



Spanish needle



Dogfennel



Mexican primrose willow

Photos by Ramdas Kanissery

Figure 1. Three citrus weeds were investigated for their potential to serve as a feeding source for Asian citrus psyllids.

Weed control may help psyllid management

By Ramdas Kanissery, Justin George and Lukasz Stelinski

Weed management is a crucial component in Florida's citrus production. Recent University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) research shows that weed management may have additional pest management benefits for citrus growers. Maintaining a weed-free grove and perimeter areas may help improve management of the Asian citrus psyllid (ACP), the insect vector that spreads HLB disease.

HLB management in citrus, in large part, has focused on managing the psyllid vector. Citrus, the predominant host, is less suitable for psyllid survival or reproduction when no new flush is available or during times when insecticide residues are on leaf surfaces. Under these circumstances,

psyllids may derive shelter and/or food resources from non-host plants such as weeds that are abundant in and around citrus groves.

UF/IFAS researchers specifically investigated whether temporary weed hosts could facilitate ACP survival and reproduction in the absence of more suitable hosts. To understand this, researchers measured feeding behavior, longevity and reproduction of ACP on common weed species that are abundant in and around citrus groves.

WEEDS INVESTIGATED

This work follows up on research conducted by the late UF/IFAS entomologist Phil Stansly and his team. They found that the psyllid may be able to use weeds as a way station

where shelter and perhaps other resources are obtained during the search for its preferred host, citrus. The three weed species investigated in the study for their potential ability to serve as alternative hosts for ACP were Spanish needle, dogfennel and Mexican primrose willow (Figure 1).

Spanish needle (*Bidens alba*), also known as common beggar's tick, is a perennial weed frequently found in citrus groves. It is known for prolific seed production, where each plant produces approximately 1,000 seeds. The seeds can stay viable for three to five years in the soil and are spread by wind, water, equipment, humans and animals. Spanish needle can flourish in groves, resulting in a monoculture of the weed, and consequently compete with the citrus trees for resources and interfere with grove operations. While this weed can be managed chemically by pre- and post-emergent herbicides, its ability for massive seed production in combination with fast reestablishment from soil seed banks results in a year-round presence in citrus groves.

Dogfennel (*Eupatorium capillifolium*) is another perennial weed that has been found throughout the southeastern United States. It is a troublesome weed in citrus groves and is

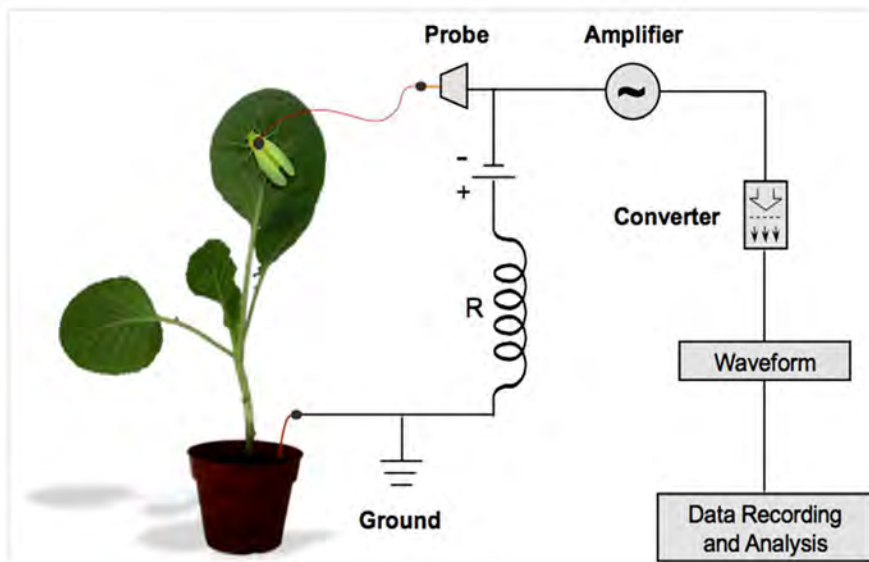


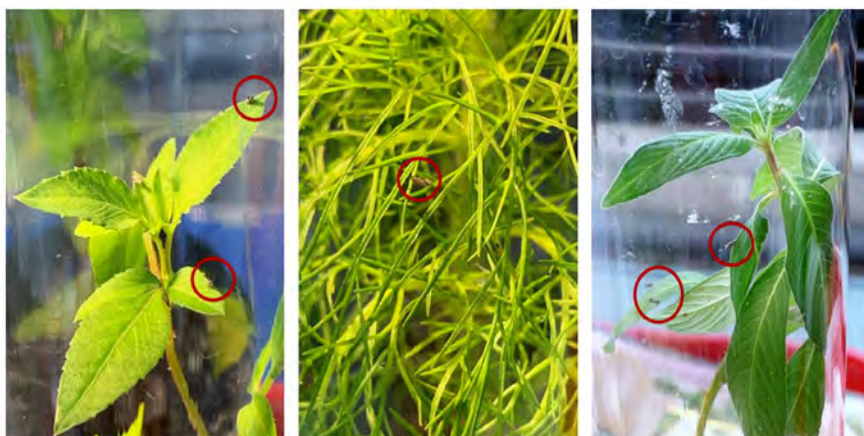
Figure 2. This schematic representation shows how electrical penetration graph technology was used for recording psyllid feeding behavior.

Image credit: Liu et al. 2013



Figure 3. An experiment was set up to record psyllid feeding on weeds using electrical penetration graph technology.

Photo by Justin George



Photos by Justin George

Figure 4: Asian citrus psyllids feeding on Spanish needle (left), dogfennel (middle) and primrose willow (right).

currently the most occurring pasture weed in Florida. The plant can grow to heights of 6 feet or more and is characterized by succulent, thick and furry stems and lace-like foliage. Dogfennel establishes quickly through seeds and can also spread from underground roots. Management of dogfennel stands can be challenging.

Mexican primrose willow (*Ludwigia octovalvis*) is a weed that thrives in citrus groves, especially in grove perimeter areas. Primrose willow is highly tolerant of fluctuating water levels and is abundant in irrigation canals and drainage ditches. The weed is resistant to harsh conditions in the grove. For instance, its tissues swell rapidly when immersed in water as a defense mechanism against waterlogging.

ACP FEEDING BEHAVIOR

Asian citrus psyllids perform xylem- and phloem-feeding activities on citrus leaf and stem tissues. While xylem feeding contributes to maintaining water balance, phloem feeding is for ingesting nutrients that are important in survival and reproduction. Determining psyllid feeding behavior, particularly xylem- and phloem-feeding activities on weed plants, is necessary to understand the dynamics of ACP movement, survival and persistence in and around citrus groves.

The study objectives were to measure the potential of citrus weeds that are prevalent in the ditches and beds of poorly managed groves to serve as viable secondary hosts to psyllids and to spread from HLB-affected to non-infected citrus. Electrical penetration graph (EPG) technology was used as a tool for quantifying the complex feeding behaviors of psyllids on weed plant tissues. EPGs are recordings of resistance changes (electrical potential) following the penetration of psyllids' mouthparts into specific plant tissues. The EPGs allow quantification of the amount of time spent in feeding and/or penetration activities (Figure 2 and Figure 3).

The 18-hour-long EPG recordings and behavioral assays provided new information about the feeding behavior of psyllid nymphs and adults on Spanish needle, dogfennel and Mexican primrose. The EPG recordings combined with insect behavioral

assays demonstrated that psyllids could extend their survival by feeding on the xylem of these weed plants and thus use them as a source of water in the absence of host plants (Figure 4, page 16).

The results from this study provide insights on how psyllids utilize secondary or alternate hosts for survival following insecticide treatment or during dispersal. However, results showed that both adult and immature psyllids were unable to successfully feed on the phloem of weed plants, likely limiting their ability for reproduction on weeds.

IMPLICATIONS

Adequate and timely weed management in groves and surrounding areas may reduce the favorable plant bank for psyllids during periods of inhospitable grove conditions. For instance, when the resources for psyllid feeding are absent, or stress in the form of insecticide application is present, psyllids may seek shelter on citrus weeds and use them as a source of food.

Hence, to fine-tune integrated pest management for psyllids, appropriate weed management should be considered as a possible method to reduce resistant populations. Cultural approaches, including weed management, may help reduce ACP populations and improve plant health.

If unmanaged, weeds compete with trees for resources, subsequently affecting tree growth and productivity. Weeds may also create a favorable environment for pathogens that can infect tree trunks and roots. Weeds can also hinder horticultural operations, obstruct irrigation systems and reduce the efficacy of soil-applied fertilizer and chemicals.

For more information about managing weeds in citrus, see UF/IFAS Electronic Data Information Source publication HS-107 (<https://edis.ifas.ufl.edu/cg013>).

Ramdas Kanissery is an assistant professor at the UF/IFAS Southwest Florida Research and Education Center in Immokalee. Justin George is a postdoctoral researcher and Lukasz Stelinski is a professor, both at the UF/IFAS Citrus Research and Education Center in Lake Alfred.



Gain peak crop performance with the SOAR[®] micronutrient program.

- ✓ Better bloom
- ✓ Higher yields
- ✓ More pounds of solids
- ✓ Disease resistance

soar
BLOOM SPRAY + CITRUS MIX

4206 Business Lane | Plant City, Florida | 33566
Always read and follow label directions carefully. Soar[®] is a registered trademark of Chemical Dynamics, Inc. ©2020 Chemical Dynamics. All Rights Reserved.

CHEMICAL DYNAMICS
Our Business Is To Help You Grow

800.277.4950

CHEMICALDYNAMICS.COM

Raising quality trees for 41 years

Dilley
Citrus Nursery

Linda & Jim Dilley
863.368.2187
863.368.1997

- Certified Registered 4" Containers
- Rootstocks: All old Lines & X639, US802, US812, US942, US897
- UF Varieties
- Taking orders for 2020 & 2021

