Assessing the effects of pH on Venus flytrap performance

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Abstract

The Carolina coastal plain habitat of the *Dionaea muscipula*, better known as the Venus flytrap, faces many environmental threats such as agricultural runoff which is known to alter soil pH. We propose a relationship between soil pH and Venus flytrap snap trap performance, in which traps kept in acidic or basic solutions have a greater activation delay* and decreased closure speeds** than those kept in neutral conditions. Our results indicate a link between soil acidification and the ability for *D. muscipula* to survive.

Introduction

Dionaea muscipula, the Venus flytrap, has evolved to thrive in nutrient-poor soils through carnivory. Despite its fame, the Carolina native plant faces threats from poaching, climate change, and poor agricultural activity. Agricultural runoff, including nitrogen-rich fertilizers, alters soil pH and content, potentially impacting Venus flytrap health.

Understanding the effect of pH on trap performance is crucial for conservation efforts. Our experiment aims to elucidate this relationship, providing insights into mitigating environmental stressors threatening Venus flytrap populations.

*Activation delay: time between first probing and initiation of snap trap closure

**Closure speed: time between initiation of snap trap closure and cessation of movement

Methods

Acidic and basic buffers were titrated using deionized water and sulfuric acid or potassium chloride. Approximately 200 ml of buffer (deionized water for control traps) was added to the corresponding flytrap group. The target pH for acidic conditions was 4.50 ± 0.10 and 8.10 ± 0.10 for basic conditions. Traps were allowed to acclimate for 48 hours before performance assays were completed.In performance assays, traps were stimulated with a metal probe, and their movements were captured by video camera. Flytrap performance was determined using video manipulation.

Materials

- Acidic pH buffer (Sulfuric acid and deionized water)
- Basic pH buffer (Potassium hydroxide and deionized water)
- Deionized water
- 9 Venus Fly Traps
- pH meter

Results

Our findings show flytrap performance was negatively affected by both acidic and basic conditions; optimal performance occurred under control conditions. Based on these trends in data, our hypothesis was supported. Closure time was significantly different between each group whereas activation delay was less significant. Through subsequent closure testing, each group had a trend of decreased performance on successive trap closures as well.

1

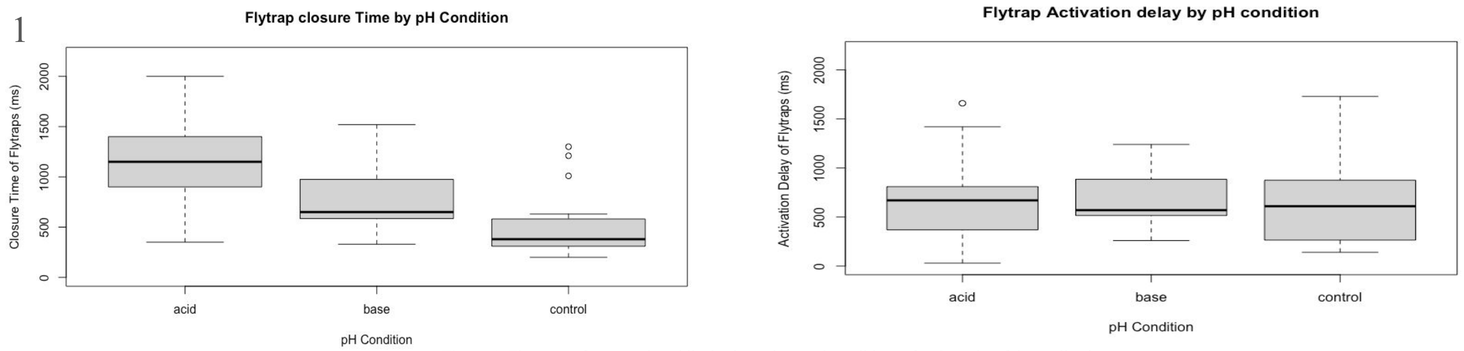

Figure 1: Flytrap performance in acidic, basic, and control conditions after 2 weeks of data collection.

2

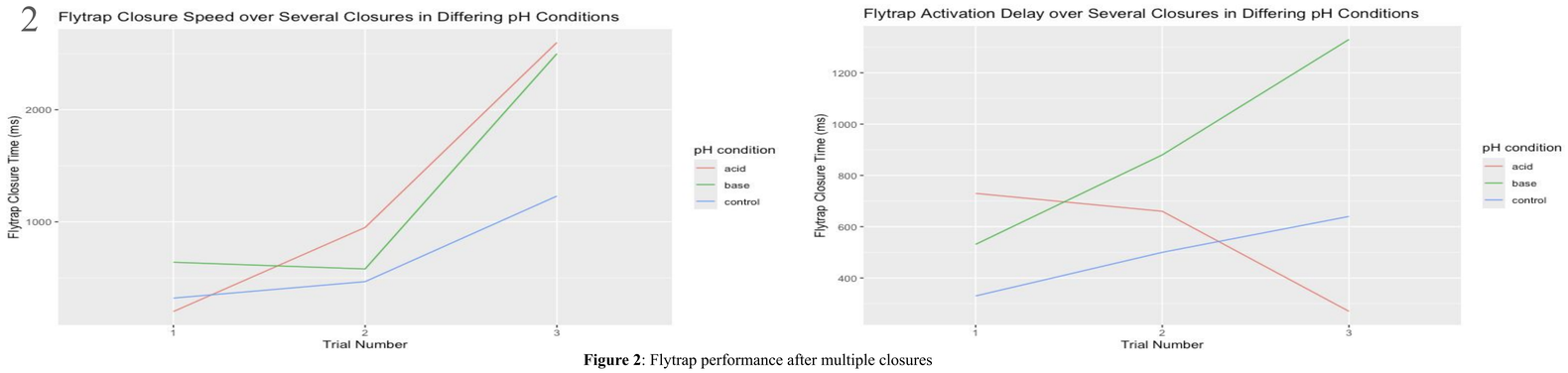

Figure 2: Flytrap performance after multiple closures

Conclusion

Decrease in snap trap closure speed in correlation to changes in soil pH suggests a potential link between agricultural runoff and Venus flytrap performance. Future studies may explore Venus flytrap performance after exposure to common pesticides and fertilizers. Ultimately, we believe that monitoring soil pH of the Venus flytrap's habitat will become important to the plant's conservation.

References:

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