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## **The Cactophilic *Drosophilla Mojavensis* Feed on the Yeast and Bacteria that Grow in Necrotic Cactus Tissues**

Luciano M. Matzkin

*University of Alabama in Huntsville*

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### **Faculty Mentor:**

Dr. Luciano M. Matzkin, Assistant Professor, Department of Biological Sciences, Imm0015@uah.edu, (256) 824-4326, Shelby Center 302K

### **Project Summary:**

The cactophilic *Drosophila mojavensis* feed on the yeast and bacteria that grow in necrotic cactus tissues, but at the same time ingest the tissues derived from the cactus host. Cacti have a variety of secondary metabolic compounds that are toxic to a number of organisms. The cactophilic *D. mojavensis* species is composed of four host populations that are both geographically and ecologically distinct. Each host population utilizes a different species of necrotic cactus, individually adapted to the distinct and toxic chemical profile of the cactus host.

In prior pilot studies using *D. mojavensis* we have observed distinct patterns of insecticide resistance among the different cactus host populations. Many of the same enzymatic pathways (e.g. Glutathione S-transferase and Cytochrome P450) associated with resistance to insecticides in insects are used in *D. mojavensis* to adapt to the toxic compounds found in their natural cactus necroses. To further understand the standing genetic variation in detoxification ability across the *D. mojavensis* populations and its sister species *D. arizonae* (also a cactophile) we plan to examine natural resistance to a broad category of insecticides. We plan to test organophosphate (e.g. malathion), organochloride (e.g. DDT) and pyrethroids (e.g. permethrin) classes of insecticides. As previously performed in our lab, we augment our standard banana-molasses fly media with the insecticide and then transfer young larvae (40 per vial) to the test food. Initially, using one line per population and species we will test larval viability using a number of different concentrations of the insecticides. Once an adequate test insecticide concentration is found (*i.e.* not too strong to immediately kill the flies or too weak in which no effect is observed relative to control) we will examine multiple lines (>20) per population and species.

### **Student Duties:**

The student will be responsible for rearing the *Drosophila* stocks, preparing all the test media (with insecticide), transferring the larvae into the test media, measuring larval viability, collecting and analyzing the data. The student will be trained in current *Drosophila* handling techniques, experimental setup and data analysis.

### **Mentor Supervision and Interaction:**

I will personally meet with the student early in the summer to go over all the specifics of the experiment including our safety protocols. In addition to myself the lab is composed of a full time lab manager which will also oversee the work. I will schedule weekly meetings with the student to go over the project as well as have her/him provide me with a summary of the weekly progress. I will sit with the student and go over the

specifics of how to collect and catalog data as well as the data analysis procedures. The ultimate goal will be to eventually produce a peer-reviewed publication in which the student would be an author. Lastly, the student will give a presentation to the entire research group on the results of her/his summer work during one of the first weekly lab meetings of the Fall semester.