United States Department of Agriculture, Forest Service

Pacific Southwest Research Station

Institute of Pacific Islands Forestry

Tectococcus ovatus: A Biological Control Agent Proposed for Release against Strawberry Guava (Waiawi)

Research Update. June 2005

Overview. The Institute of Pacific Islands Forestry of the USDA Forest Service has petitioned Hawai`i Department of Agriculture for permission to release a new biological control agent, *Tectococcus ovatus*, against strawberry guava or waiawi, a major pest plant in the Hawaiian Islands. Biological control or biocontrol involves the introduction of natural enemies from the native range of the pest plant to reduce its impact and spread. The proposed biocontrol agent, *Tectococcus*, has been evaluated carefully both in its native range and under quarantine in Hawai`i to reduce the risks to non-target species. Before it can be released in Hawai`i, *Tectococcus* must pass review by regulatory agencies including the Hawai`i Department of Agriculture, USDA Animal and Plant Health Inspection Service, and US Fish and Wildlife Service, as well as the public and the state Board of Agriculture.

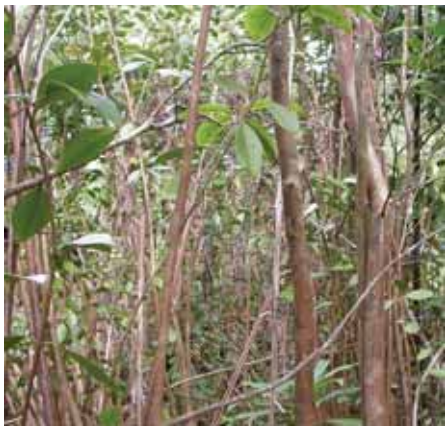

Figure 1. Dense strawberry guava thicket in a Hawaiian forest.

The Problem. Strawberry guava (*Psidium cattleianum;* Myrtaceae), one of the state's most disruptive alien weeds, infests thousands of acres of forest on all the major Hawaiian islands. It forms dense thickets up to 30 ft. in height and suppresses native species, including many which are rare and endangered. Strawberry guava is also a wild host of fruit flies, including the Mediterranean fruit fly, which cost taxpayers and farmers millions of dollars annually in quarantine and eradication efforts.

Distribution of Strawberry Guava. *P. cattleianum* is native to southeastern Brazil, where it grows from sandy coastal plains to elevations of 3900 ft, usually in disturbed areas of the native forest. It survives in subtropical conditions with repeated winter frosts. *P. cattleianum* is now a widespread tropical weed. In Hawai`i it is common between sea level and approximately 3900 ft (occasionally to 5250 ft). This weed has the potential to invade an estimated 47 percent of the land area of Hawai`i Island .

Figure 2. Red and yellow fruited varieties of strawberry guava.

Control Options. Strawberry guava is commonly controlled by cutting, bulldozing and/or application of herbicides. However, repeated applications are usually necessary and methods are difficult and expensive to apply over extensive areas of poorly accessible terrain. Biological control provides a long-term management option, but until recently was considered infeasible because of the risk to strawberry guava's relative, common guava. Over the last decade, several insects that attack strawberry guava,

but not common guava, have been identified in Brazil. A leaf galling insect, *Tectococcus ovatus*, is especially promising.

Figure 3. *Tectococcus* galls on strawberry guava leaves in Brazil.

Biology of *Tectococcus ovatus.* *Tectococcus ovatus* Hempel (Homoptera: Eriococcideae) is a small scale insect that creates galls on young leaves. The mobile stage of *Tectococcus* is the newly hatched nymph or crawler. Crawlers typically move to new leaves at the stem tip where they begin to feed and form galls. Each female remains enclosed in a gall throughout her life, producing up to several hundred eggs in a matrix of wax filaments, which help the eggs and crawlers to float on the wind. Under quarantine conditions in Hawai`i, *Tectococcus* reproduces continuously, with a generation time of 6-10 weeks. We expect that *Tectococcus* will be able to tolerate the full range of strawberry guava habitats in Hawai`i because its native range includes wide variation in temperature and humidity.

Host Specificity. Biocontrol agents are more likely to feed on closely related plant species than on distantly related species. Thus, in evaluating the safety of potential biocontrol agents, it is important to test native and commercial plants related to the target weed. There are no native members of the genus *Psidium* in Hawai`i, although the common guava, *Psidium guajava*, is commercially important. In Hawai`i, the family Myrtaceae is represented by 49 species in 9 genera, including 8 native species. The dominant tree of native Hawaiian forests, `ohi`a (*Metrosideros polymorpha* Gaud.), and numerous introduced timber trees, including *Eucalyptus* species, are distant relatives. All laboratory tests and field observations indicate that *Tectococcus* is highly specialized to use only *P. cattleianum* and closely related species within the genus *Psidium*. Quarantine tests of a broad spectrum of Hawaiian plant species, including all ecologically prominent Myrtaceae and some uncommon native members of this family, indicate that no species in Hawai`i other than *P. cattleianum* will serve as hosts for this insect. Evidence that *Tectococcus* cannot develop on common guava (*P. guajava)*, includes laboratory tests in Hawai`i and Brazil as well as over 10 years of observations of populations developing on *P. cattleianum* in close proximity to *P. guajava* at field sites in Brazil.

Expected Impacts. Because it is host specific, *Tectococcus* is expected to affect directly only the target weed *P. cattleianum* in Hawai`i. Infestations of *Tectococcus* are expected to spread gradually on the target plant, reaching damaging levels within a few years at each release site. We expect *Tectococcus* to cause reduced growth rate and reduced fruit and seed production, decreasing the spread of strawberry guava over a period of years. Impacts of *Tectococcus* on strawberry guava are expected to have major economic benefits including improved control of pest fruit flies, increased effectiveness of mechanical and herbicidal control, and long-term protection of vulnerable native forest ecosystems from one of their most serious threats.

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06/26/2005