Glossina palpalis gambiensis selects its larviposition site: from behavioral to semiochemical characterization

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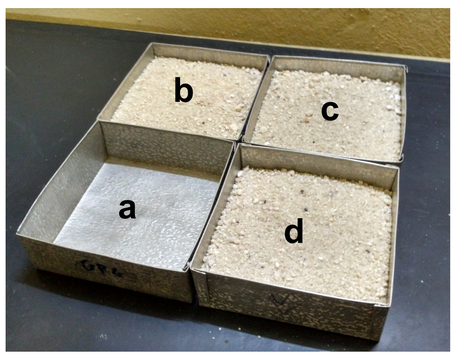
- In Sub-Saharan Africa, tsetse flies are the vectors of trypanosomes to humans, and domestic animals
- So far, vector control has focused on a unique behavioral target: the "host seeking behavior"
- The tsetse fly larviposits a single larva every 10 days in a specific site
- Larval aggregation has been identified in the field, and female larviposition seems to be mediated by larval exudates
- ➢ **We characterized the larviposition-site selection of *Glossina palpalis gambiensis* from behavioral to semiochemical**


Female tsetse larvipositing © Ray Wilson

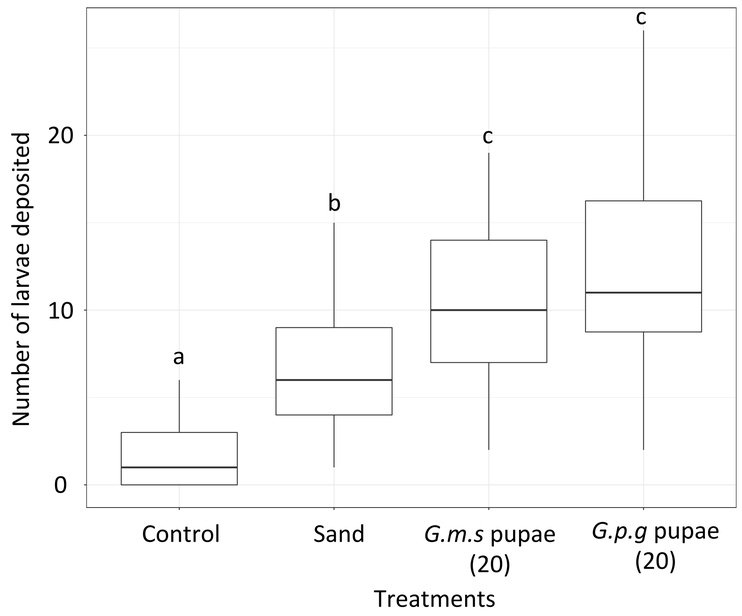
Experiment 1: Behavioral response of gravid flies to larval compounds

Four-choice larviposition bioassays



a. Empty tray (cleaned at day 3)
b. Autoclaved sand (cleaned at day 3)
c. Sand with *G. p. gambiensis* pupae (n=20)
d. Sand with *G. m. submorsitans* pupae (n=20)

- 50 gravid females per cage
- 4 cages and 10 replicates per cage
- 5-day experiment



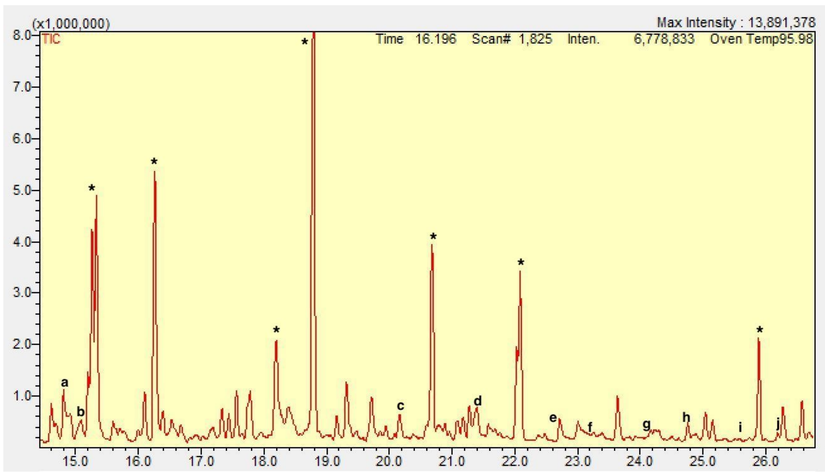
- ➢ **Female flies selected significantly more often sites with pupae ($P < 0.05$), but did not discriminate between sites containing conspecific and heterospecific pupae**
- ➢ **The larviposition-site selection by female flies appears to be mediated by hetero-specific compounds**

Experiment 2: Identification of larval semiochemicals

SPME fiber extraction
(PDMS−DVB 65 µm)

- 50 larvae allowed to pupate
- 6-hour extraction
- 2 replicates

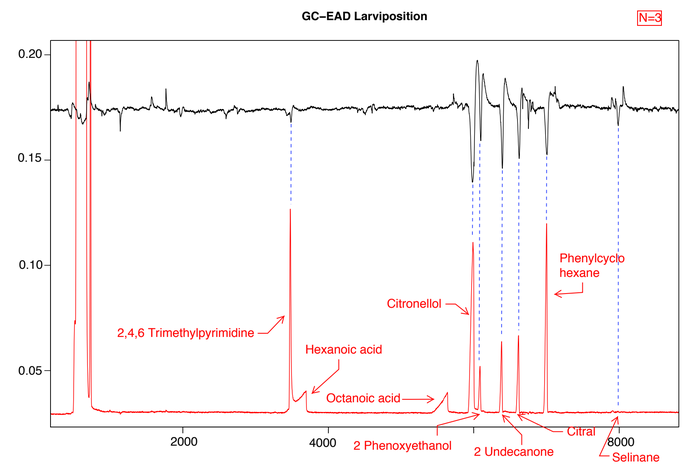
GC-MS analyses and retention-time profile comparisons



Identification of ten potential compounds

a. 2,4,6-Trimethylpyrimidine
b. Hexanoic acid
c. *iso*-Citronellol
d. Octanoic acid
e. 2-Phenoxyethanol
f. Neral
g. Citral
h. 2-Undecanone
i. Benzenecyclohexane
j. Selinane
* pollutants or compounds present in control (empty) vials

Electroantennogram responses

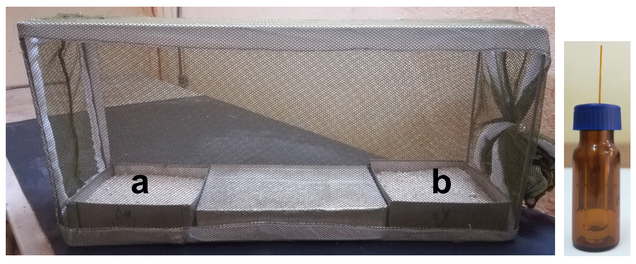


- 15-day old gravid females
- Commercial chemicals
- Dichloromethane dilution (1/1000)

- ➢ **We did not identify n-Pentadecane and n-Dodecane found by Saini et al. (1996) as biological active compounds in *G. m. morsitans* larvae**
- ➢ **Gravid female electroantennogram responses were positive for all compounds tested**

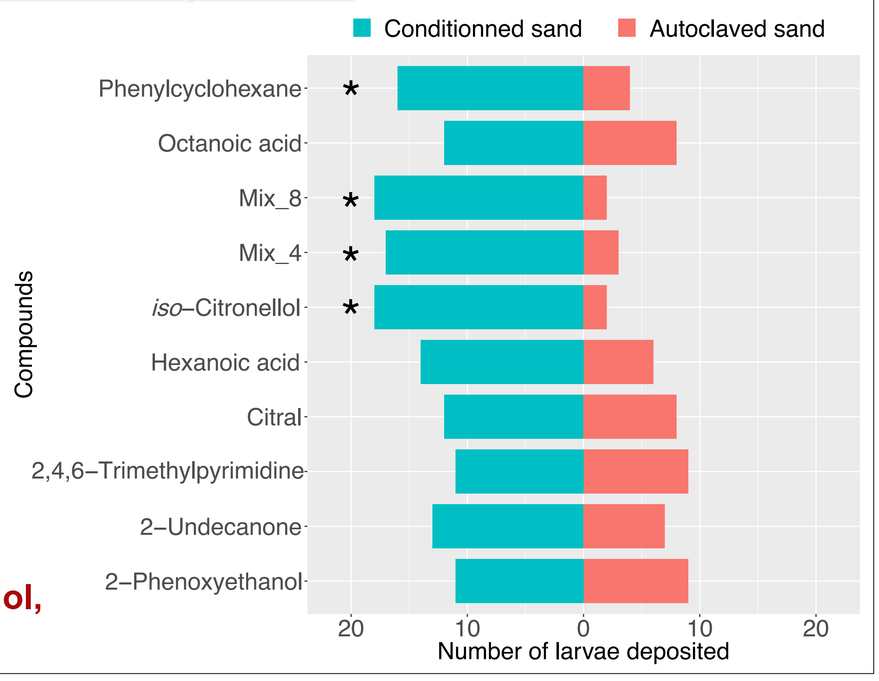
Experiment 3: Behavioral assays with commercial compounds

Two-choice larviposition bioassays



a. Autoclaved sand
b. Sand conditioned with synthetic compounds: glass vial with 150 µl solution, delivered through a 0.5 mm capillary tube allowed slow regular emissions of compounds

- Larviposition test using individual flies
- 20 replicates per compound
- Mix of all 8 compounds (25 µl per compound)
- Mix of 4 non-active compounds (Octanoic acid, Citral, 2-Phenoxyethanol and 2, 4, 6-Trimethylpyridine)



- ➢ **Gravid females deposit significantly more larvae in trays conditioned with either *iso*-Citronellol, Phenylcyclohexane or each of the two mixtures but not the other compounds**

Perspectives

- ➢ **Compound attractiveness will be confirmed in the field with wild flies**
- ➢ **Results will allow to develop innovative vector-control strategies through manipulation of larviposition behavior**

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Reference:
Saini, R.K., et al., Identification of major components of larviposition pheromone from larvae of tsetse flies *Glossina morsitans morsitans* westwood and *Glossina morsitans centralis* machado. J of Chem Ecol, 1996