GC/MS Analyses of Protein-Based Tephritid Fruit Fly Lures

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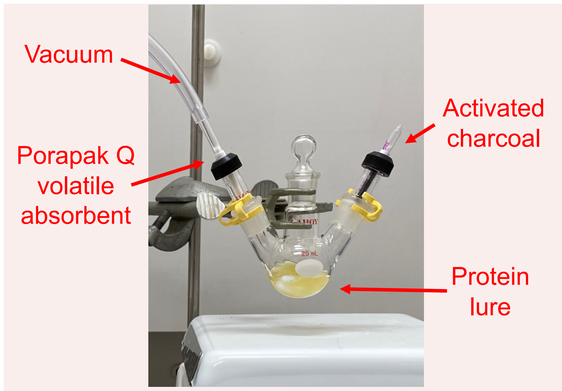
Introduction

Tephritid fruit fly species are a major threat to ecosystems and agricultural environments. Specifically, the Queensland fruit fly (*Bactrocera tryoni,* Qfly*)* and the Melon fly (*Bactrocera cucurbitae),* found in Australia and Hawaii respectively, are serious agricultural pests. Protein-based lures are used to attract tephritid fruit flies to control their populations.[1] GC/MS analysis of commercial protein-based lures can determine abundant compounds in effective lures. These compounds can be used to create synthetic lures which are highly specific to species of interest. An example of this is Biolure, a synthetic lure targeting the Mediterranean fruit fly (*Ceratitis capitata*). The preliminary results of this study will be used for the creation and testing of a similar synthetic lure which will be studied in Northern Australia and Hawaii.

Methods

- A variety of protein-based lures were sent to EMU from the Queensland Department of Agriculture and Fisheries.
- 25 mL round bottom flasks were used to contain the lures while air was passed through activated charcoal and into the flask at a rate of 1.0 L/min . The volatiles were collected on Poropak Q, a porous polymer absorbent, while the lures were stirred.
- The volatile compounds were extracted from the Poropak using 2 mL of dichloromethane.
- The solvent was injected into the GC/MS and the compounds were identified using the NIST mass spec database.



Results

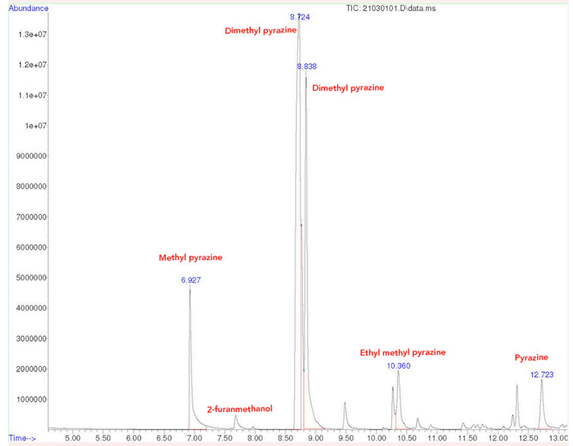
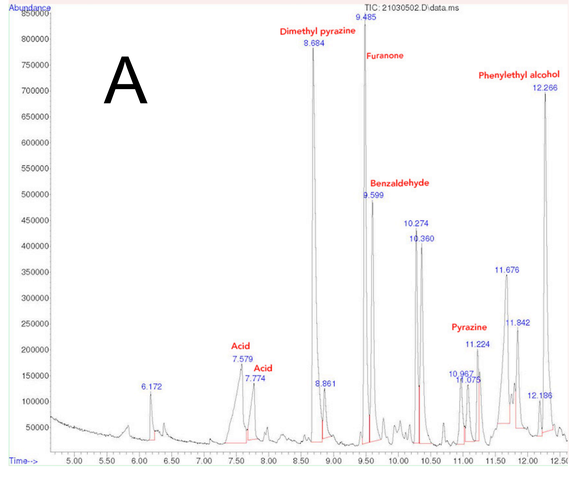


Figure 1. GC trace of protein lure, Biodelear. Note the absence of benzaldehyde and its analogs.



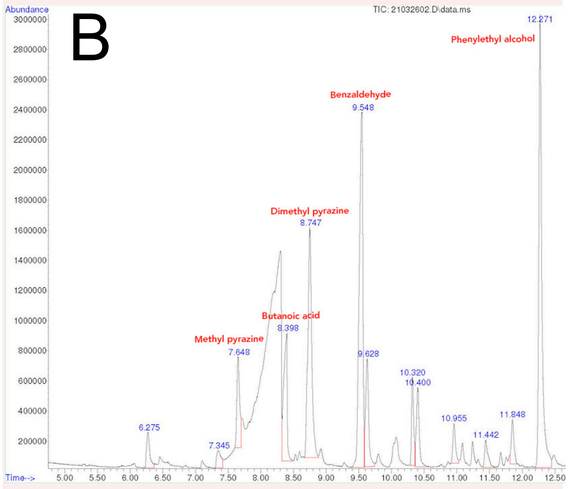


Figure 2. GC trace of Yeast Autolysate (A) and Hymlure (B). Each lure showed a large abundance of benzaldehyde.

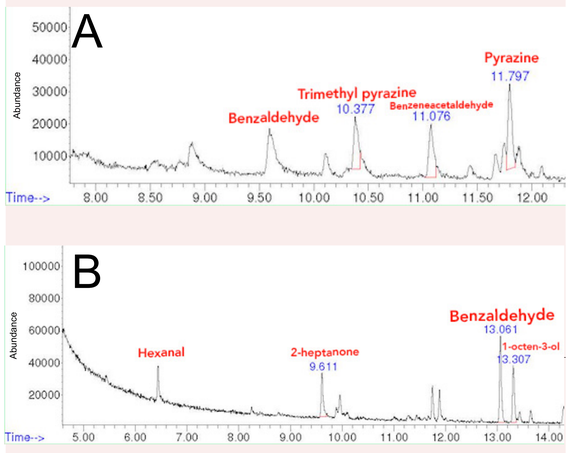


Figure 3. GC trace of Solulys (A) and Torula (B) yeast. These lures showed a lower abundance of compounds compared to the other lures.

Conclusions

- The most common and most abundant compounds found were benzaldehyde and its analogs and alkylpyrazines.
- Minor compounds that were also found consisted of organic acids and furanones.
- Commercial lures that are known to have little effectiveness for Qfly, such as Biodelear, were missing benzaldehyde and its analogs.
- Torula and Solulys yeast did not show the abundance of compounds that were seen in other lures.
- The major compounds determined by these results will be used to create a synthetic lure in Hawaii. Biological responses to synthetic lures will be tested through electrophysiology, bioassays, and field trapping.

References

[1]Biasazin, T.D.; Chernet, H.T.; Herrera, S.L.; Bengtsson, M.; Karlsson, M.F.; Lemmen-Lechelt, J.K.; Dekker, T. Detection of Volatile Constituents from Food Lures by Tephritid Fruit Flies. *Insects* 2018, *9*, 119. https://doi.org/10.3390/insects9030119

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