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Tuliptree Aphid Scientific Name: *Illinoia liriodendri* (Monell) (Insecta: Hempitera: Aphididae)[1]

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

The tuliptree aphid, *Illinoia liriodendri* (Monell) (Figure 1) is a specialist, sap-feeding insect herbivore of tulip poplar (*Liriodendron tulipifera*) that commonly reaches high densities on trees planted in urban settings. *Liriodendron tulipifera* is a large tree species native throughout eastern North America known commonly as tuliptree or tulip poplar (Driestadt and Dahlsten 1988). This tree is a common ornamental species used in urban forests throughout the mid-Atlantic states of North America. Although it occurs mostly in temperate regions, *Illinoia liriodendri* can be found in most places where tulip poplar is grown. While its effects are recognized to be mostly aesthetic, heavy infestations of tuliptree aphid can significantly impact young trees by causing premature leaf drop and reducing aesthetic quality. *Illinoia liriodendri* is considered the most important insect pest of this tree species in urban landscapes (Frank 2019).

Figure 1. Adult and immature tuliptree aphids, *Illinoia liriodendri* (Monell), on the underside of a tulip poplar leaf.
Credits: Lyle Buss, UF/IFAS

Nomenclature

The tuliptree aphid was first described by Monell in 1879 as *Siphonaphora liriodendri*. Its scientific name has been revised multiple times and prior identifiers are listed below (GBIF Secretariat 2021, Kim et al. 2011). Besides *Illinoia liriodendri*, the name most commonly seen in literature is the previously recognized *Macrosiphum liriodendri*.

Illinoia liriodendri (Monell, 1879)

Macrosiphum liriodendri (Monell, 1879)

Nectarophora liriodendri (Monell, 1879)

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Siphonophora liriodendri(Monell, 1879)

DistributionTuliptree aphids are native to eastern North America but are commonly found wherever their host trees, *Liriodendron tulipifera*, are. Thus, tuliptree aphids have been recorded in locations where tulip poplars are not native but are cultivated as an ornamental tree. Outside of the eastern U.S., tuliptree aphids have been documented in California (Driedstadt 1987), western Europe and Asia (Influential-points 2022), Hungary (Bozsik 2012), Slovakia (Kollar and Barta 2016), and Serbia (Petrovic-Obradovic et al. 2018).

Description

Apterous (wingless) adults (Figure 2 and Figure 3) are approximately 3 mm long, pale green, and possess long siphunculi or cornicles (indicated by a blue arrow on Figure 2) that are darkened, particularly on the distal (distant) ends. The cauda (indicated by a yellow arrow on Figure 2) is pale yellowish green to pale green, roughly half the size of the siphunculi, with six hair-like projections called setae. Antennae (indicated by the red arrow on Figure 2) are exceptionally long and pale brown, darkening towards the distal ends. The legs are long with green femurs (as indicated by an orange arrow in Figure 2), followed by pale green tibia that are brown to black at the proximal and distal ends (indicated by green arrows on Figure 2), and end in deep brown tarsi (indicated by a purple arrow in Figure 2). Alate (winged) adults (Figure 4) appear similar to wingless adults, except with wings attached to an orange to light brown thorax, with darker legs (Kollar and Barta, 2016).

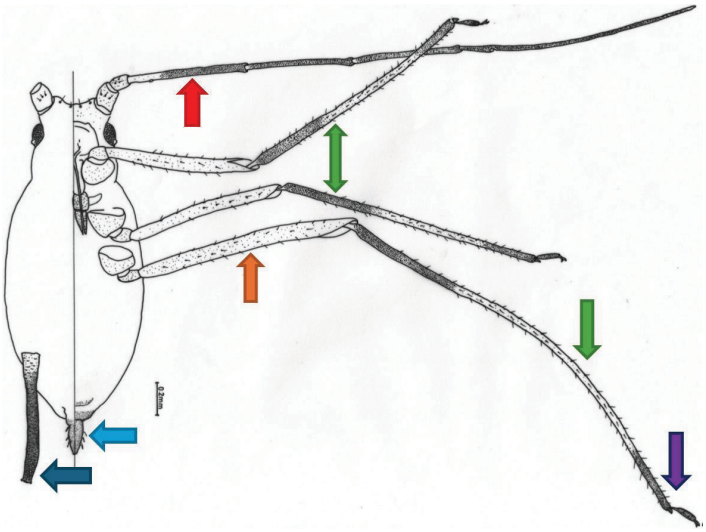

Figure 2. *Illinoia liriodendron* apterous adult female with dorsal (top) side illustrated on the left, ventral (under) side illustrated on the right, and notable body segments identified by colored arrows.
Credits: Image adapted with permission from Petrovic-Obradovic et al. (2018)

Life Cycle

Male and oviparous (egg-laying) female aphids develop in the late fall, and during this time fertilized eggs are deposited in bark crevices near the leaf buds of tulip poplars, where they overwinter as eggs until spring. The pale green eggs hatch in the spring upon the first flush of new leaves, where aphid nymphs move to feed and develop on phloem sap from the underside of leaves. Adult females reproduce parthenogenically (without mating) throughout the spring and summer (Driestadt and Dahlsten, 1988), and can produce eggs (oviparity) or give birth to live (viviparity) female young (Figure 5). The parthenogenic reproductive cycle and overlapping generations allows tuliptree aphid populations to dramatically increase through the spring and summer. Alate (winged) adults of both sexes are produced in late fall to facilitate mating, the production of overwintering eggs, and dispersal to viable overwintering sites (Bozsik, 2012, Dreistadt and Dahlsten, 1988).

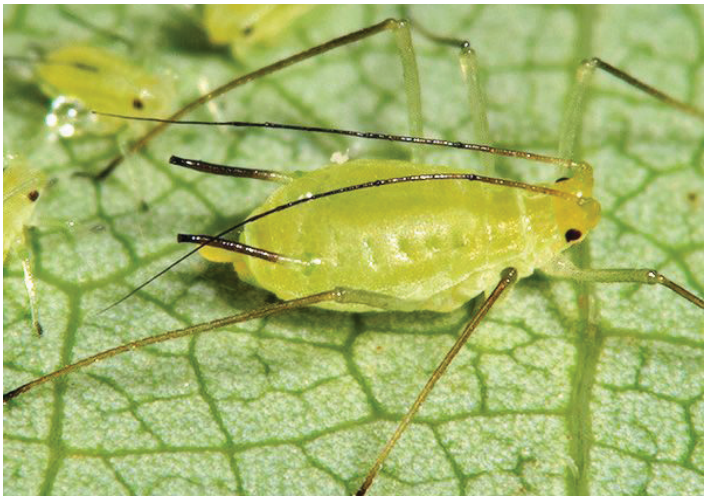

Figure 3. An apterous (wingless) adult *Illinoia liriodendri*.
Credits: Image provided with permission from https://influentialpoints.com/

Figure 4. An alate (winged) adult *Illinoia liriodendri*.
Credits: Image provided with permission by https://influentialpoints.com/

Figure 5. Wingless (apterous) adult female *Illinoia liriodendri* giving birth to a live nymph, who will immediately begin feeding on sap within tulip poplar leaves.
Credits: Lyle Buss, UF/IFAS

Hosts

While tuliptree aphids are reportedly monophagous (host specific) to *Liriodendron tulipifera*, they have also been reported on one other species within the Magnoliaceae family, *Magnolia grandiflora*, in Europe(Kollar and Barta, 2016).

Economic Importance

Tuliptree aphids feed on phloem within tree leaves, extracting nutrients and creating signs and symptoms typical of many sap-feeding pests. The presence of these aphids is rarely associated with causing tree decline but has notable aesthetic and nuisance impacts when high populations cause significant honeydew accumulation on surfaces beneath infestations, sooty mold growth on honeydew, leaf chlorosis (yellowing), and premature leaf drop, particularly on young and heavily infested trees. Honeydew accumulation also attracts other insects such as ants, wasps (Figure 6), and beetles that feed on the honeydew (Bozsik 2016, Kollar and Barta 2016). This increase in wasp activity may be undesirable for some people if trees are in close proximity to recreational or leisure spaces. Honeydew excretion by aphids increases during warmer temperatures when aphid feeding activity also increases (Dreistadt, 1987). Due to their tendency to reach high densities on tulip poplar in urban and residential settings, insecticide applications to suppress aphid activity are common, which comes with associated monetary cost and the potential for non-target impacts depending on the insecticides used.

Management

Monitoring tulip poplars for tuliptree aphid presence and population density is important for preventing severe infestation and negative impacts. Beginning in late spring or early summer, periodically inspecting tulip poplar leaves for typical signs and symptoms of aphid infestations can facilitate early detection and management action, if needed. Another common pest of tulip poplar is the tuliptree scale (*Toumeyella liriodendra; https://entnemdept.ufl.edu/creatures/orn/scales/tuliptree_scale.htm*), which also excretes large volumes of honeydew. Therefore, it is important to identify the source of honeydew excretion. Tuliptree aphids can be effectively managed with a variety of strategies including proper plant healthcare, biological control agents, and insecticides. Managing tuliptree aphids may be challenging in some cases since tulip poplar trees can grow exceptionally tall and have dense canopies, making monitoring challenging and foliar pesticide application impractical. Due to their large mature size, it is often encouraged to plant tulip poplars in areas with more room to grow and where they will not interfere with urban and residential activities like vehicular traffic, buildings, and impervious surfaces (Dreistadt, Dahlsten, and Hagen, 1988). Although not well understood for these species, tulip poplars planted in areas with less pavement and more vegetative cover may be less susceptible to high density *Illinoia liriodendra* infestations caused by increased heat and tree stress (Dale and Frank, 2017).

Figure 6. Paper wasp feeding on accumulated honeydew excretions on the surface of a tulip poplar leaf directly beneath a high density *Illinoia liriodendri* infestation.
Credits: Adam Dale, UF/IFAS

Biological Control

Natural predators of *Illinoia liriodendra* are typically highly active and easily observed among populations of the aphid. Multiple predacious insect taxa are reported to attack tuliptree aphids such as lacewings (Bozsik, 2012), lady beetles (Figure 7), hoverfly larvae, pirate bugs (Dreistadt, Dahlsten, and Hagen, 1988), and parasitoid wasps. Tuliptree aphids attacked by parasitoids are brown or black, immobile, and commonly called 'mummies' (Figure 8). Previous surveys of parasitized tuliptree aphids indicated the presence of twelve parasitoid species, primarily in the genus, *Aphidius* (Zuparko and Dahlsten, 1993). It is important to note that pesticide selection and use can dramatically influence the effectiveness of predators and parasitoids in suppressing aphid infestations. Therefore, product selection and application methods are critical to evaluate before taking pest management action.

Figure 7. Lady beetles are common predators of tuliptree aphids. Here a tuliptree aphid and lady beetle can be observed on the underside of a tulip poplar leaf.
Credits: Dr. Steven Frank, NC State University

Figure 8. Brown aphid mummy parasitized by a wasp, among a population of *Illinoia liriodendra* on the underside of a tulip poplar leaf.
Credits: Dr. Steven Frank, NC State University

Chemical Control

In high-density *Illinoia liriodendri* infestations, insecticides may be the best option to reduce infestations and associated plant damage. There are several insecticide options that can effectively suppress aphid populations. However, tree size and location may determine the required application method (e.g., foliar spray, soil drench, tree injection) and product. For small- to medium-sized trees, horticultural oils and insecticidal soaps targeting the undersides of leaves can be used to manage tuliptree aphids with minimal harm to natural predators and parasitoids, but they require direct contact with the aphids to achieve control. For larger trees or trees located where a foliar spray application is not safe or practical, soil drench or root flare injections are likely a better solution. These application methods use systemic insecticides, which can be highly effective against aphid pests (Bozsik 2012, Dreistadt and Dahlsten, 1988).

Systemic insecticide applications to tulip poplar are not recommended unless aphid infestations threaten tree survival or pose another severe threat. This is because tulip poplar is a primary host plant for the eastern tiger swallowtail butterfly (Papilio glaucus) (Hall and Butler, 2021) and serves as an important resource for this insect and other wildlife that rely on it (e.g., birds) in urban landscapes. Systemic insecticides get expressed within leaf tissue throughout the tree. Therefore, an application targeting aphids will also likely negatively affect butterfly caterpillars feeding on leaf tissue. Mature tulip poplars (about 15 years old or more) also produce flowers in the spring that are highly attractive to pollinators. Therefore, use of insecticides should be mindful of flower presence or time until flowers are produced, to minimize any potential exposure of insecticides to pollinators via contaminated flower resources.

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