The Pepper Weevil Problem Past, Present and Future

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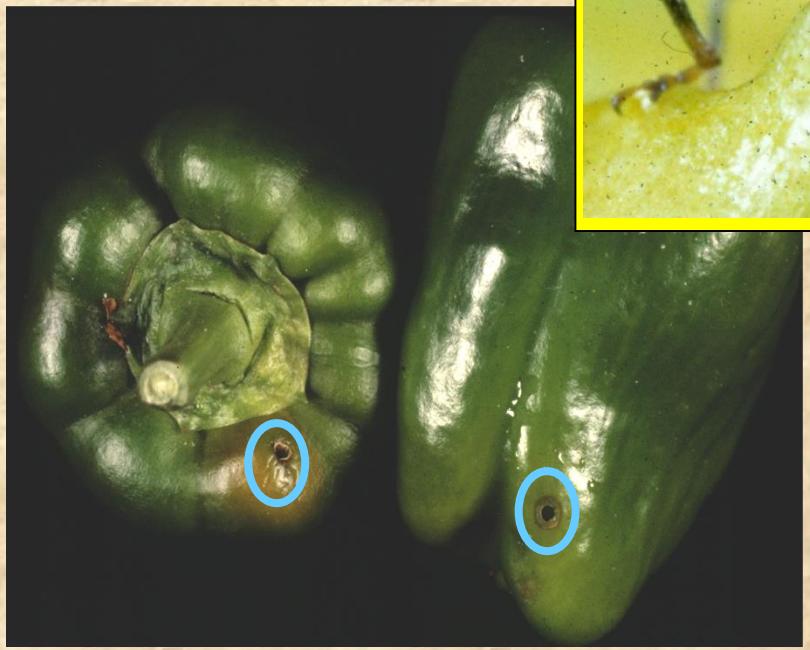
Pepper Weevil

- Introduced from Mexico in the early 1900's along with its congener the boll weevil
- The pepper weevil, *Anthonomus eugenii* Cano, is a key pest of all pepper cultivars in much of the Southern US as well as Mexico, and the Caribbean.
- S FL - limiting factor…



Pepper Weevil

- Easily moved with infested fruit and possibly transplants, it has extended its range and showing up earlier in the northeastern US, as well as Canada recently found in Holland and Italy.
- Protected agriculture may provide refuge from winter conditions.

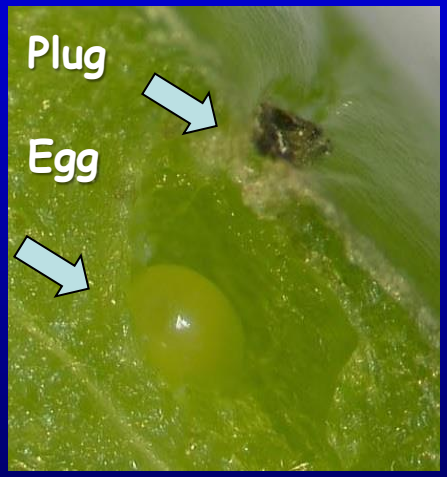
Pepper Weevil
Anthonomus eugenii

- **Biology**
  - Life cycle, host plants
- **Scouting**
  - Counts, Pheromone traps
- **Management**
  - Cultural, Chemical

Pepper Weevil, Anthonomus eugenii

Adult Prefers feeding on flower buds

Prefers laying eggs near calyx of young fruit



Egg laid in small cell sculpted by mandibles and covered by a plug

Larvae burrow into fruit, feed on placenta and seeds

Infested fruit often fall to the ground where adult emerges

Photos by E. Rodriguez

Pepper Weevil Biology

- Egg incubation: 3 to 5 days
- 3 larval instars: 13 to 17 days
- Pupal stage: 3 to 6 days
- Preoviposition: 2 to 3 days
- Fecundity: 340 eggs in 1 month
- Adult longevity: 3 months
- Limited host range – Solanaceae
  - Reproduces on pepper, nightshade, tomatillo

Scouting

- Scouting is important in detecting the presence of pepper weevil
- It is important to know early on that they are in the field.
- The adult is susceptible to insecticidal control.
- Once the weevil has laid its eggs - it’s too late.

Scouting Pepper Weevil

Adults: Concentrate on

- Field margins
- Upper 1/3 of plant
- Leaf axils and blooms
- Pheromone traps

Also Look For:

- Punctured/fallen fruit or blooms

Cultural Control of Pepper Weevil

- At least 3 months fallow
- Control nightshade
- Plant in isolated locations
- Avoid sequential planting
  - Rotate crops
- Shorten crop cycles
- Remove and destroy infested fruit
- Plow down and incorporate old crops

Chemical Control of Pepper Weevil

- Only adult subject to insecticidal control
- Foliar neonicotinoids
  - Actara, Belay most effective
  - Assail, Scorpion also active
  - Don’t rotate neo-nics
- Vydate
  - Some resistance seen
  - 3 - 4 pts / APP
- Pyrethroids alone or in combination
  - Only late season, only if necessary to avoid thrips problems
- Recently Exirel (cyantraniliprole)
- Not much new

Toxicity of Vydate to Pepper Weevil Adults

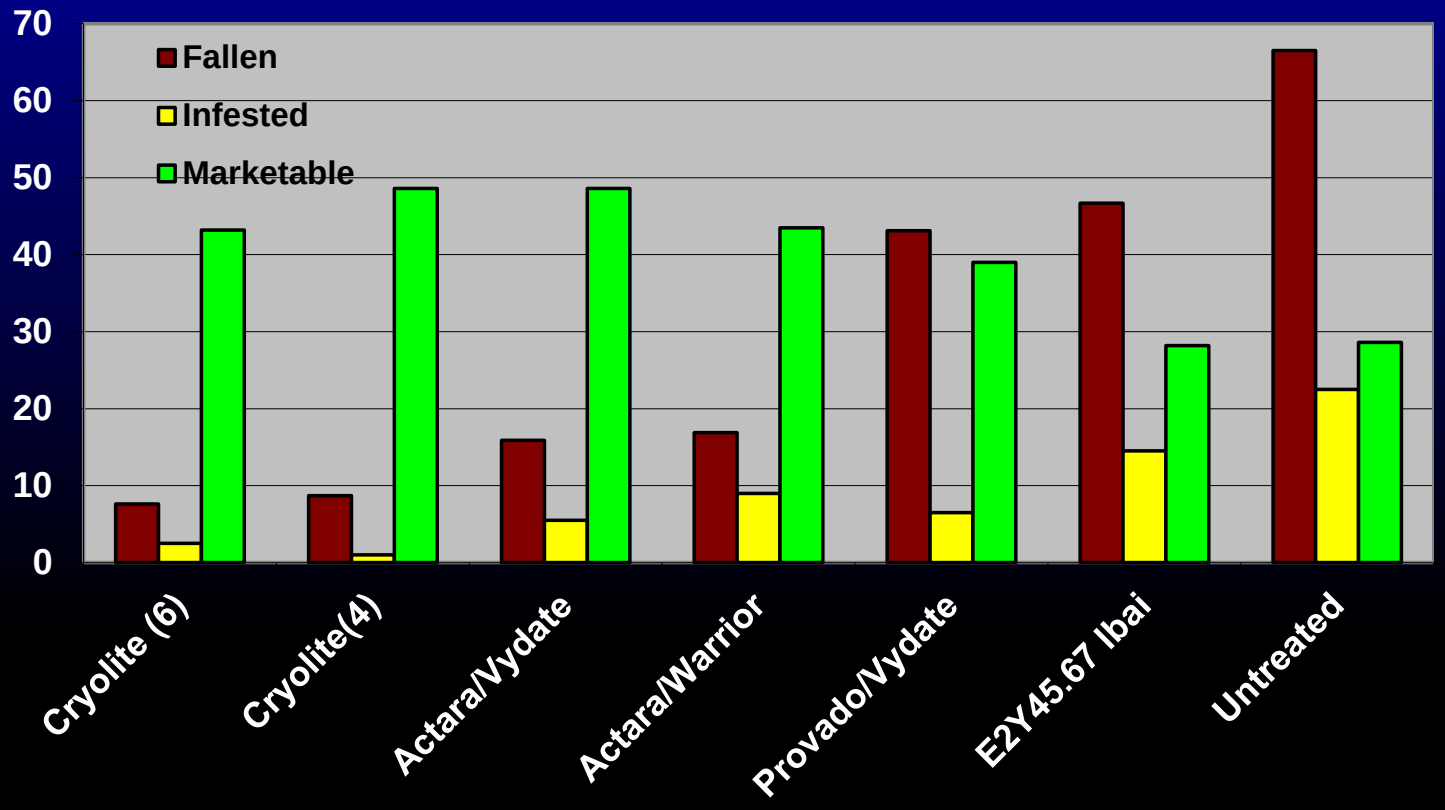
Weevil population	LC_{50} (ppm)	RS_{50}*
Organic farm	0.76	----
GCREC – lab	3.63	4.8
GCREC – field	0.91	1.2
Immokalee-1	1.88	2.5
Immokalee-2	1.33	1.8
Immokalee-3	1.39	1.8
Lakewood Ranch	2.01	2.6
Parrish	0.83	1.1
Wimauma	0.80	1.1

*Ratio of LC_{50}s of field population and organic farm population.

Jalapeno Pepper, Fall 2003

P. Stansly and J. Conner, SWFREC

Number of Fallen Fruit, Infested Fruit (%) and Marketable Fruit (lbs) 21 Plants

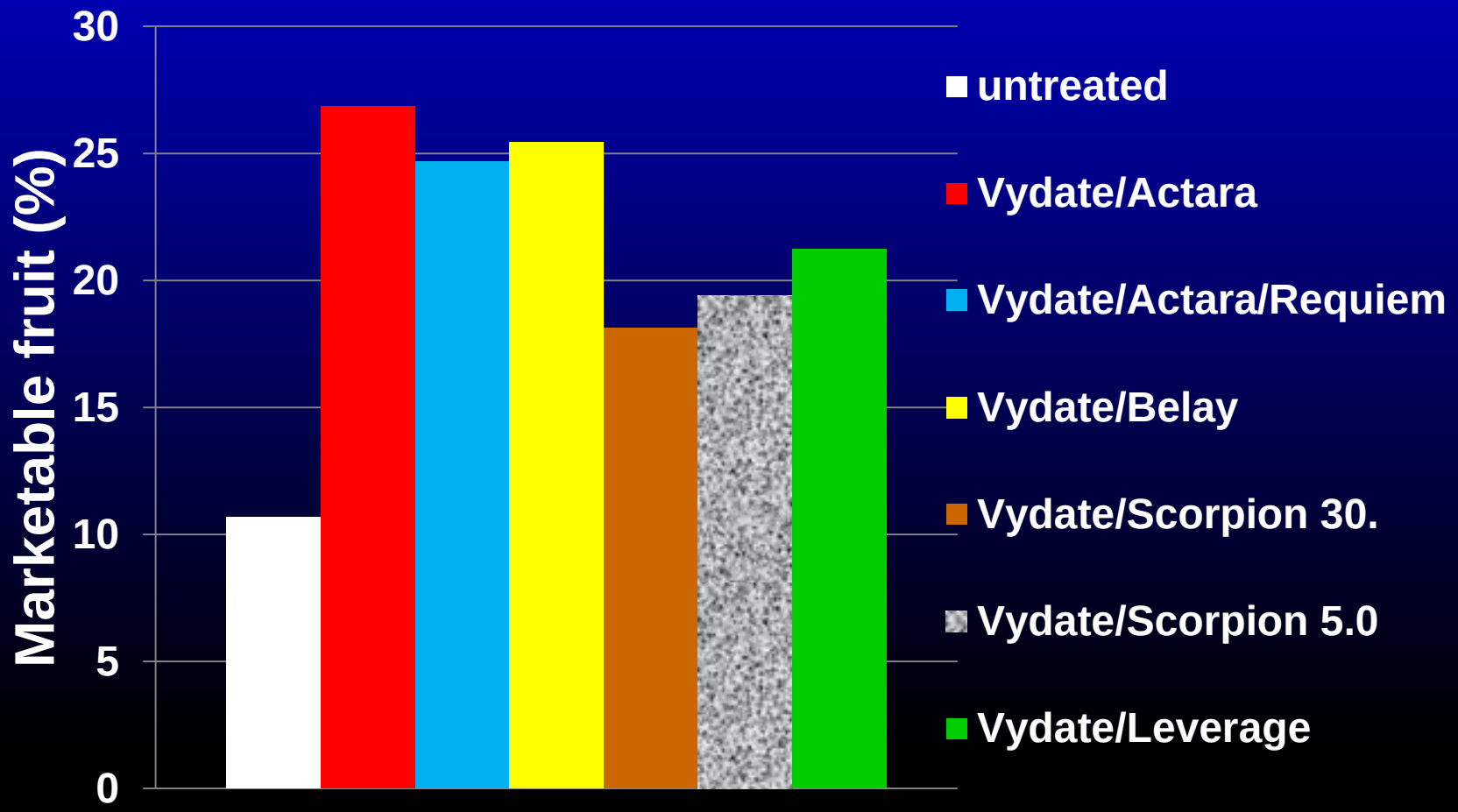


Insecticide Trial
SWFREC Spring 2011

Single row high clearance sprayer operating at 180 psi and 2.3 mph with the spray delivered through two vertical booms fitted with yellow Albuz® hollow cone nozzles, each delivering 10 gpa.

		4 May	9 May	12 May	18 May	23 May	27 May	2 Jun	6 Jun	9 Jun	13 Jun	16 Jun	20 Jun
	(GPA)	(40)	(40)	(40)	(40)	(40)	(60)	(60)	(60)	(60)	(60)	(60)	(60)
Treatment/ Formulation	Rate (Procuct/acre												
Untreated													
Vydate 3.77 LV	4 pts	x		x		x		x		x		x	
Actara 25 WG	3.67 oz		x		x		x		x		x		x
Vydate 3.77 LV	4 pts	x		x		x		x		x		x	
Actara 25 WG	3.67 oz		x		x		x		x		x		x
Requiem 25 EC	4 pts	x	x	x	x	x	x	x	x	x	x	x	x
Vydate 2L	4 pts	x		x		x		x		x		x	
Belay 2.13 SC	6.0 oz		x		x		x		x		x		x
Vydate 2L	4 pts	x		x		x		x		x		x	
Scorpion 35 SL	3.0 oz		x		x		x		x		x		x
Vydate 2L	4 pts	x		x		x		x		x		x	
Scorpion 35 SL	5.0 oz		x		x		x		x		x		x
Vydate 2L	4 pts	x		x		x		x		x		x	
Leverage 360	4.1 oz		x		x		x		x		x		x
Induce	0.25%		x		x		x		x		x		x

Results: Spring 2011

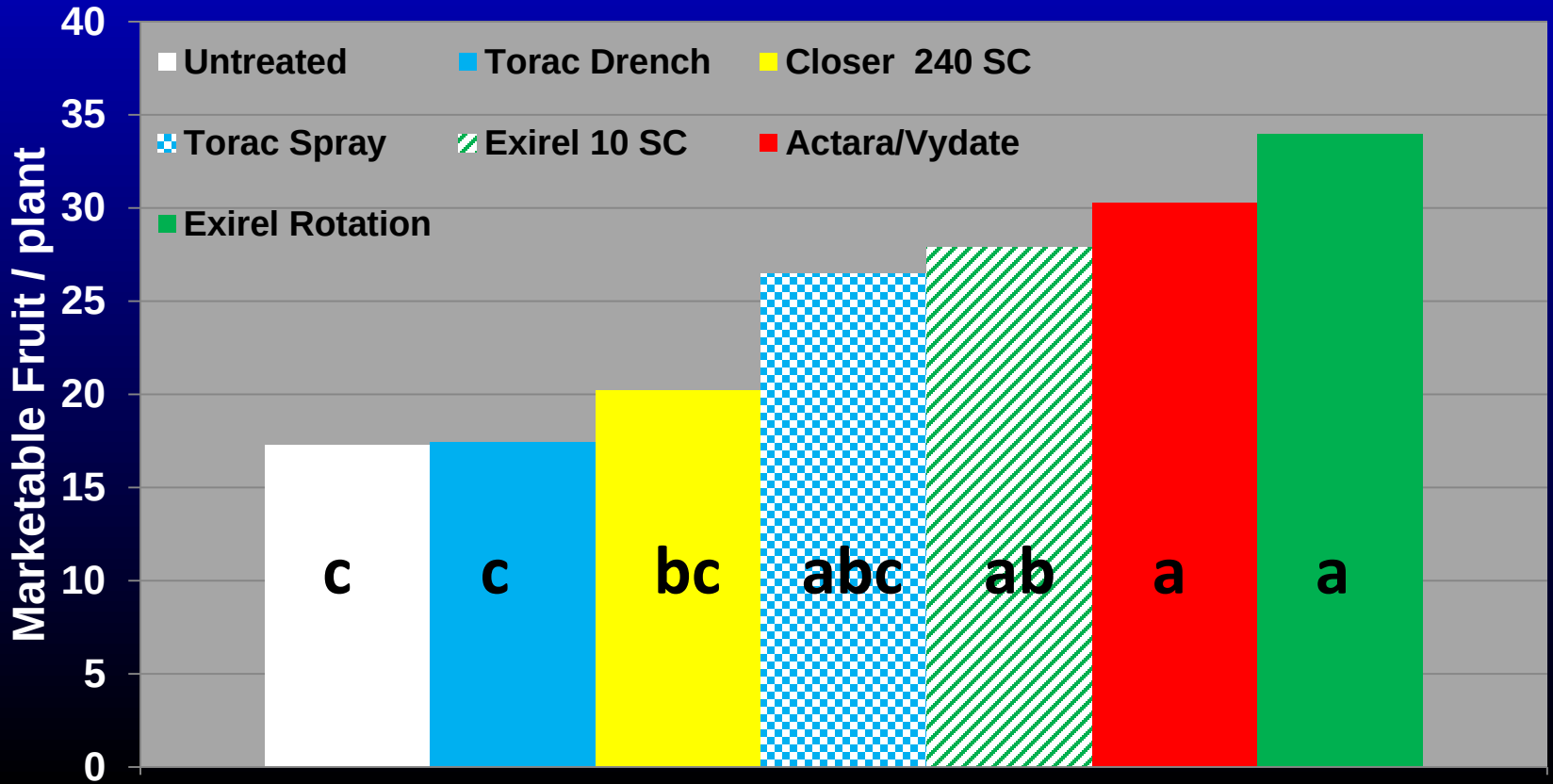


Fruit Collected 19, 25 May and 1,8.15, 22 Jun)

Pepper Weevil on Jalapeños
SWFREC Fall 2011

Product /formulation	Rate /acre	4-Oct	20-Oct	25-Oct	1-Nov	8-Nov	15-Nov	23-Nov	29-Nov	5-Dec	6-Dec	12-Dec	15-Dec	19-Dec	21-Dec	23-Dec	27-Dec
Untreated																	
Actara 25 WG	3.8 oz			X		X		X		X			X			X	
Vydate L	3 pts				X		X		X			X		X			X
Closer 240 SC	5.7 oz			X	X	X	X	X	X	X		X	X	X		X	X
Torac 15 EC DRENCH	21.0 oz	X	X		X						X				X		
Torac 15 EC	21.0 oz			X	X	X	X	X	X	X		X	X	X		X	X
Exirel 10 SC	20.3 oz			X	X	X	X	X	X	X		X	X	X		X	X
Actara 25 WG	3.8 oz			X				X					X				
Exirel 10 SC	20.3 oz				X				X					X			
Vydate L	3 pts					X				X						X	
Asana XL	9.6 oz						X					X					X

Pepper Weevil on Jalapeños SWFREC Fall 2011



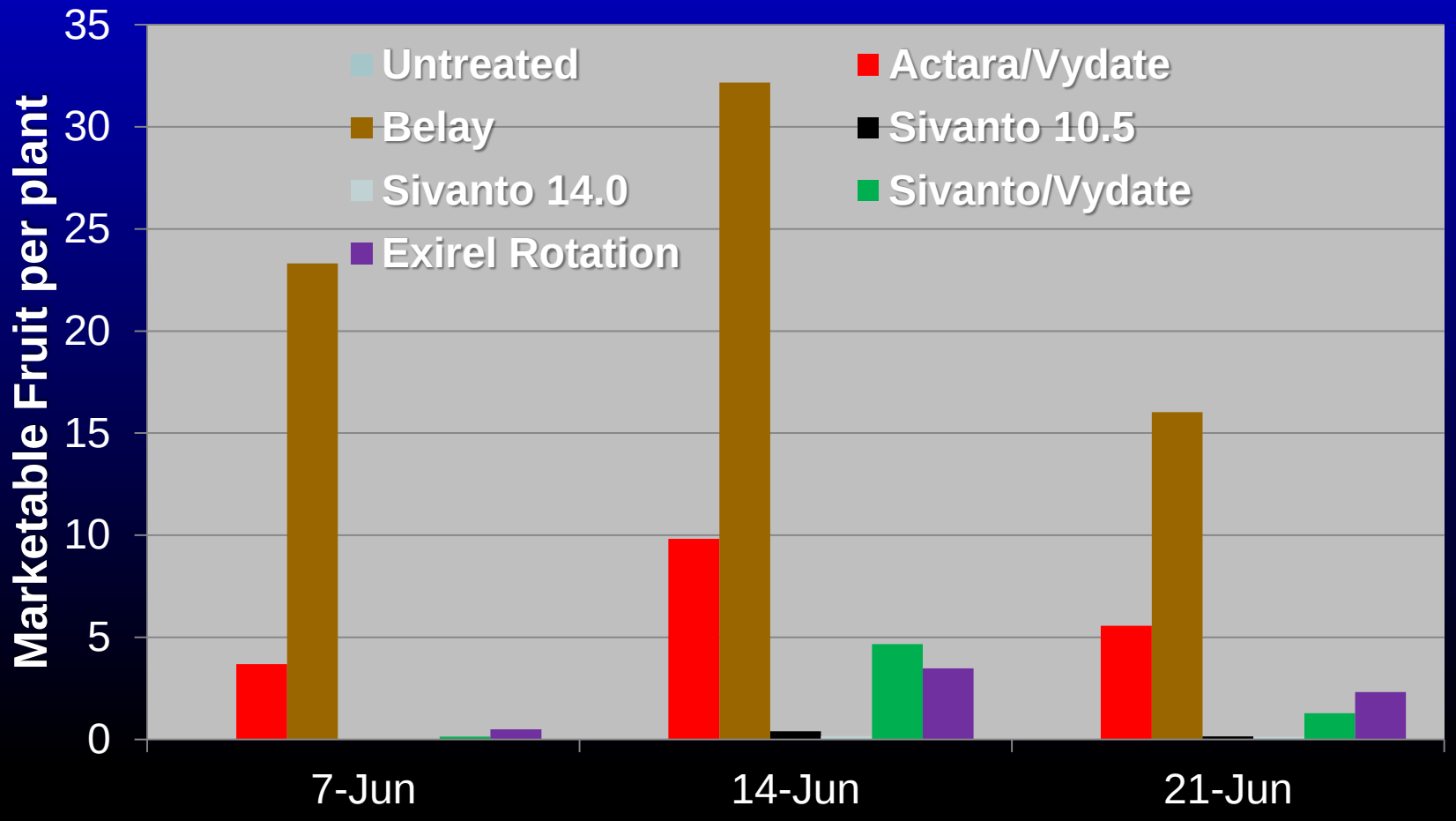
Average 49 culls per plant

Pepper Weevil Trial Spring 2012
Jalapeños

		9-May	14-May	17-May	21-May	25-May	29-May	1-Jun	4-Jun	8-Jun	11-Jun	15-Jun	18-Jun
Untreated													
Actara	3.75 oz	x		x		x		x		x		x	
Vydate	3 pts		x		x		x		x		x		x
Belay	6.0 oz	x	x	x	x	x	x	x	x	x	x	x	x
Sivanto	10.5 oz	x	x	x	x	x	x	x	x	x	x	x	x
Sivanto	14.0 oz	x	x	x	x	x	x	x	x	x	x	x	x
Sivanto	14.0 oz	x		x		x		x		x		x	
Vydate	3 pts		x		x		x		x		x		x
Exeril	20.25	x				x				x			
Vydate	3 pts		x				x				x		
Actara	3.75 oz			x				x				x	
Hero	10.3				x				x				x

Pepper Weevil on Jalapeños Spring 2012

Results



Reflective Mulches for Pest Control in Open Field Peppers

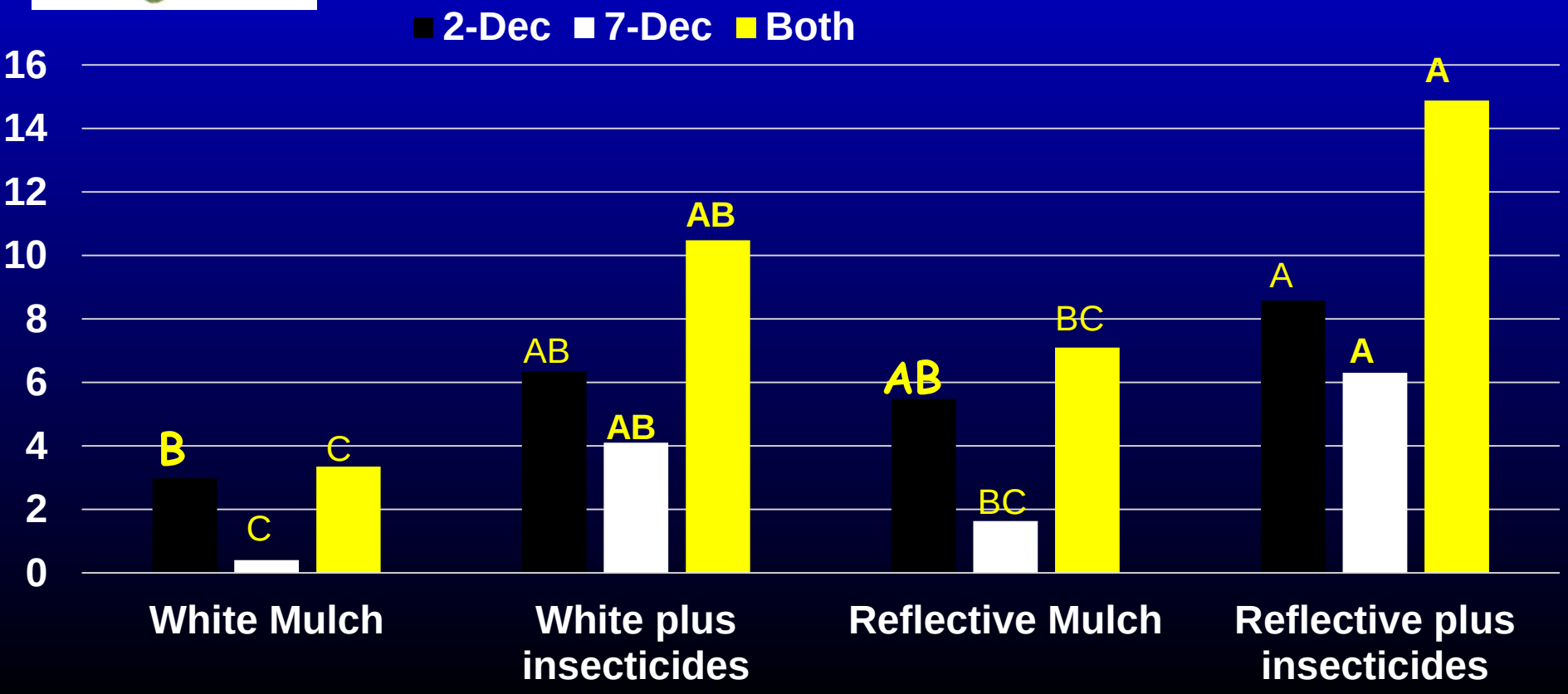
Barry Kostyk , Xulin Chen, Monica Triana and Phil Stansly
University of Florida – IFAS – Immokalee
Florida Entomological Society – Puerto Rico
July 16-20, 2017

Application Dates and Method of Applications

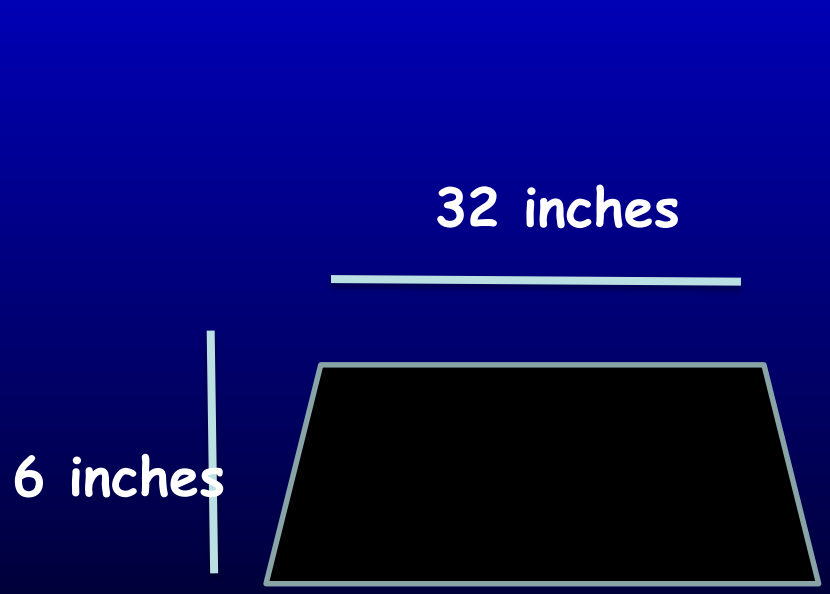
Product	oz/ acre	10-Sep	28-Sep	12-Oct	30-Oct	5-Nov	13-Nov	16-Nov	20-Nov	25-Nov	30-Nov	4-Dec	8-Dec	11-Dec	15-Dec	18-Dec
Untreated																
Admire	10.5	drench														
Actara	3.67				x		x		x		x		x		x	
Vydate	32.0					x		x		x		x		x		x
REFLECTIVE MULCH																
REFLECTIVE MULCH																

* Actara applied more times than allowed by the label

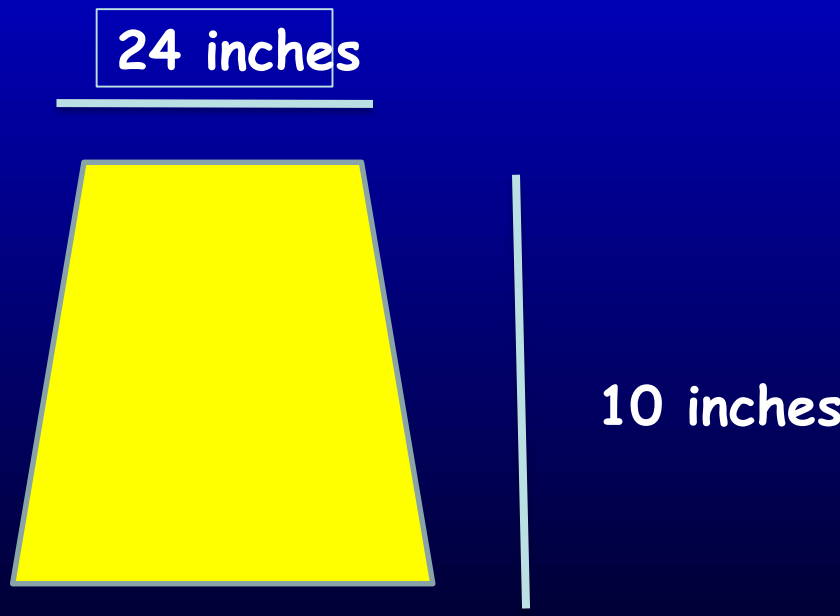
Marketable Fruit per plant



Different bed geometries



Standard bed size in SW Florida Vegetable production



Alternate bed size being Proposed by Shukala et al UF – IFAS – SWFREC

Insecticidal Program

			Applied								
bed	mulch	treat	1-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	8-May	11-May	15-May
24	black	insect	Verimark	Radiant	Radiant	Assail	Assail	Belay	Belay	Belay	Actara
24	black	untreated									
24	ref	insect	Verimark	Radiant	Radiant	Assail	Assail	Belay	Belay	Belay	Actara
24	ref	untreated									
32	black	insect	Verimark	Radiant	Radiant	Assail	Assail	Belay	Belay	Belay	Actara
32	black	untreated									
32	ref	insect	Verimark	Radiant	Radiant	Assail	Assail	Belay	Belay	Belay	Actara
32	ref	untreated									

Effect of Mulch Type on Pepper Weevil Ovipostion/Feeding holes per flower bud

1-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	8-May	11-May	15-May
Verimark	Radiant	Radiant	Assail	Assail	Belay	Belay	Belay	Actara

Catolaccus hunteri

Most abundant parasitoid in Florida

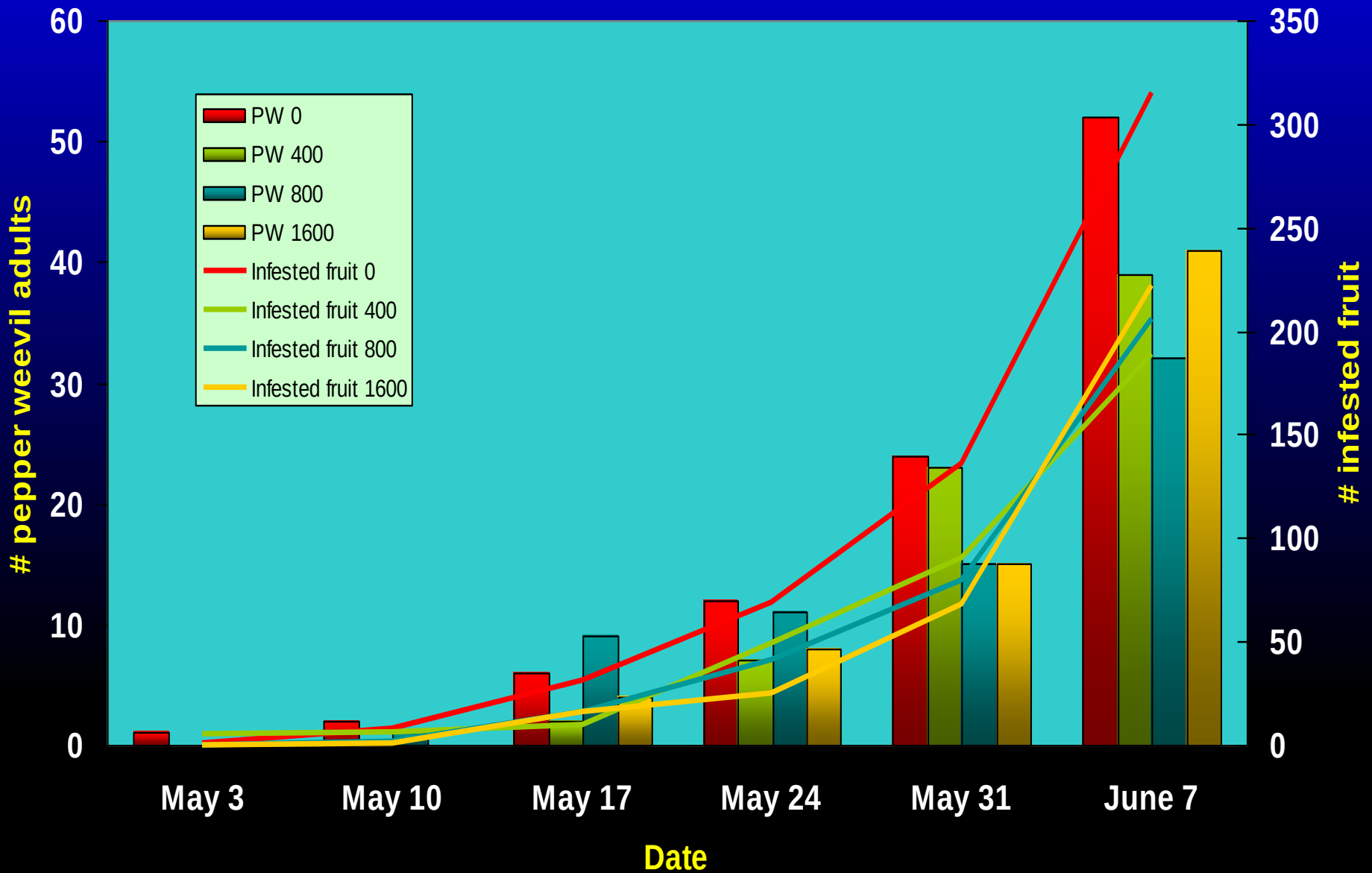
Ectoparasitoid attacking primarily third instars

Mostly limited to larvae in flower buds and small fruit

Not considered limiting to pepper weevil

Parasitism ranges from 5% to 35%

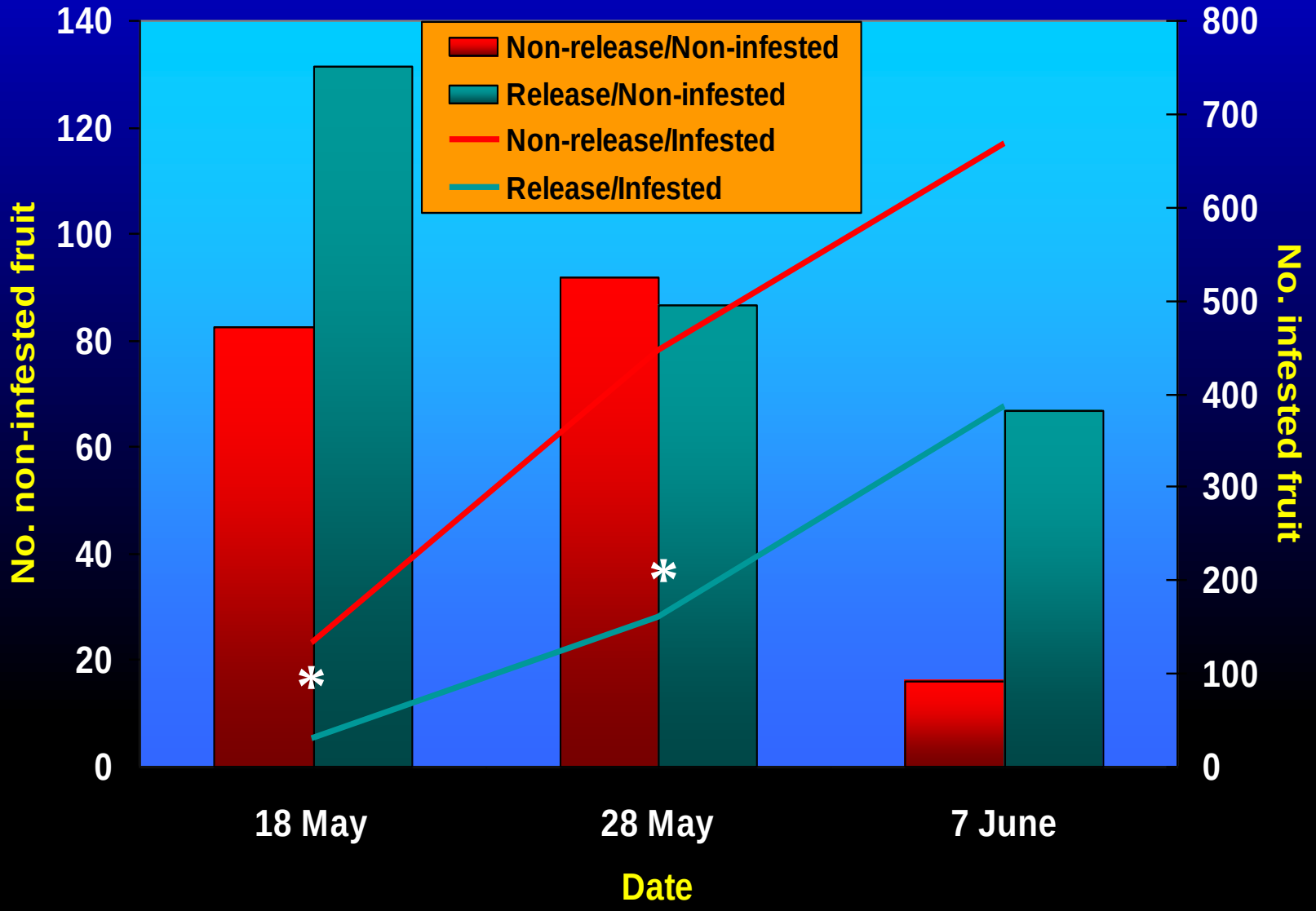
Cumulative Number of Pepper Weevil Adults and Infested Fruit in Bell Peppers at Three Release Rates (per acre) of *Catolaccus hunteri*



Area under the progression curve of the cumulative numbers of weevil adults and infested fruit following releases of *C. hunteri* at three release rates

Release rate	Adults	Infested fruit
None	194.5a	1677.7c
800	116.8a	1180.8b
1600	110.8a	1063.8b
3200	86.0a	818.7a

Numbers of Fruit Infested or Non-infested by the Pepper Weevil Following Release of *Catolaccus hunteri* in Nightshade Then Pepper



Toxicity (LC_{50}) of Selected Insecticides to *Catolaccus hunterii*

Insecticide	Residual	Topical
Lorsban	0.029	0.292
Lannate	0.139	3.321
Vydate	2.126	1.847
SpinTor	2.331	1.299
Avaunt	42.84	226.0
Confirm	>135,940	0.309
Neemix	>340,000	------
Prokil Cryolite	>849,600	------

Chemical Control of Pepper Weevil

- Only adult subject to insecticidal control
- Foliar neonicotinoids
  - Actara, Belay most effective
  - Assail, Venom also active
  - Don’t rotate
- Vydate
  - Some resistance seen
  - 3 - 4 pts / APP
- Pyrethroids alone or in combination
  - Only late season, only if necessary to avoid thrips problems
- Possibly some help coming from Exeril
- Not much new

Reducing Weevil Pressure and Avoiding Insecticide-induced Thrips Problems

- **Cultural controls to reduce pest populations**
  - Host free period in summer
  - Shortened crop cycles
  - Rapid crop destruction
  - Crop rotation
  - Weed control (nightshade)
  - Metalized plastic mulch

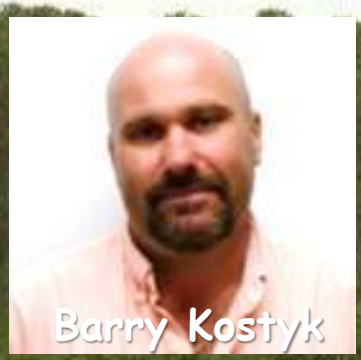
- **Use selective insecticides**
  - Avoid OPs, and especially pyrethroids
  - Use spinosyns only for thrips control.

Glyphosate

- Know when to pull the plug!

Acknowledgements

- Valent USA
- Bayer CropScience
- Dow AgroSciences
- DuPont Crop Protection
- Gowen Co.
- Syngenta Crop Protection
- SWFREC Vegetable Entomology Team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Cameron Brennan


Robert Riefer