Effects of fine-root stimulation and application rates on imidacloprid detection in ash canopies

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Introduction

The emerald ash borer (*Agrilus planipennis*) (EAB) was first found in the United States in 1992 in Michigan. Since it's introduction it has killed millions of ash trees (*Fraxinus* species) throughout the upper Midwestern states despite the implementation of state and federal quarantines of the movement of ash wood.

Preventative chemical applications are currently the only management for EAB infestations. Of the eight chemical applications that are currently being recommended (Herms, *et al*, 2009) imidacloprid at a 2x rate has shown good efficacy towards protection. The method of application is a favored because it may be applied as a soil drench, rather than a stem injection, which results in wounding. However, this treatment has been found to work best in trees smaller than 15" DBH.

The ineffectiveness of imidacloprid on large trees is not completely understood, but it is believed to be related to whether enough material is able to be absorbed into the tree. Watson (2002) reported that fine root densities can be greater in compost or a compost-topsoil mix than in surrounding soils. With an increase in fine roots, theoretically the uptake of imidacloprid into the tree would increase.

Materials and Methods

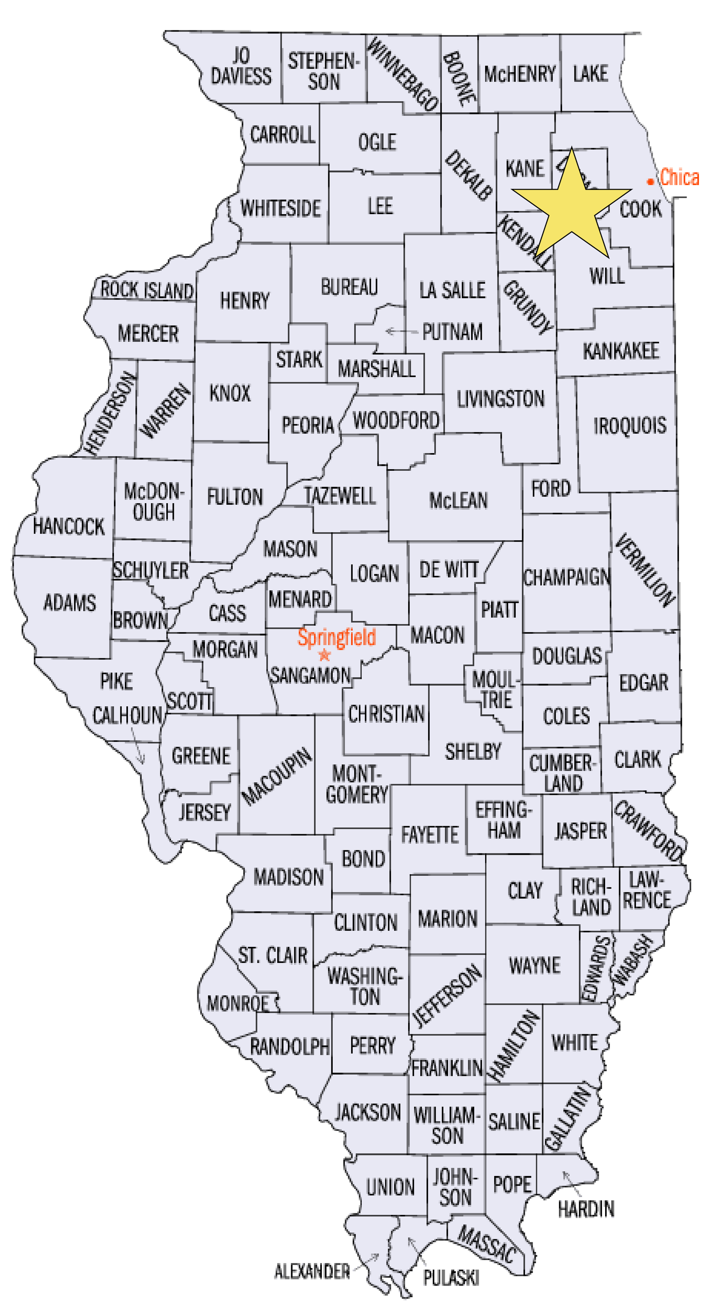
This study was conducted in Naperville, Illinois on healthy 28–53 cm (11 – 21 in) green ash (*Fraxinus pennsylvanica*) street trees. The three root treatments were:

1) Root collar excavation (RCX), using a pneumatic tool, exposing a 46 cm (18 in) radius around the trunk and deep enough to expose the roots then replace the excavated soil with a compost-soil mix.
2) Trees with existing 46 cm (18 in) radius mulch ring around the trunk on top of the intact soil.
3) Un-excavated, un-mulched control (grass).

All mulched and excavated trees were irrigated the summer of the first year when necessary. Root density samples were taken two years after root treatments were applied.

The two rates of imidacloprid (Xytect 2F, Rainbow Treecare Scientific Advancements, Minnetonka, MN) were 6 ml and 12 ml (2 and 4 oz, respectively).

Foliar samples were collected six and twelve weeks after application. A quantitative ELISA kit (Envirlogix, Portland, ME) was utilized to determine the parts per billion (ppb) of chemical in the dried leaf tissue (Harrell, 2006).



Green ash (*Fraxinus pennsylvanica*) street trees in Naperville, IL that were used for detection of imidacloprid in the canopy

Results

The results of this study showed that at six weeks after chemical application the two chemical application rates were significantly different regardless of the root-treatments (p = 0.012). The two chemical rates were significantly different in the mulch (p = 0.043) and RCX (p = 0.006) treatments, but not in the grass treatments.

The RCX trees had significantly more imidacloprid detected than the grass treatments at the 2x rate (p = 0.041). The chemical differences may be explained by the higher fine root densities, which was nearly doubled in the excavation and mulch treatments

The two chemical rates were not significantly different12-weeks after application for any of the root treatments. This may be due to the chemical's half-life within the tree or the background 'noise', which has been an issue with utilizing ELISA kits for imidacloprid detection in trees. The amount of imidacloprid present in the leaves was not correlated with DBH.

Harrell, Mark. 2006. Imidacloprid concentrations in green ash (*Fraxinus pennsylvanica*) following treatments with two trunk-injection methods. Arboriculture & Urban Forestry 32(3): pp. 126-129.

Herms, D.A., D.G. McCullough, D.R. Smitley, C. Sadof, R.C. Williamson, P.L. Nixon. 2009 Insecticide options for protecting ash trees from emerald ash borer. North Central IPM Center Bulletin. 12 pp.

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TREE FUND
Tree Research & Education Endowment Fund
Funded by the John Z. Duling Grant