Impact of the Insect Growth Regulator Pyriproxyfen on Life Table Characteristics of *Aedes albopictus*

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Introduction

• *Aedes albopictus* is a competent vector of dengue, chikungunya, and Zika viruses (among other arboviruses).

• Significant nuisance species in suburban environments.

• Control of this species is difficult due to its day-active behavior and skip oviposition ability.
Insect Growth Regulator (IGR)

• Insect growth regulators (IGRs) are pesticides that don't usually kill insects outright but instead affect the ability of insects to grow and mature normally.

• Pyriproxyfen is a pyridine-based insect growth regulator that affects the hormonal balance in arthropods.
  – Disturbs egg-laying and egg-hatch by mimicking natural insect hormones to keep young insects from maturing into adult forms, preventing target insects from multiplying.

• Pyriproxyfen products can come in many forms, including liquids, granules, dusts, and pellets.
Study Objective

- Characterize the extent to which Archer® (active ingredient: pyriproxyfen)(insect growth regulator) impacts life table characteristics of *Aedes albopictus* in a laboratory study designed to simulate barrier spray exposure.
Study Design

• Glass bottles coated with either:
  – 1 mL Archer® (AI: pyriproxyfen)(1 oz/gallon made in acetone)
  – 1 mL acetone control

• Caps removed and bottles placed on bottle roller until contents evaporated (1 - 2 minutes).

• Uncapped bottles placed into dark drawer and used within 24 h.
Study Design

• 100 blood fed *Ae. albopictus* introduced into bottles and exposed for 2 hours.
• Bottles rolled every 30 minutes to ensure mosquito tarsi were exposed.
Study Design

• Mosquitoes were transferred into individual number-coded cardboard cages containing shallow (59 mL) or deep (177 mL) oviposition cups with oviposition substrate.
  – 88 cages total:
    • 22 large, control
    • 22 large, pyriproxyfen
    • 22 small, control
    • 22 small, pyriproxyfen
Study Design

- Six days post-blood feeding, egg strips retrieved and eggs counted (fecundity rate).
- Ovaries dissected and retained eggs counted.
- Egg strips dried and then submerged back into same oviposition cups.
Study Design

• At 6 days and 12 days after egg strips were submerged, larvae were counted in oviposition cups (fertility).

• All emerged adults were counted (emergence) for the duration of the study.
Survival rates for those who laid and those who did not lay eggs by group:

- Control group: 18-21 mosquitoes laid eggs (up to 48%)
- Treatment group: 10-11 mosquitoes laid eggs (up to 25%)
Fecundity significantly lower in mosquitoes exposed to pyriproxyfen (compared to control).
Results

Fertility rate significantly lower in the pyriproxyfen group (compared to control) & larger containers showed significantly higher hatch rate (compared to smaller)

Adult emergence was higher among the control group & emergence was significantly higher among large containers (compared to smaller)
General Observations

• Exposure to IGR: pyriproxyfen reduced fecundity, fertility, and subsequent adult emergence.

• Not all mosquitoes exposed to pyriproxyfen experienced the same degree of reduction in life table characteristics.
Discussion

• Comparisons should be done to evaluate efficacy of pyriproxyfen on life table characteristics of other mosquitoes (such as *Culex pipiens/quinquefasciatus*, *Aedes aegypti*, *Aedes triseriatus*).

• We expect variation in these relationships between species, populations, and under different environmental conditions.
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Questions?

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