Citrus INDUSTRY Est. 1920

Developing snail management programs in Florida citrus

BY LAUREN DIEPENBROCK AND NICOLE QUINN

In recent years, a new pest has been added to the ever-evolving scope of pest management in Florida citrus: *Bulimulus bonariensis* snails. These snails, also referred to as ghost snails or peanut snails, were reported to be clogging irrigation jets in Central Florida in 2020 in limited locations. Now, in 2025, they have spread throughout Florida and much of the southeastern United States. They impact a broad array of agricultural commodities and are becoming problematic in residential areas as well.

In citrus, the primary impacts documented to date include microjet clogging (Figure 1), defoliation within individual protective covers (IPCs) and occasional trunk damage to green stems (Figure 2). Additionally, the snails have been noted to feed at sites of previous canker lesions on fruit (Figure 3) and under bark after freeze damage (Figure 4).

Because this snail is a recently established pest, there is much that is not known about its biology or the best management options. As such, this article serves to share the information that University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) researchers are developing about *B. bonariensis* snails in citrus to help growers make informed management decisions.

Photo by L. Diepenbrock

Figure 1. Snails covering microjet

Photo by L. Diepenbrock

Figure 2. *Bulimulus* snails feeding on green trunk

Photo by A. Paolillo

Figure 3. Canker lesions after snail feeding

Photo by L. Diepenbrock

Figure 4. Snails feeding at site of bark cracking from frost damage

SEASONAL BIOLOGY

While *B. bonariensis* snails can be found throughout much of the year, their presence is most obvious in groves in late spring/early summer before the rainy season starts. The snails are not only abundant on tree trunks at this time, but they also tend to cluster on microjets, which leads to reduced irrigation efficiency. This can have severe ramifications on HLB-affected trees by impacting the ability of both water and nutrients to reach roots.

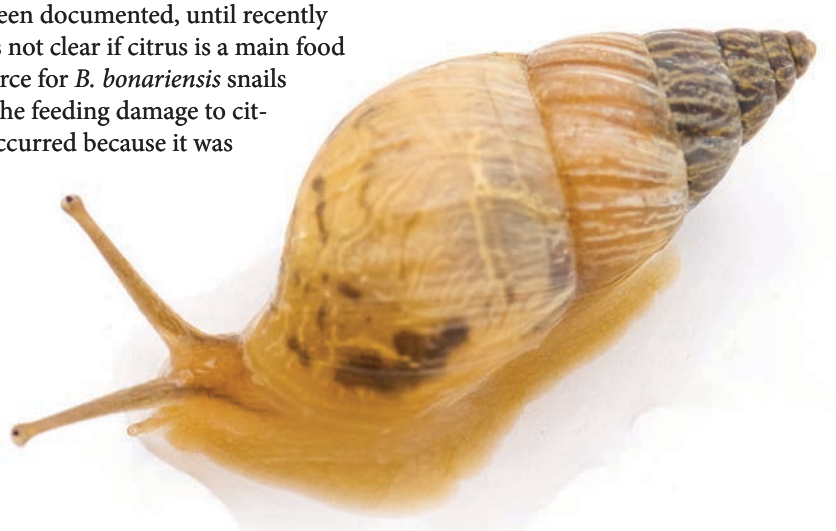
Researchers have been using a series of traps to document relative snail populations within groves. Activity is seen throughout much of the year, with notable increases in trap captures from March up until the seasonal rains begin in June or July. Snails are more readily captured by traps in the dry periods as they seek refuge from the hot, dry grove soil surfaces.

Once rain events begin, usually in mid to late June, snails move away from the traps and are often not found impeding microjets during the rainy period. Similar patterns throughout the year suggest that moisture and/or ground temperature may be the driving force for snail movement either across the ground (wet, cooler periods) or up tree trunks and microjets (dry, hot periods). This statement is largely based on observations and data obtained through trapping. Researchers will further document this behavior throughout 2025.

FEEDING PREFERENCES

While feeding damage to citrus has been documented, until recently it was not clear if citrus is a main food resource for *B. bonariensis* snails or if the feeding damage to citrus occurred because it was the only option, such as when snails become trapped within IPCs. To better understand their feeding preferences, snails were collected from groves. Snail guts were dissected and subjected to molecular analysis to describe their contents. Preliminary data from this research shows that most of the foods consumed by these snails consist of weeds that are commonly found in groves. Citrus comprised less than 1% of species detected.

Weeds clearly play an important



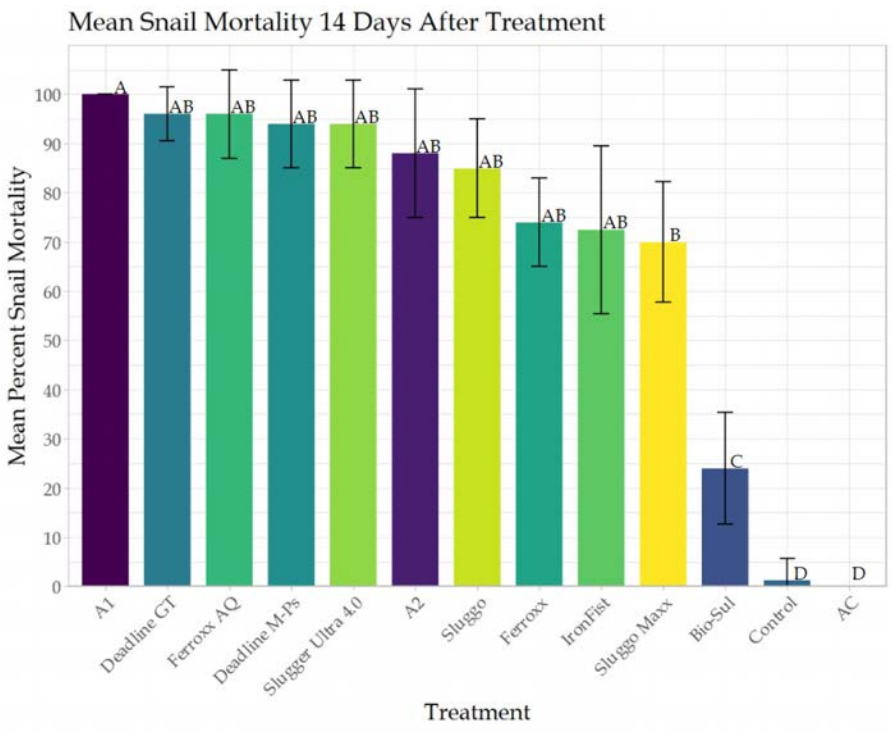


Figure 5. Baits tested for efficacy against *B. bonariensis*. All baits tested at 10x the standard for molluscicidal testing

Source: Ganesh and Diepenbrock, preliminary data

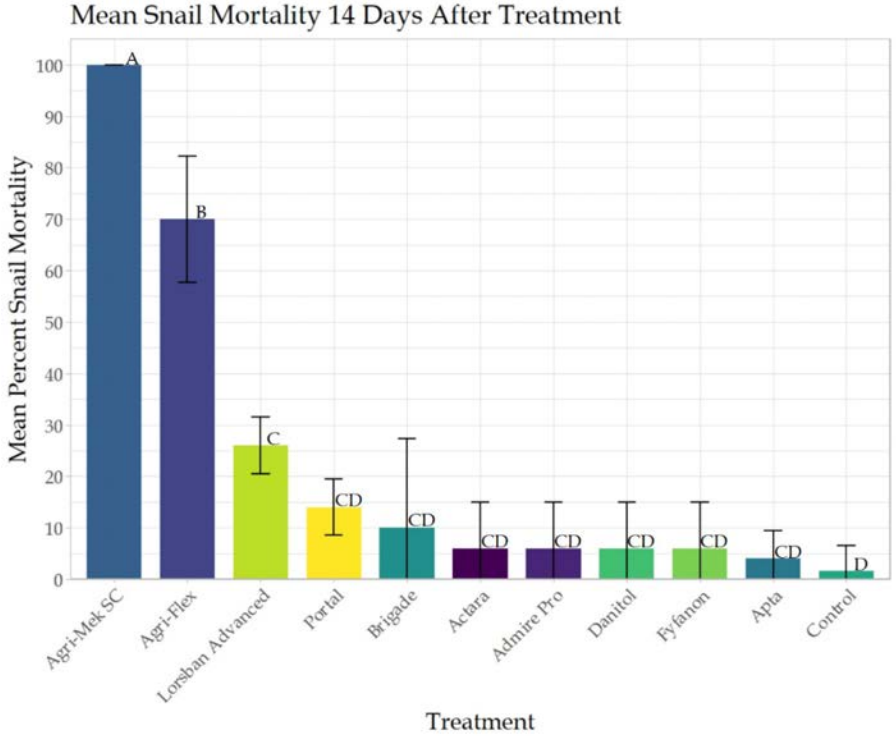


Figure 6. Evaluation of commonly used insecticides against *B. bonariensis*. Note that these data do not constitute a recommendation, and none are labeled for use against snails.

Source: Ganesh and Diepenbrock, preliminary data

role in the life cycle of *B. bonariensis*. What is unclear right now is how weed management would impact these snails. Would increasing vegetation in row middles reduce impacts on irrigation? Or would modifying ground cover reduce overall snail populations? UF/IFAS will explore this further in the summer of 2025.

CHEMICAL MANAGEMENT OPTIONS

Pesticides exist for managing snails, mostly in the form of molluscicidal

baits. Baits registered for use in citrus, along with two baits under development for use in citrus, were evaluated in semi-field assays to determine their efficacy on *B. bonariensis* (Figure 5, page 24). Of the baits that are commercially available, Deadline GT, Ferroxx AQ, Deadline M-Ps and Slugger Ultra consistently showed mortality of 90% or greater. Additionally, one of the baits under development had 100% mortality of *B. bonariensis*. This bait has a narrower range of potential non-target pests. With further testing, it is anticipated that this material will be available for growers in the coming years.

In addition to molluscicides, other pesticides including insecticides, herbicides and fungicides have been found to be efficacious toward the management of snails in other production systems. Using the same semi-field assays, researchers evaluated several commonly used insecticides to determine if any had potential to impact this pest (Figure 6, page 24). While these chemistries are not currently registered for snails, future label expansions may occur with proper supporting data. From this screening, products containing abamectin had the highest mortality rates. This chemistry has been found to have mortality for a limited spectrum of snails in other regions and may be a tool for use in management plans. Potential deterrents, which could prevent snails from clogging irrigation jets in the first place, are also being evaluated.

WHAT'S NEXT?

UF/IFAS continues to evaluate chemical tools for use toward the management of *B. bonariensis*. At the same time, researchers are seeking predators, documenting field populations and will soon be using tracking technology to follow snails and document what elements of a grove habitat influence where they move within the field (e.g., ground temperature, moisture availability and shade availability).

Lauren Diepenbrock is an assistant professor at the UF/IFAS Citrus Research and Education center in Lake Alfred. Nicole Quinn is an assistant professor at the UF/IFAS Indian River Research and Education Center in Fort Pierce.

Committed to Collaboration

By Rick Dantzler, CRDF chief operating officer

Brazil. A bountiful land with wonderful people. And citrus. A lot of citrus. A lot of stunningly good citrus. And HLB.

After five days of touring groves and meeting with researchers in Brazil, a delegation from the Citrus Research and Development Foundation returned with firsthand understanding of the successes and challenges facing Brazilian citrus growers. To be sure, these growers have their challenges. HLB and a changing climate are affecting how they farm. Some groves were so perfect they seemed like something out of a Disney movie. Others had highly symptomatic trees marked with yellow ribbon that were literally on their way out. These trees, mostly either Pera or Valencia on Swingle, will be pulled and replaced after the next harvest.

While we were there, it was announced that Brazil's harvest for the 2024–25 season would be 230 million boxes, the second lowest in 37 years. The decline was attributable mostly to drought, but HLB has taken its toll. Still, growers have been successful in significantly reducing HLB infection rates through concerted psyllid control efforts. They attack psyllids with aggressive spraying programs — weekly in some cases — and refuse to give *C*Las safe harbor by removing trees found to be infected. These are control measures beyond the reach of Florida growers. Or are they? We found ourselves considering ways to implement psyllid control on an industrial scale, learning from the mistakes of prior efforts.

Brazilian growers use high-end nutrition programs, but they aren't much different than what many growers in Florida use or have tried. Nitrates are preferred over sulfates, and in slightly higher quantities. However, I sensed that groves looked healthier primarily because of better psyllid control, not different nutrition programs.

One of our goals was to learn about an $18 million effort that Brazilian researchers kicked off in March. Teams of researchers will work with a single focus: solving the HLB problem in the most advanced ways known to science. But it goes further; research will be done in ways that allow results to be used by regulators if there are new products or technologies that require approval. Researchers begin their work knowing what is required, preventing it from having to be repeated for an approval process.

The trip confirmed our research strategy of eliminating as much *C*Las as possible until the "tree of the future" gets into the hands of growers, but we left with a lot to ponder.

Our host was Fundecitrus, a research entity formed nearly 50 years ago. They shared everything they were doing, knowing that our return to greatness will prove they can stay great, too. And how will greatness be gained and maintained? By producing juice that tastes so good consumers will be incapable of turning away. It was here that the most important goal of the trip was realized: a commitment to collaborate. We discussed specific things we could do together, maximizing the strengths of each organization. More on that later, but the trip sealed a partnership that will make both industries more successful.

CRDF Grower Dollars at work for you

Column sponsored by the Citrus Research and Development Foundation