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FOR SUSTAINABLE AGRICULTURE

The effects of thrips on strawberry production in Iowa

Abstract: The presence of thrips (tiny insects) in strawberry fields has been associated with undesirable bronzing of the fruit. This study examines the links between thrips and damage to Iowa strawberries.

Question & Answer

Q: What role if any do thrips have in contributing to strawberry bronzing and how are they best managed?

A: They may have less of a role than previously thought, and treatment thresholds should be revised to include more factors than number of thrips observed.

The extension objectives were to:

- Conduct a survey to assess growers' knowledge of thrips,
- Estimate the yield loss growers have experienced due to thrips, and
- Calculate insecticide usage to control thrips.

Background

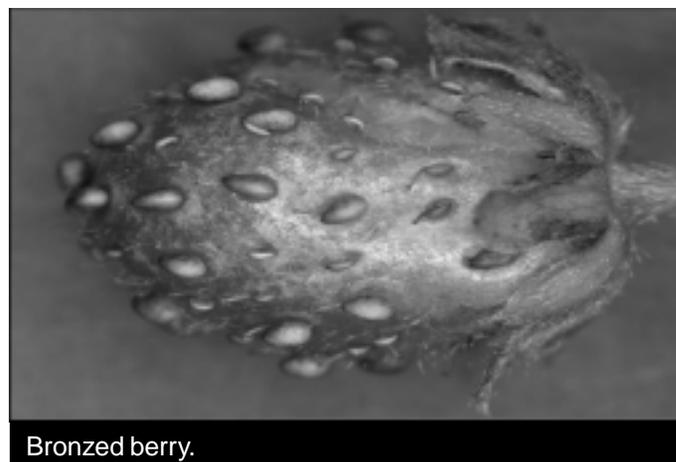
Midwest strawberry growers incurred economic losses due to bronzing of June-bearing strawberries in 1994. Bronzing refers to the damage to strawberry fruits that was presumed to result from thrips feeding on the plants. Thrips are minute insects, about the size of an eye of a needle, that begin feeding on strawberry flowers when the flowers open in May. The piercing of a flower cell causes individual cells to die, creating a bronzed appearance on the strawberry fruit. However, Midwest growers did not have evidence confirming that thrips feeding or other factors (such as low temperatures during flower development) caused bronzed berries.

The research objectives for this project were to:

- Identify the thrip species infesting strawberry fields in central Iowa,
- Evaluate the effects of thrips feeding on the development of bronzed strawberries, and
- Determine if thrips overwinter within Iowa strawberry fields.

Approach and methods

Extension: The survey to assess Iowa strawberry growers' knowledge of thrips was mailed in March 2002. The growers surveyed were registered with the Iowa Department of Agriculture and Land Stewardship and the Iowa Fruit and Vegetable Growers Association. Twenty-three questions were asked about how growers dealt with thrips on their farms.



Bronzed berry.

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Budget:

\$12,290 for year one
\$10,770 for year two

Research: Adult and immature thrips were collected randomly from strawberry flowers and fruits during three growing seasons at three sites in central Iowa. Collection started in early May when primary flowers were first noted and continued through fruit development. Sample sizes were increased in 2001 and 2002. The strawberry field at the ISU Horticulture Station was hand-harvested five times in 2001 and seven times in 2002 and berries were sorted as marketable and non-marketable and weighed.

Soil samples to a depth of 5 cm were collected from three central Iowa strawberry fields in April 2001 and March 2002. The samples were dried in Berlese funnels and thrips were collected in alcohol to see they were overwintering in the fields. To determine if thrips were flying into the fields, yellow and blue sticky cards were placed in each of the three strawberry fields from April to June 2001 and March to June 2002. The numbers of thrips captured on the cards were tabulated and analyzed.

Results and discussion

Extension: Approximately 37 percent of the 102 growers completed the survey. Most of them (70 percent) had heard about thrips being an insect pest of strawberries. However, thrips were not considered a primary pest in their own strawberry production systems.

Research: Of the thrips collected from the three central Iowa fields, nearly 82 percent were the eastern flower thrips (*Frankliniella tritici*) and the remaining 18 percent were primarily *Frankliniella fusca*. The mean number of adult and immature thrips per flower or fruit ranged from zero to seven in 2000, from zero to 22 in 2001, and zero to 16 in 2002. The incidence of thrips on both flowers and fruits was common in 2001 and 2002. However, the mean number of thrips on flowers was two to 16 times higher than on berries.

In 2001, an average of 68 percent of the hand-harvested strawberries was classified as marketable. Some of the unmarketable berries were seedy or had other damage, but less than 1 percent was bronzed, despite the presence of thrips in the fields. An average of 63 percent of the berries was deemed marketable in 2002. Lack of pollination was the main reason for the lack of market quality. Once again, even though there were thrips in the fields, less than 1 percent of the berries were bronzed.



In 2001, one thrip was found in the 39 soil samples. In 2002, five adult thrips were collected from 72 soil samples. A check of the sticky cards in 2001 showed that more insects were attracted to the yellow cards and adults were more likely to be trapped. Yet in 2002, the thrips were more likely to be found on the blue sticky cards and most of the the thrips captured were mature rather than immature. In both years, most of the thrips were eastern flower thrips.

Conclusions

The size of a pest population that enters the overwintering stage may be used to predict the size of the spring population. However, in this study *F. occidentalis* thrips overwintered in the Iowa strawberry fields, but only *F. tritici* was collected from strawberry flowers and fruits and sticky cards. Incidentally, the recovery of five *F. occidentalis* from the Iowa soil samples was the first record of this thrip species overwintering in the Midwest United States. The difference in observed yearly variation in captures of *F. tritici* by yellow and blue sticky cards may be related to the densities of thrips in the strawberry fields.

Impact of results

In previous studies, different strawberry cultivars and thrips species were used to assess thrips damage to strawberry fruit. Preliminary thresholds to trigger insecticide spraying had been set between 0.5 and 2 thrips per flower and fruit. Researchers observed mean numbers from 0.1 to 48 thrips

per flower and fruit during both years of this study. Yet, even though the numbers of thrips exceeded the recommended preliminary threshold, no damage was observed. One hand-harvested field yielded 73 percent marketable berries of which less than 1 percent was bronzed. *F. tritici* were collected from different stages of the strawberry blossom (bud, open flower, flowers that had dropped petals, and berry). Higher numbers of thrips were collected from the flowers than the fruits. However, no damage was detected. This is significant because once the berries are formed, damage caused by *F. tritici* will be minimal.

Thresholds for thrip infestations used by Midwest strawberry growers may need to be revised to include additional factors such as cultivar, environmental conditions during thrips infestations, levels of plant stress, types of mulch and irrigation practices, and temperatures during bud formation. One study suggested that dry conditions could contribute to thrips damage because the plants would be stressed by the lack of moisture and rainfall may help keep down the thrip populations.

Education and outreach

Researchers presented an update on the thrips project at the Iowa Fruits and Vegetable Growers Association meeting in January 2002 and gave a poster presentation at the 2001 Entomological Society of America meeting. An article will appear in *HortScience* and manuscripts have been submitted to other horticulture publications. A master's thesis was prepared focusing on phytophagous thrips in Iowa strawberry fields.

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