Controlling Red Elm Bark Weevil

IN AMERICAN ELM TREES WITH TRUNK INJECTIONS

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The objective of this project was to determine a safe, effective and environmentally conscious control procedure for red elm weevil *(Magdalis armicollis)* in American elm *(Ulmus americana)* trees and specifically to test trunk injection of Acephate. The following article was provided by Michael Booth, a 2006 Canadian TREE Fund Jack Kimmel Research Grant recipient, and is a prime example of how your donations to CTF promote leading arboricultural research in Canada.

There is a high value attached to elm trees on the prairies and northern great plains in part because of their aesthetic form, slow growth and declining numbers. "Elm trees are an important part of the landscape in towns and cities throughout Saskatchewan. The cities of Saskatoon and Regina each have more than 100,000 elm trees, with an estimated value of $3,000 each," according to Hyde (2004). Further west, Edmonton is home to the world's largest collection of American elm trees that are free of Dutch elm disease. Management of these large, mature trees requires regular maintenance and control of insect pests, disease/vectors and other plant stressors. With proper management, we can minimize losses due to disease, reduce tree maintenance costs, and help maintain a healthy elm population for future generations.

Red elm weevil is a potentially serious pest of elm trees in grassland and parkland regions of Western Canada and the US. Attacks by this insect increase under drought stress (Saunders et al., 2004). The red elm weevil (REW) is attracted to dead or dying elms. Adults are free-moving leaf eaters. Females lay eggs in elm twigs and the larvae, which are white and legless, feed under the bark causing the twig ends to die off. The larvae pupate under the bark then adults exit the twig leaving small exit holes. REW is native to North America and has been around for decades. Extensive damage by this insect was recorded early

in the 20th century. Tucker (1907) described elm trees that were killed by the larvae boring into branches and trunks and concluded that destruction of the afflicted trees was the only way to prevent more extensive infestations.

Method of Application & Control

At present, there are no pesticides registered in Canada for trunk injection. This has forced the tree care industry to utilize less satisfactory methods of chemical application such as canopy spraying, soil injection/drench, implantation and banding. Foliar, soil injection and other methods may be effective controls but pose potential risks to non-target microorganisms including natural enemies of insect pests. Health impacts related to the risk of human exposure and potential contamination of ground water and soil are also concerns with some of these methods. Implant applications (Ace caps) were considered too injurious a method.

Acephate (Orthene) is registered in the US for trunk injection. The pesticide is highly water soluble, is easily translocated in the plant, controls a broad spectrum of insects, and is easily mixed to the required dilution rate. At present in the US, injection systems that contain a 97% a.i. formulation are available. Due to the ongoing re-evaluation of Orthene in Canada, the Pesticide Management Regulatory Agency (PMRA) would allow use of this formulation only in an efficacy trial. We have requested approval for a User Requested Minor Use Label Expansion (URMULE) for the 75% SP formulation available in Canada, a future option.

Injection application was preferred because it is considered the least invasive method available. The Ecoject system, which is being developed in Canada, was selected as the application apparatus because it is an active rather than a passive injection system which saves time during re-application. Another feature of the Ecoject system is that its injection canisters are reusable and reloadable allowing for different control products to be injected thus reducing the chemical waste associated with "one shot" passive systems. The Ecoject system is also simple to operate and use and only requires a cordless drill to create the injection holes.

We used the same dosages and formulation available in the US, 1.5 g a.i., 97% a.i. DF formulation per 6" circumference injected 12" above the root flares. To measure the effect of the pesticide application, periodic insect counts were taken using tangle foot traps placed in the foliage. To help determine if the chemical dosage created a stress on the trees that would cause chlorosis (leaf yellowing), two foliage samples were taken, one at the time of application and one following the pesticide application. Spectrophotometry was used to measure levels of chlorophyll A and B (Biochrom Ultrospec 3300 Pro Spectrophotometer).

Results

The experiment was conducted on 50 mature elms that were paired (treated and untreated). Insect counts showed that between the first and second trap sampling there was a 36% reduction in number of REW in the treated trees relative to the untreated controls. The drop in weevil numbers was statistically significant during the weeks immediately following appliction (ANOVA). After this point, insect count numbers dropped off to the point that there was no significant difference between the treated and control trees. Because of the drop-off in counts, later sampling was not as conclusive as hoped, thus requiring further study. We cannot determine if this is a result of the injections or some other cause, perhaps the effect of weather or co-joined roots. To determine if this occurred, chemical residue analysis would have to be conducted in future tests.

The results of the two foliar samples showed no significant difference in the wavelengths associated with chlorophyll between the control and treated trees. This leads us to believe that the dosage we used did not act as a stressor on the plant and that no phytotoxicity occurred. The combination of the chemical and injection system could be considered a potential control method well within the industry's standards.

Now What?

Is further study needed? Yes, and for several reasons. The results of this study, while encouraging, are not definitive. A test during heavy infestation would provide useful information. Furthermore, injection application for the control of other insect pests in other tree species needs to be studied, although our basic observations of ladybird beetles indicated no change in numbers comparing treated and untreated. More detailed counts of other insects were not undertaken. Also, the use of other pest control products via injection application needs to be studied and developed.

Injected control agents may provide future options for control of other boring or plant-infesting insect pests of ornamental trees such as: emerald ash borer; banded, native, and European bark beetles; REW; western ash bark beetle; lilac borer; and cottony psyllid that spend some portion of their life cycle within the plant's tissue making them very difficult to control utilizing conventional methods.

With global warming, the incidence of drought stress could increase, making trees more susceptible to insect predation. As well, new insect pests from similar geographic regions are appearing. With the tree care industry's practice of PHC, an integrated management program is paramount. We hope that the results of this study are encouraging enough to interest the industry to make an application to PMRA and Arysta Lifescience (who manufactures Orthene) to have an URMUR (User Requested Minor Use Registration) developed for the 97% a.i. formulation. As a user group, Canadian ISA chapters have size and professional credibility as assets. We have stuck a toe in the door regarding the potential of injection application and have completed one test toward development of a possible control product and method. We should open that door and step through. ♦

Photo Captions

Adjacent page. Left: red elm bark weevil (REW) larvae. Oval: adult REW. Right: tunnelling created by the larvae. Below left: the Ecoject system. Below right: a tanglefoot trap with collected insects.

Elm History...

Native to eastern North America and sometimes known as white elm or American white elm, it is an extremely hardy tree that can withstand harsh winters (-42˚C). Extensively planted as ornamental trees in cities across the country in the past because of their ability to withstand the demands of city life like restricted growing areas, they can live for hundreds of years. The 200 year-old, 27 metre tall elm at 24 Humewood Drive in Toronto is among only 30 big elms in the city that have managed to escape Dutch elm disease which has wiped out most of the continent's elms. Madeleine McDowell of the Humber Heritage Committee is trying to get the Humewood elm a heritage designation because of its connection to William Hume Blake (1809-1870), Chancellor of Canada West, and the fact that it is a remnant from an ancient forest with a gene pool that goes back 10,000 years.

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