

Overview of Asian Longhorned Beetle Research by the USDA Forest Service, North Central Research Station, in East Lansing, Michigan

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Abstract

Our current research on the Asian longhorned beetle (ALB), *Anoplophora glabripennis*, focuses on acoustic detection, systemic insecticides, and natural enemies.

Acoustic detection. Over the past 2 years, we have conducted a number of studies in collaboration with researchers at the Oak Ridge National Laboratory to identify unique acoustic signal descriptors associated with ALB larval feeding in live trees and wood packing materials. We have recorded feeding sounds from ALB larvae as well as larvae of several native cerambycids: cottonwood borer, linden borer, locust borer, red oak borer, sugar maple borer, and whitespotted sawyer. Overall, feeding sounds of cerambycid larvae are quite similar but ALB feeding sounds do have unique signal descriptors. We have developed real-time filter algorithms that recognize sounds of feeding larvae in both trees and cut logs. In China, we have recorded ALB larvae feeding in infested elm, poplar, and willow trees. Recordings have been of larvae that were feeding at distances of up to 7 m away from the sensor. We have also developed a prototype field-portable ALB acoustic detector.

Systemic insecticides. Over the past two years, we have tested the efficacy of various systemic insecticides to kill ALB larvae and adults. In China, we have injected infested elm, poplar, and willow trees. We have tested imidacloprid (Imicide, J.J. Mauget Co.), azadirachtin (Ornazin, Cleary Chemical Corp.), emamectin benzoate (Shot One, Novartis), and thiacloprid (J.J. Mauget Co.). Overall, mortality rates of the within-tree ALB life stages were highest for imidacloprid. In addition, when dead adult beetles were counted around the base of each tree, the imidacloprid treated trees had the highest number of dead ALB adults. In the laboratory, we reared cottonwood borer larvae (CWB), a surrogate for ALB, on artificial diet treated with various concentrations of imidacloprid and azadirachtin. Both insecticides had strong antifeedant effects, which resulted in larval weight loss. Complete mortality occurred at the highest doses of imidacloprid (160 ppm) and azadirachtin (50 ppm) after 12 weeks of feeding. Some mortality occurred at lower doses (0.16 ppm imidacloprid and 0.5 ppm azadirachtin). After 18 weeks, surviving larvae were able to complete development when placed on untreated diet.

Natural enemies. Potential natural enemies for ALB were obtained from field-collected ALB in North America and China, from ALB reared in quarantine laboratories, and from native cerambycids. Necropsy of ALB revealed microsporidia, entomopathogenic fungi, nematodes, and a dipteran parasitoid. Microsporidia were found in larval midguts and in adults from several provinces of China. Fungal pathogens included *Beauveria* spp. and *Metarhizium* spp. in ALB adults from North America and China; resting spores of an Entomophthorales in ALB adults and eggs from North America; and *Verticillium* spp. in ALB larvae from China. Endoparasitic dipteran larvae were found in 4% of ALB larvae collected in Chicago in June 2001 (n = 76); some ALB contained multiple parasitoids. Unidentified nematodes were found in liquefied ALB found in Chicago and New York; ALB cadavers from China also contained nematodes. Identification of natural enemies and studies on their impact on ALB survival and performance are in progress.