Evolutionary Interactions between the Invasive Tallow Tree and Herbivores: Implications for Biological Control

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Abstract

Understanding interactions between insect agents and host plants is critical for forecasting their impact before the insects are introduced, and for improving our knowledge of the mechanisms driving success or failure in biological weed control. As invasive plants may undergo rapid adaptive evolution during the process of range expansion, the potential evolutionary interactions of insects and plants may influence the effectiveness of biological control. In this presentation we will discuss the biogeographic variation in plant defense to insects in the tallow tree, Triadica sebifera) (L.) Small, which is native to China but invasive in the United States. Because the U.S. populations showed reduced resistance but increased tolerance to herbivory by specialists, we predict that the invasive tallow tree may support a rapid population build-up of insect agents but the insects' impact may be low if these specialists are introduced. Our chemical analysis shows that the U.S. populations had low concentrations of quantitative defense compounds but high qualitative defense compounds, which suggests that plants from invasive populations have altered chemistry that influences the selection and development of insect biological control agents. We will also discuss our current study on the evolutionary interactions of above-below ground herbivores in tallow tree, which can affect invasion success, herbivore population dynamics and biological control. As invasive plants may employ novel defense strategies to cope with the differing herbivore communities, thus affecting biological control, we conclude that without taking into account the differences in resistance and tolerance to herbivores of plants from the native vs. invasive range, predictions of the ease of establishment of agents and their effectiveness at controlling host plants may both be incorrect.