

Biocontrol of Strawberry Guava in Mākaha Valley, O`ahu

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Background



Strawberry guava (*Psidium cattleianum*)

The Honolulu Board of Water Supply (BWS) Watershed Program works to ensure an adequate supply of fresh water for current and future generations, by protecting the ability of O`ahu's watersheds to capture and store rainfall in the aquifers below. This ability is critical, as rainfall is the sole natural source of fresh water supply for the island.

One of the methods BWS employs to protect the watersheds is to reduce the spread of invasive plant species which are considered to be high water users, taking up rainfall that would otherwise be percolating into the ground and recharging the water supply aquifers.

Strawberry guava (*Psidium cattleianum*) is considered to be one of the most destructive invasive plant species in Hawai`i. This species was brought to Hawai`i in 1825 for its fruit and ornamental attributes. Due to a lack of natural predators and diseases in Hawai`i compared to its native Brazil, the plant has spread rapidly across the islands via both shoots and seeds, replacing many hundreds of thousands of acres of native forest with monotypic stands of the plant. For native forest replaced by strawberry guava, the rainfall lost to groundwater recharge due to this plant, is thought to be around 25 percent of total rainfall.

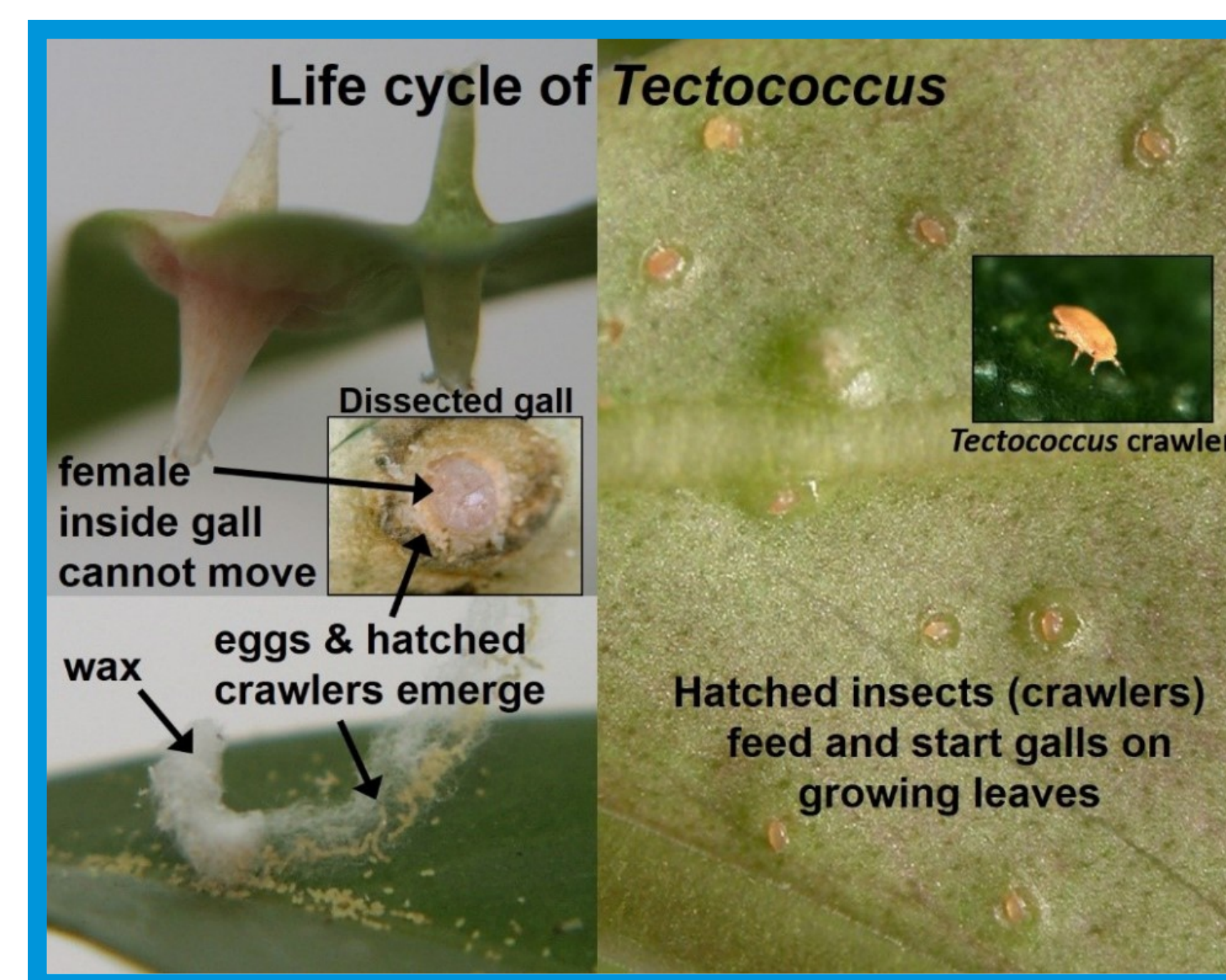


Typical dense stand of strawberry guava

Biocontrol: *Tectococcus ovatus*

Biological control, or "biocontrol", is a technique used to reduce the spread of an invasive plant by introducing a plant-feeding insect or disease that targets only the invasive species. Biocontrol agents are often natural predators of the plant in its native range. Biocontrol practices have improved greatly over the years; biocontrol agents are now extensively vetted before introducing them to a new environment.

The tiny scale insect, *Tectococcus ovatus*, was identified by the U.S. Department of Agriculture - Forest Service approximately 20 years ago as an effective biocontrol agent for strawberry guava. Since that discovery, comprehensive laboratory and field testing was conducted by Hawaii-based Federal and State agencies, including: U.S. National Park Service, U.S. Department of Agriculture, State of Hawaii Department of Land and Natural Resources, State of Hawaii Department of Agriculture, and University of Hawaii. The testing showed that *T. ovatus* lives in "galls" only on the leaves of strawberry guava, slowing the plant's growth and reproduction, while not impacting other native or nonnative plant species.



Source: USDA Forest Service

The insect also spreads relatively slowly through the stands of strawberry guava, as it is a crawling insect rather than a flying insect. Therefore, the State of Hawai`i Department of Agriculture granted permission to release *T. ovatus* in Hawai`i, as a supplemental control to other methods such as manual cutting and pulling of plants. Since that time, *T. ovatus* has been released at numerous sites across the state, including dozens of watersheds across O`ahu.

T. ovatus Release on BWS Watershed Land, Mākaha

Based on this successful introduction of *T. ovatus* across Hawai`i, and with the support of the State of Hawai`i Department of Land and Natural Resources (DLNR), BWS initiated a *T. ovatus* release in test plots on BWS watershed land. As strawberry guava has been overtaking much of the BWS watershed land in Mākaha, two 20 ft x 20 ft test plots were sited in this region, along a southwest-facing ridge in the back of the valley. The plots' exposure to wind was anticipated to aid in the spread of *T. ovatus* hatchlings over time.



Test plot location, Mākaha Valley



Strawberry guava on test plot, prior to "topping"



Strawberry guava on test plot, after "topping"

Drawing from methods used successfully in the previous *T. ovatus* releases in Hawai`i, the test plots were prepared by "topping" the existing strawberry guava, waiting until the new leaves began to "flush", then planting several young strawberry guava already inoculated with *T. ovatus* throughout the plots. The test plots were prepared in late 2017, and inoculated in early 2018.

Current Observations and Future Work

The *T. ovatus* release has been extremely successful; as of November 2022 the entirety of the test plots appear to have been inoculated with *T. ovatus*, and the inoculation has spread far from the plots through the adjacent strawberry guava, up the ridge and across nearby lower elevations to adjacent ridges. Infected strawberry guava are heavily galled, with a large number of leaves and fruit that have dried up and fallen. The total spread extent at this time (approximately 5 years) is 2,553,020 ft², from the original 800 ft² of the test plots; this spread occurred without any additional inoculation work.

