Visualization of Fluorescence in *Isoptera*

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Introduction

From previous studies, it has been found that the fluorescent alkaloid norharmane is the major component that is present in termites that causes them to fluoresce. The β-carboline is within the hemolymph of the termite's internal fluids. It is also believed that norharmane is even used for an antimicrobial defensive mechanism from across phylogenetics. In order to put some of these theories through further studies, a new high-powered scope called the Leica DFC 7000 T was used. Through the usage of this new scope, we will be able to look at higher resolution pictures, find where the fluorescence is taking place, and possibly find new information about their fluorescence.

Methods

Termites that were used throughout this study were found in the woods behind Parkwood Apartments near Eastern Mennonite University's campus. Older stumps and decomposed trees were looked at, and shovels and picks were used to find the termites.

The termites were then put into a vial and were frozen by putting them into a refrigerator for 5-10 minutes. The deceased termites were placed under a Leica DFC 7000 T high-powered microscope. This microscope was compatible with a LasX computer software that was able to control the microscope. The termite's photos would all be taken using multi-focus imaging to receive the best quality pictures. Two pictures would be selected: one with the "Empty" filter, which had no florescent stain present, and the second one with the "DAPI" filter, or 4′,6-diamidino-2-phenylindole. This fluorescent stain allowed us to see the bright blue fluorescence that was seen in some of our termites.

Results

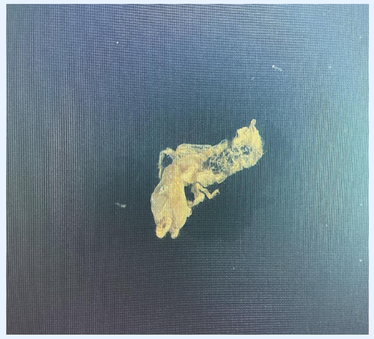

Fig 1. *Isoptera* worker (left) and soldier (right) without UV light under the "Empty" filter.

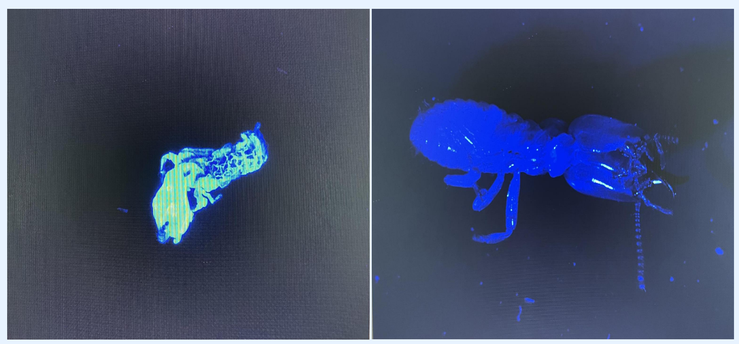

Fig 2. *Isoptera* worker (left) and soldier (right) with UV light under the "DAPI" filter. The worker had high levels of fluorescence, whereas the soldier had much lower levels of fluorescence.

Fig 3. Multi-focus image of an *Isoptera* workers using the SLI white lights from the Leica DFC 7000 T microscope.

Conclusions

There is still so much research to do for this topic. Majority of the time, we were figuring out how to work the new Leica DFC 7000 T microscope and trying to obtain fresh termites to take pictures of. Some possible conclusions based upon our initial research and pictures are:

- Some *Isoptera* could have different levels of norharmane present in them based upon their role. For example, a worker vs a soldier.
- The season that the termites are caught in could influence their fluorescence levels.
- The species of termite could influence their fluorescence levels.
- The amount of time that the termite is deceased could cause an increase or decrease in the amount of norharmane that remains present in their hemolymph.

In order to follow up on these questions, we will continue to follow up on this research and try to find more information to understand this amazing mechanism.

References

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