EFFICACY OF LAMBDA-CYHALOTHRIN FOR CONTROL OF THE ASIAN LONGHORNED BEETLE

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ABSTRACT

Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is among high risk invasive species that recently invaded the U.S. from China. The methods used to eradicate ALB within North American infestations have thus far included: visual survey for ALB-infested trees, removal of ALB-infested trees, removal of all host trees within a given radius (e.g., 400 meters) of known ALB-infested trees, and/or treatment with a systemic insecticide (e.g., trunk injection or soil injection) of all host trees within a given radius (e.g., 400 meters) of known ALB-infested trees. To date, over 32,000 and 23,000 high value shade trees have been removed

in the US and Canada, respectively, in an effort to eradicate ALB and prevent its permanent establishment.

The objective of the research reported here was to investigate the potential development of an alternative control method based upon selective application of the pyrethroid, Lambda-Cyhalothrin, as an encapsulated insecticide under the trade names of Demand®CS or Scimitar® CS. More specifically, the objectives of the initial studies include: (1) to determine the Lethal dose (24hr) and Knockdown dose (1 minute) of Lambda-Cyhalothrin, the active ingredient of Demand® and Scimitar®, applied topically to adult ALB, and (2) to determine the residual activity of Demand® by exposing adult ALB to treated bands (Bands: 600 X 300 Denier, 7 Mil. PVC backed polyester fabric; Source: American Home and Habitat, Inc.; Product # FPV600B; Contact: www.ahh.biz). The objectives of the subsequent studies include: (1) to determine the residual activity of Demand® by exposing adult ALB to treated caged Acer mono trees, and (2) to determine the efficacy of Demand® and Scimitar® by spraying ALB-infested Acer negundo street trees.

LETHAL AND KNOCKDOWN DOSE OF LAMBDA-CYHALOTHRIN

Results from the 24-hour lethal dose (LD) studies showed that the: (a) LD_{50} = 0.13639µg/beetle (CI = 0.04717, 0.21372), and (b) LD_{90} = 0.78461µg/beetle (CI = 0.47376, 3.03056). Results from the knockdown (KT) studies showed that the: (a) KT_{50} = 69.28298 sec (CI = 58.87043, 84.27864), and (b) KT_{90} =282.78445 sec (CI = 187.77320, 624.53467).

RESIDUAL ACTIVITY OF DEMAND®TREATED DENIER BANDS

Demand®CS provided 100 percent mortality for 90 days when applied to bands at 450mg a.i./L and 600mg a.i./L. Additional field studies in which Demand®CS is applied to bands are needed. Exposure of adult *A. glabripennis* to a lethal dose of Demand®CS is based upon several factors, including: (1) the willingness of adult beetles to walk onto and across treated bands, and (2) the number and position of bands wrapped around branches in trees at risk. We recently evaluated the willingness of adult beetles to walk onto and across different materials. Results showed that that, among the materials tested, adult *A. glabripennis* most readily walked onto and across denier, while they hesitate to walk onto burlap. We have been evaluating where within different tree species adult *A. glabripennis* most commonly reside, particularly adult female *A. glabripennis* as they lay eggs during the first year of colonization. These studies will pin point where bands should be placed within trees so that they have the highest probability of killing adult beetles and preventing colonization.

RESIDUAL ACTIVITY OF DEMAND® -TREATED POTTED *ACER MONO* TREES

Demand®CS, prepared in tap water at dosages of 94.0mg a.i./L, 204.24mg a.i../L, and 315.19mg a.i../L, was applied to each of 10 potted *Acer mono* trees. Tap water was applied to 10 control trees. Each tree was then individually caged using hardware cloth. On the 1st, 8th, 15th, 22nd, 29th, and 36th day post-treatment (DPT), two male and two female field-collected ALB were randomly introduced into each of the forty cages. Adult beetle mortality was assessed after 24 hours. Beetles failing to exhibit leg movement when prodded with a fine bush were scored as dead. Results from the cage study indicate that Demand®CS can cause 95% and 90% 24-hour mortality for 29 days when applied to potted trees at 204.24mg a.i../L and 315.19mg a.i../L, respectively. However, because adult beetles were commonly found seeking refuge in cooler areas of the cage (e.g., holes or cracking in the soil surface or underneath the lip of the pots) that had not been treated with Demand® CS, these results likely **underestimate** the mortality that would occur on large landscape treated-trees and on treated potted trees that are adequately shaded and/or on which all surfaces are treated. Additional field studies where Demand®CS is applied to potted sentinel trees for monitoring the relative seasonal abundance of adult *A. glabripennis* are planned. Most importantly, these additional studies will determine if Demand®CS alters the attractiveness of the sentinel trees. However, where potted sentinel trees are strictly used for detection of adult *A. glabripennis*, treating sentinel trees with Demand®CS or any other insecticide is **not necessary** since the unique signs of feeding left by adult beetles are sufficient for detection.

EFFICACY OF DEMAND® CS- AND SCIMITAR® CS-TREATED *ACER NEGUNDO* URBAN-LANDSCAPE TREES

Results showed that exposure to 300mg a.i../L and 600 mg a.i../L Demand®CS provided overall population control of 99.0% (27 live/2,765 dead) and 98.4% (43 live/2,717 dead), respectively, over the 58-day test period in 2005 (14 July to 9 September). Results also showed that exposure to 300mg a.i../L and 600 mg a.i../L Scimitar®CS provided overall population control of 98.4% (15 live/926 dead) and 98.4% (13 live/791 dead), respectively, over the 67-day test period in 2006 (13 July to 17 September). This shows that Demand® is highly effective at controlling adult ALB. However, it is important to note that the treated and check (control) plots were spatially very close to one another, and as a consequence, the live ALB that continued to be found within the treated trees were largely immigrants from the untreated check plots. We are confident that, had the treated and check plots been farther apart and/or a treated buffer been included between the treated and check plots, it highly probable that percent control would have been consistently maintained at ca. 100 percent. To obtain a direct measure of immigration, additional data analysis is currently in progress at this time, comparing the number of exit holes/tree for 2005 and 2006. This will aid in determining the relative proportion of ALB within trees that resulted from emergence versus immigration. Furthermore, because our goal is to prevent oviposition by live female ALB and because ALB in Yanji, Jilin, have a 24-month life cycle, exit holes/tree will be evaluated in 2007 and 2008. This data will provide a measure of the efficacy of Demand® CS and Scimitar® CS to prevent attack by ALB.