Thrips:
Identification, Biology and Management in Garlic and Onions

Eric Natwick
UC Cooperative Extension
etnatwick@ucdavis.edu

Supported by
CA Garlic and Onion
Research Advisory Board

Thrips

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

Adults of most species have 2-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.

Only 1% of the 5,000 known thrips species are pests.

Some species are important vectors of plant viruses e.g. IYSV.

Economically important thrips that threaten California Garlic & Onion Production include:

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

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

Thrips cause direct feeding injury to garlic & onion crops

Thrips Damage to Onions

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

Onion field heavily infected with IYSV.

Photo by Grant J. Poole.

Thrips Management in Garlic and Onions

- **Identification** is the 1st step to pest management
- **Biology of the pest**: life cycle, behavior, hosts, damage potential, is it a disease vector?
- **Economic injury level** & treatment threshold
- **Control options:**
  - ***Biological***
  - ***Host plant resistance***
  - ***Cultural practices***
  - ***Chemical control***

Thrips Identification Is Key To Management

- **The first important step** in any pest management program is the accurate identification of the pest.
- **ID is important 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 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

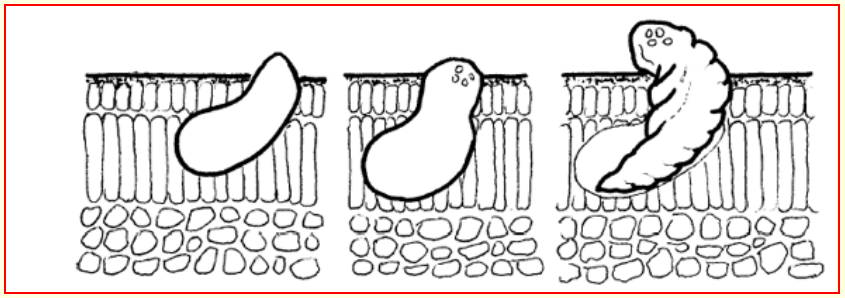
- **Entomology CNAS**

  Dept of Entomology, University of California
  367 Briggs Hall
  Riverside, CA 92521
  (951) 827-4714 (951) 827-4360 Fax: (951) 827-3087
  Email: mark.hoddle@ucr.edu

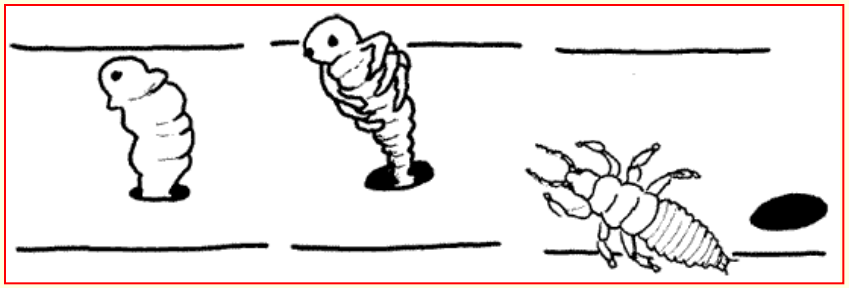
Thrips Life Cycle

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 into plant tissue and most species pupate in or on soil.

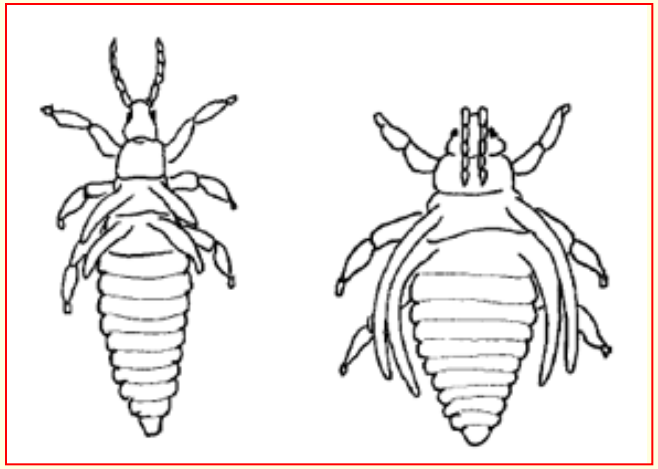
a) Hatching Eggs:



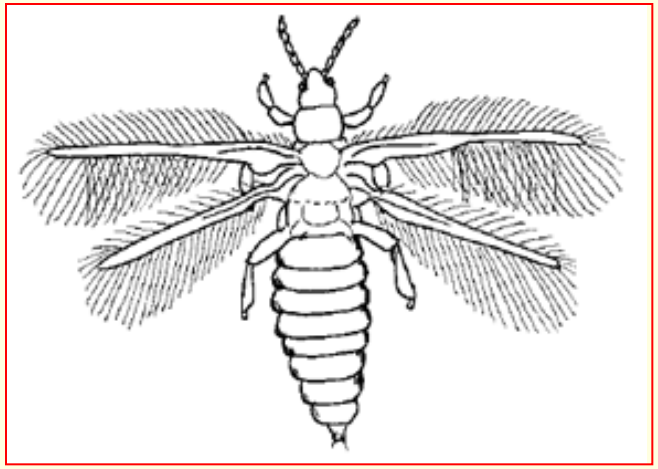
b) Emerging Larvae:

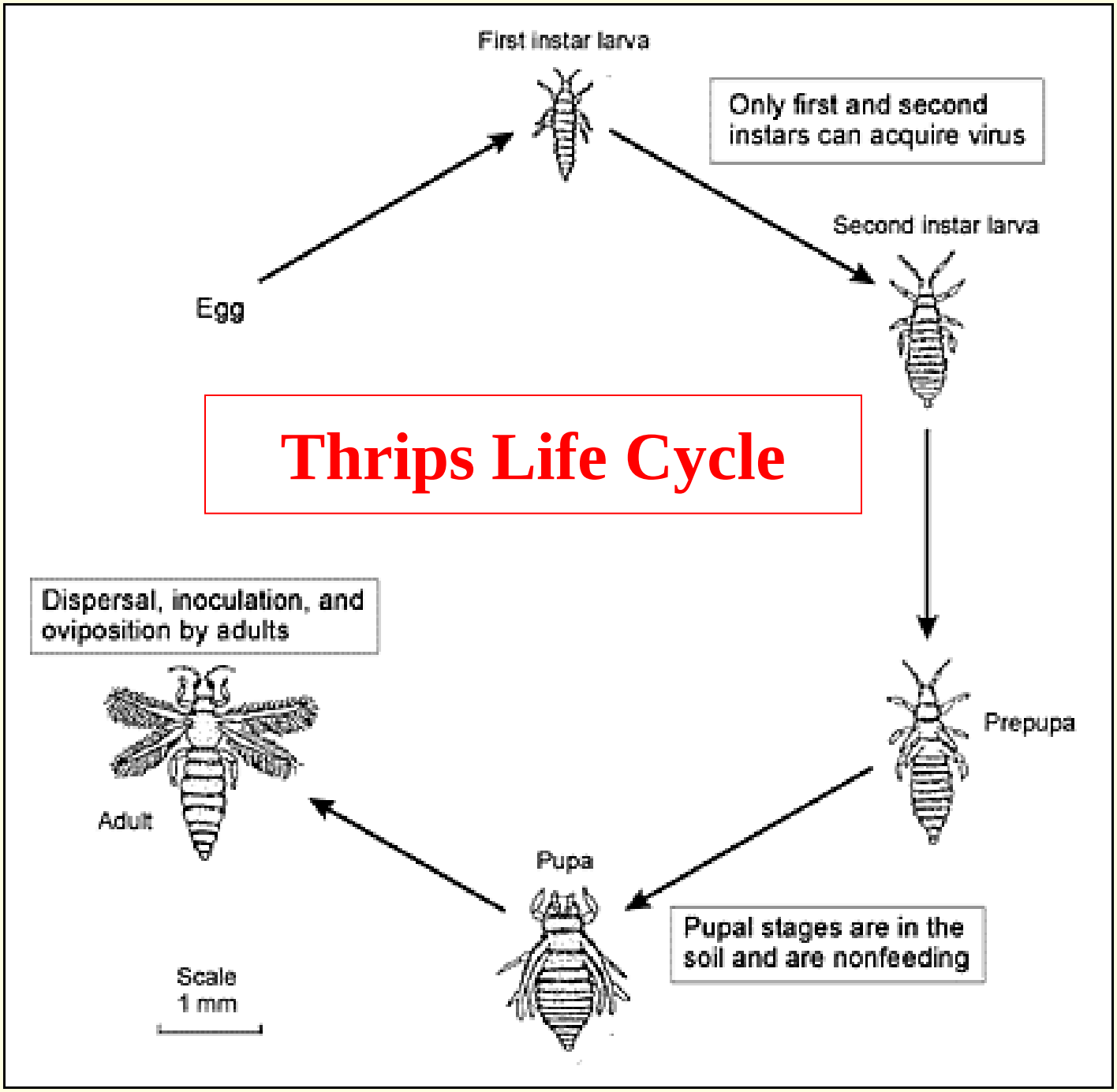


c) Prepupae & Pupae



d) Adults:




First instar larva
Only first and second instars can acquire virus
Second instar larva
Egg
Thrips Life Cycle
Dispersal, inoculation, and oviposition by adults
Prepupa
Adult
Pupa
Pupal stages are in the soil and are nonfeeding
Scale
1 mm

Biological Control of Thrips

- Many predators attack thrips, unfortunately they rarely keep thrips populations below economic injury levels.
- **Minute pirate bugs *Orius spp*.** and other (Anthocoridae) many thrips species and other pests
- **Predatory mite;** many species, e.g. *Neoseiulus californicus* (McGregor)
- **Parasitic wasps;** many species in several families
- **Green lacewings *Chrysopa* and *Chrysoperla spp.* (Chrysopidae)** many thrips species and other pests
- **Entomopathogens** e.g. *Beauveria bassiana*
- Some predacious thrips species include:
  - **banded-wing thrips**
  - **black hunter thrips**
  - ***Franklinothrips* or vespiform thrips**
  - **sixspotted thrips**

HOST PLANT RESISTANCE

- Some varieties or types of onions and garlic are more susceptible to thrips feeding injury and injury from IYSV.

- If possible, plant varieties that are more tolerant of thrips injury and/or IYS disease.

Cultural Controls for Thrips & IYSV

- **Sprinkler irrigation can suppress thrips population levels.**
- **Don't plant upwind from crops that harbor thrips *e.g. small grain crops.***
- **Use thrips-free IYSV-free transplants; *if possible choose thrips tolerant varieties.***
- **IYS disease symptoms may be more severe with plant stress *(i.e. moisture, temperature extremes, salinity, soil compaction, pink root, etc.)***
- **Use clean culture; *quickly remove plant residues from harvested crops before thrips migrate to later plantings.***
- **Straw or yellow mulch has shown some suppression of thrips and IYSV.**
- **Onion growers and PCA's need to familiarize themselves with the symptoms of IYS disease.**
- **Bury all cull piles that may contain bulbs with IYSV.**
- **Remove volunteer onions ASAP.**
- **Weed control?**

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

New weed hosts for IYSV in PNW

Prickly Lettuce: *Lactuca serriola*	Puncturevine: *Tribulus terrestris*	Lambs quarter: *Chenopodium album*	Redroot pigweed : *Amaranthus retroflexus*	Kochia: *Kochia scoparia*

Sampangi, R.K., S. K. Mohan, and H.R. Pappu. 2007. **Identification of New Alternative Weed Hosts for Iris yellow spot virus in the Pacific Northwest**. Plant Disease: 91-1683.

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

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

CHEMICAL CONTROL

- **Insecticides** are the most effective management tool for thrips control in onions and garlic.
- Insecticide treatments that **control thrips larvae** help manage IYSV buildup and spread within a field.
- Treatment **thresholds vary** by:
  - **Crop** (garlic or onion) and **crop type** (shallots, fresh market, dehydrator, seed)
  - Presence of a disease such as **IYSV**

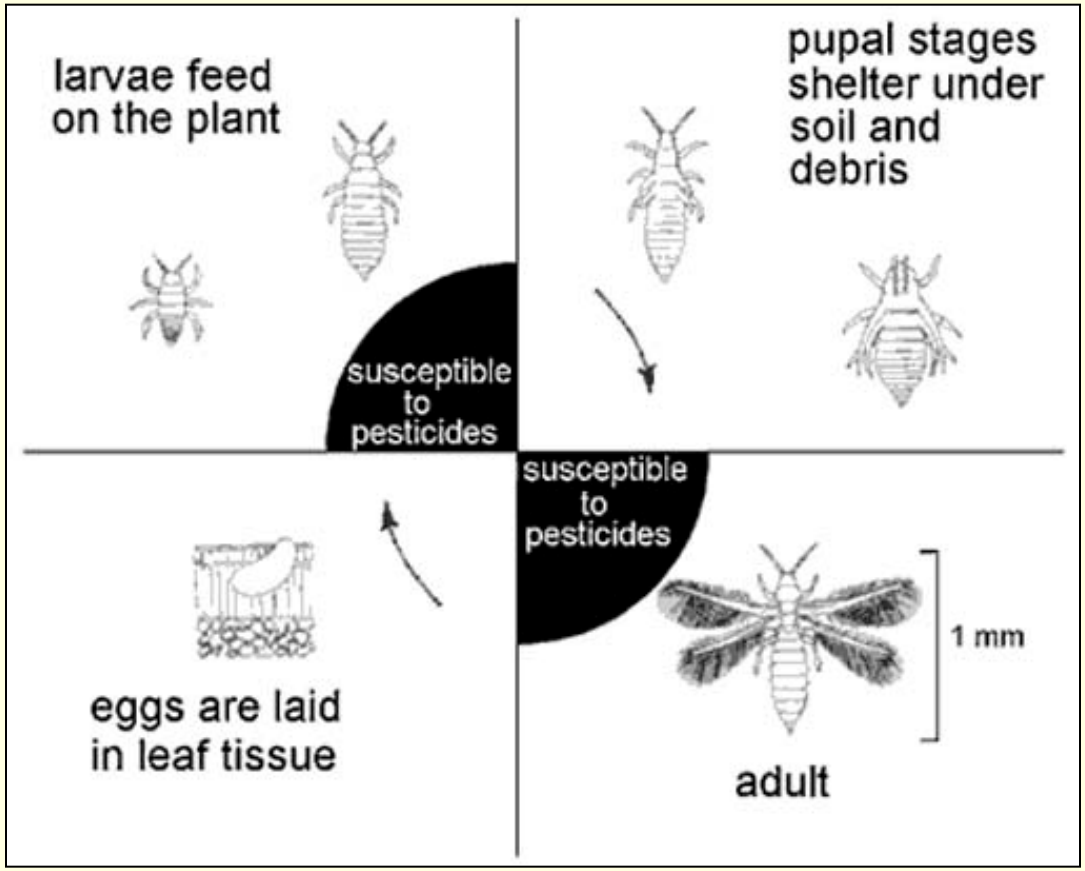
Insecticidal Control of Thrips

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, Entrust, Radiant, Mustang, Warrior, and azadirachtin are efficacious against thrips.

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



THRIPS CONTROL INSECTICIDES

Product	MOA Group	Rate as Oz/acre	P.H.I. days	Special Considerations
Radiant SC	5	6 - 10	1	5 - 9 pH; no more than 2 consecutive group 5 insecticides
Entrust	5	4 - 8	1	OMRI; No more than 9 oz /acre/season; pH>7
Mustang	3A	3.2 - 4.3	7	No more than 21 oz /acre/season. Other pyrethroids may be used, e.g. Warrior or Pounce.
Lannate SP	1A	Garlic – 8 Onion- 16	7	May tank mix with a pyrethroid
Vydate L	1A	2-4 pt	14	Dry bulb onion only under SL R-1053; garlic & onions in Modoc & Siskiyou counties
Assail	4A	30SG 5-8 & 70 WP 2.1-3.4	7	No less than 7 days between treatments. No more than 4 applications or more than 13.7 oz /acre/season.
Aza-Direct; Ecozin Plus	UN	16 – 32; 15 - 30	0	OMRI; Opt pH 5.5-6.5; don't exceed pH 7.0 May be mixed with other insecticides.

Currently available insecticides are mostly ineffective for management of IYSV

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).**

Thank you ...

... Are there any questions?

Supported by
CA Garlic and Onion Research Advisory Board