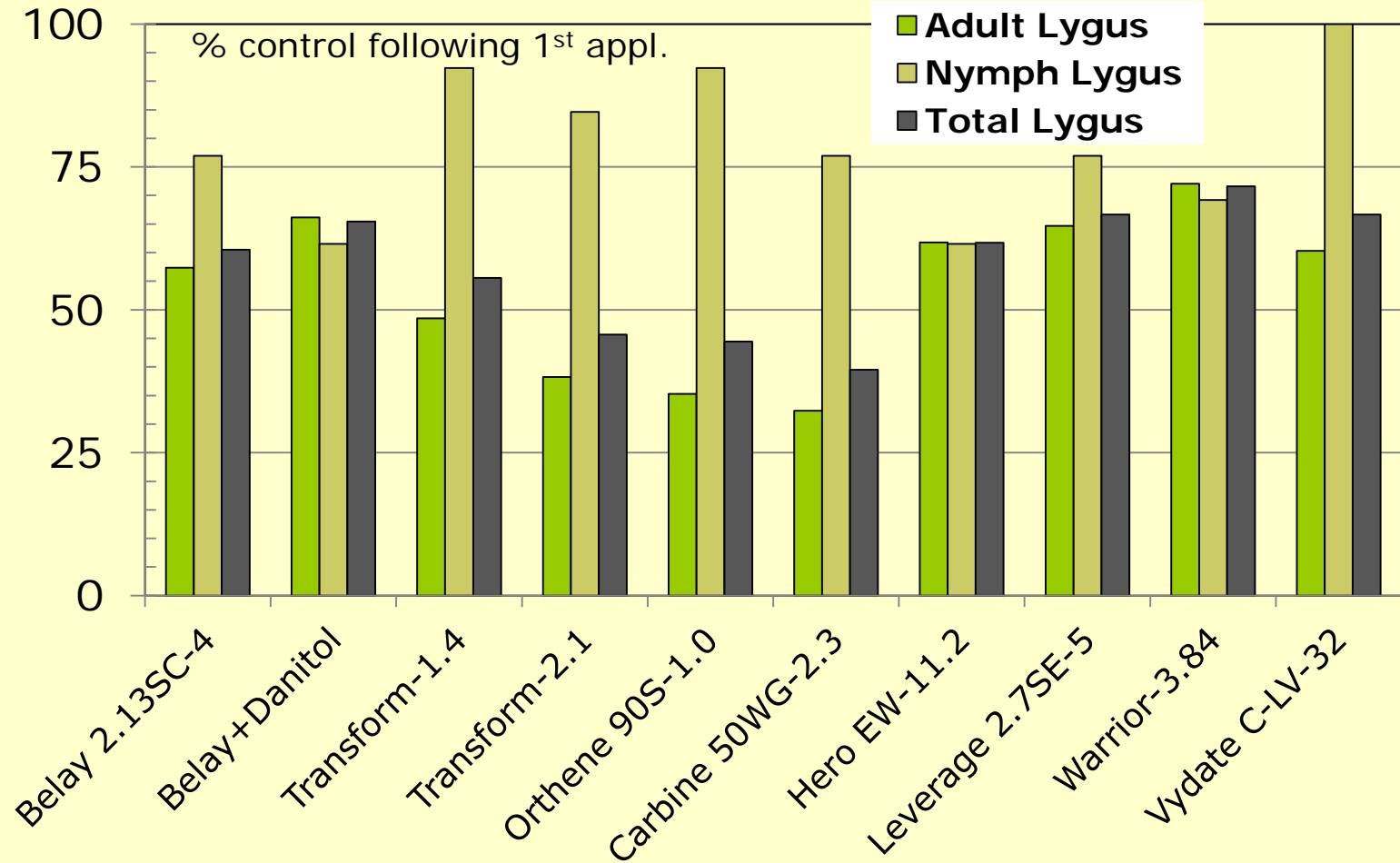
Lygus Bug Management 2008



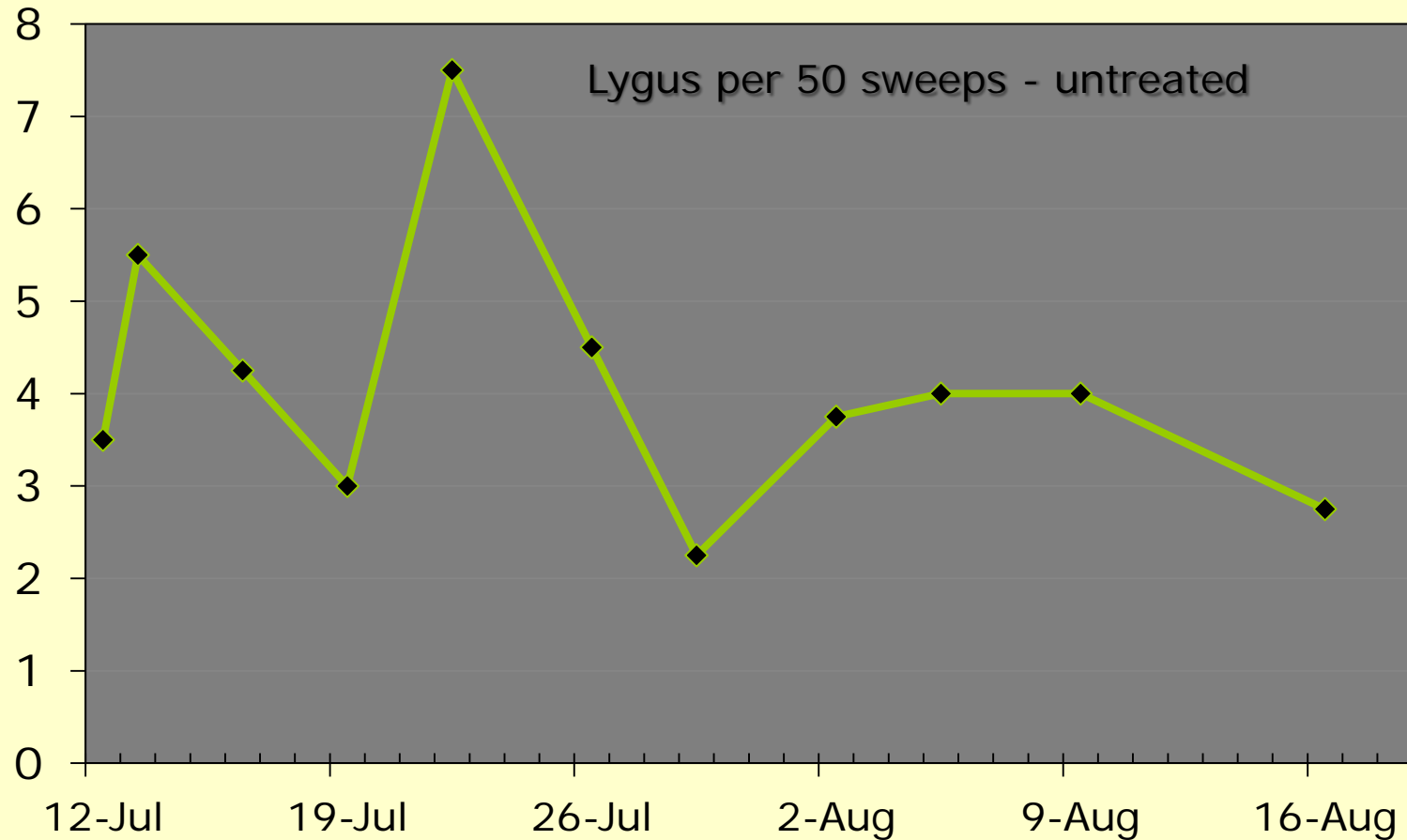
Lygus Bug Management 2008



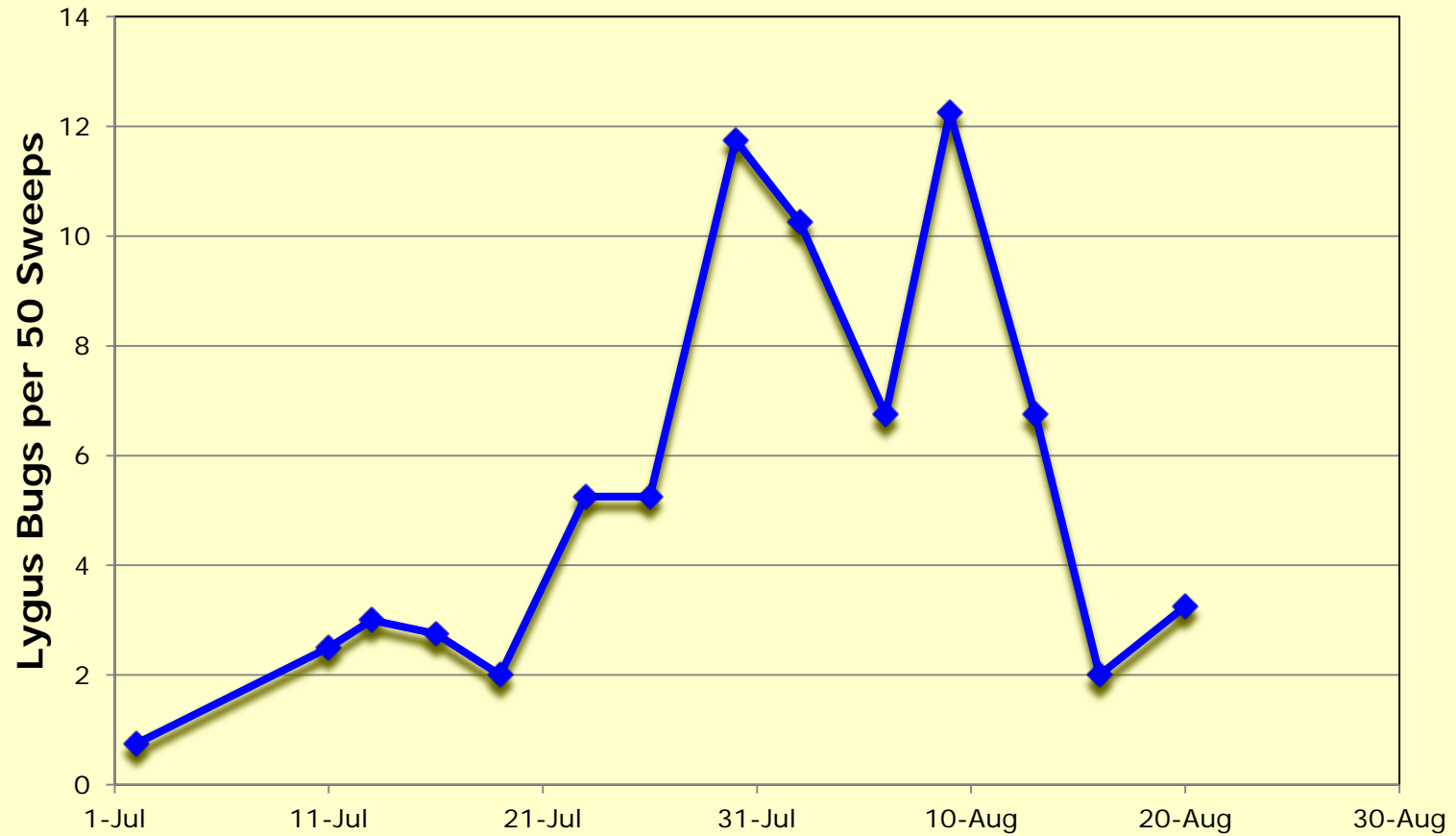
Lygus Bug Management 2010



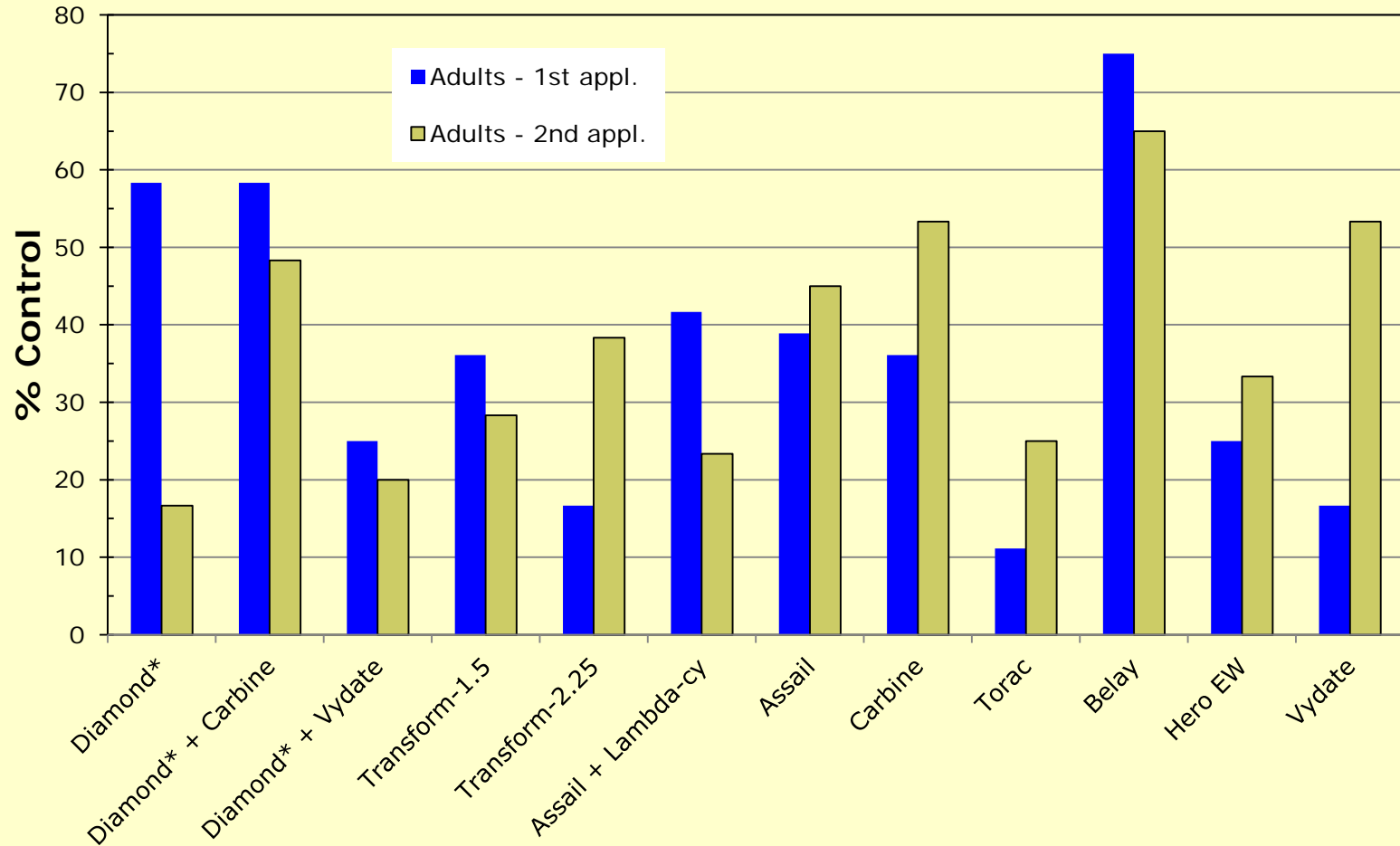
Lygus Bug Management 2010



Lygus Bug Management 2012

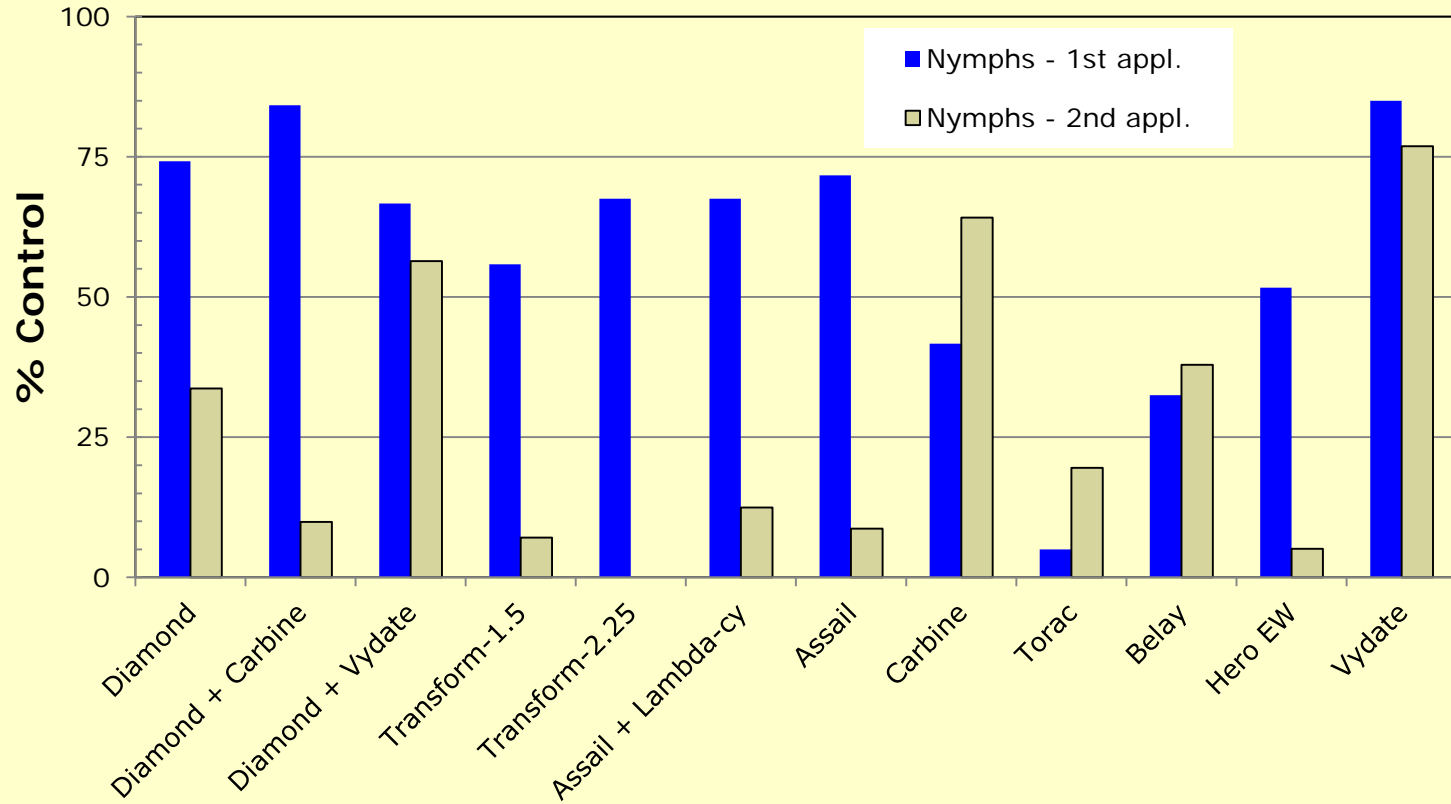


Lygus Bug Management 2012

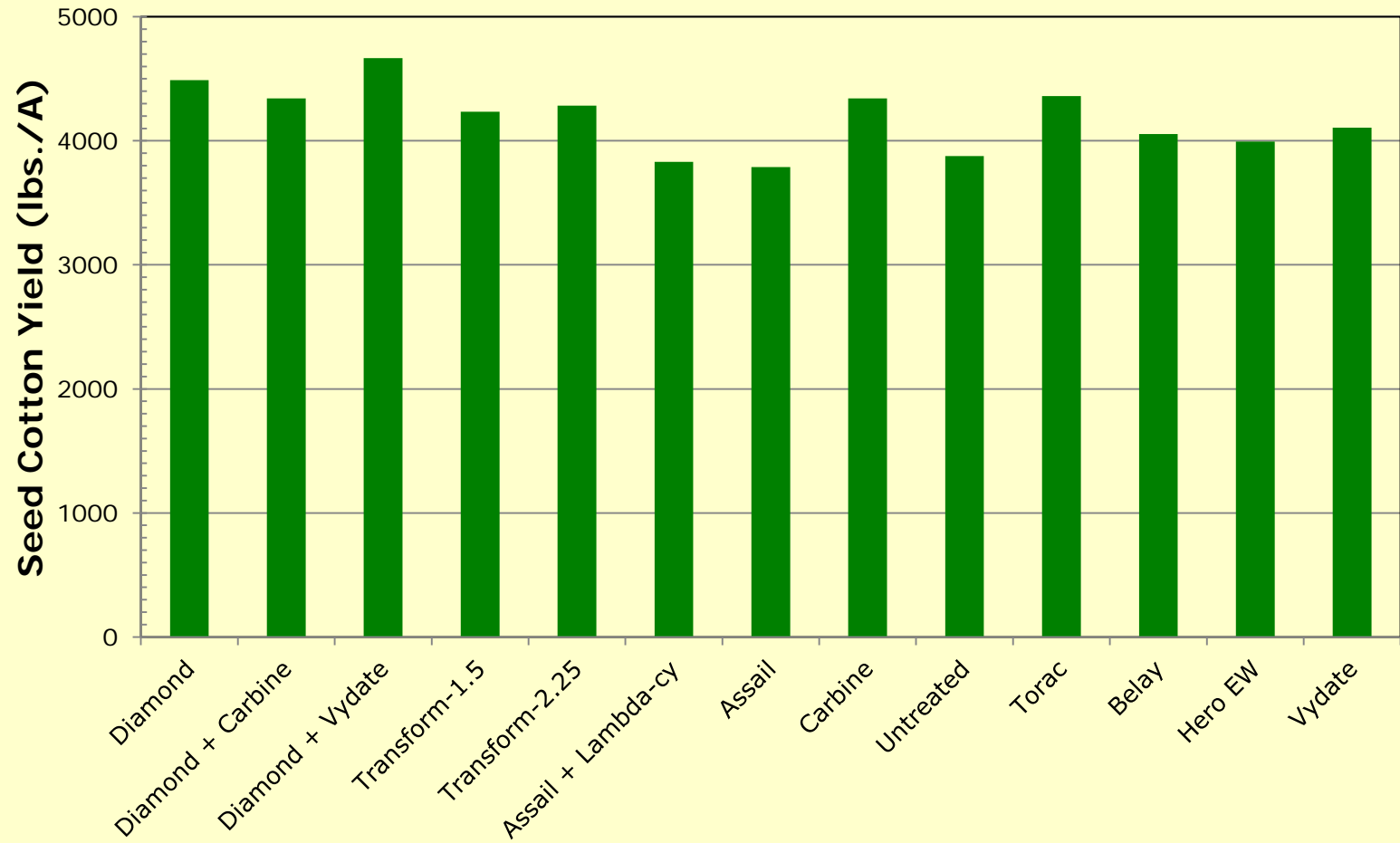


* applied 2 weeks earlier

Lygus Bug Management 2012



Lygus Bug Management 2012



Lygus Bug Susceptibility

- ❖ Used zip-loc bag bioassay
- ❖ Coat inside of bags with various concentrations of pesticides
 - ❖ Capture
 - ❖ Vydate
 - ❖ Monitor
 - ❖ Carbine
- ❖ Placed 5 adult lygus in each bag
- ❖ Held bags at room temperature
- ❖ Recorded mortality at 3, 8, and 24 hours after placing lygus into bag
- ❖ Compared results to values developed in late 1990's
- ❖ Tested bugs from three locations in SJV collected each in June and August in 2008-12
- ❖ insects collected from alfalfa adjacent to cotton fields

Lygus Bug Susceptibility

	Dis. Dose (ppm)	2008	2009	2010	2011
Capture	200	600	370	500	225
Vydate	40	190	175	290	290
Monitor	100	900	275	950	450
Carbine	?	na	na		

Lygus Bug Susceptibility

- ❖ Used floral foam bioassay method
- ❖ Floral foam plug (12 long and 17.5 mm diam.) saturated with formulation – honey water solution
- ❖ Five concentrations + control
- ❖ Placed in a 20 ml sample vial
- ❖ 2 adult lygus in each vial; 15 vials per dose
- ❖ Held at room temperature
- ❖ Recorded mortality at 24 and 48 hrs.
- ❖ Tested bugs from three locations in SJV collected each in June and August
 - ❖ 2010-12 – Carbine
 - ❖ 2011-12 – Belay and Transform

Lygus Bug Susceptibility

	Discriminating Dose (ppm)	
	2010	2011
Carbine	4650	1650 (4 locations)
Belay		0.2 (0.04 to 0.7)
Transform		50.7 (25 to 90)

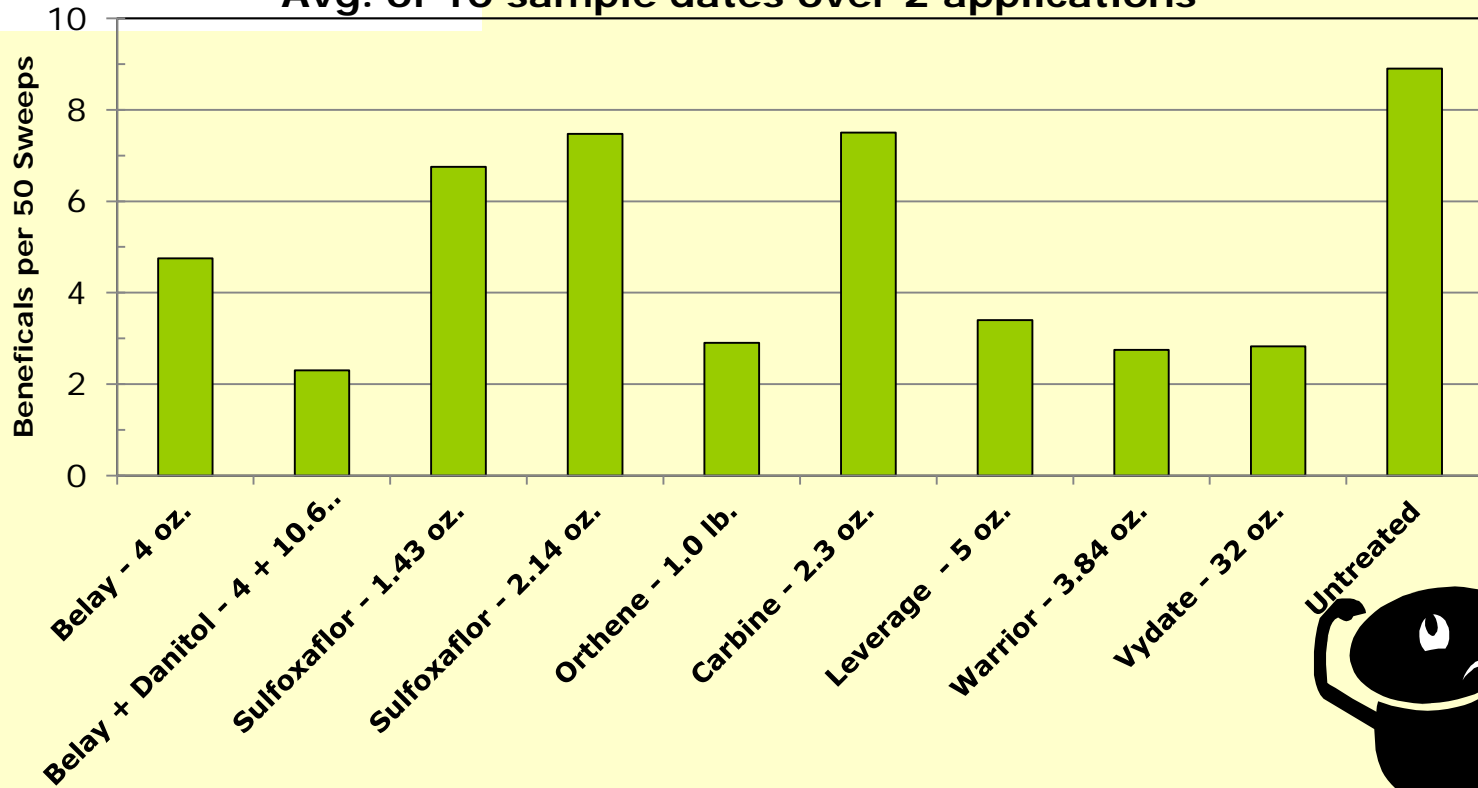


Impacts on Secondary Pests



Beneficials- 2010

Avg. of 10 sample dates over 2 applications



Mites and Aphids in Cotton

Strawberry spider mite:
Tetranychus turkestanii



Twospotted spider mite:
Tetranychus urticae

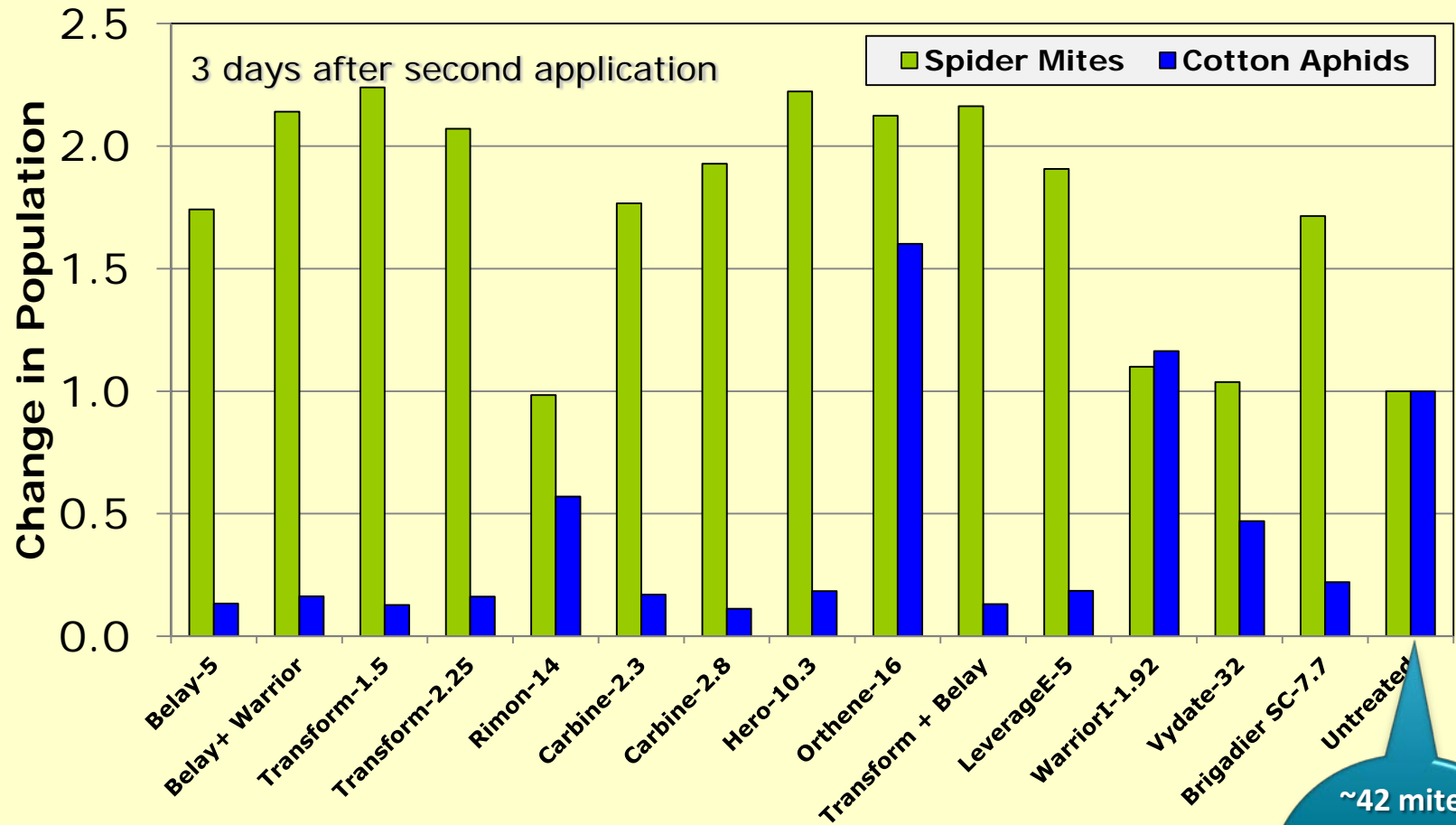


Pacific spider mite:
Tetranychus pacificus



Lygus Bugs – 2011

Secondary Pests

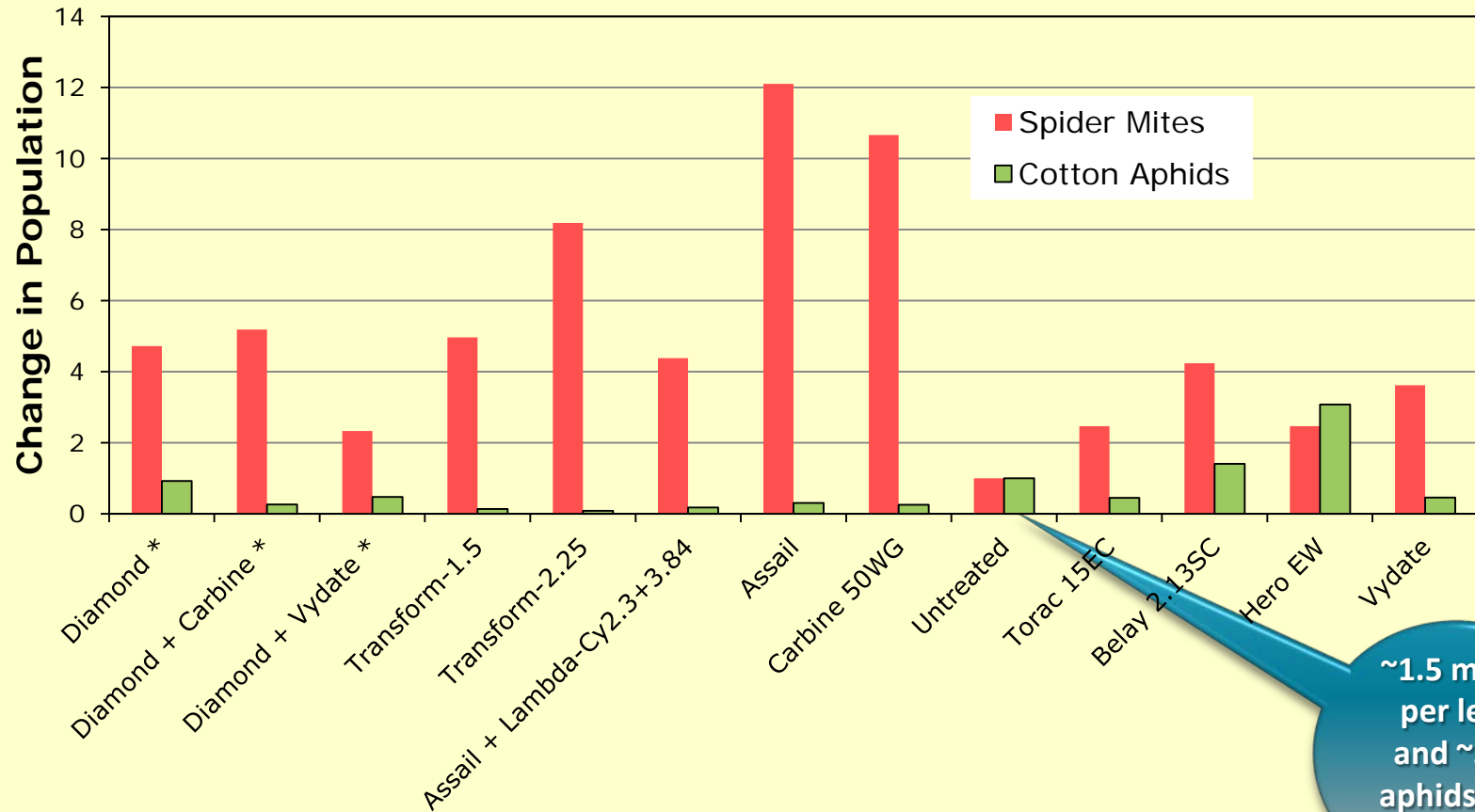


~42 mites
per leaf
and ~30
aphids per
leaf

Lygus Bugs – 2012

Secondary Pests

7 days after second application



~1.5 mites
per leaf
and ~3.8
aphids per
leaf

Impacts on Spider Mites and Other Secondary Pests



Late-season spider mite
build-up in 2011 – worst
since early to mid 1990's
-- Belay "blamed"



Thanks to:

- Cotton Incorporated
- staff of West Side REC
- summer field assistants



