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Banana Rust Thrips
Damage to Banana and Ornamentals in Hawaii

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Banana rust thrips, *Chaetanaphothrips signipennis* (Bagnall) (Thysanoptera: Thripidae), was collected once in 1954 from an outdoor planting of anthurium in Manoa, Oahu, and was not seen again until 1996, when it was collected from several commercial nurseries and farms on the island of Hawaii, after causing severe damage to anthurmium, ti, dracaena, and banana.

Banana rust thrips are present in parts of Australia (Queensland and New South Wales) and Central America (Honduras, Panama), Brazil, Fiji, Sri Lanka, and India. They are also established in Florida.

The banana rust thrips is similar in appearance to two other introduced *Chaetanaphothrips* species, the anthurium thrips, *C. orchidii* (Moulton) (see Hara et al. 2002), and *C. leeuweni* (Karny), which also share the same hosts, including banana, ti, and anthurium. Banana rust thrips can be differentiated from the other two species by clear differences in body features (specifically, the presence in females of body hairs and glands that are visible only with a microscope [Sakimura 1975]).

Hosts

The primary hosts of banana rust thrips are anthurium, ti, dracaena, and banana. They also infest immature fruits of orange, tangerine (mandarin), and tomatoes, as well as green beans.

Damage

The appearance of feeding damage caused by banana rust thrips varies with the host plant species. In most cases, thrips prefer to feed on very young, succulent, immature fruits, flowers, and foliage.

On dracaena and ti (Fig. 1a), thrips can be observed feeding in the whorls of immature leaves, causing discoloration and silvering (characterized by long white streaks) as well as random squiggles or curlicues near the petiole end of developed, unfurled leaves. Also, particularly on red ti varieties, the immature leaves may fail to unfurl and thus appear as deformed leaf whorls (Fig. 1b).

On anthurium, banana rust thrips damage appears as white streaks or scarring on the front and back of the spathe, deformed spathes, and, with age, bronzing of injured tissues (Fig. 1c). In severe cases, mature anthurium spathes fail to open, plant growth may be reduced, and the foliage may be affected by deformity, bronzing, and streaking. Damage by banana rust thrips to certain anthurium cultivars, such as 'Kalapana' and 'Ozaki', may appear as curlicues rather than streaks.

On banana, feeding damage is observed on the pseudostem, but it is the injury to the fruit that significantly affects marketability (Fig, 2). Thrips feeding in leaf sheaths results in characteristic dark, V-shaped marks on the outer surface of leaf petioles. Damaged tissue becomes bronzed or rust-colored with age. Feeding damage to the fruit occurs on fingers soon after the flower petals dry, initially typified by a water-soaked appearance. Young fruits may have dark, smokey-colored random squiggle or curlicue feeding tracks on the surface. On mature fruit, oval-shaped, reddish "stains" may be seen where the fingers touch. Extensive damage may cover more of the fruit surface with reddish-brown or black discoloration and superficial cracks. Though unmarketable, such fruits are still edible.

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Biology

Adult banana rust thrips reproduce sexually. After mating, females lay kidney-shaped eggs that are invisible to the naked eye by depositing them in plant tissues where the thrips feed. Eggs hatch in 6–9 days; the newly hatched yellow nymphs feed for a few days before molting into the second nymphal stage, which is yellow or orange and feeds for a few more days. After 8–10 days, mature nymphs migrate off the host plant into the soil or growth medium below and molt into prepupae that look similar to nymphs but have wing pads. After 2– 5 days, prepupae enter the pupal stage, which has longer wing pads. Both stages remain in the soil, medium, or surface debris beneath the host plant and are capable of crawling but do not feed. In 6–10 days, the adult emerges from the pupal cells and may remain beneath the surface for up to 24 hours before making its way up to reinfest the host plant.

Adult female banana rust thrips are slender, creamy yellow to golden brown, and 1/16–1/25 inch long (about the thickness of a dime; Fig. 3). Their wings have dark, eye-like spots at the base and are fringed; when the wings are folded, the adult appears to have a black line down its back.

The entire life cycle (egg to adult, Fig. 4) is completed in approximately 28 days, but it may take up to 3 months during cooler seasons. Higher temperature and humidity and new growth of host plants appear to be favorable to thrips' feeding and breeding, leading to heavier infestations and greater damage during the summer months.

Biological control

In Hawaii, anthocorid bugs (*Orius tristicolor*, *O. persequens*, and *O. insidiosus*), are general thrips predators, but the extent of their effectiveness against banana rust thrips is not known. Some lacewings, ladybird beetles, and predacious mites may also exert some control on nymph and adult thrips, while ants may prey on prepupae and pupae in the soil, growth medium, or surface debris near the base of the host plant. Several fungi, including *Paecilomyces* spp. and *Verticillium lecanii*, have been isolated from other thrips species and may infect banana rust thrips as well.

Cultural control

Remove infested flowers and foliage from the field or shadehouse to eliminate sources of thrips. Discard old stock plants that may harbor thrips, and obtain thrips-free propagative material for restocking.

There are no reports of resistant or susceptible anthurium cultivars, although injury is more noticeable on

Figure 1. Feeding damage by banana rust thrips on ti and anthurium: A. Streaks and curlicue markings on opened ti leaf. B. Deformed leaf whorls on red ti that failed to unfurl. C. Deformed anthurium spathe.

Figure 2. Damage to banana fruit by banana rust thrips.

pastel shaded cultivars such as 'Marian Seefurth'.

In banana plantings, covering bunches with polyethylene bags during fruit development provides a physical barrier to insect infestations, but bags cannot fully protect the fruit when a thrips infestation is heavy.

Biorational control

A hot-water dip at 120°F (49°C) for 10 minutes before planting can disinfest anthurium propagative material of banana rust thrips. Banana, dracaena, ti, and anthurium have all shown potential for heat treatment, although cultivar sensitivity has been observed to vary with season. Tests indicated that some anthurium cultivars tolerate hot-water treatment as top cuttings with leaves, including 'White Lady', 'Blushing Bride', and 'Kozohara', while the 'Ozaki' cultivar cannot tolerate the hot-water dip except as whole stem pieces (*gobo*). The dracaena cultivar 'Janet Craig' was also tolerant of hot-water treatment. Due to variations among cultivars and growing conditions, small-scale phytotoxicity tests should be conducted before a large amount of propagative material is hot-water treated.

Chemical control

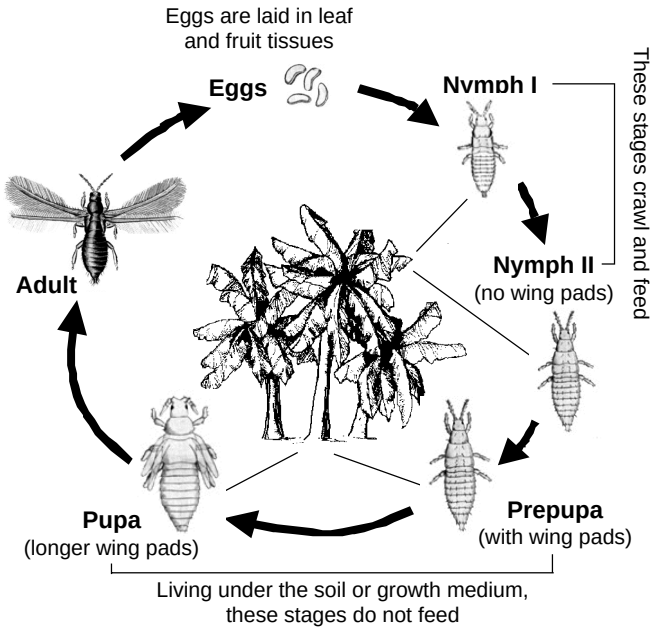
Figure 3. Adult banana rust thrips.

Because pesticide registrations may change, consult a chemical sales representative, the Hawaii Department of Agriculture, or the CTAHR Cooperative Extension Service for information on insecticides currently approved for use against thrips in a particular crop.

Remove infested flowers and foliage from the field or greenhouse to allow increased insecticide penetration and coverage. Growers have reported that banana rust thrips tends to be more difficult to control than anthurium thrips, possibly due to the former's pesticide tolerance and greater reproductive capacity. Growers are advised to consider insect development of pesticide resistance in devising their integrated pest management practices.

Generally, thrips populations increase during the summer and decrease during the winter due to fluctuations in temperature and rainfall. Consequently, repeated spray applications may be needed only from May

Figure 4. Life cycle of the banana rust thrips.



Insect drawings from D. Schulz (see *References*).

through August. Foliar sprays are usually applied two to three times at 2-week intervals for moderate to severe thrips infestations. Since thrips prefer young, growing plant tissue, direct insecticide sprays to the area of bud development or, in anthurium, to the base of the plant, where the spathes develop. Use caution when applying insecticides on anthurium, because phytotoxicity varies among cultivars and is more likely to occur under hot, dry growing conditions. When thrips injury is sustained during the bud stage, injured anthurium flowers will be harvested for at least a month following application of an effective insecticide.

In banana, spraying the immature bunches and the surrounding soil can significantly reduce thrips damage to the fruit; when bagging bunches, spray just before bagging. A contact, granular insecticide applied in a 30-inch radius around each banana plant is effective against the prepupal and pupal stages of banana rust thrips that inhabit the soil. No granular insecticide is currently registered for use on anthurium.

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