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GOLDFLECK DAMAGE TO TOMATO FRUIT CAUSED BY FEEDING OF *FRANKLINIELLA OCCIDENTALIS* (THYSANOPTERA: THRIPIDAE)

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Flower thrips, *Frankliniella* spp., are important pests of tomatoes, *Lycopersicon esculentum* Mill., throughout the mid-Atlantic region. Several species cause direct damage to the leaves and fruits, and species such as the western flower thrips (WFT), *F. occidentalis* (Pergande), and the tobacco thrips, *F. fusca* Hinds, also vector tomato spotted wilt virus (Zitter et al. 1989).

Damage caused by *F. occidentalis* to tomato can appear in several forms. In greenhouses, *F. occidentalis* will feed on the leaves of young transplants, causing a spotting and desiccation of the leaves. Sclar (2000) states that *F. occidentalis* are attracted to pollen sources, and will feed extensively on flower tissues and degrade flower quality. This results in reduced length of bloom and flower tissue damage. Salguero Navas et al. (1991) report that small indentations appear in tomato fruit from female oviposition, and these indentations are sometimes surrounded by a light-colored halo. This damage can result in rejection of fruit and lowering of grade.

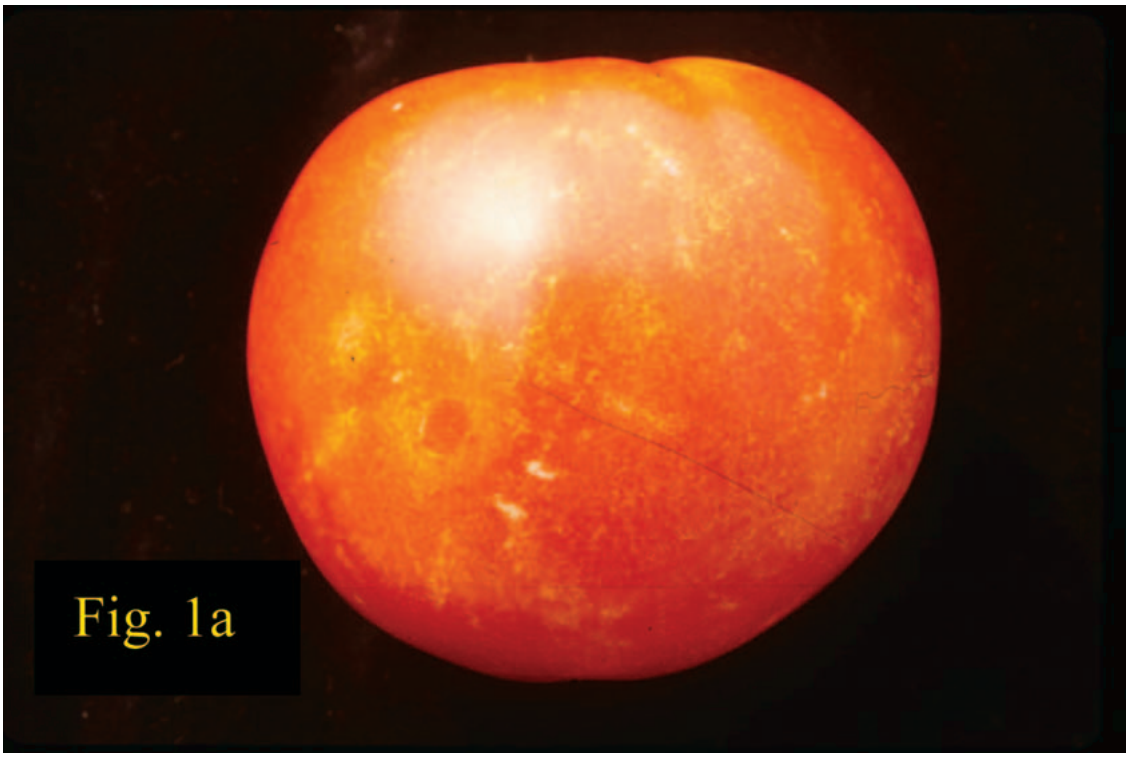
Although originally reported in the southwestern portion of the United States, WFT was first reported along the east coast in Georgia in 1981 (Beshear 1983). It is now present throughout the east coast, including New Jersey. Cosmetic damage to tomatoes, appearing as 'goldflecking' and or goldfleck rings on red tomatoes, began to occur simultaneously with the appearance of *F. occidentalis* in New Jersey. Ghidiu (1999) reported that up to 31% damage caused by goldfleck on tomato fruit was observed in fresh market tomatoes in southern New Jersey. Growers originally attributed the gold-fleck and goldfleck rings appearing on tomato fruit as damage caused either by environment, pesticide phytotoxicity, or a combination of these. However, Rice (1992) described a similar damage on nectarines as whitish skin patches caused by removal of cell contents by feeding of *F. occidentalis* that resembled spray residue which could not be washed off. The goldfleck rings often appear on the fruit where the skin was in contact with another object, such as another fruit, stem or leaf. Similar damage caused by *F. occidentalis* has appeared on nectarines throughout the region (Hogmire 1995), showing up as silverish spots or rings on fruit where the surface was in contact with another fruit or stem. He reported that *F. occidentalis* feed in protected areas such as in the flowers, under leaves, and between two fruit that are touching each other, resulting in a circular silver blemish.

The cosmetic fruit damage of goldfleck on tomato has become a serious economic problem throughout the mid-Atlantic region, resulting in the culling and downgrading of fruit. The purpose of this study was to determine if *F. occidentalis* causes the goldfleck spots and halo rings to green and red tomato fruit.

The studies were conducted in glass greenhouses in 2001. Tomatoes, 'Florida 47', were seeded to flats on 5 Feb., and on 6 Apr individual plants were transplanted into 7.6-liter pots containing a peat-vermiculite mix according to the Commercial Vegetable Production Recommendations for New Jersey (Anon. 2001). Twelve plants were placed on benches in each of two isolated, environmentally controlled, self-supporting enclosed greenhouse units on 7 Apr.

On 15 Apr., fruits on all plants were thinned to single fruit, or clusters of three fruit where the fruit were in contact with each other, and the remaining fruit and flowers were removed. An oversize yellow-orange ping-pong ball (Sears brand, 4.5 cm diam), simulating a small tomato, was attached with 20.3 cm long twist ties to each of the four green fruits and four red fruits on plants in both the treated (infested) and untreated (not infested) greenhouse units. Dennill & Erasmus (1992) found that infested, clustered avocado fruits were consistently more damaged by thrips than single fruits. The ping-pong balls were cleaned in distilled water and represented a non-organic object in contact with fruit to provide a protected area for the *F. occidentalis*. Each greenhouse had four plants each with at least one cluster of fruit (with fruit contacting each other), four plants each with at least one red fruit with a ping-pong ball attached, and four plants each with at least one green fruit with a ping-pong ball attached to it (the treated greenhouse contained infested plants, and the untreated greenhouse contained non-infested plants). *F. occidentalis* (identification confirmed by Dr. M. Parella, University of California) were reared on young asparagus ferns in a separate greenhouse and collected on 16 Apr with a white shake cloth and a Fisher aspirator. Approximately 50 *F. occidentalis* adults and nymphs were placed on the fruit of each treatment. Tomato fruit were harvested on 9 May, examined, and the number of fruit with "gold-fleck" damage was recorded on both green and red tomatoes in both greenhouses. Tomato pots were irrigated as needed by drip irrigation with micro-emitters.

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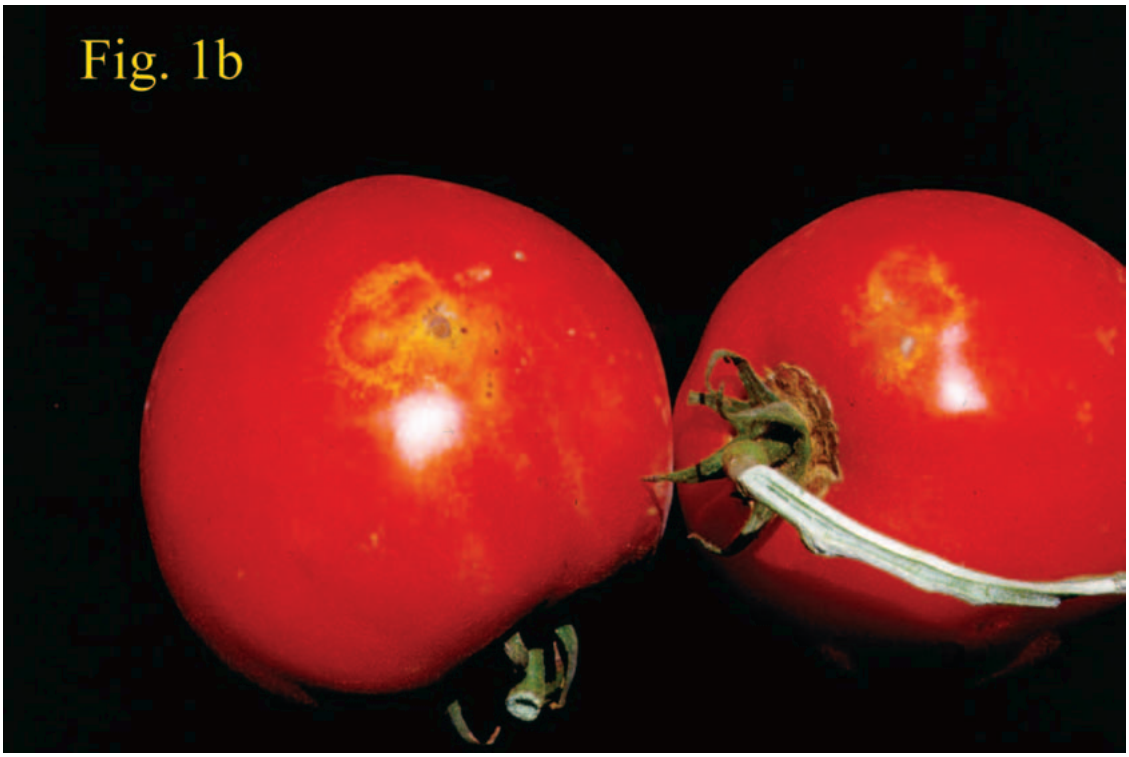


Fig. 1. (a) Goldflecks on tomato caused by feeding of *F. occidentalis* (Pergande). (b) Goldfleck rings on tomatoes at the spot they were touching each other, caused by feeding of *F. occidentalis* (Pergande).

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Only tomato fruit (both green and red) that had been infested with *F. occidentalis* had visible "gold-fleck" damage on the surface of the fruit approximately 3 weeks after infestation (Fig. 1a, b); none of the red or green fruit in the uninfested greenhouse had any visible signs of goldflecking. The gold-fleck was observed on a higher percentage of infested red tomatoes (average 60% damaged red fruit) than on infested green tomatoes (average 25% damaged green fruit) for both the tomatoes that had a ping-pong ball attached and tomatoes that were in a cluster. *F. occidentalis* feeding damage on green tomatoes appeared as faint whitish flecks against a green background, making it difficult to see, while feeding damage on red tomatoes appeared as bright gold flecks against a red background. Gold-fleck damage appeared as both random individual flecks, or small spots, on the skin of fruit that were not touching another object, and also as circular gold rings of fleck on the skin of fruit that were touching another object, i.e., another fruit or the ping-ball ball. These rings outlined the border of the contact area between the two objects. Similar cosmetic damage of goldfleck rings was reported in nectarines and peaches by Hogmire (1995) and on plum (Lewis 1997).

No oviposition damage by females was observed on either the green or red fruit, indicating that gold-flecking is caused by feeding damage alone. Not all fruit infested with *F. occidentalis* showed damage, suggesting that either thrips mortality was high or feeding on the fruit was variable. The thrips used in this experiment were mixed populations of age and sex, which may have contributed to the increased variability.

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Summary

Although several species of thrips attack tomatoes in the mid-Atlantic region, results from this experiment show that the cosmetic fruit damage referred to as "gold-flecking" is caused by direct feeding of *F. occidentalis*. Further, the damage can occur on single green or red fruit, or on fruit that come in contact with another object, possibly leaves, stems or adjacent fruit. Further research is needed with the other tomato-infesting thrips species to determine if their feeding causes similar damage. Thrips management programs could then use feeding damage in the field to determine if the program needs adjustment to obtain better control of the thrips population.

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