The Effects of Water Stress on Datura wrightii

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The Effects of Water Stress on *Datura wrightii*

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Abstract

The Santa Monica Mountains are home to a unique Mediterranean type ecosystem. Due to the effects of global warming and human disruption, the native species are beginning to decrease in population. It is imperative to observe and study the native species in order to preserve the local plant and animal life. This project focuses on the native flower *Datura wrightii*, specifically the causes of the opening and closing of its flowers. For *Datura wrightii* to be pollinated, it must be open. The results of this project will help to educate the public on how to sustain an environment in which *Datura wrightii* can flourish. This study also hopes to encourage people living in Mediterranean type climates to plant native flowers, like *Datura wrightii* instead of introducing nonnative species. Our hypothesis was that temperature, light level, and relative humidity affect water stress on the flower which is the main factor to why the flower opens and closes. Our hypothesis was partially supported.

Introduction

- *Datura wrightii* flowers open and close due to factors unknown at the time; our project deals with the reasons behind this phenomenon.
- This research will help us better understand the impact of water stress on *D. wrightii*.
- According to Robert A. Raguso, in his article, “Wake Up and Smell the Roses: The Ecology and Evolution of Floral Scent,” *D. wrightii* have a tendency to open thirty to sixty minutes after sunset releasing a certain scent along with a higher Carbon Dioxide level than ambient.
- Discovering methods to keep the flower open for longer periods of time, will provide hawk moths, the natural pollinators of *D. wrightii*, with a greater opportunity to increase pollination.
- We predicted that the opening and closing of *D. wrightii* is related to water stress on the plant.
- When *D. wrightii* is open, there is much more surface area exposed to the sun this allows for an increase in transpiration as opposed to when it is closed.
- We think that the closing of the plant is an adaptive method for water conservation

Methods

- Gathered 6 *D. wrightii* samples during drought season
- Measured water potential using the Scholander-Hammel Pressure Chamber
- Recorded temperature, relative humidity, and the light level at the stem, leaf, and flower
- Recorded condition of plants i.e. number of buds, youth, mature, dead white, dead brown, fruit
  - Measured diameter and length of mature flowers
  - Measured length and width of plant
  - Repeated process after rains

Results

<table>
<thead>
<tr>
<th>Plant 1</th>
<th>Plant 2</th>
<th>Plant 3</th>
<th>Plant 4</th>
<th>Plant 5</th>
<th>Plant 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature</td>
<td>1:0</td>
<td>3:0</td>
<td>0:0</td>
<td>2:0</td>
<td>0:0</td>
</tr>
<tr>
<td>Youth</td>
<td>6:2</td>
<td>3:3</td>
<td>1:0</td>
<td>4:1</td>
<td>3:0</td>
</tr>
<tr>
<td>Bud</td>
<td>10:4</td>
<td>4:0</td>
<td>14:0</td>
<td>8:0</td>
<td>6:0</td>
</tr>
<tr>
<td>Dead white</td>
<td>8:0</td>
<td>2:0</td>
<td>7:0</td>
<td>3:0</td>
<td>2:0</td>
</tr>
<tr>
<td>Dead brown</td>
<td>16:0</td>
<td>8:0</td>
<td>8:3</td>
<td>8:1</td>
<td>7:1</td>
</tr>
<tr>
<td>Fruit</td>
<td>8:11</td>
<td>3:1</td>
<td>4:3</td>
<td>3:15</td>
<td>5:11</td>
</tr>
</tbody>
</table>

Before Rain:After Rain

<table>
<thead>
<tr>
<th></th>
<th>Temperature</th>
<th>Relative Humidity %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Rain</td>
<td>23.5</td>
<td>55.8</td>
</tr>
<tr>
<td>After Rain</td>
<td>16.7</td>
<td>88.3</td>
</tr>
</tbody>
</table>

Conclusion

Overall, we found that while water stress actually does have an affect on the flowers, it seems to be a combination of many factors. As we began to learn more about the plant and its behaviors, the more we began to realize this. Instead of having a definite conclusion, we discovered that this “simple” behavior of *D. wrightii* is far more complex than previously thought and requires further testing in order to truly discover what the main factors are that lead to the opening and closing of these flowers.

Works Cited


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