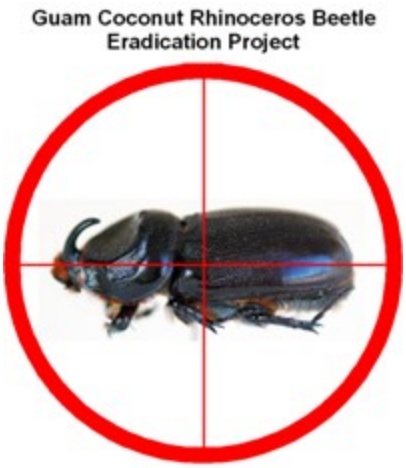

Preliminary Bioassay of DUTREX® using Adult Coconut Rhinoceros Beetles

Report prepared by
Aubrey Moore
amoore@uguam.uog.edu
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DUTREX® is an injectable insecticide containing 5% imidacloprid and 0.95% abamectin which is being considered as a prophylactic treatment for protecting coconut trees from damage by coconut rhinoceros beetles, *Oryctes rhinoceros*. Adults of this beetle bore into the crowns of coconut palms where they feed on sap.

Materials & Methods

Serial dilutions were made from a sample of DUTREX® to which a tracer dye, Rhodamine LT had been added at 5 ml per litre. Five percent sucrose in water was used as the diluent.

Beetles came from a laboratory colony maintained at the University of Guam and they where approximately the same age: two weeks post eclosion. These beetles, with a mean mas of 3.0 g, were noticeably smaller than field -caught individuals. Beetles were placed individually into plastic food boxes containing peat moss, but no food or water, one day before dosing.

Each beetle was dosed by using a pipettor to place a 5 microlitre drop of insecticide solution on its mouthparts. This operation was done under a stereo microscope and the beetle was observed until it had imbibed the droplet, usually within a few seconds. The beetle was then placed back in its box containing peat moss. The boxes were labeled with treatment information and placed into a large plastic container.

Results & Discussion

At 24 h after treatment, only 2 beetles had died: one of one beetles dosed with a 10% DUTREX® solution, and one of six beetles dosed with a 1% DUTREX® solution. The remaining 30 beetles were all apparently healthy. Twelve of these had escaped from there individual boxes into the large plastic container by boring a hole through the thin plastic. In two cases, escapees had bored into the box of a beetle of the opposite sex. The escapement problem precluded extending mortality observations beyond 24 h. In the future, more robust containers will be used to prevent escapes.

Limited data from this bioassay show that the 24 h LD50 for adult rhino beetles is much greater than 2.5 micrograms of imidacloprid. Given that the expected imidacloprid concentration in the crowns of injected trees is about 1 ppm (see appendix), a beetle would have to imbibe more than 2.5 ml of sap before receiving a lethal dose.

To minimize damage by rhino beetles boring into crowns of coconut palms, a highly toxic, fast-acting insecticide is required. Insecticidal activity of DUTREX® at deliverable concentrations may be too weak and too slow to prevent significant damage by adult rhino beetles. Other injectable insecticides containing other active ingredients should be tested as potential alternatives.

Table 1: 24 h mortality of adult *Oryctes rhinoceros* treated by oral injection of DUTREX®.

Dilution	Dosage	No. of beetles treated	No. of beetles dead at 24 h	Mortality at 24 h
10E-1	25,000 ng imidacloprid 4,800 ng abamectin	1	1	100%
10E-2	2,500 ng imidacloprid 480 ng abamectin	6	1	17%
10E-3	250 ng imidacloprid 48 ng abamectin	5	0	0%
10E-4	25 ng imidacloprid 4.8 ng abamectin	5	0	0%
10E-5	2.5 ng imidacloprid 0.48 ng abamectin	5	0	0%
10E-6	0.25 ng imidacloprid 0.048 ng abamectin	5	0	0%
Control	-	5	0	0%

Appendix

Concentration of active ingredients in coconut sap and tissues following trunk injection has not yet been measured. By modeling a coconut palm as a cylinder, and assuming even distribution of insecticide throughout the tree's volume we can estimate concentration of imidacloprid following a 21 ml injection of DUTREX® as:

PPM = 10^6 * (0.05 * 21) / tree_volume ; 21 ml of DUTREX® (5% imidacloprid) injected

tree_volume = pi * radius^2 * height ; radius and height in cm

For a 10 m tree with a 40 cm diameter trunk, the estimated concentration of imidacloprid is 0.8 PPM.

This estimate is comparable with 1 to 2 PPM of imidicloprid in leaves and twigs of injected trees reported by Poland et al. (2006).

Reference

Poland, T. M., R. A. Haack, T. R. Petrice, D. L. Miller, L. S. Bauer & R. Gao 2006. Field evaluations of systemic insecticides for control of *Anoplophora glabripennis* (Coleoptera: Cerambycidae) in China. J. Econ. Entomol. 99(2): 383-392.
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