The Ficus Leaf-Rolling Psyllid

A New Pest of *Ficus microcarpa*

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Figure 1. The FLRP, perhaps new to the Western Hemisphere, causes a distinctive, tight, complete leaf rolling on *Ficus microcarpa* (D. R. Hodel).

A psyllid, perhaps new to the Western Hemisphere and that causes a distinctive, tight, typically complete leaf rolling (**Fig. 1**), has been found on *Ficus microcarpa* (Chinese banyan, Indian laurel fig) in Los Angeles, Orange, San Bernardino, Ventura, San Diego, and Riverside counties. This species of *Ficus* is one of our most common, useful, and widespread, ornamental landscape trees (**Fig. 2**), and has long been a target for numerous pests.

Co-author Linda first detected this pest on trees in Carson south of Los Angeles in February, 2016. We have observed it throughout the area, including western Los Angeles, Pasadena, Duarte, Long Beach, Lakewood, Claremont, and Universal City (San Fernando Valley) in Los Angeles County; Irvine and Anaheim in Orange County; Thousand Oaks in eastern Ventura County; Oceanside in northern San Diego County; Montclair in western San Bernardino County; and Corona in western Riverside County. It is

Figure 2. *Ficus microcarpa* is one of our most common, useful, and widespread, ornamental landscape trees, as here lining Bellflower Blvd. in Lakewood (D. R. Hodel).

Figure 3. Co-author Gevork "sweeps" the periphery of the canopy of *Ficus microcarpa* for the FLRP (D. R. Hodel).

Figure 4. Co-authors Gevork and Linda examine the trappings of the "sweep" (D. R. Hodel).

likely widespread, perhaps even outside this six-county area.

We have identified this psyllid, which we call the Ficus leaf-rolling psyllid (FLRS), to be in the family Triozidae and tentatively to the genus *Trioza*. California Department of Food and Agriculture entomologist and thrips specialist Alessandra Rung has just reported to us that Daniel Burckhard, a psyllid specialist at the Natural History Museum of Basel in Switzerland, has identified the FLRP as *Trioza brevigenae*. Named and described in 1973 by R. N. Mathur, it is native to northern India but little else is known about it.

Here we provide information about the history of the detection, damage symptoms, description of the pest, and possible management strategies. Unfortunately, little is known about FLRS.

History

In February, 2016, while looking for pests on a *Ficus microcarpa* (sometimes incorrectly referred to as *F. nitida* or *F. retusa*) in Carson, Linda noticed numerous branch tips with leaves completely and tightly rolled (**Fig. 1**). This damage is remarkable in its rather sudden appearance because this same tree was inspected one month earlier for other pests and the rolled leaves were not observed. Linda alerted co-author Donald and in April the two of them made further observations, detections, and collections, and with this additional information contacted co-author Gevork (**Figs.3-4**).

Damage

So far we have observed the FLRP only on *Ficus microcarpa*. Damage is fairly obvious and unusually conspicuous on heavily infested trees. Leaves at the branch and twig tips are tightly and typically completely rolled into a narrow cylinder (**Figs. 1, 5**), sometimes eventually compressed to only about 3-5 mm in diameter (**Fig. 6**). The rolling process begins at the distal end or leaf apex and, like two cresting waves, progresses adaxially (upper leaf surface) along each margin and proximally toward the leaf base (**Fig. 7**). One rolled margin eventually overtakes the other, actually forming a cylinder with two tubes (**Fig. 8**). In some instances only one margin rolls, in which case the rolling stops at the leaf blade midrib. The rolled leaf is brittle and remains green throughout although other pests, such as *Josephiella microcarpae* (the leaf gall wasp) and various mealybugs, might be present and discolor or further deform the cylinder of rolled leaves. Indeed, the rolled leaf provides protection and harborage for several other insects and spiders as well.

The rolled leaves could be mistaken initially for damage from *Gynaikothrips ficorum* (the Cuban laurel thrips), which creates a gall by folding the leaf blade adaxially along the rachis. However, careful observation will quickly show the distinct difference between the rolled leaf (cause by the FLRP) and folded leaf (caused by Cuban laurel thrips). Indeed, the FLRPs shape the leaf to look more like the Mexican food *taquito* (tightly rolled

Figure 5. Leaves infested with the FLRP are tightly and typically completely rolled into a narrow cylinder (D. R. Hodel).

Figure 6. Sometimes the rolled cylinder of leaves reaches only about 5 mm in diameter (D. R. Hodel).

Figure 7. The rolling process begins at the distal end or leaf apex and, like two waves, progresses adaxially (upper leaf surface) along each margin and proximally toward the leaf base. Note the adult FLRP perched at the junction of the two rolled leaf margins (D. R. Hodel).

Figure 8. One rolled margin eventually overtakes the other, actually forming a cylinder with two tubes (D. R. Hodel).

tortilla) while the Cuban laurel thrips cause the leaf to look more like a *taco* (folded *tortilla*). Also, the folded leaf gall from the Cuban laurel thrips typically has dark or purplish flecking or stippling on the abaxially leaf surface. Other insects, such as mealybugs, and even spiders can sometimes cause leaves to roll although in such instances the leaf is more loosely rolled and not nearly as distinctively tight as with the FLRP (**Fig. 9**).

Because the FLRP is likely a new arrival, we know nothing about its long-term impact on tree health. If damage is mostly restricted to few or several leaves, long-term health would likely not be significantly affected; in such cases it could be considered simply a nuisance esthetic issue. On the other hand, if most or every new leaf is infested and rolled, as it appears it is going to be on at least one of the trees we saw, esthetic damage would be significant and tree health would likely decline because of reduced photosynthesis.

Figure 9. Occasionally other insects and spiders can sometimes cause leaves to roll although in such instances the leaf is more loosely rolled and not nearly as distinctively tight (left) as with the FLRP (right) (D. R. Hodel).

The FLRP appears to be nearly exclusively attracted to the newest developing leaves, which are softer, more pliable, and easier to roll, rather than simply the leaves' position on the canopy periphery where they would be first encountered. If further study shows this observation to be true, it will impact how this pest can be managed culturally and mechanically.

Description and Identification

Psyllids are somewhat difficult to identify; many psyllid species remain poorly documented because the specimens, including types, tend not to remain intact over time, obliterating features critical for diagnosis and forcing one to rely on less than adequate, abbreviated descriptions, sometimes only a few words in length.

Peeling back the rolled leaf blades typically reveals various developmental stages of FLRP nymphs (**Figs. 10-11**). Metamorphosis is gradual. Immatures are 1-2.5 mm long, oblong, dark grayish tan initially changing to brownish and then brownish

Figure 10. Peeling back the rolled leaf blades typically reveals various developmental stages of the FLRP (D. R. Hodel).

Figure 11. An FLRP perches on the leaf margin (D. R. Hodel).

Figure 12. Immature FLRPs are 1-2.5 mm long, oblong, dark grayish tan initially changing to brownish and then brownish green, with a skirt of white, waxy filaments longest at anterior and posterior ends of the body (G. Arakelian).

green. Advanced nymphal instars have skirts of long, white, waxy filaments at cranial and caudal parts of their bodies (**Fig. 12**). Wing pads are typically visible in later developmental stages and are extended anteriorly close to eye level. Cast skins of last instar FLRP nymphs are often seen attached to the leaves

Figure 13. Cast skins of last instar FLRP nymphs are often seen attached to the leaves (G. Arakelian).

(**Fig. 13**), from which the adults have emerged (**Fig. 20**).

Adult FLRPs are typically found outside and adjacent to rolled leaves (**Figs. 7, 14-15**); apparently they exit the confines of the rolled leaf immediately upon reaching adulthood. Adults are small (about 2.6-2.8 mm long). The head and thorax are brownish

Figure 14. Adult FLRPs are typically found outside and adjacent to or on rolled leaves. Note cast skin of late instar FLRP nymph in upper left (D. R. Hodel).

Figure 15. Adult FLRPs are frequently observed with raised abdomens, which they move from side to side like a dog wagging its tail (D. R. Hodel).

green. The abdomen is green when young and brown when old. Wings are 3 mm long, transparent, with no color pattern, and extend beyond the posterior end of the abdomen. Eyes are red and protruding (**Figs. 16-17**). Females are larger than males.

The FLRP exhibits two peculiar behaviors. In one, the more common of the two observed, it sits on a leaf blade or perches on the margin of a rolled leaf, raises its abdomen until it is at about a 45 degree angle (**Figs. 14-15**), and then moves it from side to side like a dog wagging its tail. In another, it extends one wing until it is at a right angle to the body, as if stretching prior to working out, then waves it back and forth while walking.

Figure 16. Adult FLRPS have transparent wings that extend beyond the abdomen and red, protruding eyes (G. Arakelian).

Figure 17. The red, protruding eyes, green abdomen, and long, transparent wings characterize the FLRP (G. Arakelian).

We have also observed that the FLRP seems much more active in warmer, still weather, with temperatures ranging from 25 to 30 C (76 to 86 F) or higher, underscoring its likely tropical origin. It is less conspicuous on cooler, cloudy, breezy days.

Amazingly, we have detected a second, likely new and/or unidentified, possible psyllid associated with the FLRP. We have seen no adults of this second possible psyllid, only early instars. They are about 0.75 mm long, oval, flat, and orange with red eyes (**Fig. 18**). They are only on the outside of the rolled leaf and are sunken in a shallow pit so that the top of their body is level with the surrounding leaf surface (**Fig. 19**). This second possible psyllid is easy to miss because of its small size and sunken nature in the leaf surface. They do not appear to be causing any significant damage and might simply be opportunistic feeders, attracted to the rolled leaf that the FLRP has already attacked and made more palatable and appealing for feeding. Further study is needed to identify this second possible psyllid and confirm its association with the FLRP.

Management

Unfortunately, nothing is known about the management of the FLRP and additional work will likely be sorely needed. The spectrum of natural enemies of FLRP has not been studied although we have found lacewings, lady beetles, and pirate bugs among the leaves. Until the FLRP is identified and more is known about its natural history, innoculative biological control holds little promise although naturally occurring biocontrols are likely present. Management options likely warranting evaluation include vigilant scouting, followed by judicious and immediate removal, bagging, and disposal of shoot tips with infested leaves, which could be combined with ground and foliar treatment with systemic pesticides for rare, exceptional, noteworthy and valuable tree specimens. Although not yet tested for FLRP, cover/barrier residual insecticides might be effective; however, while they have relatively long residual effects, they can also negatively affect beneficial insects and other nontarget invertebrates.

Frequent, periodic pruning, as is done for hedges and topiary, might also be an effective management technique by constantly removing infested leaves. Such regularly pruned specimens frequently have been observed with less damage from foliar pests, including, the leaf gall wasp, Indian laurel thrips, and the FLRP. Because the FLRP likely primarily attacks new, soft, pliable, unfurling new growth, management techniques that suppress new growth, such as withholding or lowering irrigation and fertilizers, might also

Figure 18. Early instars of a second, as yet unidentified possible psyllid, perhaps in a symbiotic, opportunistic relationship with the FLRP, are about 0.75 mm long, oval, flat, and orange with red eyes (G. Arakelian).

be effective techniques for reducing infestations. Indeed, we have observed neglected trees with little or no irrigation and much reduced new growth that have many fewer pests, including leaf gall wasps, Indian laurel thrips, and the FLRP.

The cultivar *Ficus microcarpa* 'Green Gem', which appears more resistant to some pests like the Indian laurel thrips, does not appear to be resistant to the FLRP. Another cultivar, *F. microcarpa* 'Variegata', is also susceptible to the FLRP.

Figure 19. Early instars of the second possible psyllid are only on the outside of the rolled leaf and are sunken in a shallow pit so that the top of their body is level with the surrounding leaf surface (D. R. Hodel).

Figure 20. Adult FLRP emerges from cast skin (G. Arakelian).

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