

EVALUATION OF TRUNK INJECTIONS FOR CONTROL OF EMERALD ASH BORER

Deborah G. McCullough¹, Therese M. Poland³,
David L. Cappaert¹, Phillip Lewis⁴,
and John Molongowski⁴

Departments of ¹Entomology and ²Forestry, Michigan State University,
243 Natural Science Building,
East Lansing, MI 48824

mccullod@msue.msu.edu

³USDA Forest Service, North Central Research Station,
220 Nisbet Building,
East Lansing, MI 48823

⁴USDA Animal and Plant Health Inspection Service,
Otis Methods Laboratory, W. Truck Road,
ANG Base, MA 02542

ABSTRACT

In 2003, we evaluated trunk injections of imidacloprid for control of emerald ash borer (*Agrilus planipennis* Fairmaire) (EAB). Results were variable and indicated that efficacy could be affected by injection timing and method and by tree size and vigor. In 2004, we continued studies to assess the optimal timing for imidacloprid trunk injections and the persistence and translocation of imidacloprid in ash trees.

One project involved a two-year evaluation of two popular trunk injection methods on street trees growing in two subdivisions in Ann Arbor. In May 2003, we randomly assigned 30 green ash trees at Site 1 (average of 42 cm dbh) to one of five treatments: untreated Control, Imicide (10 percent, 3 ml Mauguet capsules, 1 capsule per inch dbh/2), Pointer (12 percent in 2003, 5 percent in 2004, wedge, 1 ml per 10.2 cm basal circum), an early Bidrin treatment or a late Bidrin treatment (12 percent, 2 ml Mauguet capsules, 1 capsule per inch dbh/2). Imidacloprid (Imicide or Pointer) was injected on 21 May 2003. Bidrin was injected on either 2 June or 14 July in 2003. Trees were injected with imidacloprid (Imicide or Pointer) again on 19 May 2004 or with Bidrin on 15 June 2004. At Site 2, we injected and monitored 18 green ash (16 cm dbh) and 18 white ash (13 cm dbh) trees. These trees were randomly assigned to treatments in May 2003 and were injected with either Imicide or Pointer on 21 May 2003 and on 19 May 2004.

Canopy condition of each tree was estimated periodically in 2003 and 2004. The number of exit holes per m² was determined in September 2004 on five sections (each 3800 cm²) of each tree to estimate the density of EAB adults emerging in 2004. Density of larval EAB was quantified in three to four bark windows (each approximately 300 cm²) excavated on each tree.

At Site 1, canopy dieback on untreated Control trees jumped from an average of roughly 20 percent in June 2003 to an average of 50 percent in September 2004. Pre-treatment canopy dieback on all injected trees ranged from 15-19 percent in June 2003 and dieback remained low, averaging 25 to 30 percent in September 2004. On average, about 10 EAB adults per m² emerged from Control trees in 2004, but an average of 80 larvae per m² were feeding in those trees in September. Significantly more EAB adults emerged from untreated Control trees in 2004 than from any of the injected trees. Larval density on all injected trees was 82-96 percent lower than on the Control trees.

At Site 2, canopy dieback progressed from roughly 10 percent in June 2003 to over 60 percent in September 2004 on the green ash Control trees. On the white ash Control trees, average dieback remained below 10 percent in 2004. On the green ash Control trees, an average of roughly 35 adult beetles emerged in 2004, while larval density averaged 80 per m². Green ash trees injected with either Imicide or Pointer had significantly lower adult emergence than Control trees. Larval density on green ash trees was roughly 89 percent lower in Imicide trees and 45 percent lower in Pointer trees than in the Control trees (with various applications—all treatments differed significantly from each other). On the white ash trees, density of emerged adults and larvae was consistently low.

Additional trunk injection studies were initiated in 2004 at two different sites in Ann Arbor to evaluate relative levels of imidacloprid residues in xylem sap, foliage and phloem (using ELISA) over the growing season. Trees were injected with imidacloprid via Arborjet micro-infusion, Arborjet micro-injection, or Mauget capsules. Rates of imidacloprid included 0.15 g AI per injection port (Imicide), 0.20 g AI per injection port (Arborjet – small trees), or 0.4 g AI per injection port (Arborjet – large trees). Number of injection ports per tree was equal to dbh divided by 2. Half of the trees were injected on 21 May 2004; the other trees were injected on 19 July 2004. Preliminary samples from trees injected in May suggest that imidacloprid residues in the Imicide trees peaked about 4 weeks after injection at roughly 45-50 ppb. Residues in trees injected with either Arborjet device peaked about two weeks after injection at over 300 ppb. Results from six-day bioassays conducted with adult EAB indicated that beetle mortality was related to imidacloprid residues. Imidacloprid residue in xylem sap decreased in all trees during the summer, a pattern consistent with 2003 results. Processing of tissue samples for residue analysis and larval density sampling is continuing.