RESEARCH ON ASIAN LONGHORNED BEETLE IN CANADA

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ABSTRACT

An established population of the Asian longhorned beetle, *Anoplophora glabripennis* (Motschulsky), was discovered in 2003 in an industrial park in the Greater Toronto Area, on the border between Toronto and Vaughan, Ontario, Canada. The purpose of this presentation was to provide an overview of the research activities undertaken and type of information collected since that discovery. This presentation provided an overview of the research program that was initiated during the rapid response phase of the eradication programme against the Asian longhorned beetle. The overall objective of that research was to fill up knowledge gaps, to formulate local and site specific treatment recommendations, and to improve the mitigation strategy. Also presented was information on the research that has been initiated recently with a formulation of the systemic insecticide imidacloprid® to mitigate the increased risk of dispersal to uninfested areas by residual populations within the infested area.

The research program was conducted concurrently with the operational programme to eradicate the Asian longhorned beetle. Eradication of this beetle in Canada consisted of the removal and chipping of all trees considered suitable for infestation and located within 400 m of an infested tree. A tree were considered suitable if there was visual evidence (i.e., exit holes) that the beetle could complete its entire life cycle there under field conditions. All suitable trees were identified to species, assigned a unique identifier and geo-referenced prior to removal. Infested trees were brought back to a laboratory and cut into 50 cm bolts. Each bolt was examined, and the intensity of attack (e.g., number of oviposition pits and exit holes) and characteristics of the attack (e.g., size of oviposition pits and exit holes) were recorded. Also, live specimens (i.e., eggs and larvae) were collected for molecular analyses. The infested bolts were subsequently cut into smaller pieces (about 1.5 - 2.0 cm thick), and the year in which each exit hole had been created was determined. The entrance of each feeding gallery leading to an exit hole was located, and the year it had been created was also determined so that the number of years larvae spent in the tree could be calculated. Also, all species located around trees with exit holes created by the Asian longhorned beetle were surveyed to assess their suitability as hosts for the beetle. In a nutshell, information on host suitability, larva behaviour, within-tree colonization patterns, dispersal patterns among trees in the landscape, and molecular relatedness of the beetle was collected and is expected to lead to improved detection and sampling methods, as well as increased survey accuracy. Over 500 trees were completely dissected to collect the above information.

The second portion of this presentation reported on the status of three studies currently underway involving the insecticide imidacloprid®. The objective of the first study was to perform a comparative assessment of the uptake and fate of imidacloprid following soil or stem injection to high-value maple trees for control of Asian longhorned beetle. The high pressure (Echo) soil injections took place on 6 June 2006 on silver maples (four trees; avg DBH = 30 cm) and sugar maples (four trees; avg DBH = 26 cm) using Merit (75% a.i.) at 0.56 g a.i./cm DBH. For each tree, there were eight injection sites on two circles at the half and full drip-lines, for a total of 16 injection sites/tree. Stems were injected either with Confidor® (200 g/L) or EcoPrid® (50 g/L) at a rate of 0.25 g a.i./cm DBH between 7 and 9 June 2006 using the EcoJect® system. Four silver maple (avg DBH = 31 cm) and four sugar maple (avg DBH = 26 cm) were treated with each formulation. The residues of imidacloprid from soil, foliage, and cortical tissue samples collected at regular intervals from the treated trees are being quantitatively determined by HPLC-DAD analysis.

The objectives of the second study were to assess the operational feasibility of Confidor®/EcoJect® injections and to estimate the potential of trunk injections of Confidor® for controlling Asian longhorned beetle by relating foliar residue levels in each species with existing LC values from adult feeding bioassays (Wang et al. 2005). Fifteen tree species were injected: Norway maple, silver maple, Manitoba maple, sugar maple, red maple, Amur maple, white birch, willow, poplar, American elm, Siberian elm, Sycamore, mountain ash, horsechestnut, and hackberry. The DBH of these trees varied between 18 and 44 cm. Five trees of each species were treated between 26 and 29 June 2006 at a rate of 0.25 g a.i./cm DBH. Two leaves were sampled from each quadrant of the mid and upper crown (total of 16 leaves per tree) at 1, 3, 6, 9, 12, and 15 weeks after treatment. For most species, the injection of the whole amount was completed in less than 1 hour. The foliar residues of imidacloprid are being quantitatively determined by HPLC-DAD analysis.

The objectives of the third study, conducted in accordance with OECD guidelines for GLP compliance and currently ongoing, was to determine whether imidacloprid contained in leaves that fall from systemically-injected trees pose a risk of harm to non-target decomposer organisms or processes. Comparisons to risk resulting from direct exposure to imidacloprid concentrations (i.e., soil injection and leaching) were also incorporated in the study.

REFERENCE

Wang, B., R. Gao, V.C. Mastro and R.C. Reardon. 2005. Toxicity of Four Systemic Neonicotinoids to Adults of *Anoplophora glabripennis* (Coleoptera: Cerambycidae). Journal of *Economic Entomology* 98(6):2292-2300.