CONTROL OF EMERALD ASH BORER ADULTS AND LARVAE WITH INSECTICIDES

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ABSTRACT

Virtually no information is available from Asia regarding the ability of insecticide products and application methods to protect ash trees from emerald ash borer. Many landscapers in the Core infestation in southeastern Michigan have promoted various treatments to their customers, but there has been no objective evaluation of these products. Insecticides may also be useful for treating ash trees in outlying populations targeted for eradication.

Our objectives were to 1) evaluate registered insecticide products and application methods for adult and larval control; 2) identify optimal timing for soil, trunk and spray applications; 3) monitor persistence of insecticides over time; and 4) identify factors such as tree age or previous injury that could affect insecticide efficacy. In 2003, we set up insecticide studies at eight different sites with relatively light emerald ash borer densities. Trees at each site ranged from 2 to 22 inches in diameter and appeared relatively healthy. Different combinations of insecticide treatments along with untreated controls were evaluated at each site. There were at least six trees per treatment per site.

Soil injected imidacloprid (Merit 75 WP) was applied with either a Kiortiz injector or as a high pressure soil injection in mid April. On May 20-21, we applied trunk injections of imidacloprid. Products tested included Imicide (injected with Mauget capsules) and Pointer (applied with a Wedgle injection system). On June 2, we applied trunk injections of bidrin (Injecticide-B injected with Mauget capsules). Additional trees at one site were treated again with bidrin on July 14 or on September 5. Bark and foliage cover sprays (Orthene, Sevin, Tempo, and Onyx) were applied on May 30. Half of the trees in each treatment were sprayed again on July 2.

Xylem sap from shoots in the upper and lower crown of trees treated with imidacloprid (high pressure Merit, Imicide, and Pointer) at one site were collected at roughly two-week intervals from 3 June to 31 July. Samples were submitted to cooperating USDA APHIS scientists for ELISA analysis to assess imidacloprid concentration over time.

We conducted bioassays to evaluate effectiveness of insecticide applications for adult beetle control. In these bioassays, five adult beetles were caged on a leaf from treated or control trees for eight days. Survival and foliage consumption were monitored.

Removal of bark to quantify larval density in treated and control trees began in early September. On each tree, we carefully sampled bark windows, each roughly 600 cm^2, on two aspects of the trunk, on lower and upper canopy. At least 14 bark windows were sampled on each tree.

Results of ELISA tests indicated that imidacloprid applied by either soil or trunk injections had moved into the branches and upper shoots of trees by June 3. Trees treated with high pressure soil injection had the greatest imidacloprid concentrations, but between-tree variability was high. Concentrations peaked around June 24, and then declined over the next five weeks, suggesting that imidacloprid was translocated out of xylem sap.

Preliminary results of adult bioassays indicated that bidrin was highly toxic to adults. For example, on June 25, beetles caged for five days with foliage from bidrin trees sustained 100 percent mortality. Even 38 days after injection, more than 90 percent of beetles died when caged on foliage from bidrin trees for five days.

Imidacloprid was not highly toxic to adult beetles, but did act as an antifeedant. In the June 25 bioassay, less than 50 percent of beetles caged on leaves from trees treated with Merit, Imicide, or Pointer had died after five days. Beetles on imidacloprid trees consumed less than half as much foliage as beetles on control trees and many simply starved rather than feed. Cover sprays were relatively effective for at least 2-3 weeks. Beetle mortality in bioassays conducted eight days after application of the second cover spray ranged from 80–100 percent.

Larval density data was available for only one site; sampling was in progress at other sites. Preliminary data showed that larval density on untreated control trees at this site averaged roughly 45 larvae/m^2 of phloem. In comparison, larval density was less than 10 larvae/m^2 on trees treated with bidrin, high pressure soil injection of imidacloprid, or two cover sprays. Sampling and data analysis are continuing.