Fruit Fly Management in Palau

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PALAU COMMUNITY COLLEGE

STEP-UP
Short-Term Research Experience For Underrepresented Persons

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ABSTRACT

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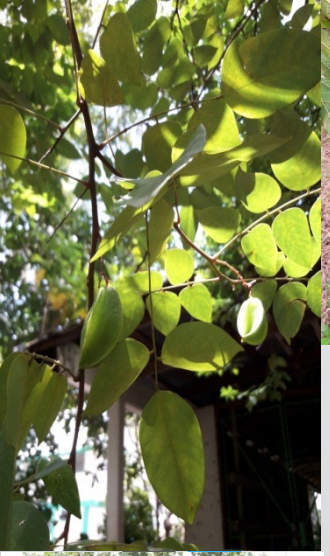
Control of Fruit Fly Population in Palau

Fruit flies have caused major damage in fruit trees across the pacific and in Palau. They have caused 90% of fruit loss on the island. There are four known species of fruit flies; mango fruit fly (*Bactrocera Frauenfeldi*), oriental fruit flies (*Bactrocera Dorsalis*), breadfruit flies (*Bactrocera Umbrosa*), and *Bactrocera Calophylli*. The female flies damage unripened fruits by injecting their larvae into the fruits by their stinger. As the larvae grow they devour the fruit from the inside out. Catching female fruit flies with existing methods have been proven difficult, but a new cost-effective method is being tested and has produced promising results. Implementation of traps made of yeast waste, crushed papaya leaves and isopropyl carried out in small bottles hung on trees have proved effective in trapping 40 female *B. dorsalis*, 12 *D. melanogaster*, as well as 3 unidentified female flies. Future plans in expanding the methods and traps used are under way to trap and control fruit flies on a larger scale.

Key Words: *B. Dorsalis*, *B. Umbrosa*, *B. Frauenfeldi*, *B. Calophylli*, Palau, yeast, papaya









Importance of Fruit Trees

- Source of food and drink
- Used for medicinal purposes
- Used in making tools and other specific materials
- Source of sustainable economy (local/tourist)









- Fruit flies of the family *Tephritidae* are considered to be the most problematic insect pest species of cultivated fruit in the world.
- There are over 4500 fruit fly species in the world and more than 50 of them are classified as major pests.
- Palau is known to have 4 fruit fly species.

Oriental Fruit Fly
Bactrocera dorsalis

- First discovered in Palau in 1999, thought to have been accidentally introduced from the Philippines.

- Host fruit:
  - Starfruit *(Averrhoa carambola)*
  - Kalamansi (*Citrus microcarpa*)
  - Guava (*Psidium guajava*)

Breadfruit Fly
Bactrocera umbrosa

- Host plant:
  - Breadfruit (*Artocarpus altilis)*
  - Jackfruit *(Artocarpus heterophyllus)*

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Mango Fruit Fly
Bactrocera frauenfeldi

- Host plant:
  - Starfruit (*Averrhoa carambola)*
  - Mango (*Mangifera indica)*
  - Tropical almond (*Terminalia catappa)*
  - Guava *(Psidium guajava)*
  - Mountain apples (*Syzygium malaccanse)*

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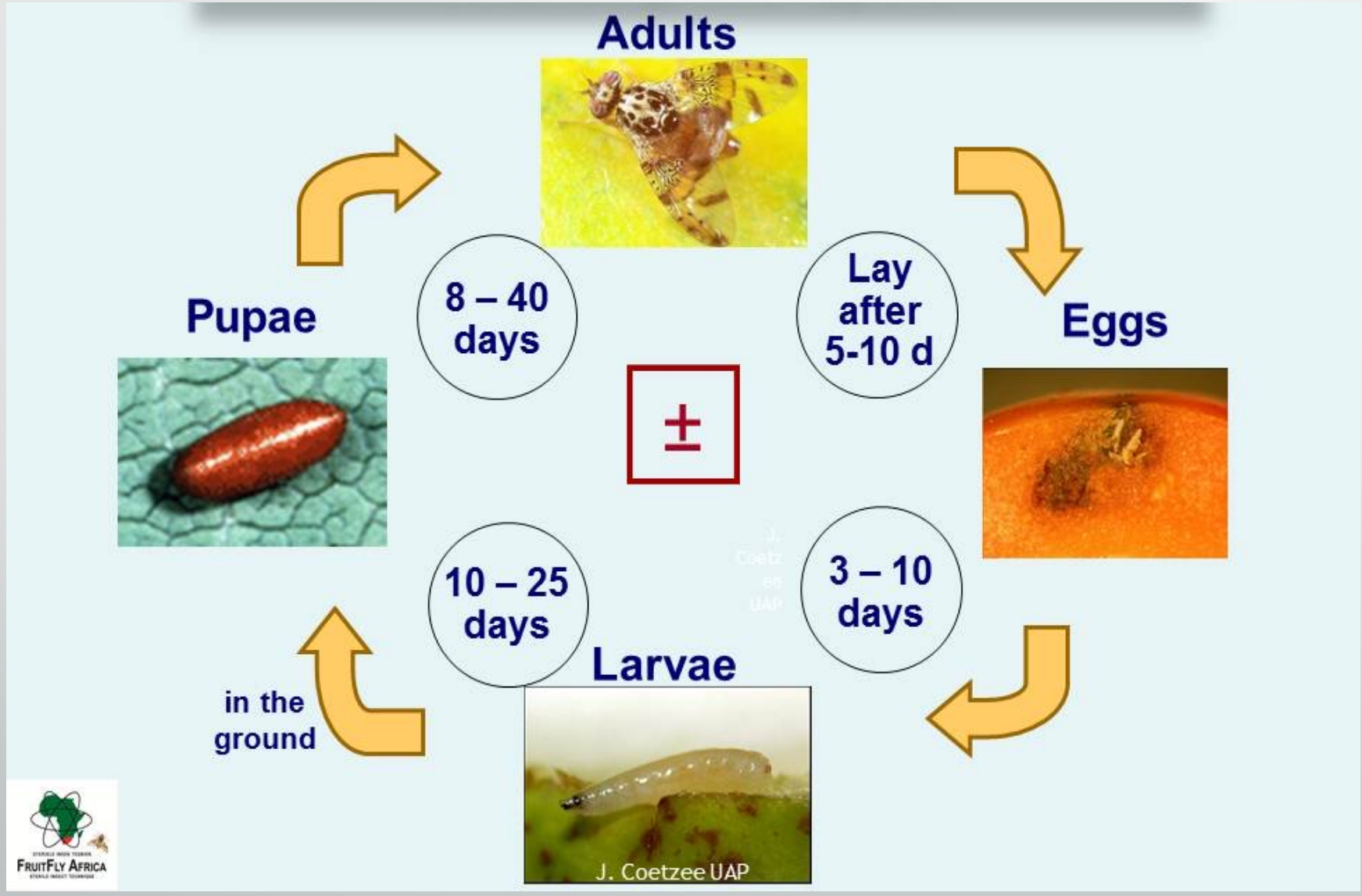
Bactrocera calophylli

- Host fruit:
  - Indian laurel (*Calophyllum inophyllum)*
- No photo
- This species does not affect the economy.

Life Cycle


Adults
Lay after 5-10 d
Eggs
3 – 10 days
Larvae
10 – 25 days
in the ground
Pupae
8 – 40 days
±
J. Coetzee UAP

Fruit Fly Damage to Fruits

There are **4 known fruit flies** found in Palau which all have contributed to nearly **90% of fruit losses** in Palau. The female fruit flies would find a host fruit and with its stinger, inject its larvae into the semi-ripened fruit and from there the fruit begins to rot. From the inside, the larvae feed on the fruit until it rots than fall to the ground where they start to develop their hardened shell and grow into adults.

Objectives

In the last 60 years, our attempts to catch a female fruit fly have all been unsuccessful. This is because traps are using female pheromones which attract male fruit flies.

My objective for this project was to create a sustainable, all-natural, and relatively inexpensive trap which could collect female fruit flies as well as the males.

Trapping and Eradication attempts

Some methods to manage and control fruit fly populations have been implemented in different pacific island countries such as Fiji and Cook Islands.

- Physical control such as bagging, which provides a physical barrier between the host fruit and female fruit fly. (It is a very effective method but very time consuming.)
- Harvesting the fruit at color break.
- Protein bait sprays. In Palau, similar method has been used but as traps.
- Eradication of fruit flies in Palau is very expensive. In 1999 it was estimated to cost $1 million to eradicate oriental fruit and breadfruit fly. And now it is estimated that it will cost more that 10 million.

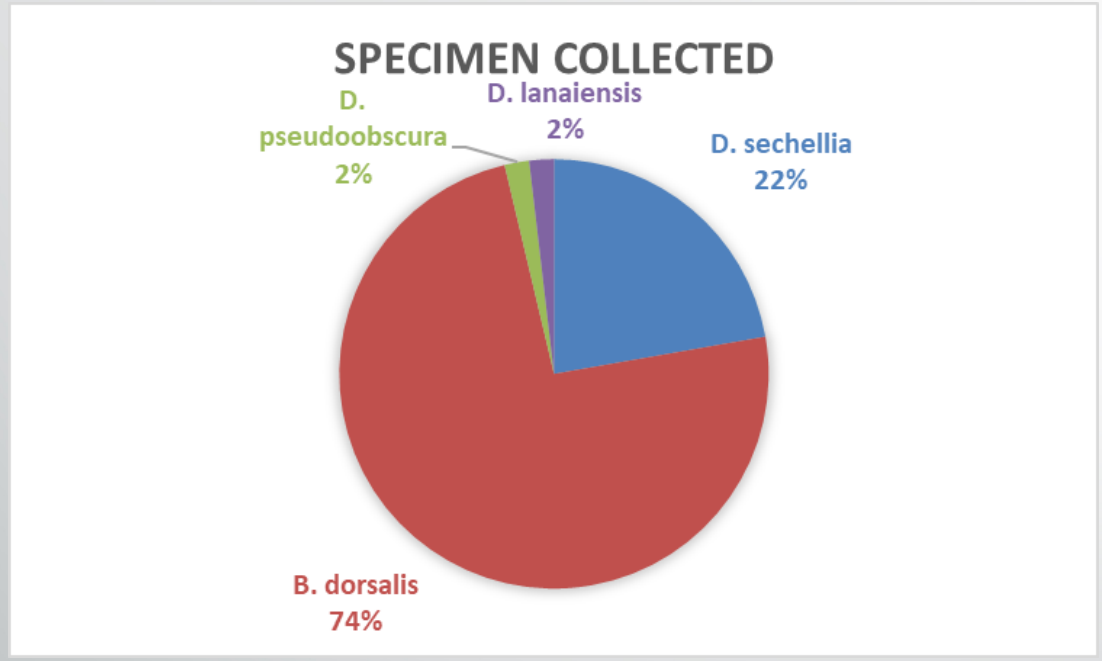
Hypothesis

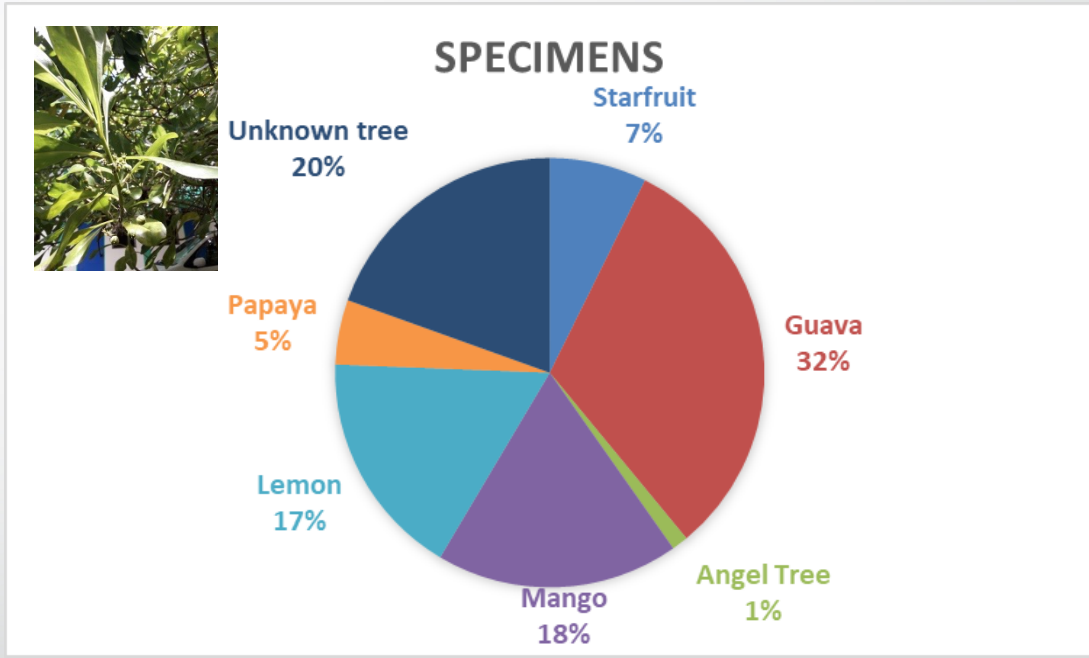
Utilizing a prior established spray method of a yeast, papain and organic solvent we will be able to attract the female fruit fly to a vat mixture and capture without the use of pesticides.

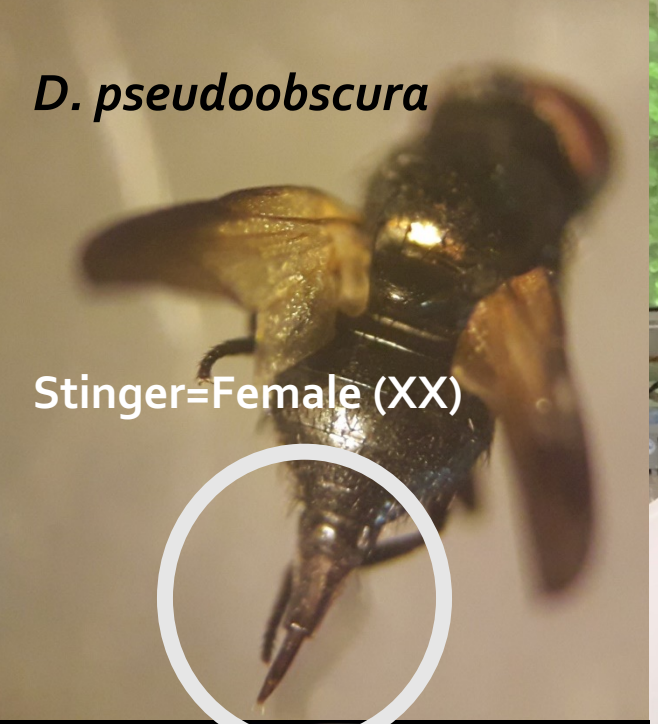
Methods and Materials

- Mixture of waste yeast brewery, papaya leaves and 70% isopropyl alcohol.
- For every 5-gallons of waste yeast, add 10-15 crushed papaya leaves and 1 cup of isopropyl alcohol. Mix well and let it settle for at least an hour. This is done so that the papain in the papaya leaves can be secreted and mixed with the yeast.
- Reused bottle filled with bait halfway and hung on fruit bearing trees.
- Strain and assess traps weekly for specimens.

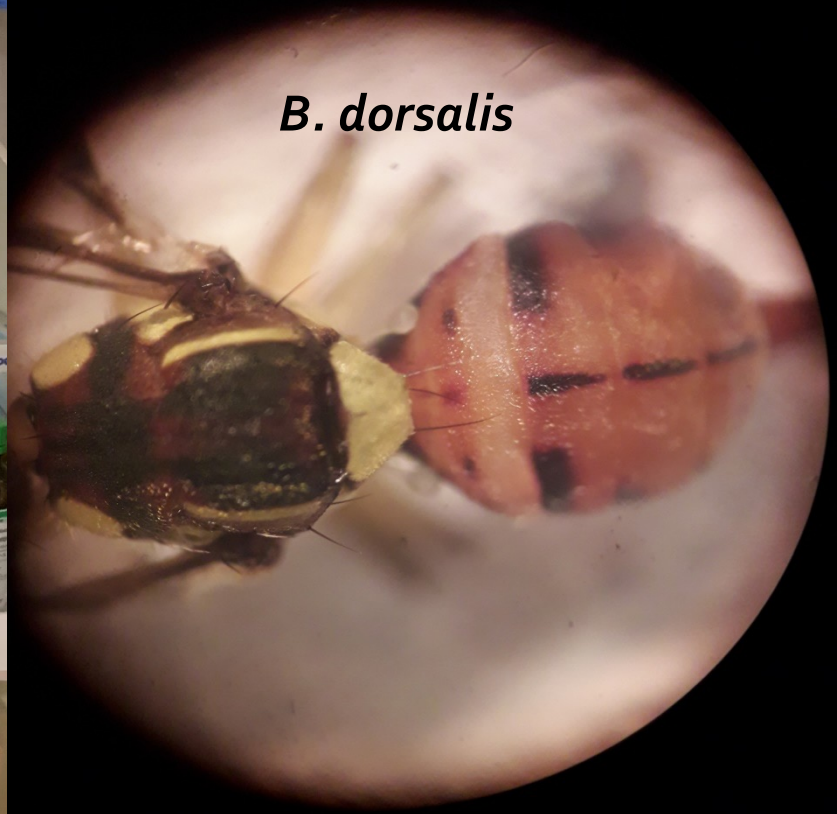
Results:
Trap Data






D. pseudoobscura
Stinger=Female (XX)


D. sechellia


B. dorsalis


D. lanaiensis

Discussion

- **FIRST** successful capture of **FEMALE** fruit fly in Palau!!!!!!!!!
- Trapping method does **NOT CONTAIN PESTISIDES**.
- **VERY ECONOMIC:** trapping method is inexpensive and easy to recreate on any tropical island.

Conclusion

1. The implementation of traps around the Palau Community College campus has proven successful in catching female fruit flies.

2. Utilizing multiple tree locations has helped us determine which types of fruit flies are mostly found on which type of tree and therefore has given us a better understanding of how to control this problem.

3. These methods will be nation-wide project is already underway with the Bureau of Agriculture to produce the bait on a larger scale and to be placed around Palau and local farms.

4. This method can be easily transferred to other places across the Pacific.

Acknowledgments

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