Western flower thrips, *Frankliniella occidentalis*, and Onion thrips, *Thrips tabaci*, are the main thrips species that occur in onion and garlic crops in California. Thrips are very small elongate insects with two pairs of wings that are fringed with long hairs that are feather-like in appearance being their most distinctive characteristic. Thrips pass through six developmental stages: an egg, two larval stages (only the larvae acquire viruses that are later transmitted my adults), 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. Adults of both onion thrips and western flower thrips are pale yellow to light brown in color. Thrips larvae have the same body shape as adults but are lighter in color and are wingless. The first instar larvae are whitish and the second instar larvae are yellowish. Prepupa and pupa are similar to the second instar larva in shape and color, but have small wing pads.

**IDENTIFICATION**

The first important step in any pest management program is the accurate identification of the pest. Western flower thrips are generally more difficult to control with insecticides than onion thrips. In some locations Western flower thrips have become very resistant to insecticides. Therefore, it is important to correctly identify thrips to species. Because of their small size and similarities in color, identifying thrips can be very difficult. A 10X hand lens may not be adequate to see the characters needed for species identification. To properly identify thrips to species, the specimens need to be cleared and mounted on microscope slides for viewing under a good dissecting binocular microscope.

**CROP INJURY**

The host range of both onion thrips and western flower thrips are very extensive, many including cereals and broadleaf crops. Both species are injurious to onions and garlic, but the onion thrips is more injurious to onions. Only onion thrips transmits *Iris yellow spot virus* (IYSV). An early and severe infection with IYSV may reduce yield of the larger bulb classes. Onion thrips thrive in hot, dry conditions and are usually more damaging in areas where these climatic conditions prevail for most of the production season. Thrips injury is caused by their unique rasping-sucking mouthparts. They rasp the surface of the leaves and sucking up the liberated plant fluid. This injury removes nutrients needed for bulb development, causes scaring and reduces photosynthesis. Leaf scarring in a heavily thrips infested onion crop causes the entire field to take on a silvery appearance. They cause damage during storage by feeding under the leaf folds and in the protected inner leaves near the bulb. Both adults and nymphs cause damage. High populations of thrips can reduce both yield and reduce the storage life. Leaf scaring is a serious problem on green onions, but thrips feeding during the early bulb development is most injurious to dehydrator onions and sweet onions.

**MONITORING**

Control measures must be implemented before the early bulb development to keep thrips populations from reaching economically injurious levels during bulb development. When the
crop is nearing harvest, higher thrips populations can be tolerated. To scout for thrips in onion and garlic crops, randomly sample entire plants and evaluate thrips numbers and damage. Pull leaves apart and, using a hand lens, all the thrips on the inner leaves near the bulb can be counted as well as those under the leaf folds. Sample at least 5 plants from 4 separate areas of the field. Check the UC Pest Management Guidelines for treatment thresholds: http://www.ipm.ucdavis.edu/PMG/r584300111.html.

**BOILOGICAL CONTROL**
Several natural enemies attack thrips: entomopathogens (*Beauveria bassiana*), predaceous mites, minute pirate bugs, lacewings, entomophagous thrips and parasitoid species. However, populations of natural enemies usually do not buildup quickly enough to prevent crop injury.

**HOST PLANT RESISTANCE**
Garlic and onion varieties completely resistant to onion thrips,, western flower thrips or IYS disease are not currently available. If possible, plant varieties that are more tolerant thrips injury and/or IYS disease because some varieties or types of onions or garlic more susceptible to injury from thrips feeding or injury from IYSV. Use thrips-free, IYSV-free transplants; if possible choose thrip tolerant varieties.

**CULTURAL CONTROL**
Cultural Controls for Thrips & IYSV
- Sprinkler irrigation can suppress thrips population levels.
- Don’ plant upwind from crops that harbor thrips e.g. small grain crops.
- Use thrips-free IYSV-free transplants; if possible choose thrip 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
- Disc or plow under onion and garlic crop residues soon after harvest.
- Bury all cull piles that may contain bulbs with IYSV
- Remove volunteer onions or garlic plants from around or within fields before planting the next garlic or onion crop.
- Control weeds that may be hosts of thrips and/or IYSV around onion and garlic fields.

**Weed Hosts of IYSV**
- Prickly lettuce (*Lactuca serriola*)
- Puncturevine (*Tribulus terrestris*)
- Lambs quarter (*Chenopodium album*)
- Redroot pigweed (*Amaranthus retroflexus*)
- Kochia (*Kochia scoparia*)
- Twoscale saltbrush (*Atriplex sp.*)
- Foxtail (*Setaria sp.*)
INSECTICIDAL CONTROL
Insecticides are the most effective management tool for thrips control in onions and garlic. Insecticide treatments that control thrips larvae help to manage IYSV buildup and spread within a field. Treatment thresholds vary by: Crop (garlic or onion) and crop type (shallots, fresh market, dehydrator, or seed) and the presence of a disease such as IYSV. 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 insecticide resistance management (IRM) practices such as rotating classes of chemistry (look for the mode of action group number on the insecticide label) to help present insecticide resistance.

SOME THRIPS CONTROL INSECTICIDES

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

Currently available insecticides are mostly ineffective for management of IYSV

Supported by California Garlic and Onion Research Advisory Board