

Lab Report #8 Template

Mendelian Genetics: Fast Plants

Results:

1. Describe the phenotype (leaf and stem color) of parental strains (discussed on first day of lab) that were used to generate the F₁ seeds that you planted:
2. Describe the phenotype (leaf and stem color) of the F₁ progeny that you used in this experiment:
3. Using Table 1 below, describe the four possible phenotypes of the F₂ seedlings starting with the dominant phenotypes associated with each character (phenotype 1) and ending with the recessive phenotypes in each character (phenotype 4). Below each description, provide the number of seedlings that displayed each of these phenotypes for your group (group 1).

Table 1 – Phenotypes of Group 1 F₂ Seedlings

| | Phenotype 1 >> | Phenotype 2 >> | Phenotype 3 >> | Phenotype 4 >> |
|---------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Counts | | | | |

4. What are the different genotypes that could be responsible for each of these phenotypes? List each of the phenotypes with their respective genotype possibilities.
5. Based upon Mendel's second law, what are your expected ratios between the 4 different phenotypes?

6. Demonstrate your rationale for this expectation (#5 on the previous page) using the Punnett square (genotypes must be provided in each box):

Gametes of “female”

| | | | |
|--|--|--|--|
| | | | |
| | | | |
| | | | |
| | | | |

Gametes of “ male”

Distinguish the different genotypes that correspond to the 4 different phenotypes by distinctive shading (e.g., shade in the different phenotypes such that the darkest represents both characters demonstrating dominant traits and lightest represents both demonstrating the recessive traits)

7. State the null and alternative hypotheses of the expected *proportions* being tested. Use the bean activity as an example.

Null Hypothesis:

Alternative Hypothesis:

8. Collect the rest of the sample data from the other groups in the class and add up the totals for each phenotype. Include your group's data in Group 1. Record the other groups in rows 2.-8.

Table 2 – F₂ Phenotypes Class Data

| Group | Phenotype 1 >> | Phenotype 2 >> | Phenotype 3 >> | Phenotype 4 >> |
|---------------------|-------------------|-------------------|-------------------|-------------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| Class totals | | | | |

9. Use the Rossman/Chance Statistical Applet to carry out a Chi-Square (χ^2) test (also called “goodness of fit” test) to compare your observed counts to the hypothesized values. You will find both (1) the link to the applet and (2) instructions for the applet at the bottom of the Week 8 Lab Module on Canvas.

Please include the following from the applet simulation results

- (a) Include your null hypothesis values and the Chi-Square value from your plant data:

Hypothesized proportions: _____.

$\chi^2 =$ _____

(b) Carry out the simulation, using at least 1,000 samples. Include a sketch of your Chi-square simulation results with the p-value shade (using the greater than function). Also include the overlay of the chi-square distribution and report both the simulation p-value and the p-value from the chi-square distribution. Be sure to label your axis include the same axis interval tick markings as the simulation.



Simulation Chi-square p-value: _____ Theoretical Chi-square p-value: _____

Are the p-values similar?

10. (a) Given your results above, how convincing is the evidence against the null hypothesis?

(b) Would you **REJECT** or **FAIL TO REJECT** the null hypothesis?

11. What conclusion do you draw about the plant genes/alleles regarding Mendel's second law based on your data? (State your conclusion in context, with brief justification.)

12. What would you conclude about the plant genes/alleles if you had made the opposite conclusion about the null hypothesis in number #10 above.