



Christopher Levine  
cpl43@cornell.edu



Neil Mattson  
nsm47@cornell.edu

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## Managing Western Flower Thrips in CEA Strawberry Operations

Western flower thrips (*Frankliniella occidentalis*) are among the most damaging greenhouse pests especially on strawberries. Adult thrips are slender insects about 1mm long (Figure 1). Thrips feed by piercing the cells and sucking out their contents leading to silver/gray patches. Thrips especially feed on growing points and flower buds leading to distortion of these tissues as they develop. Greenhouse strawberry crops are sensitive to thrips damage which can cause severe plant damage and unmarketable fruit. This article will introduce the issue of thrips in strawberries, describe common symptomology, present an initial framework for integrated pest management, and conclude with some additional resources.



Figure 1. Western flower thrips (*Frankliniella occidentalis*) under magnification. Image: P.M.J. Ramakers, Applied Plant Research, Bugwood.org

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Historically in the United States, leafy greens, microgreens, and other fast turnaround crops have been popular among controlled environment agriculture (CEA) growers. Recently, CEA companies are beginning to consider strawberries as another crop because it is also a highly perishable and higher value crop.

Unlike leafy green and herb production that often take less than two months to complete a full growing cycle, strawberry plants are frequently grown for a longer duration of time. Consequently, the longer a plant is placed in a CEA operation, the risk of a pest infestation generally increases.

Regardless of the pest, a comprehensive pest management strategy must be considered before starting an indoor strawberry operation. Preventing a pest infestation is easier than combating one that has already occurred. CEA growers should be trained to accurately identify insects, symptoms, and scout/document all pest populations on a weekly basis to ensure pests are closely monitored and managed below an economically injurious level. Quick interventions are needed if thrips are identified because they can rapidly multiply especially when a steady source of pollen is available from the flowers.

### Symptoms of Thrips

Western flower thrips themselves can be spotted with the naked eye if you look closely. Adults are long/slender insects about 1mm long with color varying from yellow to dark brown (females) or pale yellow (males) (Figure 1). Even easier to spot than thrips themselves are the damage they do on strawberry flowers and fruits.



Figure 2. Western flower thrips crawling around a strawberry flower (ex. in blue circle). Image: Bennison, Seymour, and Kirk, via [Agriculture and Horticulture Development Board](#)



Figure 3. Damage from thrips to flowers transitioning to early fruit development. Image: Christopher Levine, Cornell University

Figure 4. Bronze like fruit resulting from thrip damage. Image: Christopher Levine, Cornell University



When thrips feed on flower petals they can cause distorted and slightly discolored petals (Figures 2 and 3). The flower petals may appear slightly discolored, and thrips can be quickly spotted crawling around the flower when agitated by when one blows air directly onto the flower from one's mouth. The fruits appear seedy and have dull bronze color (rather than shiny red color). Severely damaged fruit typically will not have the red glossy color (Figures 4 & 5). Overall, thrips feeding damage can result in many unmarketable fruit.

### Solutions

It is imperative for CEA strawberry operations to incorporate a proactive and comprehensive integrated pest management (IPM) strategy. An effective IPM program typically includes a combination of biological, chemical, physical, and cultural control methods. An effective IPM strategy depends on numerous factors and a strategy that works in one CEA operation may not work as effectively in a different CEA operation. Therefore, consulting with an entomologist at your local cooperative extension office that has expertise with CEA pest management is advised because

they can recommend an IPM strategy that is tailored to one's specific circumstances. With that said, here are a few strategies to help you begin your IPM plan.

**Physical - Mechanical Control:** Insect exclusion screens can reduce the number of thrips that enter a CEA operation. Blue or yellow sticky cards may be used to monitor thrips populations.

**Organically Accepted Chemical Sprays:** Because strawberries are an edible crop, many common pesticides used for thrips in ornamental crops cannot be used. For strawberries, a combination of Azadirachtin (ex. Neemix) and *Beauveria bassiana* (ex. Botanigard) may be applied every 5-6 days to help keep thrip populations under control. Always check the product label to determine if a chemical spray can be used for your crop in your state. Be sure to note compatibility of the product with any biological controls you plan to use and pay attention to the preharvest interval (PHI) which is the minimum time between when a pesticide is applied and the crop can be harvested.

**Biological Control:** Several biological predators are available which target western flower thrips, including the predatory mites: *Amblyseius swirskii*, *Amblyseius cucumeris*, and *Amblydromalus limonicus*. These predatory mites should be proactively deployed to prevent thrip infestations from occurring in the first place. These products can come in the form of sachets or bran. The sachets are a slow-release, longer-lasting form that can be placed in each pot and the bran form can be scattered to distribute the predators it contains more uniformly across a crop. Many biological control companies have technical support that can recommend a specific protocol and product that is tailored to one's CEA operation.

**Cultural Control:** Inspect all new plant material entering a facility and be sure it is pest free before introducing it. Wearing personal protection equipment such as a clean lab coat or Tyvek suit is one tactic that may be used to reduce the risk of carrying in an invasive pest from outside the CEA operation. Additionally, planning your workflow for the day such as never visiting a clean greenhouse after visiting a thrips ridden greenhouse is another strategy to reduce the risk of carrying in an invasive pest.

**Further Resources** - There are several good resources with additional information on western flower thrips control, including:

Smessaert, J., Baets, D., Melis, P. and Van Delm, T. (2021). Scouting of pests and beneficials is essential in application of IPM strategy in strawberry. *Acta Hort.* 1309, 741-750 <https://doi.org/10.17660/ActaHortic.2021.1309.106> This article includes IPM scouting techniques, information on the most important strawberry pests including thrips, and data monitoring techniques.



Figure 5. Six strawberries that have been damaged from thrips. Image: Christopher Levine, Cornell University

Kubota, C. Controlled Environment Berry Production Information: Thrips. Ohio State University. <https://u.osu.edu/indoorberry/thrips/> Information on thrip management in CEA strawberry operations.

UC Davis IPM. Agriculture: Strawberry Pest Management Guidelines - Western Flower Thrips. <https://www2.ipm.ucanr.edu/agriculture/strawberry/Western-flower-thrips/> Comprehensive information on various strawberry pests including western flower thrips.

Gilrein, D. 2015. Time for Thrips Already? E-Gro Alert Vol. 4, Number 18. [http://e-gro.org/pdf/2015\\_418.pdf](http://e-gro.org/pdf/2015_418.pdf) Good tips for cultural management of thrips (note: many insecticides mentioned for ornamental crops cannot be used for strawberries - always check the product label).



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**CONTRIBUTORS**

Dr. Nora Catlin  
Floriculture Specialist  
Cornell Cooperative Extension  
Suffolk County  
[nora.catlin@cornell.edu](mailto:nora.catlin@cornell.edu)

Dr. Chris Currey  
Assistant Professor of Floriculture  
Iowa State University  
[ccurrey@iastate.edu](mailto:ccurrey@iastate.edu)

Dr. Ryan Dickson  
Greenhouse Horticulture and  
Controlled-Environment Agriculture  
University of Arkansas  
[ryand@uark.edu](mailto:ryand@uark.edu)

Thomas Ford  
Commercial Horticulture Educator  
Penn State Extension  
[tfz@psu.edu](mailto:tfz@psu.edu)

Dan Gilrein  
Entomology Specialist  
Cornell Cooperative Extension  
Suffolk County  
[dog1@cornell.edu](mailto:dog1@cornell.edu)

Dr. Joyce Latimer  
Floriculture Extension & Research  
Virginia Tech  
[jlatime@vt.edu](mailto:jlatime@vt.edu)

Heidi Lindberg  
Floriculture Extension Educator  
Michigan State University  
[wolleage@anr.msu.edu](mailto:wolleage@anr.msu.edu)

Dr. Roberto Lopez  
Floriculture Extension & Research  
Michigan State University  
[rglopez@msu.edu](mailto:rglopez@msu.edu)

Dr. Neil Mattson  
Greenhouse Research & Extension  
Cornell University  
[neil.mattson@cornell.edu](mailto:neil.mattson@cornell.edu)

Dr. W. Garrett Owen  
Greenhouse Extension & Research  
University of Kentucky  
[wgowen@uky.edu](mailto:wgowen@uky.edu)

Dr. Rosa E. Raudales  
Greenhouse Extension Specialist  
University of Connecticut  
[rosa.raudales@uconn.edu](mailto:rosa.raudales@uconn.edu)

Dr. Beth Scheckelhoff  
Extension Educator - Greenhouse Systems  
The Ohio State University  
[scheckelhoff.11@osu.edu](mailto:scheckelhoff.11@osu.edu)

Dr. Ariana Torres-Bravo  
Horticulture / Ag. Economics  
Purdue University  
[torres2@purdue.edu](mailto:torres2@purdue.edu)

Dr. Brian Whipker  
Floriculture Extension & Research  
NC State University  
[bwhipker@ncsu.edu](mailto:bwhipker@ncsu.edu)

Dr. Jean Williams-Woodward  
Ornamental Extension Plant Pathologist  
University of Georgia  
[jwoodwar@uga.edu](mailto:jwoodwar@uga.edu)

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