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## SURVIVAL OF EMERALD ASH BORER IN CHIPS

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### ABSTRACT

The ability of emerald ash borer (EAB), *Agrilus planipennis* Fairmaire, to survive following chipping or grinding of infested ash trees remains a critical question for regulatory officials. In October 2002, we felled eight infested ash trees and sampled sections of the trunk and large branches from each tree to estimate EAB density. We estimated that at least 9,400 to 10,000 EAB, primarily in the prepupal stage, were present in the eight trees. Each tree was loaded into a grinder at a marshalling yard in southeast Michigan and processed; half of the wood of each tree passed through a screen with 1-inch diameter holes and the rest of the wood passed through a screen with 4-inch diameter holes. We intensively inspected samples of 1" and 4" chips for evidence of EAB survival. We also checked the relatively large chips in each pile to determine if they contained an EAB life stage. Material that passed through the 1" screen was ground to a fine, "chaff-like" consistency and we found no evidence that any EAB had survived the grinding process. In the pile of 4" chips, however, we found at least eight pieces of wood with intact prepupae.

We next investigated survival of EAB in chip piles over the winter. We prepared 45 sentinel chips by chiseling small sections of wood (approx. 6 x 3 x 1 cm) containing live overwintering prepupal or L4 larvae from infested ash logs and attaching a long section of nylon twine to each chip. In late October, we buried 22 sentinel chips 15 to 35 cm deep within the 1" chip pile (roughly 3.8 m<sup>3</sup> volume) and 23 sentinel chips in the 4" chip pile (2.9 m<sup>3</sup> volume). Temperature-recording dataloggers were used to monitor temperatures on and within each chip pile. Six infested ash logs (6 to 25 cm diam.), also cut in late October, were set next to the chip piles.

Sentinel chips were retrieved from the chip piles and examined on 29 April 2003. Live EAB were held to monitor survival to the adult stage. On 4 May 2003, the chip piles were moved into screen tents and ten sticky cards were suspended in each tent to capture any adult beetles that emerged from the piles. Logs that had been placed near the chip piles were dissected in early May to estimate overwintering survival.

Six of the EAB prepupae in the 45 sentinel chips (13.3 percent) survived the winter. In comparison, 32 of the 35 prepupae (91 percent) in the logs stacked adjacent to the chip piles survived the winter. Temperatures within the chip piles ranged from -18 to 39C (-2 to 102F) between October 2002 and May 2003. Temperatures in the chip piles tracked ambient temperatures closely, indicating that little heat was generated from decomposition in our relatively small chip piles. No EAB adults were captured in the screen tents.

To further evaluate the effects of temperature on EAB survival, we chiseled 56 bark sentinel chips and 56 wood sentinel chips from infested logs on 1-7 April 2004. Each chip contained a live EAB prepupae. We filled 28 plastic boxes, each 30 x 22 x 12 cm, with ash chips collected at a marshalling yard. We placed four bark sentinel chips or four wood sentinel chips in each box of ash chips and held all boxes in growth chambers at 25°C for 3 days to allow the EAB prepupae to acclimate.

On 10 April, two boxes with bark sentinel chips and two boxes with wood sentinel chips were assigned to a temperature and time treatment which included exposure to 40°C for 8, 24 or 48 hours or exposure to 60°C for 8, 24, or 48 hours. Four additional boxes (two with bark sentinel chips and two with wood sentinel chips) were left at a constant 25°C. After exposure to the designated temperature and time treatments, boxes were returned to 25°C and held until 15 June. Sentinel chips were checked daily from 1 May to 15 June and adult emergence or observations of dead EAB were recorded. All sentinel chips were dissected on June 15.

Five of the eight EAB prepupae in the bark sentinel chips and seven of the eight EAB in wood sentinel chips that were exposed to constant 25°C survived. When bark sentinel chips were held at 40°C, a total of four, three, and three of the original eight EAB survived exposure for 8, 24, and 48 hours, respectively. A total of seven, eight, and six EAB survived in the wood chips exposed to 40°C for 8, 24, and 48 hours, respectively. No EAB survived exposure to 60°C in any of the bark or wood chips, regardless of the duration of exposure. Further assessments of EAB survival at temperatures between 40 and 55°C are planned.