Thrips: Identification, Biology and Management

Eric Natwick & Tom Turini
UC Cooperative Extension
etnatwick@ucdavis.edu
taturini@ucdavis.edu

Research on IYSV and Thrips at Washington State University

Hanu R. Pappu, Ph.D.
Pullman, WA

Supported by
CA Garlic and Onion Research Advisory Board

Thrips

Thrips are tiny slender insects are best seen with a hand lens or microscope.

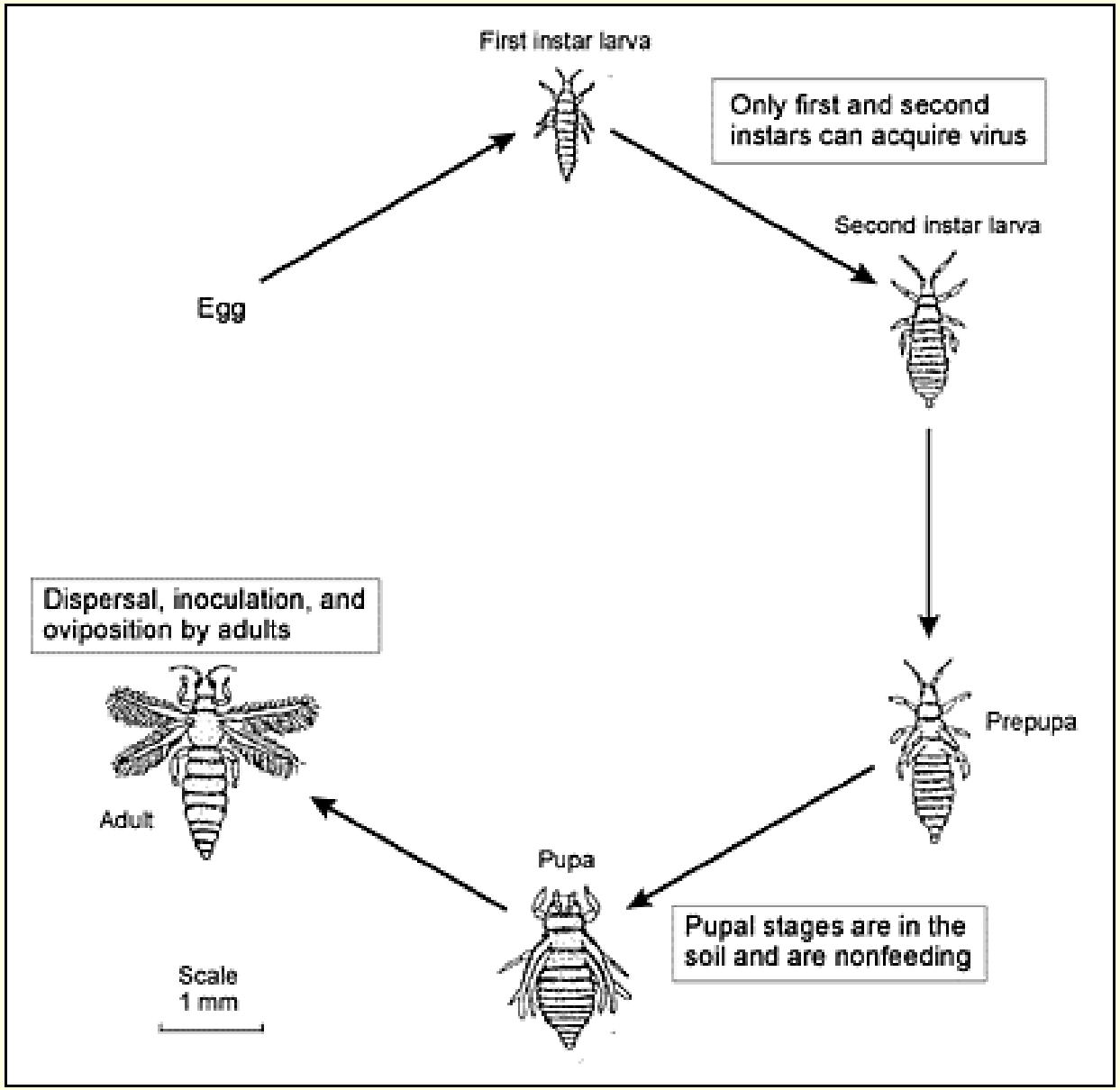
Only 1% of the 5,000 known thrips species are pests. Some species are important vectors of plant viruses.

Thrips belong to the order Thysanoptera which means “fringe wings” Adults of most thrips species have two pairs of wings that are fringed with long hairs.

Thrips species vary in color from pale yellow to light brown or black.

The immature stages have the same general body shape as adults but are usually lighter in color and wingless.

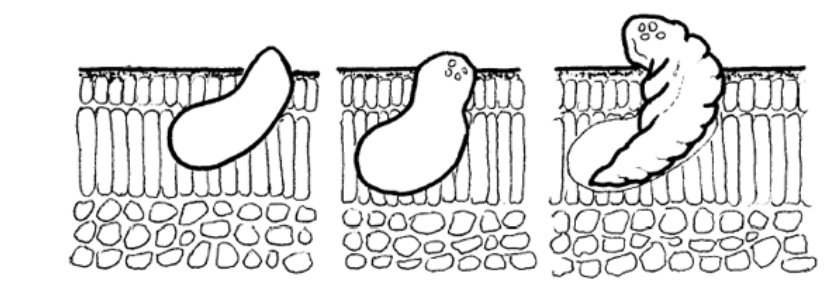
Thrips Life Cycle



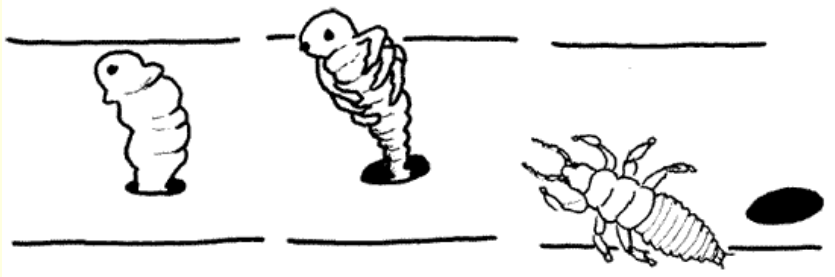
Thrips Life Cycle

Thrips pass through six developmental stages: an egg, two larval stages, a prepupal and pupal stage, and an adult. Generation time varies with temperature and the species but generally takes about a month. Most species insert eggs in to plant tissue and most species pupate in or no soil.

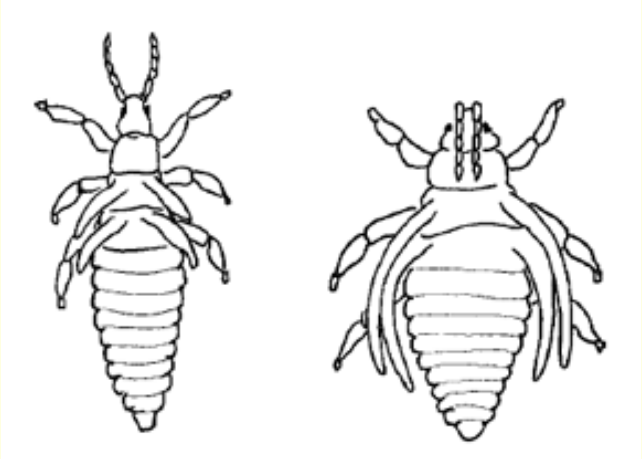
a) Hatching Eggs:



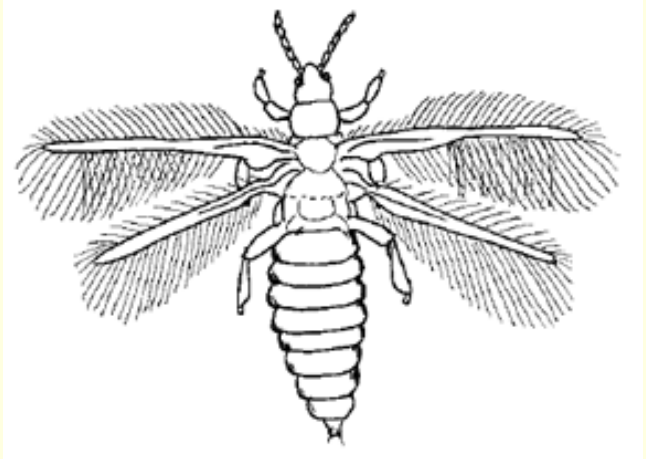
b) Emerging Larvae:



c) Prepupae & Pupae



d) Adults:



Some economically important thrips that threaten California agriculture include:

Avocado thrips, ***Scirtothrips perseae*** **Nakahara**

Bean thrips, ***Caliothrips fasciatus*** **(Pergande)**

Chili thrips, ***Scirtothrips dorsalis***

Citrus thrips, ***Scirtothrips citri*** **(Moulton)**

Greenhouse thrips, ***Heliothrips haemorrhoidalis*** **(Bouché)**

Onion thrips, ***Thrips tabaci*** **Lindeman**

Western flower thrips, ***Frankliniella occidentalis*** **(Pergande)**

Some thrips transmitted virus diseases that threaten California agriculture include:

Tomato spotted wilt virus; **transmitted by:**

western flower thrips
onion thrips
chili thrips

Tobacco streak virus**; transmitted by:**

western flower thrips
onion thrips

Iris yellow spot virus; **transmitted by:**

onion thrips

Impatiens necrotic spot virus;
transmitted by:

western flower thrips

Thrips cause direct feeding injury to crops

Cabbage

Lettuce

Cucumber

Red leaf lettuce

Onion

Thrips Identification Is Key To Management

- The first important step in any pest management program is the accurate identification of the pest.
- Particularly for biological control because natural enemies are often specific to just one pest or group of pests.
- Some entomophagous thrips are predators of other pests including phytophagous thrips.
- Some species of thrips are very resistant to insecticides e.g. Western flower thrips.

THRIPS IDENTIFICATION

- A Lucid key to the Thrips of California is now available on the web (Hoddle MS, Mound LA, Paris DL. 2008. Thrips of California. CBIT Publishing, Queensland.) http://www.biocontrol.ucr.edu/Workshop/Thrips.html
- Mark S. Hoddle, PhD; Biological Control Specialist, UC Riverside
- Entomology CNAS
  Dept of Entomology University of California
  Entomology
  367 Briggs Hall
  Riverside, CA 92521
  (951) 827-4714 (951) 827-4360
  Fax: (951) 827-3087
  Email: mark.hoddle@ucr.edu

Thrips Identification

Onion thrips
(*Thrips tabaci*)

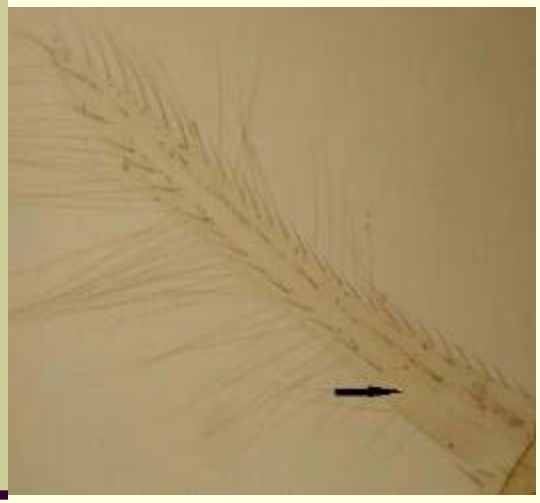
Look at the specimen from above. Western flower thrips has a row of hairs along both the upper and lower margin of the prothorax (first segment behind the head). Onion thrips has hairs on the lower, but not upper margin. This characteristic is visible with a 10X hand lens (and good eyes), but is easily seen with a good dissecting microscope visible

Western flower thrips
(*Frankliniella occidentalis*)

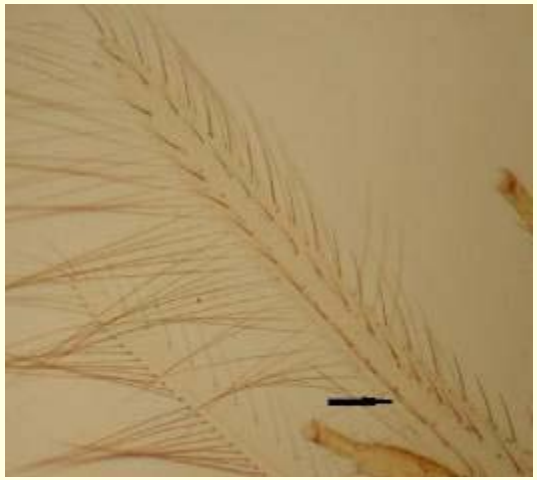
Developed by
Bob Hammon,
Colorado State University, Agricultural Experiment Station,
Western Colorado Research Center @ Fruita

Thrips Identification

Focus on the rows of setae (hairs) along the center of the rib of the forewing. Western flower thrips have two continuous rows of setae, while there is a gap in at least one row of setae in onion thrips. A dissecting microscope is necessary to see this characteristic



Onion thrips
(*Thrips tabaci*)



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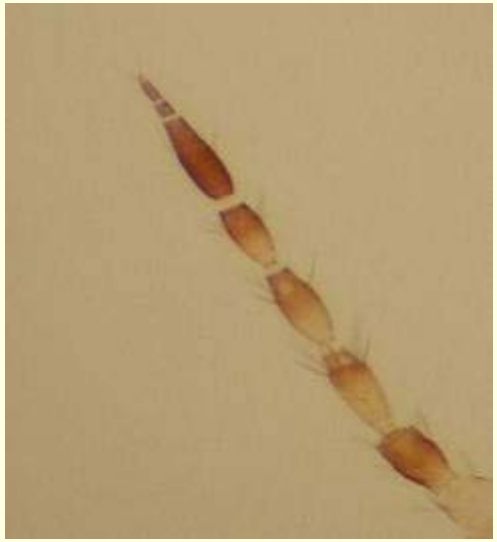
Thrips Identification

Onion thrips
(*Thrips tabaci*)

The terminal antennal segment of onion thrips is not as sharply pointed as that of Western flower thrips. This characteristic is best observed when the two species are observed side by side. A dissecting microscope is necessary to see the characteristic in enough detail to be useful.



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Biological Control of Thrips

- There are many predators of thrips, unfortunately they rarely keep thrips populations below economic injury levels.
- Some predacious thrips species include:
  - **banded-wing thrips, *Aeolothrips* spp.** black body, white wings have two distinguishing black bands and yellow body
  - **black hunter thrips, *Haplothrips mali* (Fitch)** dark brown or entirely black body, white wings, much more active than similar-looking greenhouse thripsdark, reddish-brown body
  - ***Franklinothrips* or vespiform thrips, *Franklinothrips orizabensis* Johansen, *F. vespiformis*1 (D.L. Crawford)** mostly black body, with pale or white areas; distinctly narrow where abdomen meets thorax yellow to orange body, swollen abdomen with red or dark orange band, body more stout or oval-shaped than most thrips
  - **sixspotted thrips, *Scolothrips sexmaculatus* (Pergande)** three dark blotches on each forewing, body pale to yellowishyellow to whitish body

Other Thrips Predators

- **Green lacewings *Chrysopa* and *Chrysoperla spp.* (Chrysopidae)** many thrips species and other pests
- **Minute pirate bugs Orius spp.** and other (Anthocoridae) many thrips species and other pests
- **Predatory mite;** many species
- **Parasitic wasps;** many species in several families

Cultural Controls for Thrips

- Sprinkler irrigation can help suppress thrips. Thrips thrive in dry weather, rain washes some thrips from plants.
- Avoid planting upwind from crops that harbor thrips such as small grain crops.
- Use thrips-free transplants; if possible chose thrip tolerant varieties.
- Use clean culture; quickly remove plant residues from harvested crops before thrips migrate to later plantings.

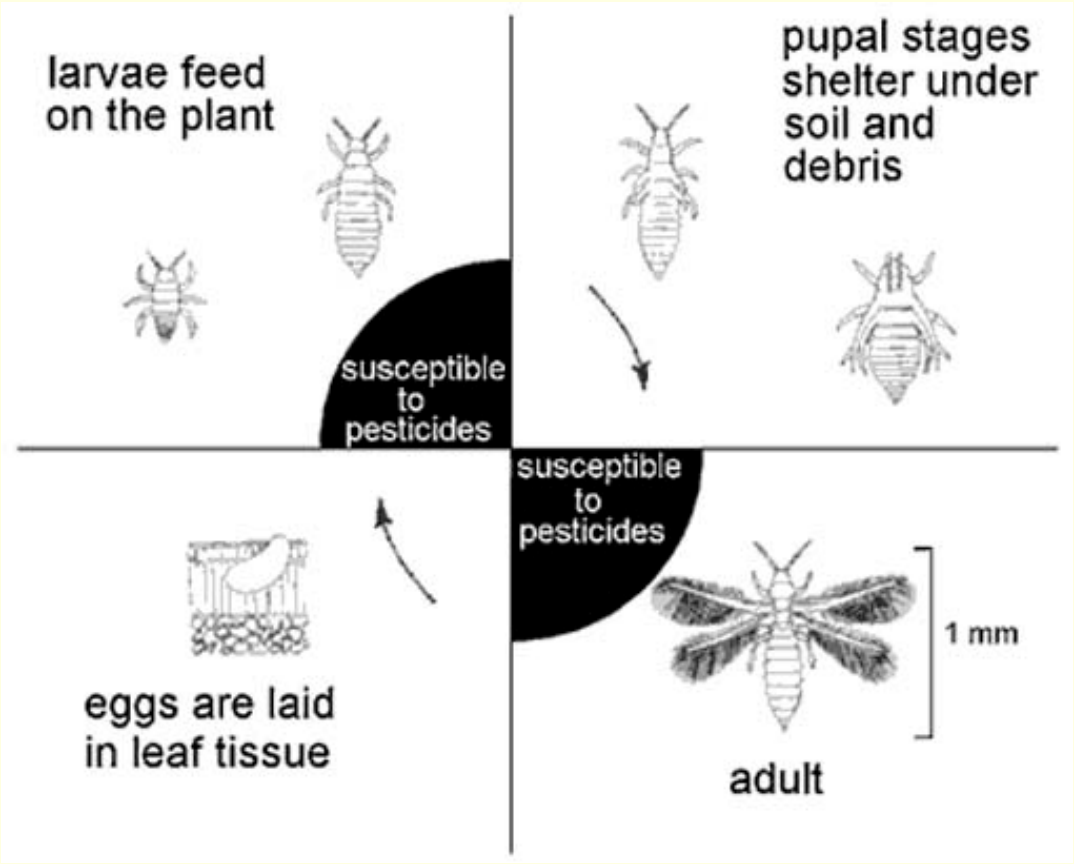
Insecticidal Control of Thrips

Timing of spray applications is critical to success. During hot weather apply in the early morning or evening when it is cooler and thrips are more active.

Spreading surfactants help insecticides reach areas where larvae are hidden.

Insecticides such as Lannate, Vydate, Success, Radiant, Mustang, Warrior, and azadirachtin are efficacious against thrips.

Use IRM practices such as rotating classes of chemistry to help present insecticide resistance.



Thrips Damage to Onions

- **Both onion thrips and western flower thrips have extensive host ranges, including cereals and broadleaved crops.**
- **Onion thrips are more injurious to onions.**
- **Onion thrips thrive in hot, dry conditions and are more damaging where these climatic conditions prevail for most of the production season.**
- **High populations of thrips can reduce both yield and storage quality of onions. Thrips are most damaging when they feed during the early bulbing stage of plant development.**
- **Both adults and nymphs cause damage. When foliage is severely damaged, the entire field takes on a silvery appearance. Only onion thrips transmits *Iris yellow spot virus* (IYSV)**

Onion field heavily infected with IYSV.

Photo by Grant J. Poole.

THRIPS MANAGEMENT IN ONIONS

- **Don’t plant onions near small grain crops.**
- **Overhead irrigation may help suppress thrips populations.**
- **Control thrips before the early bulb. Onions can tolerate higher thrips populations near harvest.**
- **Randomly sample entire onion plants by pulling leaves apart and counting all thrips using a hand lens, on the inner leaves near the bulb, as well as those under the leaf folds.**
- **Sample at least 5 plants from 4 separate areas of the field. A suggested treatment threshold is 30 thrips per plant mid-season (lower for very young plants and higher for larger mature plants).**

Thrips Insecticide Efficacy Trial On Onion Brawley, California, 2006.

2006 Trial

Control (untreated)
Vydate 2 L @ 64.0 fl
Lannate LV + Mustang 1.5 EW @ 36.0 fl + 3.8 fl
Success + Aza-Direct @ 6.0 fl + 48.0 fl
Carzol 92 SP @ 16.0 dry
Assail 30 SG @ 4.0 dry
Assail 30 SG @ 5.4 dry
Success + Prev-Am @ 6.0 fl + 0.4% v/v
Mustang + Prev-Am @ 6.0 fl + 0.4% v/v
Tesoro 4EC @ 8.0 fl
Tesoro 4EC @ 11.2 fl
NNI-0101 20 SC @ 19.0 fl (pyrifluquinazon)
FujiMite 5 EC @ 32.0 fl
NAI- 2302 15%EC @ 14.0 fl (tolfenpyrad)
NAI- 2302 15%EC @ 21.0 fl

Silwet L77 @ 0.6 ml/2L added to foliar spray mixtures.

Application Dates: 14 Feb, 6, 14, 30 Mar, 19 Apr 2006

Thrips Insecticide Efficacy Trial On Onion Brawley, California, 2007.

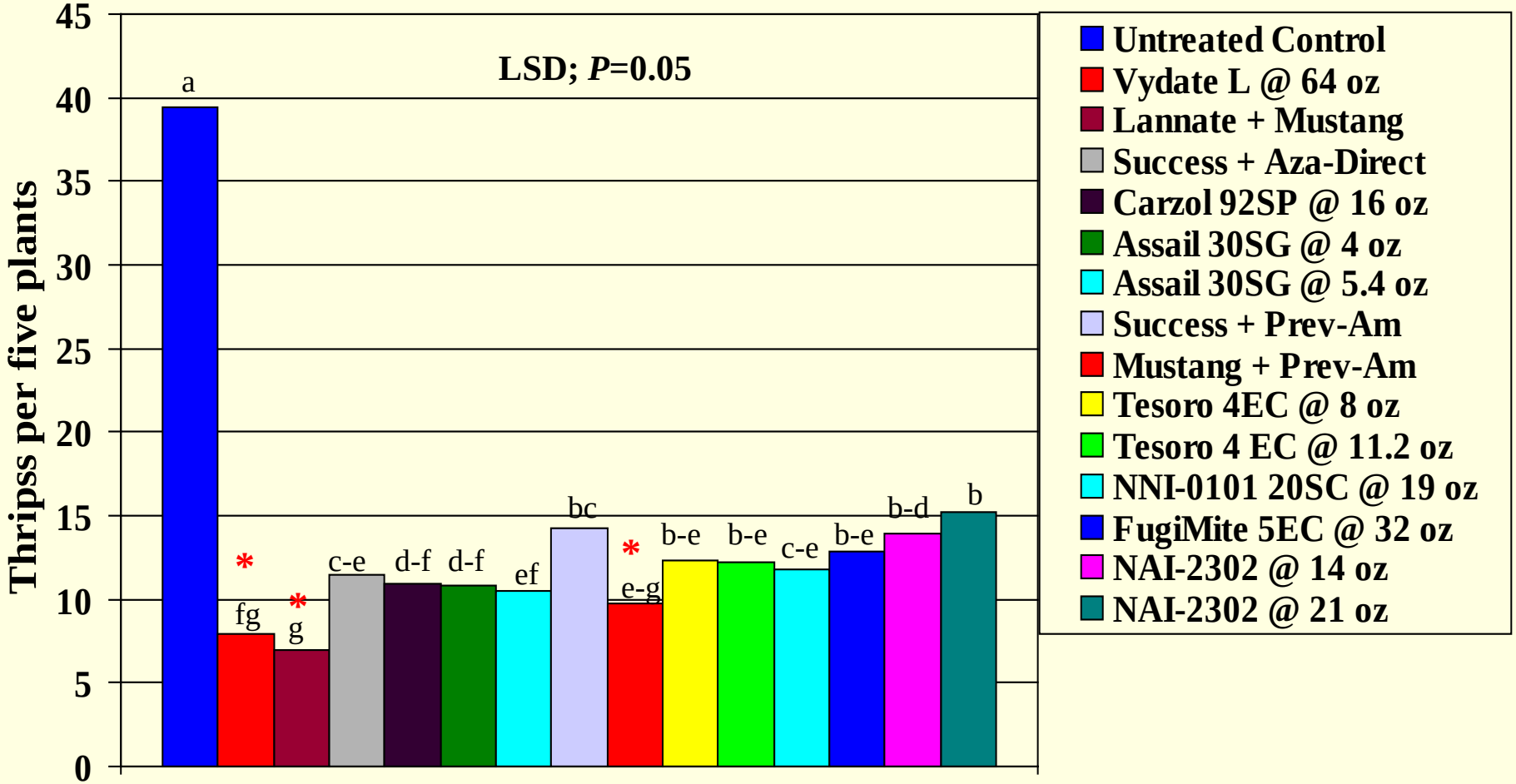
2007 Trial

Control (untreated)
Vydate 2 L @ 64.0 fl
Lannate LV + Mustang 1.5 EW @ 36.0 fl + 3.8 fl oz
Lannate LV + Warrior @ 36.0 fl oz + 3.5 fl oz
Success + Aza-Direct @ 6.0 fl oz + 48.0 fl oz
Radiant 120 SC @ 8.0 fl oz
Requiem @ 0.5% v/v
Requiem @ 1.0% v/v
Requiem + Success @ 0.5% v/v + 0.094 fl oz
Requiem + Lannate LV @ 36.0 fl oz

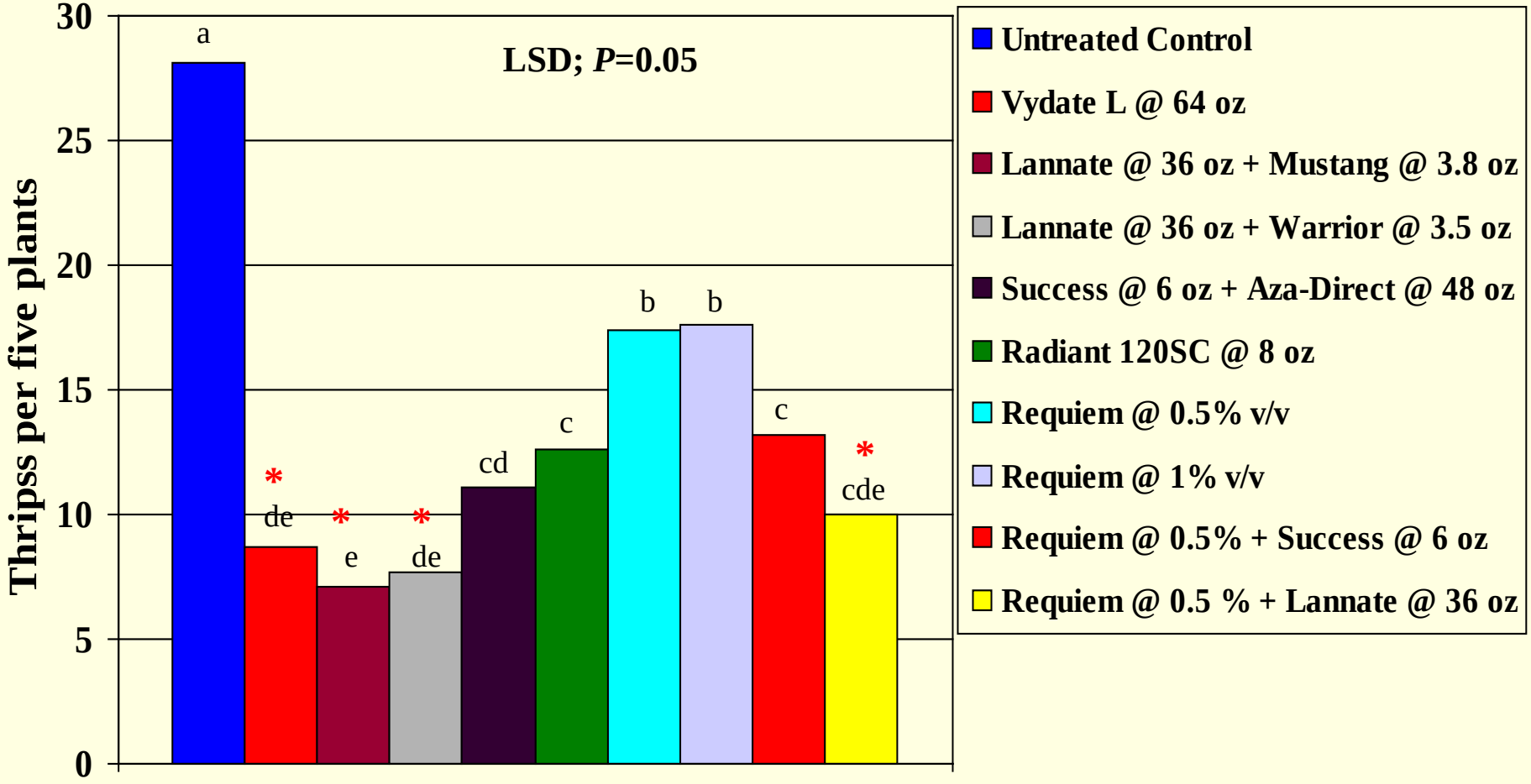
Kinetic @ 1.2 ml/2.5L added to foliar spray mixtures.

Application Dates: 8, 15 Feb, 1, 29 Mar, 10, 24 Apr, 14 May 2007

Post Treatment Thrips Means On Onions
Brawley, CA 2006



Post Treatment Thrips Means On Onions
Brawley, CA 2007



Effect of Insecticide Treatments for Thrips Control on Incidence and Severity of Iris Yellow Spot-Symptoms on White Creole Processing Onions . Brawley, CA. 2007.

Treatment[z]	*oz/acre*	*IYSV plants/15 ft*	*Severity Rating*[y]
Untreated	--------	19.50 b	1.25
Vydate L	64.0	* 8.00 cd	1.20
Lannate LV + Mustang 1.5EW	36.0 + 3.8	* 11.50 bcd	1.15
Lannate LV + Warrior	36.0 + 3.5	* 5.50 d	1.25
Success + Aza-Direct	6.0 + 48.0	15.75 bcd	1.30
Radiant 120 SC	8.0	32.50 a	1.40
Requiem	0.5% v/v	16.75 bc	1.10
Requiem	1.0% v/v	16.00 bc	1.25
Requiem + Success	0.5% v/v + 6.0	16.50 bc	1.30
Requiem + Lannate LV	0.5% v/v + 36.0	* 11.75 bcd	1.10
		LSD =10.37 (*P*=0.05)	NS

[z] Severity of IYS-symptoms on plants symptomatic plants on 10 May was rated as follows:

1 = 1 – 20 % of plant with IYSV symptoms
2 = 21 – 40 % of plant with IYSV symptoms
3 = 41 – 60 % of plant with IYSV symptoms
4 = 61 – 80 % of plant with IYSV symptoms
5 = 81 – 100 % of plant with IYSV symptoms

CONCLUSIONS:

- **Although we were able to demonstrate that Lannate, Mustang, Warrior, Vydate, Assail, Success, Radiant SC and other insecticides provide various levels of thrips control, none of the insecticide treatments were able to suppress onion thrips populations to levels that prevented IYS-symptom expression.**

IYSV in onion in Nevada. Summer 2008
Found on volunteer onions in Mason Valley

IYSV in garlic , summer 2008
First confirmed report of infection of garlic in the US
Diamond-shaped lesions, but more diffused compared to those found on onion

IYSV in weeds

Twoscale saltbrush (*Atriplex* sp.) in Utah, summer 2008

Kent Evans and colleagues at Utah State University

Hanu Pappu at Washington State University

IYSV in weeds

Foxtail (*Setaria* sp.) in Utah, summer 2008

Kent Evans and colleagues at Utah State University

Hanu Pappu at Washington State University