Understanding sensory-driven behavior and ecological adaptations between populations of *Drosophila mojavensis*

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Background

In insects, variable chemical cues emitted by plants can be used to identify appropriate food resources and are primarily detected by the insect's olfactory sensory system (Vosshall and Stocker, 2007). Differences in the sensitivity of the olfactory system can contribute to shifts in odor-mediated behavior, which potentially can lead to speciation between populations (Brown et al., 2020) .

Drosophila mojavensis is a desert-adapted fruit fly species with different preferences in host plants between populations. Olfactory cues from host cacti are used for choosing feeding and breeding locations (Vosshall and Stocker, 2007). This research examines the host preference behavior of two populations of *D. mojavensis* in response to the volatile chemicals emitted by their host plants. Odor-mediated behavioral responses to an array of ecologically relevant host-plant chemical compounds were measured for two fly populations.

This research sets the groundwork for future research on the relative influence of peripheral olfactory system changes on shaping behavior between populations. Those different odor-mediated behavioral responses can cause changes in the olfactory system, potentially leading to speciation between populations.

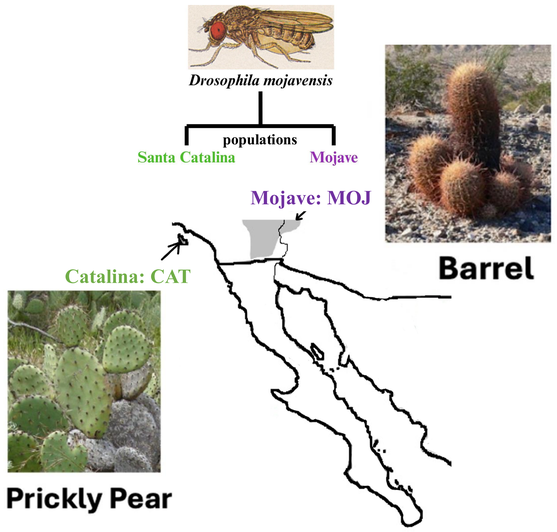

Figure 1: Geographic distribution and cactus hosts of Catalina and Mojave populations of *D. mojavensis*

Hypothesis

We hypothesize that two populations of the same species adapting to different host plants will differ in their behavior toward different environmental odors.

Materials and Methods

- A T-maze setup with two arms: one with a 1% diluted odor compound and the other with the vehicle, control.
- The flies were loaded in the middle of the T-maze and allowed to move freely to both ends.
- The responses were video-recorded for 15 minutes.
- A response index of attraction or repulsion was calculated by using the formula:

$$RI = \frac{number\ of\ flies\ on\ odor\ side - number\ of\ flies\ on\ control\ side}{total\ number\ of\ flies}$$

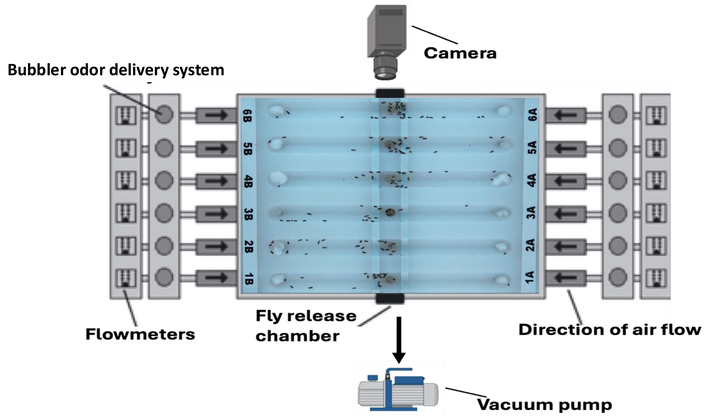

Figure 2: Behavioral assay system (T-maze) (modified from Brown et al., 2013)

Results and Discussion

- Populations vary in response to odor compounds. They responded significantly differently to at least one odor compound.
- No significant difference between the two populations studied for the tested odor compounds ($p < 0.05$).
- Future studies may want to incorporate the testing of mixtures of odor compounds, not only a single odorant to get a more comprehensive understanding of the behavioral responses of different populations.

Acknowledgment

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Results and Discussion (cont.)

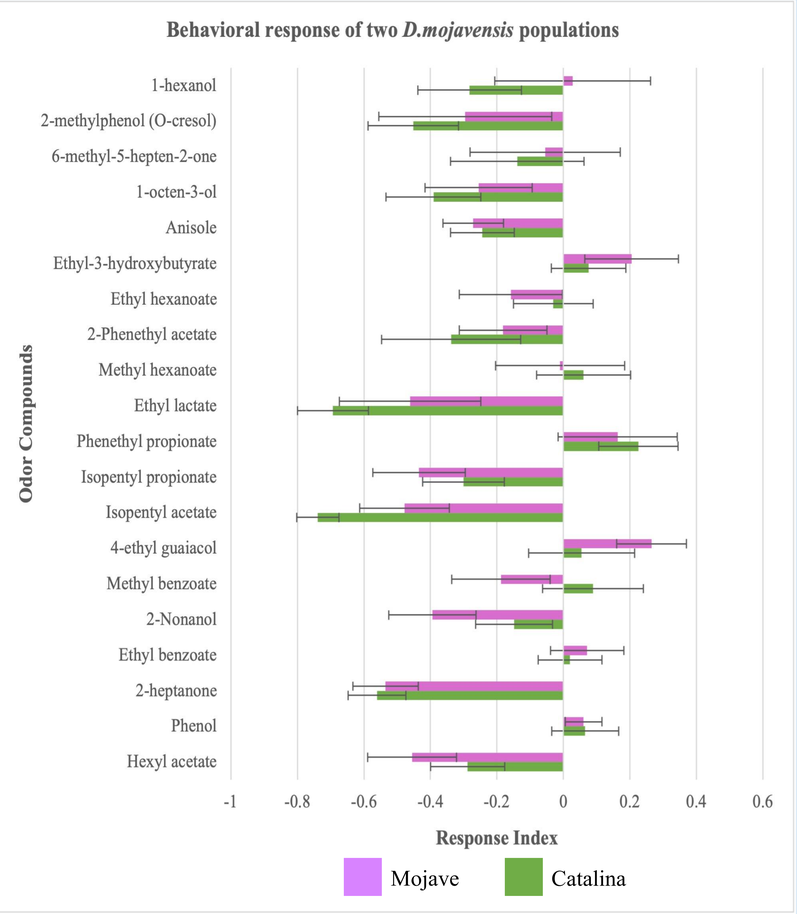

Figure 3: Responses indices between two populations for tested odor compounds

References

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