Sugar Feeding by Invasive Mosquitoes on Ornamental Plants

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Introduction

» Sugar feeding is important for both male and female mosquito life (Foster, 1995) (Upshur et al., 2019)

» Mosquitoes use olfaction (among other cues) to find their blood and sugar meals (Bowen, 1991; Ray, 2015)

» *Aedes aegypti* and *Aedes albopictus* are two invasive species that are spreading through the US quickly, bringing disease with them (Reinhold et al., 2018)

Introduction

» Recently emerged mosquitoes need plant fluids to survive long enough to blood-feed, and make better use of their blood meal (Foster, 1995)

» In addition, they receive non-carbohydrate nutrients including amino acids, salts, and vitamins from nectar or other plant-derived fluids (Baker & Baker, 1973; Nicolson & Thornburg, 2007; Rivera-Perez et al., 2017)

» I hypothesize that invasive mosquitoes use sugars in the flowers we plant in urban areas, which contributes to the success of these species and their ability to be efficient disease vectors
Introduction - Flower Roster

- Celosia
- Goldenrod
- Scaevola
- Marigold
- Lantana
- Mexican Heather
- Yarrow
- Guara
- Wave Petunia
- Red Impatiens
- Butterfly Bush
Plant Visitation Assays

Question(s)

» What plants are the mosquitoes feeding on?
» Are some plants avoided / preferred?

• 11 different plants total
• Mosquitoes are starved 1-2 days upon emergence
• Three replicates of experimental group: (10 females, 10 males) for both lab-reared species simultaneously running for one plant species
• Subsequent sugar analysis on mosquitoes
Plant Visitation Assays

Goldenrod Visitation

» For some plant species, both mosquito species are active
» Males and females act differently for some plant species
Sugar Analysis

Question(s)

» Did they feed in the nectar?

» Cold anthrone test on collected mosquitoes (Van Handel, 1985)

https://www.onlinebiologynotes.com/anthrone-test-objective-principle-reagents-procedure-and-result/
Sugar Analysis

Graph showing the percentage of positive sugar feeds for various plant species across different mosquito species. The graph includes data for Ae. aegypti and Ae. albopictus, with separate bars for male and female mosquitoes of each species. The plant species listed are Wave Petunia, Red Impatiens, Marigold, Celosia, Butterfly Bush, Guara, Lantana, Mexican Heather, Scaevola, Goldenrod, and Yarrow.

- **Wave Petunia**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male and female.
- **Red Impatiens**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Marigold**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus female.
- **Celosia**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus female.
- **Butterfly Bush**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male and female.
- **Guara**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Lantana**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Mexican Heather**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Scaevola**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Goldenrod**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.
- **Yarrow**: Higher percentage for Ae. aegypti male and female, and lower for Ae. albopictus male.

The graph highlights the varying sugar preferences of the mosquito species for different plant species, indicating specific feeding patterns and preferences.
Scent Collection

Question(s)

» Do they use scent to locate the plants?

» What compounds are they using?

Lahondère et al., 2019
Scent Collection: GC-MS Analysis

» Empty Bag Control
Scent Collection: GC-MS Analysis

- Camphene (1)
- β-Myrcene (2)
- α-Phellandrene (3)
- Limonene (4)
- β-Ocimene (5)

Mosquitoes are known to respond to these compounds.
Question(s)

» Which volatile compounds in the plant’s scent cause a response in these mosquitoes?

» Are these attractive or repellent responses?
Long-Term Goals

» Inform the public against planting flowers attractive to *Ae. aegypti* and *Ae. albopictus*

» Bait development
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Thank you

Questions?
Quantitative

![Graph showing total carbohydrates for different plant species]

- **Wave Petunia**: High carbohydrates for both Ae. aegypti and Ae. albopictus.
- **Red Impatients**: Moderate carbohydrates for Ae. aegypti and low for Ae. albopictus.
- **Marigold**: Moderate carbohydrates for both species.
- **Celosia**: Low carbohydrates for both species.
- **Butterfly Bush**: Low carbohydrates for both species.
- **Giara**: Low carbohydrates for both species.
- **Lantana**: Low carbohydrates for both species.
- **Mexican Heather**: Low carbohydrates for both species.
- **Scaevola**: Low carbohydrates for both species.
- **Goldenrod**: Low carbohydrates for both species.
- **Yarrow**: Low carbohydrates for both species.

Legend:
- Green bar: Ae. aegypti
- Yellow bar: Ae. albopictus