UNIVERSITY OF GEORGIA

Mosquito-flower power: Determining how nectar contents can influence mosquito vectors

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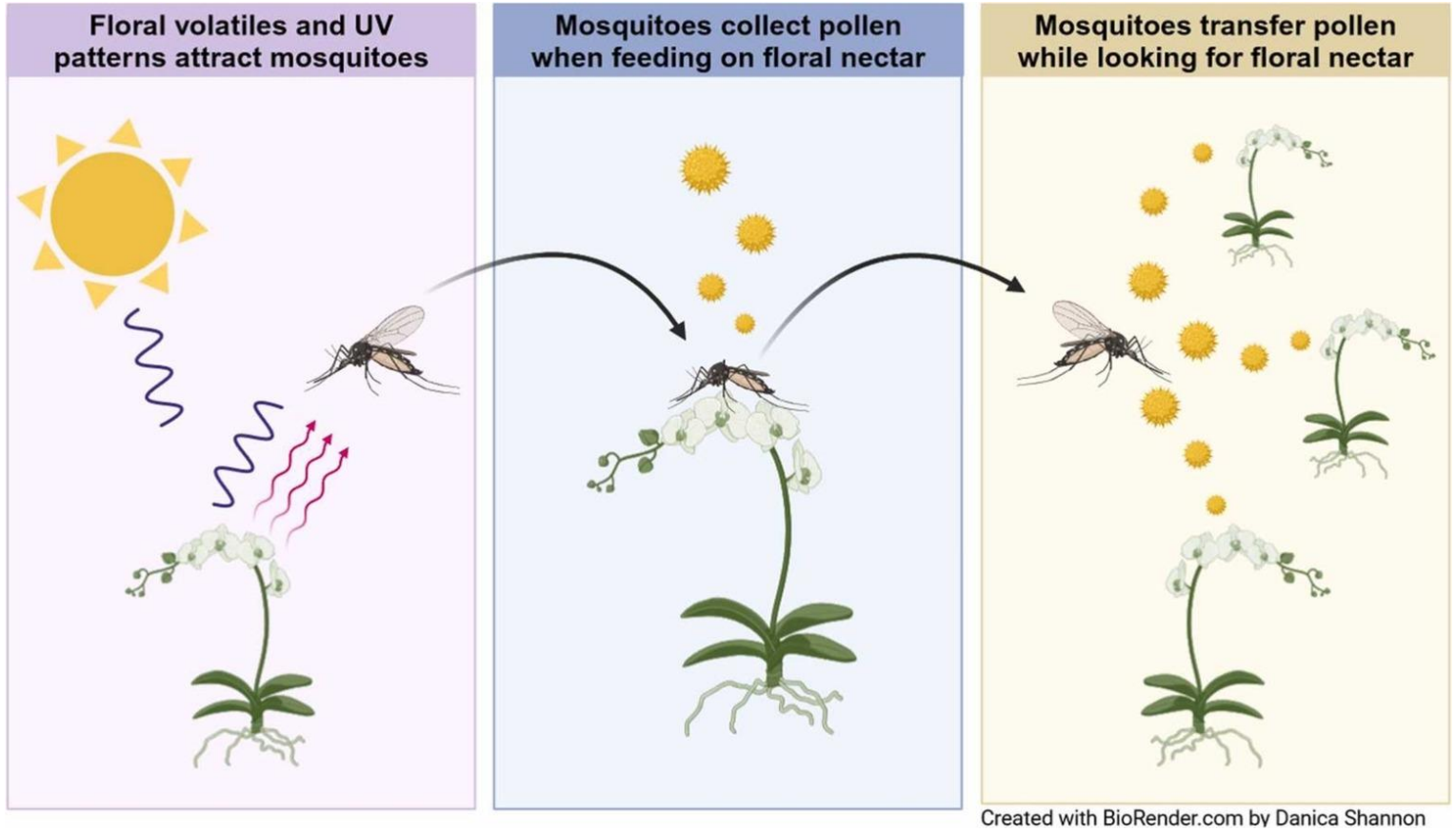
Mosquito-flower interactions

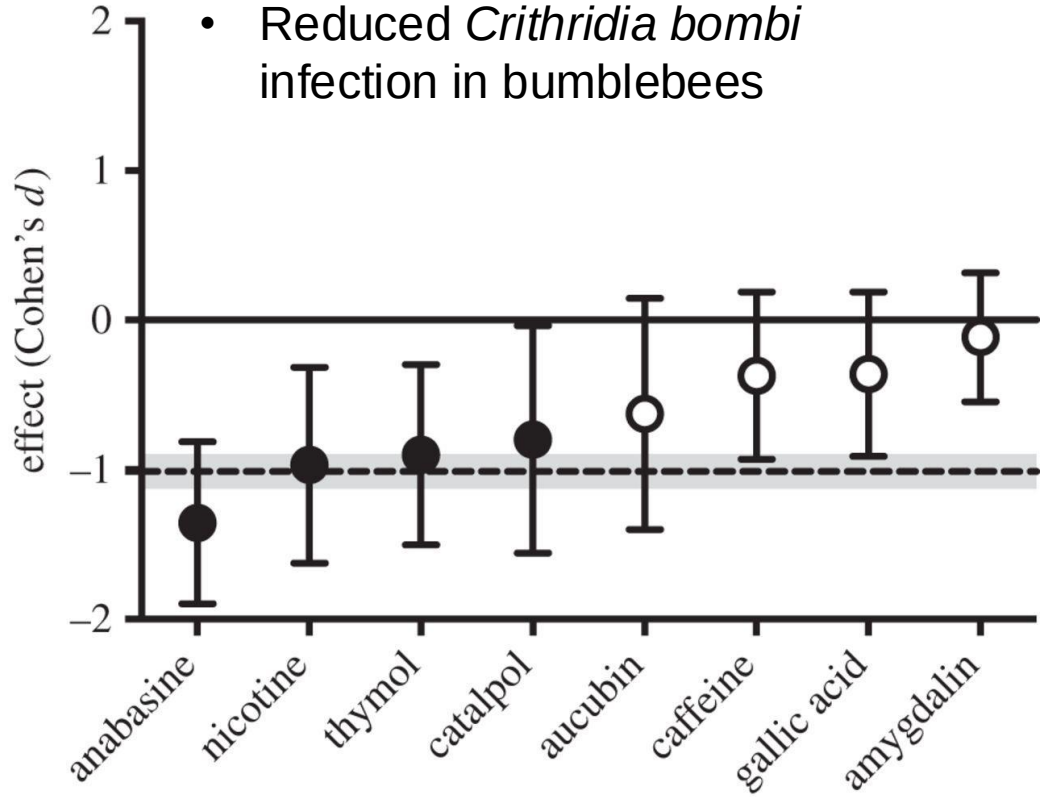
- Mosquitoes have a massive impact on **global public health**
- Significant research focused on human impact
- Not as much consideration for how their innate **interactions in environment**
- In addition to females blood feeding, most **mosquitoes feed on plant sugar**



Nectar Mitigation of Pathogens

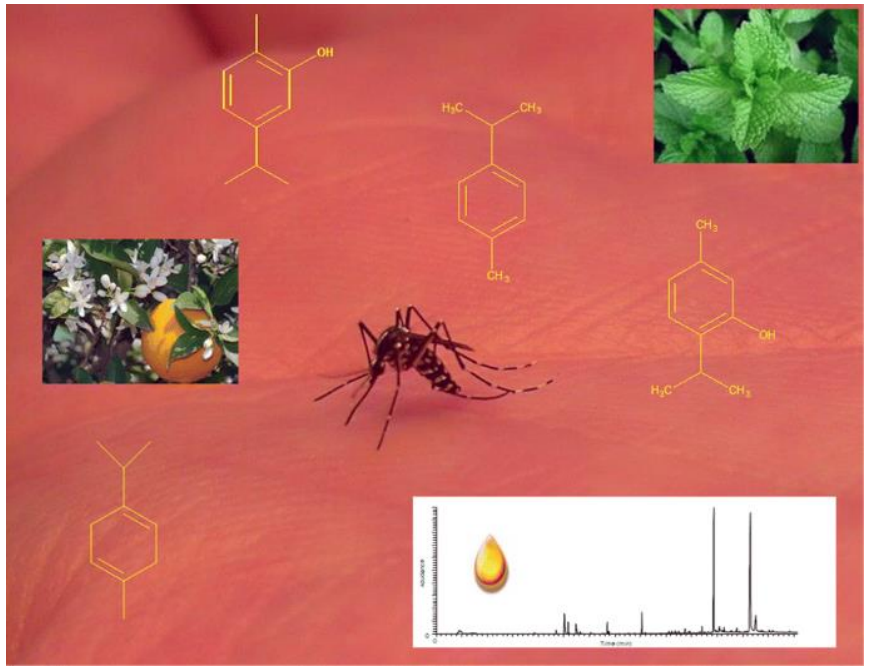
- Multiple examples of **mitigating effects** of nectar consumption in insects

- Reduced *Crithridia bombi* infection in bumblebees



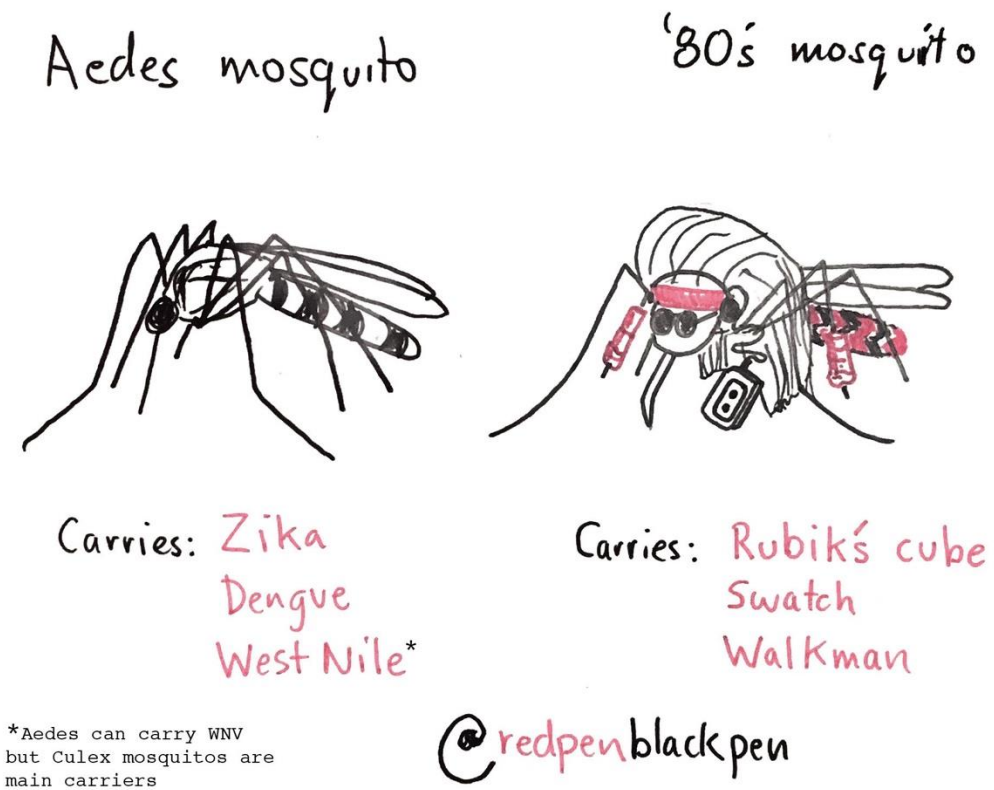
Richardson et al., 2015

- Plant essential oils used as effective insecticides against mosquitoes



Ntalli et al., 2019

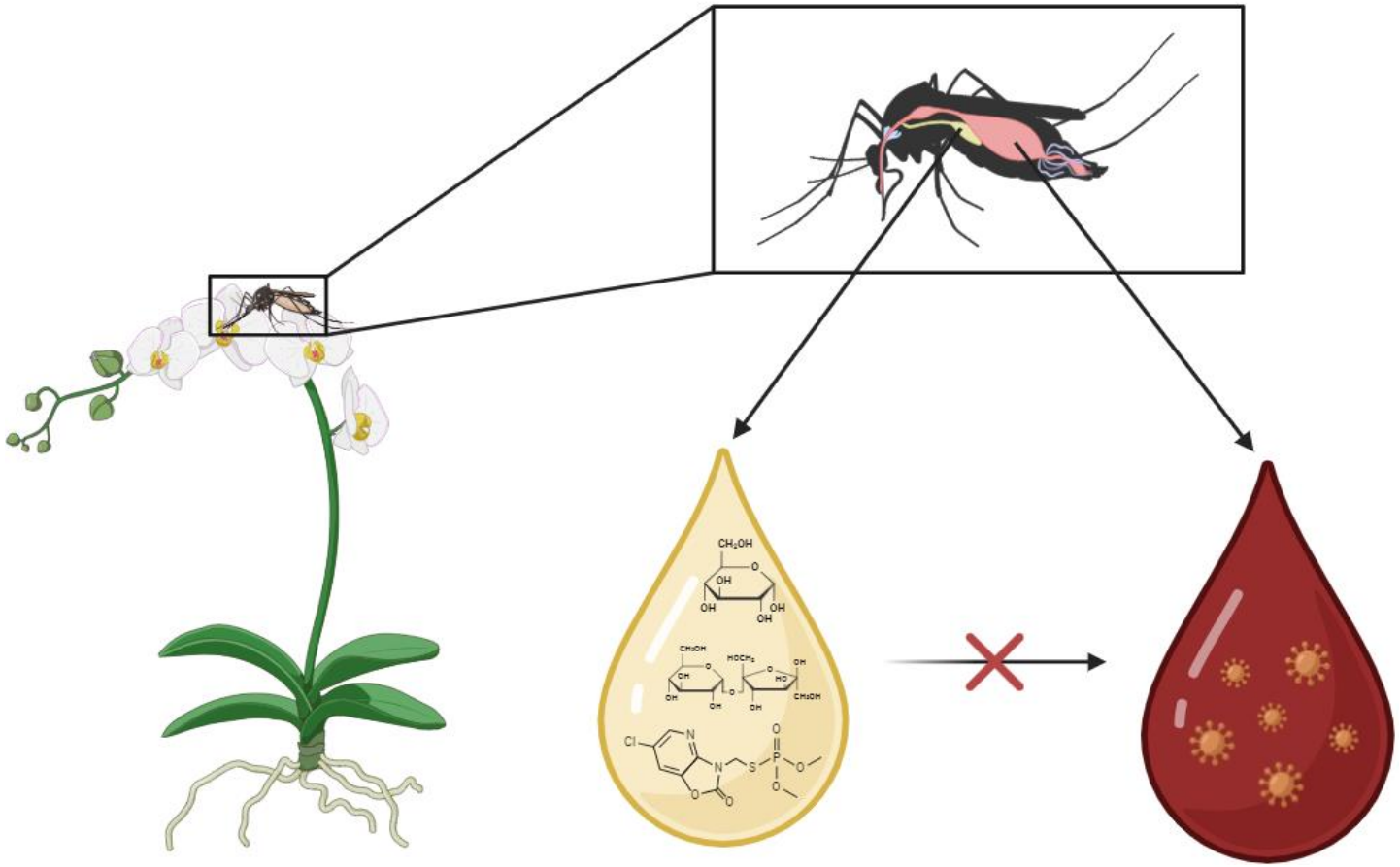
Heavy Metal Impacts



- Unique opportunity to conduct research on **heavy metal contaminated** land on SRS
- Heavy metals only investigated with relation to **larval mosquito habitats**
  - Akhtar et al., 2021; Mireji et al., 2008; Mireji et al., 2010; Sarkar et al., 2004
- Heavy metals can be **taken up by flowers** and collect in nectar repositories
  - Xun et al., 2018
- **How could this impact adult vectors?**

Gaps in Knowledge

- What flowers are mosquitoes interacting with?
- What constituents are present in flower nectar?
- How can these components impact mosquito vectors?

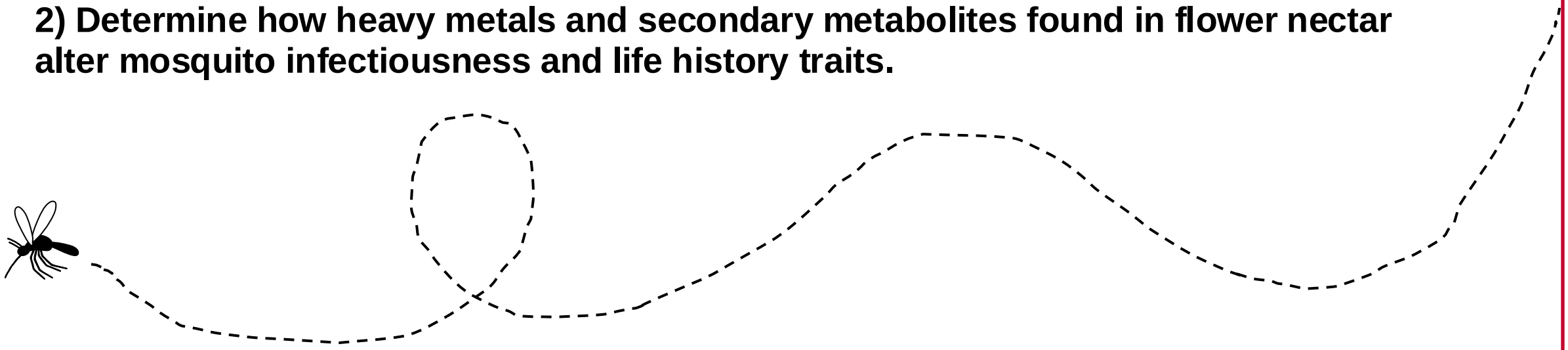


Aims

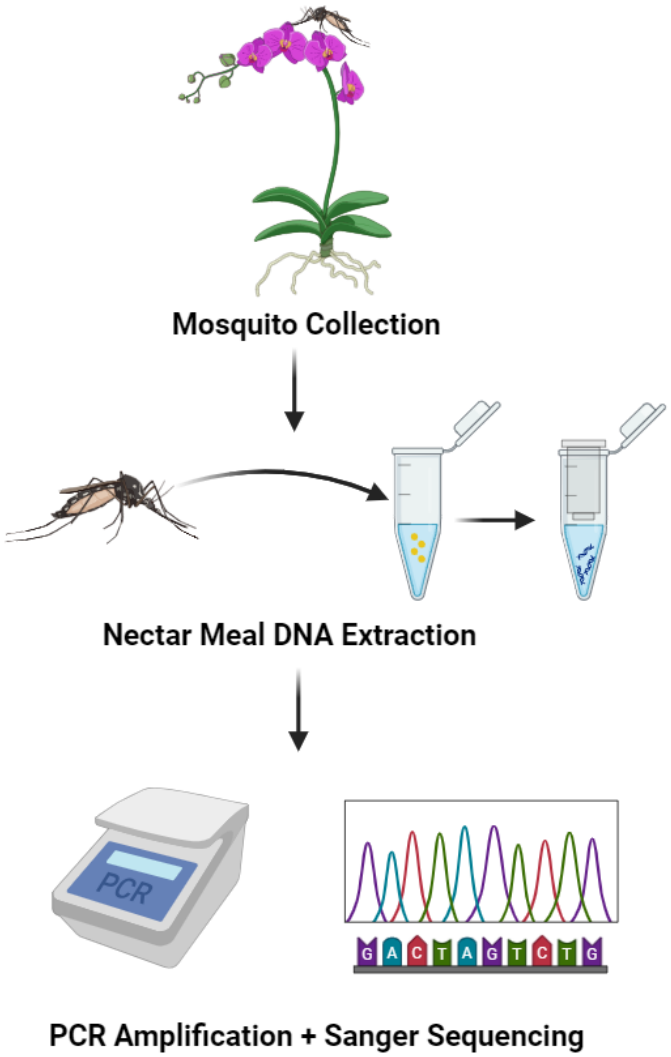
Hypothesis: The presence of heavy metals and secondary metabolites in flower nectar will alter infection rate in mosquitoes.

1) Document what mosquito-flower interactions are occurring at the Savannah River Site and areas of Yucatán, Mexico.

2) Determine how heavy metals and secondary metabolites found in flower nectar alter mosquito infectiousness and life history traits.



Aim 1 Approach



- **Field collection** of mosquitoes across SRS
- *Aedes aegypti* specimens from **Yucatán**
- Protocol similar to methods seen in Upshur et al., 2023
- Wash and **whole-body DNA extraction**
- **PCR amplification** using Phusion polymerase
- **Sanger sequencing** and BLAST comparison

Aim 1 Results

SRS Mosquitoes
Ae. atlanticus/tormentor
Ae. infirmatus
Ae. fulvus pallens
Ae. mitchellae
Ae. vexans
Cx. erraticus
Cx. nigripalpus
Cx. salinarius
Cx. quinquefasciatus
Ps. ciliata
Ps. cyanescens
Ps. ferox
Cq. perturbans
Mn. dyari

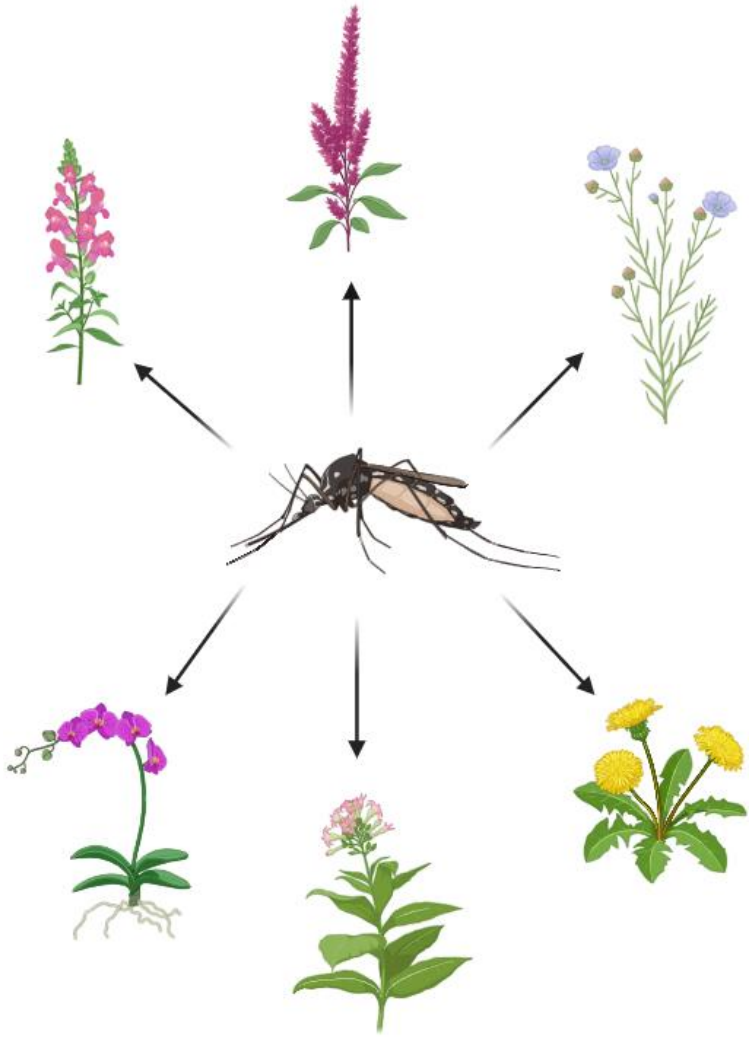
SRS Plant Families
Amaryllidaceae
Orchidaceae
Amaranthaceae
Capparaceae

Yucatan Plant Families
Orchidaceae

- SRS mosquitoes were **morphologically identified** before DNA extraction
- Some only identified to genus
- All Yucatán species were ***Aedes aegypti***
- BLAST matches **>80%** similarity

Challenges and next steps

- **Low quantities of genetic material** for amplification
- **Primer pairs** make plant identification challenging
  - Need more diagnostic option



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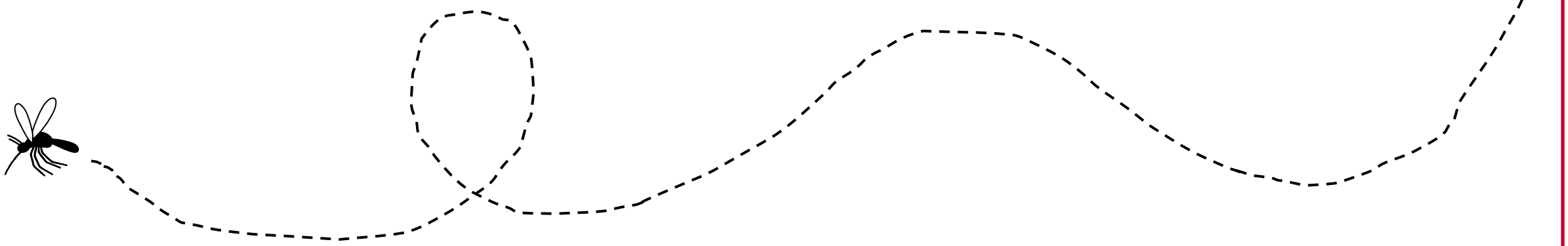
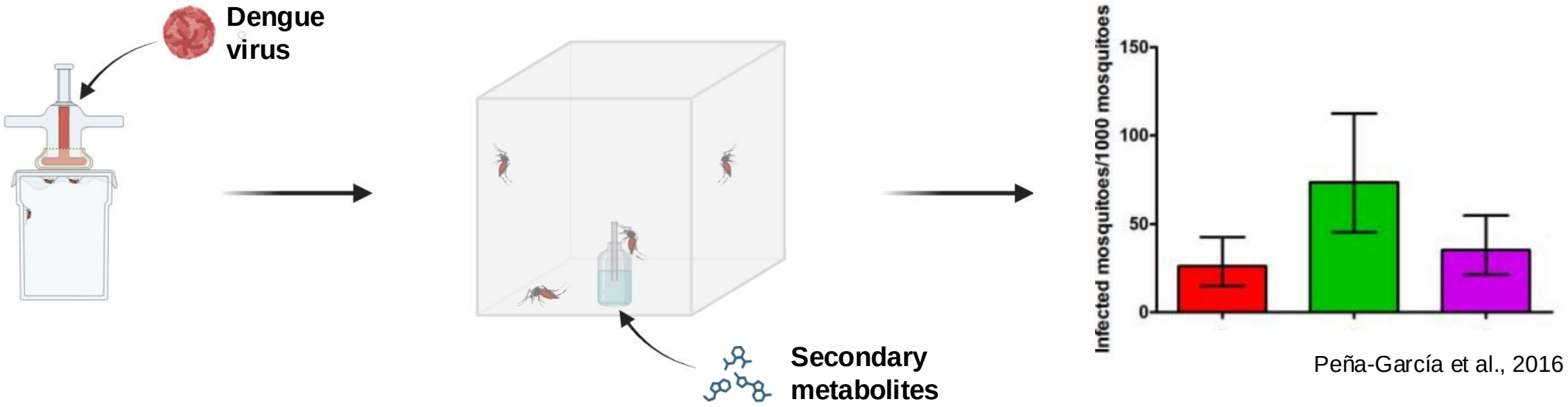


Aim 2 Approach

- **Mass spectrometry** on heavy metal and secondary metabolites in nectar
- **Enhance sugar water** with synthetic equivalents and provide **infectious blood meal**
- **Record variables** like infection rate and mosquito mortality



Peña-García et al., 2016

Future Directions

- **Continue to process** field caught and Yucatán mosquitoes
- Use **additional primers** to help distinguish nectar meal IDs
- Begin **cataloguing components** to enhance sugar water
- **Finalize protocol** for Aim 2 experiments

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Thank You!