

Albizia Biological Control Update – August 2016

Ken Puliafico & Tracy Johnson

Institute of Pacific Islands Forestry, PSW Research Station, USDA Forest Service

Exploration for natural enemies of albizia (*Falcataria moluccana*) began in 2015 and has continued in a second exploratory trip to Indonesia in April and Papua New Guinea in May, 2016. This follow-up trip's goals were twofold: I. explore new regions within the native range for additional insect agents at different elevations, and II. Start the first experiments to evaluate potential agents with the assistance of our Indonesian collaborators. Over the first year and a half of this project, we have established relationships with researchers in Indonesia and Papua New Guinea (PNG) who will be essential partners for evaluating potential biocontrol agents (below). Prospects for finding host-specific natural enemies of albizia are very good, based on previous biocontrol projects for similar tree species and our initial results look promising.



Surveying albizia branches with Indonesian collaborators from the Pattimura University, Molucca Islands (left). Warea Orapa from NAQIA – PNG investigating highlands variety of *Falcataria moluccana* (right).

The survey portion of the spring 2016 exploratory trip focused primarily on the tree's native range where we investigated wild trees, timber and agroforestry plantations. This trip's collections of natural enemies, especially on the island of New Guinea and in the Moluccas, are continuing to reveal substantial herbivore biodiversity. We visited over 25 sites in each country, Indonesia and PNG, and made extensive collections of defoliators, leaf galling insects, and stem miners (below). We were able to bring specimens from PNG to Hawaii to start the process of identification. Meanwhile our specimens from Indonesia have been deposited with local collaborators pending the approval of export permits. A local student has started some initial sample preparation at the Bogor Agricultural University to speed up the identification process.



Leaflet galls caused by eriophyid mites found in Molucca Islands and New Guinea (left) and galling wasps from PNG (right)



Stem boring caterpillar (left) in young green stems in PNG and weevil (right) in a woody twig from Cerem Island in the Moluccas.

In May, we joined collaborators in Papua New Guinea for a two week survey of the PNG Highlands which includes the majority of the agricultural and agroforestry production of the country. Because the native range of *F. moluccana* is much closer to the equator we wanted to explore different elevations that encompassed the full range of climatic conditions found in the

Hawaiian albizia invasion. We investigated the high altitude variety of *F. moluccana* and compared it to the lowland varieties to discover that there is a significant difference in the morphology of these two biotypes, with the Hawaiian albizia trees matching the lower elevation variety. We collected samples from both varieties for comparisons, but mostly focused our efforts to examining the lowland trees in their upper most elevational extent. The trees did not have fruit at this time but we plan on investigating herbivores attacking reproductive structures during our next trip in October. The exploratory trip to Papua New Guinea allowed us to build on our collaborations with the PNG Forest Research Institute and National Agriculture Quarantine and Inspection Authority (NAQIA – PNG), while also meeting researchers from PNG Coffee Industry Institution - Coffee Research Institute and local NGOs.

The most promising enemy among early biocontrol prospects is a rust fungus that galls new growth of young and mature trees. This disease is a major hindrance in albizia plantations in the Philippines and Indonesia. Preliminary tests are focused on screening this potential biocontrol agents against our native koa (*Acacia koa* and *Acacia koaia*), which is albizia's closest Hawaiian relative. In April we began growing koa in Indonesia with our university collaborators. An Indonesian expert on this fungus has started the preliminary tests to determine whether it poses any threat to koa and 6 other Fabaceae species grown in Hawaii. Our experiments will include laboratory inoculated plants that will allow us to examine the fungal infection on a cellular level as well as open field trials. The combination of approaches will allow us to assess the risk of this potential agent on these high priority test plants.



Uromycladium rust fungus on shoot tip (left) and sapling stem (right) of *Falcataria moluccana*.

Over the next year or so we expect to identify several natural enemies that will merit more detailed evaluation. Securing permits to export live natural enemies from the native region and developing methods for rearing and testing each new species will be the main challenges for the subsequent phase of this project. In addition, we are collecting samples of albizia itself to attempt to identify genetic types which most closely match our trees here in Hawaii, in order to focus research to the most appropriate sites within the native range.