New Developments in Tomato and Lettuce Pest Management in California

Tom Turini
University of California
Agriculture and Natural Resources
Vegetable Crops Advisor
Fresno and Kings Counties

UC CE | University of California
Agriculture and Natural Resources | Cooperative Extension

Overview – Recent challenges in Central CA

- Tomato
  - Fusarium diseases
  - Beet curly top virus/Beet leafhopper
  - Stink bug
- Lettuce
  - Fusarium wilt
  - Thrips-transmitted viruses

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Fusarium Diseases of Tomato Common in Central California

Fusarium Foot Rot

Fusarium solani f. sp. *eumartii*

Fusarium Crown and Root Rot

Fusarium oxysporum f. sp. *radicis-lycopersici*

Fusarium Wilt

Fusarium oxysporum f. sp. *lycopersici*

- Race 1
- Race 2
- Race 3

Fusarium Foot Rot

Fusarium solani f. sp. *eumartii*

Hosts: Tomato, potato, eggplant

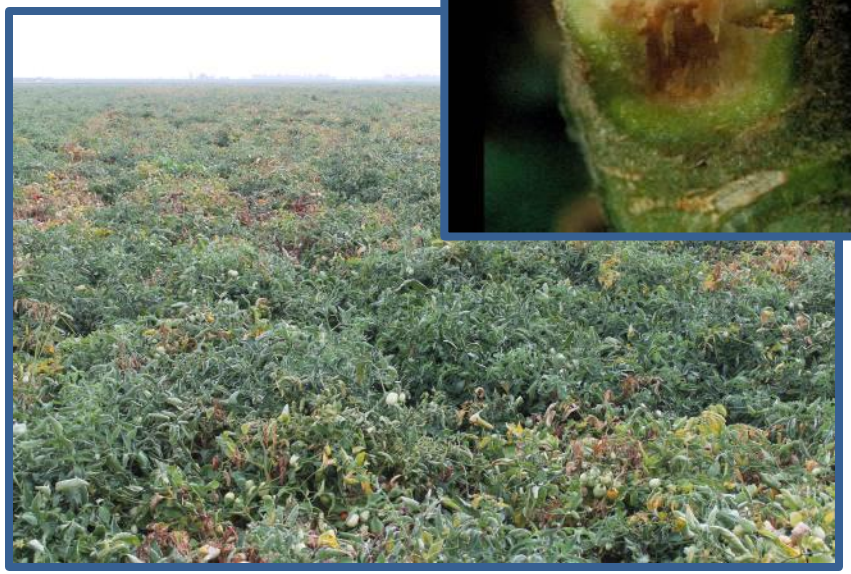
Fusarium Crown and Root Rot

Fusarium oxysporum f. sp. *radicis-lycopersici*

Hosts: some legumes, cucurbits, other solanaceous plants, ect.

Optimum temperature: 18 C (64 F)

Fusarium Wilt



Fusarium oxysporum f. sp. *lycopersici*

Hosts: some legumes, cucurbits, other solanaceous plants, ect.

Optimum temperature: 27 C (80 F)

Control Options for Fusarium Pathogens of Tomato

- Containment - Sanitation, limit movement of infested soil and plant material.
- Resistant varieties – Resistance to 1 and 2 are common in commercial varieties; 3 is present in very few & Crown and Root Rot is also available in very few.
- Crop rotation away from susceptible crops will reduce levels of the pathogen in the soil, but will not eliminate risk if susceptible crop is planted.
- Avoid root knot nematode-infested soils.

Root Knot Nematode in Tomato

Meloidogyne hapla, M. incognita, M. javanica, **and *M. arenaria***

- Resistant varieties are widely available.
- Resistance is not effective against all species.

- Resistance-breaking nematodes are present in tomato production areas in Central California.

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Beet curly top virus

Beet leafhopper

Circulifer tenellus

- The only vector of the curly top viruses.
- Four to 5 generations in California
- Strong flier
- Favored by warm dry conditions
- Introduced from the Middle East ~100 years ago.
- Tomatoes and melons are not preferred hosts

Photo by Lori Dunning

Host Range: > 300 species

- Crops: beets, beans, tomatoes, peppers, cucumbers, squash, muskmelon, watermelon, spinach.
- Weeds: filaree, perennial pepperweed, Buckhorn plantain, Russian thistle and mustard species

Bassia spp.

Russian thistle

Goosefoot

Filaree

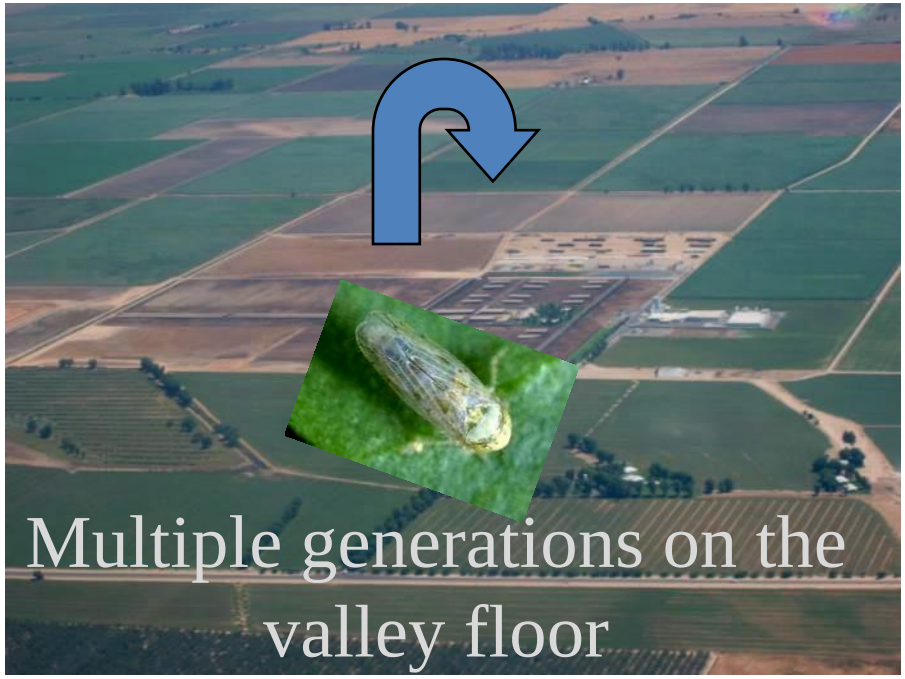
Peppergrass

Buckhorn plantain

Curly Top Disease Cycle

Spring: adult leafhoppers migration

Fall: adult leafhoppers migrate for overwintering in the foothills



From Gilbertson Presentation 9 May 2013.

Cultural Control

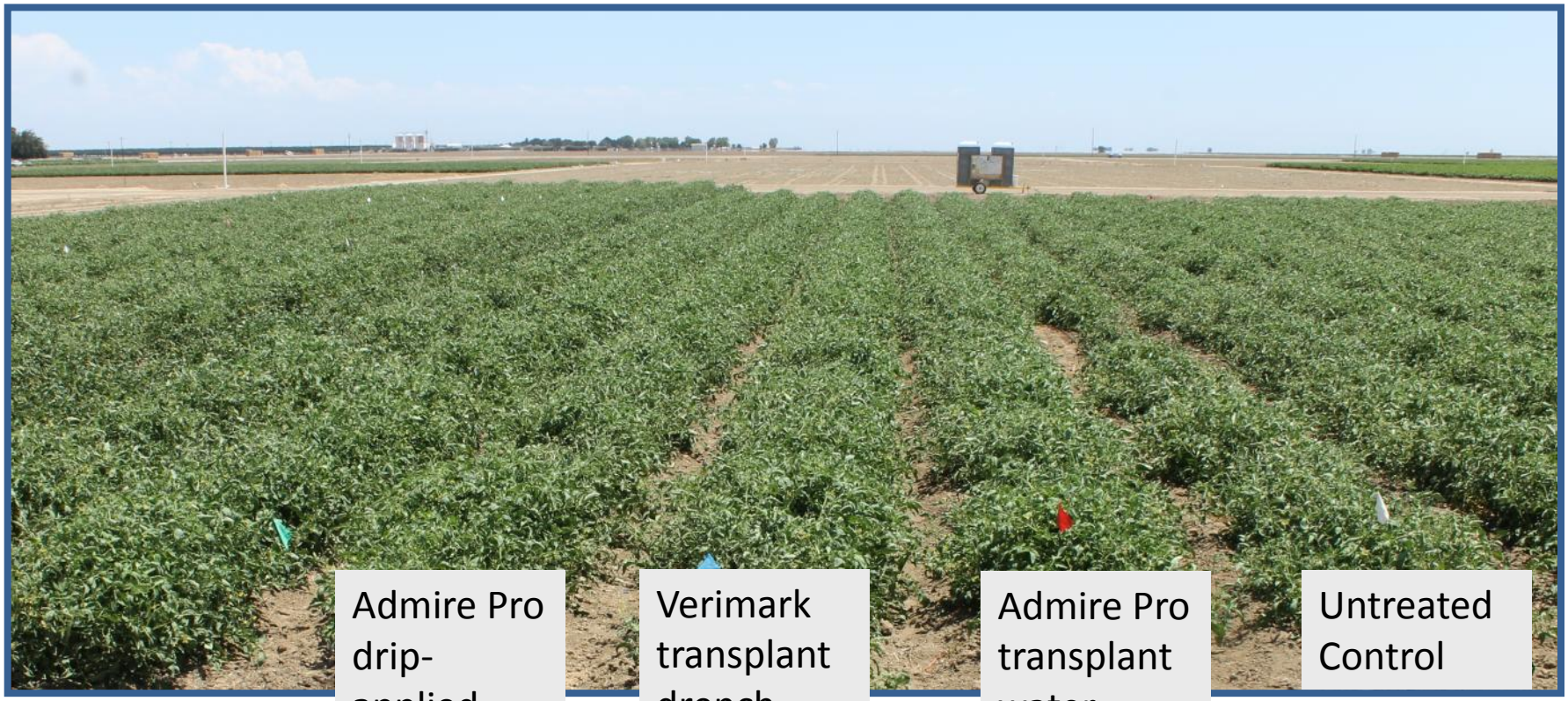
- Increase planting density
- Sanitation: weed control on roadsides, ditch banks, young orchards and vineyard
- Where possible and needed, treat weeds with insecticide before mowing or disking: If it is during production of susceptible crops.

Insecticide Treatment of Crop

- Use with other management tactics
- Under conditions of very high pressure, may not provide commercially acceptable levels of control
- The objective is to reduce the number of times that a leafhopper transmits the virus

Insecticide Program Comparison, 2015

- University of California West Side Research and Extension Center – Five Points
- Sun 6366 processing tomato plants were transplanted on 22 May
- 6 treatments were compared in 4 rep RCB design – 200 ft long plots
- Total plants per plot recorded on 17 Jun, BCTV symptomatic plants were recorded 22 Jun and at 14 day intervals; Harvested on 10 Sep



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Extremely High Population Densities in San Joaquin Valley Processing Tomatoes, 2013-14

Stink Bugs Associated with Damaged Tomatoes from 2013-2014 were Consperse

Consperse stink bug: ***Euschistus conspersus***

Biology

- Overwinter as adults on the ground under cover, or on weeds.
- In March or April, they move from the overwintering site mate and ley eggs
- There are multiple generations per year dependent upon temperatures

Management

- Trapping, degree day model to target nymph stage, which is more sensitive to insecticides.
- Pyrethroid and neonicotinoid insecticides are effective if coverage is good.
- In fall, destroy overwintering habitats near sites where tomatoes will be planted in spring.

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Fusarium Wilt in Lettuce

Fusarium oxysporum f. sp. *lactucum*

Biology

- Temperature: 46° - 90°F (optimum: 82°F)
- Lettuce is only affected by *F. oxysporum* f. sp. *lactucum* and this pathogen does not cause disease in other plants.
- Survives on surfaces of roots of other plants and in resting structures.
- Soil inoculum levels decline substantially over 5 years

Management

- Avoid planting lettuce in fields with a history of this disease.
- Sanitation: Avoid moving soil from an infested field to a clean field.
- Susceptibility of lettuce varieties to *F. oxysporum* f. sp. *lactucum* differs

Response of lettuce varieties to *F. o.* f. sp. *lactucum*, Coalinga, 2012

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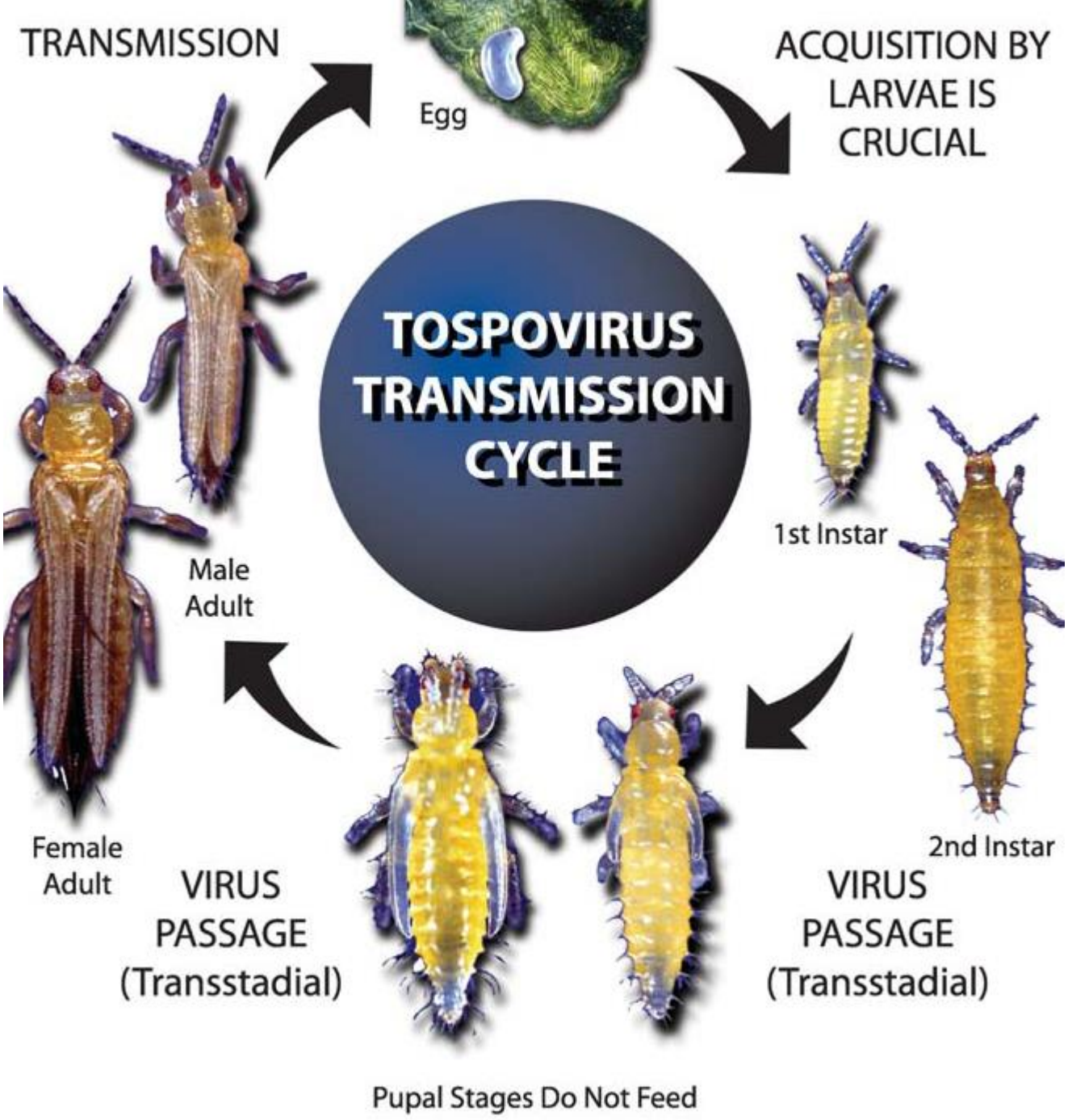
Tospoviruses: Thrips transmitted viruses

Impatience necrotic spot and Tomato spotted wilt virus

Biology

- *Tomato spotted wilt virus* has over 800 plant hosts: including tomatoes, peppers, radicchio, as well as many weeds.

- *Impatiens necrotic spot virus* has a smaller host range, though this virus still infects a large number of ornamental plants and a few vegetable crops.



A. E.Whitfield, D. E. Ullman, and T L. German. 2005. **TOSPOVIRUS-THRIPS INTERACTIONS.** Annu. Rev. Phytopathol. 2005. 43:459–89

Tospovirus Management

Before planting

- **evaluate planting location and time**
- **implement weed management**
- **use virus- and thrips-free transplants**

During the season

- **monitor fields for thrips**
- **manage thrips**
- **rotate insecticides**
- **monitor fields for tospovirus and remove infected plants**
- **implement weed management**

After harvest

- **promptly remove and destroy plants after harvest**
- **control weeds/volunteers**

From: Gilbertson/Batuman Mar 2014


Thank you
Tom Turini
UCCE, Fresno/Kings
Vegetable Crops
taturini@ucanr.edu
559-375-3147

Stink Bug Species Reported in CA

Say's stink bug complex: *Chlorochroa sayi* and *Chlorochroa uhleri*

Redshouldered stink bug: *Thyanta pallidovirens*

Consperse stink bug: *Euschistus conspersus*

Southern green stink bug: *Nezara viridula*

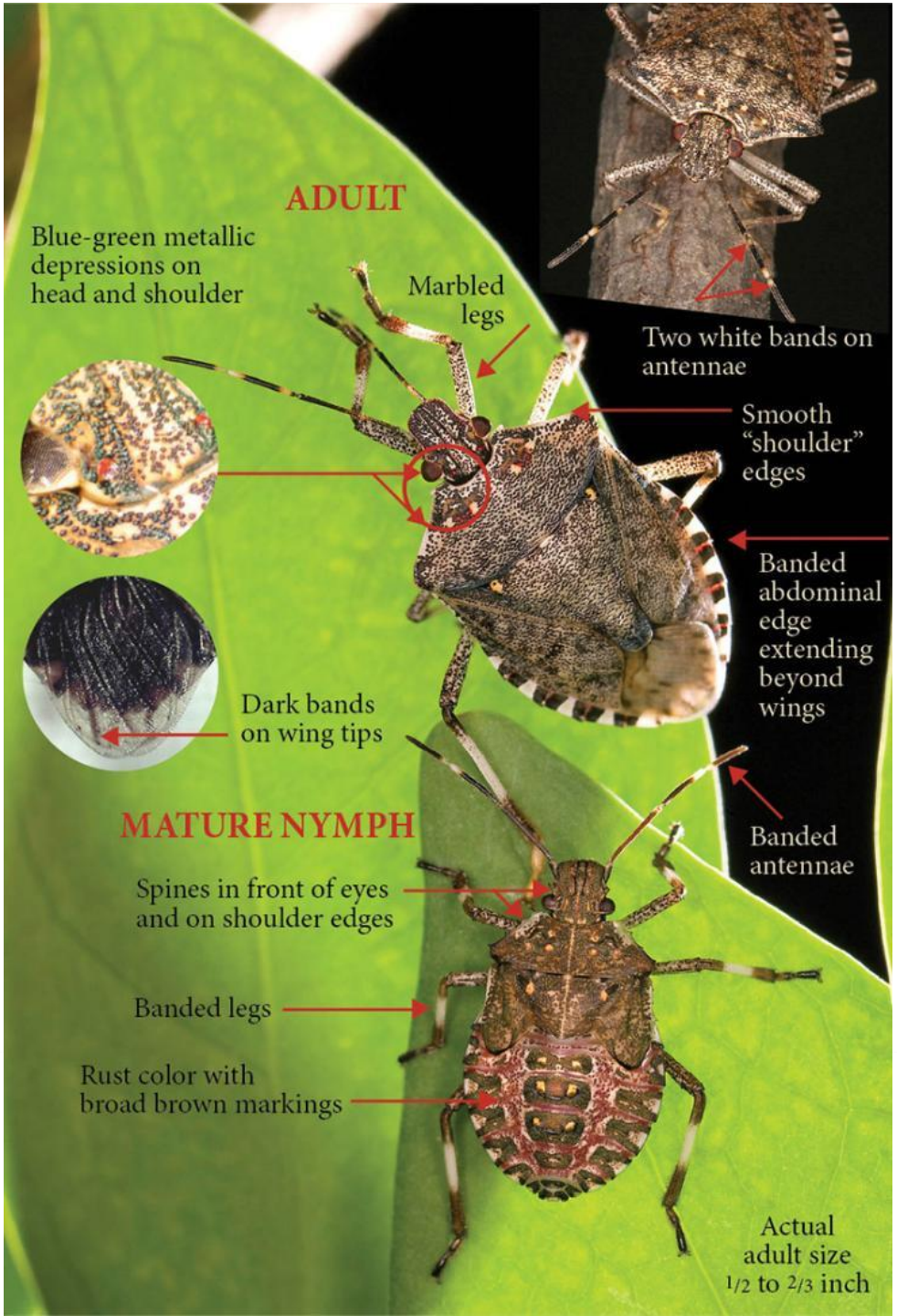
Stink Bugs Recently Reported in California

Euschistus servus
Brown stink bug

Halyomorpha halys
Brown marmorated

Slide adapted from Goodell 2014

Brown marmorated stink bug (BMSB), *Halyomorpha halys*



Brown vs. Consperse

Slide adapted from Goodel 2014

Influence of Insecticide Applications on BCTV incidence, Five Points, 2015

	BCTV (%)		
	22 Jun	1 Jul	14 Jul
Untreated Control	9.9	12.1	13.9
Verimark 13.5 oz/A tray drench (5/21/15)	2.8	3.7	5.7
Admire Pro 4 oz/A transplant water (5/22/15) Silvanto 2 fl oz directed foliar (5/22/15) Admire Pro 6.5 Drip (6/22/15)	7.8	8.1	10.3
Admire Pro 10.5 oz/A transplant water (5/22/15)	5.3	6.8	8.0
Silvanto 2 fl oz directed foliar Admire Pro 6.5 Drip (6/22/15)	11.7	12.8	11.5
Admire Pro 6.5 Drip (6/22/15)	10.4	11.8	9.7
$LSD_{0.05}$	4.29	3.18	3.87
CV (%)	35.95	22.88	26.06

Acknowledgements Stink bug

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