

Effect of debarking and heating on survival of the thousand cankers disease vector and pathogen in black walnut logs

Albert Mayfield III¹, Adam Taylor², Stephen Fraedrich¹, Paul Merten³, and Darren Bailey⁴

¹ USDA Forest Service, Southern Research Station, amayfield02@fs.fed.us, sfraedrich@fs.fed.us;

²University of Tennessee, Center for Renewable Carbon, mtaylo29@utk.edu; ³USDA Forest Service, Forest Health Protection, pmerten@fs.fed.us; ⁴Tennessee Division of Forestry, Darren.Bailey@tn.gov

Abstract

Thousand cankers disease (TCD) is a fatal disease of black walnut (*Juglans nigra*), caused by attacks of the walnut twig beetle (*Pityophthorus juglandis*) and associated infection with a canker-causing fungus (*Geosmithia morbida*) on branches and stems. Phytosanitary tools allowing movement of walnut logs without spreading the TCD vector or pathogen are needed in the commercial walnut industry. This study evaluated heat and debarking for efficacy in eliminating the walnut twig beetle and *G. morbida* from small black walnut logs. One hundred fifty black walnut logs (3-7 inches diameter, 12 inches long) were cut from TCD-symptomatic trees and 30 logs were exposed to one of the following five treatments in both June and August, 2011: 1) kiln heated at 60°C for 30 minutes, 2) kiln heated at 65°C for 30 minutes, 3) kiln heated at 70°C for 30 minutes, 4) debarked by hand with a chisel, and 5) control. Actual heat treatment times ranged from 30-40 minutes. In each treatment group, 10 logs were sampled for pathogen pre- and post-treatment, and 20 logs were placed in rearing containers and monitored for insect emergence. In the June 2011 trial, *G. morbida* was recovered post-treatment only from control and debarked logs, but was present in 40-100% of pre-treatment logs in all treatments. *Geosmithia morbida* was not isolated from post-treatment logs of any heat treatment in either trial. No live beetles of any species emerged from heat-treated logs, whereas live beetles emerged from 75-90% of control logs. Walnut twig beetle did not emerge from control logs in the June trial but emerged from 20% of control logs in the August trial. Only ambrosia beetles (sapwood borers) emerged from debarked logs. Time required to heat logs to the target temperature, at both the outer sapwood and the log core, increased with log diameter. Heating the outer sapwood to 60°C, 65°C, or 70°C for 40 minutes is sufficient to kill *G. morbida* in small black walnut logs, whereas debarking does not ensure elimination of the pathogen. The three heat treatments eliminated all live beetles from all logs, but because walnut twig beetles emerged from a low percentage of control logs, follow-up work is planned to more conclusively evaluate the effect of heat treatments on the walnut twig beetle and the minimum effective temperatures for eliminating both disease agents.