Biology 164 Laboratory

Inbreeding Depression and the Evolutionary Advantage of Outbreeding in Brassica rapa, Part III

Objectives of Part III of this study:

1) Review and summarize results of Part II of study

2) Measure seed germination and seedling survival from outcrossed plants and from selfed plants.

3) Measure the following fecundity correlates from outcrossed plants and from selfed plants:
   a. Plant height (cm),
   b. Number of flowers
   c. Fresh weight (g)

4) Summarize results, including statistical analyses, and draw conclusions on the strength and evolutionary consequences of inbreeding depression.

I. Pollination Success

In Part II of the study we measured the number of pods that matured and the number of seeds produced. Using these data, the computer calculated the following measures of pollination success.

<table>
<thead>
<tr>
<th>Experimental Treatment</th>
<th>% of pods matured</th>
<th># seeds per pod pollinated</th>
<th># seeds per pod matured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selfed plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcrossed plants</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparative Stats</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Perform the appropriate statistical analysis to summarize and compare differences in the three measures of pollination success between selfed and outcrossed plants.

Use Table 1 to record summary descriptive stats and comparative stats.
II. Seed and Seedling Survival
Retrieve your twenty plants and closely inspect each to determine whether the seeds germinated. Germination is indicated by emergence of the root or shoot from the seed. Note also which of the germinated seeds survived to produce adult plants. Record data in Table 2 and add your data to the class data.

<table>
<thead>
<tr>
<th>Experimental Treatment</th>
<th># seeds germinated</th>
<th># plants surviving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selfed seed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outcrossed seed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

III. Fecundity Correlates
You will measure three characteristics of your plants that are known to be correlated with fecundity (the ability to produce viable seeds). First, measure plant height (mm) from the soil surface to the highest apical meristem. Next, count the number of flowers and buds (this should include unopened buds, flowers that are open, and previously opened flowers that are now withered). Finally, cut the stem at soil level and measure the fresh weight of the plant (to mg) using the electronic balances provided. Plants that have prematurely dried out should not be weighted but can provide data on both flower number and plant height. Enter your data in Table 3 and add your data to the class data.

<table>
<thead>
<tr>
<th>Experimental Treatment</th>
<th>Plant height (mm)</th>
<th># flowers &amp; buds (including spent flowers)</th>
<th>Fresh weight (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selfed or Outcrossed</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IV. Summary of Results

1. Three StatView datafiles containing class data have been generated for this study:
   a. “Inbr Depr #1” contains data for Table 1 of the study.
   b. “Inbr Depr #2” contains data from Table 2 of the study.
   c. “Inbr Depr #3” contains data from Table 3 of the study.

2. Perform the appropriate statistical analyses to answer the following questions (consult with your instructor if you are unclear about how to apply statistics):
   a. Did % of pods matured, # of seeds per pods pollinated and # of seeds per pods matured differ significantly between outcrossed and selfed pollinations?
   b. Did germination and survival differ significantly between outcrossed and selfed offspring?
   c. Were there any significant differences seen between outcrossed and selfed offspring for any of the three measurements of fecundity correlates.

3. Based on your analysis of the various parameters measured (pollination success, seed and seedling survival, fecundity correlates), decide whether there is evidence that inbreeding depression occurred in this study.

4. Submit a report that includes a summary of results, using properly formatted tables and figures where appropriate, and conclusions drawn directly from the results. The report is due at the end of lab.