Photic Effects on Venus Flytrap Closure

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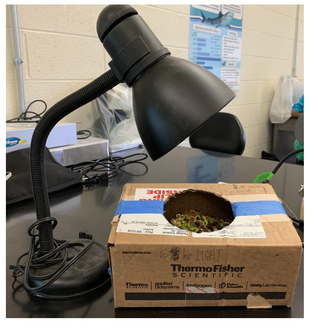
Introduction

Venus flytraps (*Dionaea muscipula*) rely on both light and carnivory as the principal sources of energy and nutrients. Venus fly trap closing mechanisms are initiated by stimulation of the trigger hairs in the leaf that results in an action potential and closing of the trap. Based on previous research, there is evidence that light exposure plays a significant role in flytrap development and metabolism regulation (Tokarz et al., 2018). This experiment attempts to determine if increased exposure to light has a significant effect on trap closure times. The hypothesis is that there will be significant differences in closure time between the control, the 6-hour light exposure treatment, and the 18-hour light exposure treatment. The potential effects of trap sizes and increased trial periods (24-hour, 48-hour, 69-hour) were taken into consideration in this experiment.

Methods

- Nine Venus flytraps were labelled in each of the three pots according to size categories of small, medium, large.
- Plants were placed into three conditions, a control (12-hour light: 12-hour dark) and two experimental conditions: 6-hour light: 18-hour dark treatment, and 18-hour light: 6-hour dark treatment.
- Plants were sustained in containers with 24 ml of water.
- 3 total trials: 24-hour period, 48-hour period, and 69-hour period were performed.
- The Venus flytraps were probed, and closure time was recorded.



Set-up of experiment (left)

Trial, Treatment & Trap Size Effects on Closure Speed

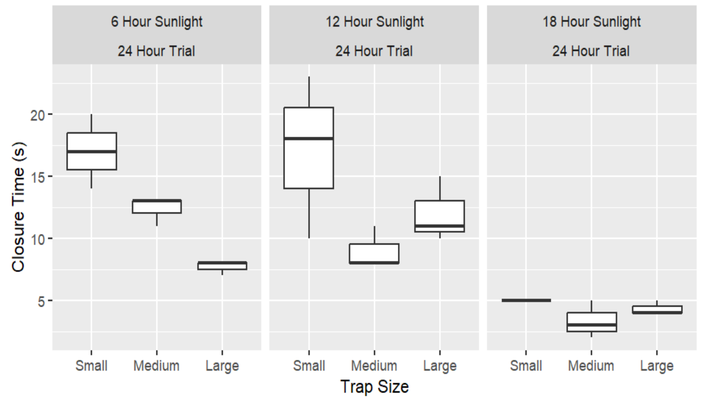
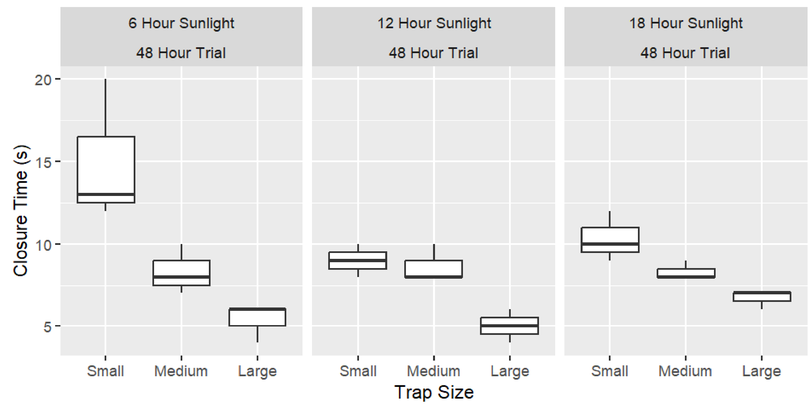


Figure 1. A box plot for the 24-hour trial period depicting a significant difference in closure time based on trap size–small, medium, large (p-value = 0.0041) and treatment–6 hr, 12 hr, 18 hr (p-value = 9.752e-6) respectively.

Figure 2. A box plot for the 48- hour trial period depicting a significant difference in closure time based on trap size–small, medium, large (p-value = 5.48e-5) and no significant difference in treatment–6 hr, 12 hr, 18 hr (p-value = 0.173) respectively.



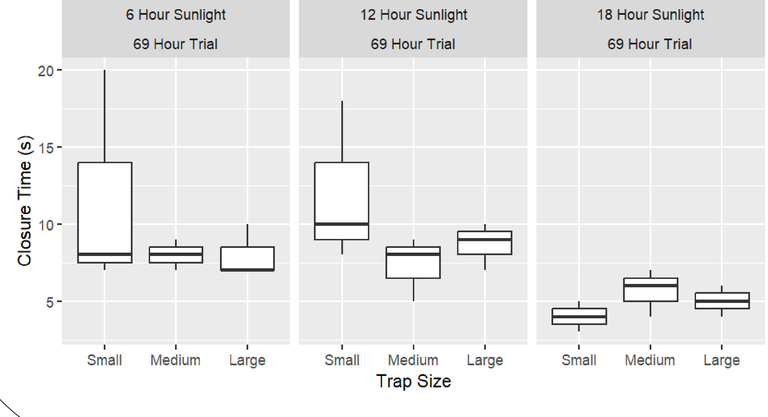


Figure 3. A box plot for the 69-hour trial period depicting no significant difference in closure time based on trap size–small, medium, large (p-value = 0.295) and no significant difference in treatment–6 hr, 12 hr, 18 hr (p-value = 0.0112) respectively.

Major Findings:

- There was a significant difference between the closure times of Venus fly traps exposed to various treatment lengths (6, 12, 18 hrs). Increased exposure to sunlight (18 hr) leads to greater photosynthetic rate, and thus led to greater energy storage utilized for faster closure times.
- There was a significant difference between the closure times of small, medium and large Venus fly traps.
- A 24-hour trial period was optimal likely because excessive exposure to sunlight led to trap dysfunction and dehydration.
- Future experimentations with this focus can help researchers understand evolutionary changes that have occurred in fly traps that live in light deficient areas and how they can compensate for this lack of energy.

References:

Tokarz, Krzysztof, et al. “Response of Dionaea Muscipula J. Ellis to Light Stress in in-Vitro: Physiological Study - Plant Cell, Tissue and Organ Culture (PCTOC).” SpringerLink, Springer Netherlands, 28 Feb. 2018