Session D, 2017 Second Place: The Influence of Abiotic Factors on the Growth Pattern of Monotropa uniflora

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Recommended Citation
Dami, Katherine; Ferlenda, Jennifer; and Quinn, Annarose, "Session D, 2017 Second Place: The Influence of Abiotic Factors on the Growth Pattern of Monotropa uniflora" (2017). Cranberry Lake Biological Station. 28.
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The Influence of Abiotic Factors on the Growth Pattern of *Monotropa uniflora*

By Katherine Dami, Jennifer Ferlenda, Annarose Quinn
Introduction

• *M. uniflora* grows in moist conifer or hardwood forests (Kong, 2015).
• Evolved from an autotrophic ancestor (Hirce, 1972).
• Do not have chlorophyll (Lutz, 1973).
• ~4,000 known parasitic plants (Press, 2005).
• Associates with fungal species in the family Russulaceae (Massicotte, 2004).
• Spend their life underground without light, except for its flowering period when they develop shoots (Tsukaya, 1998).
Our Interest

Most studies focused on phylogeny...

...we wanted to do something different

(Kong, 2015)
Hypothesis 1

$H_1$: As canopy cover increases, *Monotropa uniflora* will grow in larger clusters.

$H_0$: Canopy cover has no effect on the growth pattern of *Monotropa uniflora*. 
Hypothesis 2

$H_1$: As soil moisture increases, *Monotropa uniflora* will grow in larger clusters.

$H_0$: Soil moisture has no effect on the growth pattern of *Monotropa uniflora*. 
Hypothesis 3

$H_1$: As pH decreases, *Monotropa uniflora* will grow in larger clusters.

$H_0$: Soil pH has no effect on the growth pattern of *Monotropa uniflora*.
Experimental Design

Independent Variables
• Soil pH
• Soil temperature
• Soil moisture
• Leaf litter thickness
• Canopy cover

Dependent Variable
• Growth pattern of *M. uniflora* (single, double, triple, etc.)
Methods

Population 2
Spherical Densiometer- Canopy Cover (%)
pH Testing
# Population 1 Data

<table>
<thead>
<tr>
<th>Population Number</th>
<th>Sample</th>
<th>Stems</th>
<th>Soil Temp (°C)</th>
<th>Soil Moisture (%)</th>
<th>Tree Type</th>
<th>Canopy Cover (%)</th>
<th>Leaf Litter Thickness (cm)</th>
<th>Soil pH</th>
<th>Diameter (cm)</th>
<th>Height (cm)</th>
<th>Environment</th>
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Results/ Overview of System
Stem Number

Soil Temperature (°C)

\[ y = -2.949 + 0.4203x \]

\[ p = 0.209 \]

\[ R^2 = 1.6\% \]
$y = 3.133 + 0.2096x$
$p = 0.381$
$R^2 = 0.8\%$
$y = 9.219 - 1.079x$
$p = 0.183$
$R^2 = 0.8\%$
\[ y = 6.558 - 0.2116x \]

\[ p = 0.016 \]

\[ R^2 = 5.8\% \]
$y = -14.49 + 0.2128x$
$p = 0.019$
$R^2 = 5.6\%$
Discussion

• Ecological Theory
• Does it support what is known?
• Why did we get these results?
• Self critique
• Follow up studies
Conclusion

• Canopy cover percentage
• Soil moisture percentage
• Soil pH
• Soil temperature
• Leaf litter thickness
Fun Facts!

Fitted Line Plot

Leaf Litter Thickness (cm) = 0.5793 + 0.1805 Height (cm)

- $S = 1.37817$
- $R^2 = 31.8\%$
- $R^2(adj) = 31.1\%$

Chart showing the relationship between leaf litter thickness and height, with a linear regression line.

Images of natural scenes and plant specimens.


Acknowledgements

Thanks to:

• Dr. Fierke
• Dr. Bowman
• Dr. Schultz
• CLBS
Pioneers use to ride these babies for miles.