

# ABRC: Greening the Classroom Module

## Play Mendel Basic:

### Student Handout – Lab Procedures & Assignments

#### PROCEDURE 1 – Plant P generation seeds

##### Materials

2 strains of Arabidopsis seeds  
16 plastic pots per group  
Cheesecloth or paper towels  
Labeling tape and marker

Potting soil  
2 solid trays per group  
Weighing boats  
Plastic wrap

Fertilizer  
2 trays with holes per group  
Disposable Pasteur pipettes  
Watering can

1. Cut 16 pieces of cheesecloth or paper towel to fit the bottom of a pot. Place one piece in the bottom of each pot. This will prevent soil from escaping during watering.
2. Place potting soil in a container and moisten with water. The moisture level of the soil should resemble a wet sponge. Add fertilizer according to package directions and mix thoroughly. Wear gloves when handling fertilizer and fertilized soil.
3. Fill each pot loosely with soil. Do not compress the soil as you fill the pots.
4. Stack one tray with drainage holes inside a solid tray. Repeat to make two pairs of trays, which will simply be called trays moving forward.
5. Your group will plant two trays each containing eight pots. Using labeling tape and a permanent marker, label each tray with your group number and date (see example below).

Group 1 - Date

6. Label eight pots for each strain of Arabidopsis (see examples below).

Group 1

Ler-0

Group 1

*ag-1*

7. Fill a weighing dish with water. Working with one seed stock at a time, sprinkle a portion of the seeds of one stock into the water. Mix the seeds in the water by pipetting up and down slowly using a disposable Pasteur pipette. This will help to separate the seeds and make it easier to capture them individually. Be sure to use a different weighing dish and pipette for each seed stock to prevent cross-contamination.
8. Use the pipette to draw up individual seeds and place them on the surface of the soil. Plant nine seeds, evenly spaced, in each pot (Figure 1). Do not cover the seeds with soil.

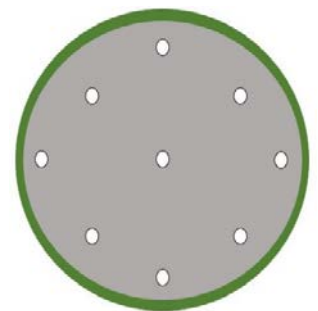


Figure 1. Placement of 9 seeds on soil surface (Price *et al.*, 2018).

9. Place four of the Ler-0 and four *ag-1* pots in each of the two trays (Figure 2).
10. Wrap each tray tightly with plastic wrap to maintain moisture levels during germination.
11. Optional – Place all of the trays inside a cold room or refrigerator at 4°C for 2-3 days. This process, known as stratification, mimics winter conditions and promotes uniform germination of the seeds. Skip this step if you do not have access to adequate refrigeration space.
12. Place the trays under fluorescent lights.
13. Remove the plastic wrap once you see seedlings emerge from the soil (approximately 7 days after planting).
14. You will begin watering the plants regularly once the wrap is removed. Do not water directly into the pots. Add water to the tray to a depth of ½ inch once or twice a week. Be careful not to overwater the pots or allow the soil to dry out.

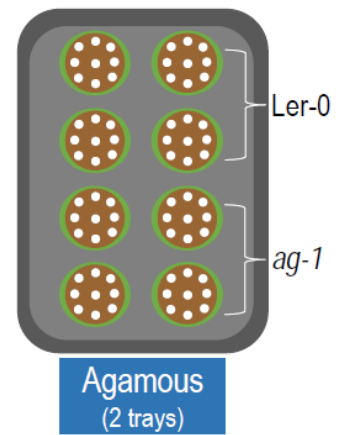


Figure 2. Illustration of how to organize pots in trays (Price *et al.*, 2018).

#### Reference

Price, C.G., Knee, E.M., Miller, J.A., Shin, D., Mann, J., Crist, D.K., Grotewold, E. & Brkljacic, J. (2018). Following phenotypes: An exploration of Mendelian genetics using Arabidopsis plants. *The American Biology Teacher*, 80(4), 291-300.

## ASSIGNMENT 1 – Observe growth and record phenotypes

Complete the following tasks in your lab notebook:

1. Define key terms related to plant growth and anatomy:  
Rosette, inflorescence, stratification, germination, and bolting.
2. Make detailed drawings of the plants. Make notes about any visible differences between the two different strains.
3. Describe the Arabidopsis life cycle by noting details about the different growth stages such as how many leaves are present in the rosette, when flowering begins, etc.
4. Indicate when the unique trait was first noticeable for each strain (*e.g.*, in rosette stage or after flowering).

## ASSIGNMENT 2 – Analyze the inheritance of the *ag-1* allele

1. Complete the worksheet for this assignment.
2. In your lab notebook, define key genetic terms:  
Genotype, phenotype, dominant and recessive.

### ASSIGNMENT 3 – Formulate next-step research questions

Complete the following tasks in your lab notebook:

1. Think about what you have learned about the *ag-1* mutation, the Ler-0 reference strain, and the life cycle of *Arabidopsis*. Write about what else you would like to learn about *Arabidopsis*, and what types of experiments you would like to conduct using this plant.
2. Write a research question for a new experiment using *Arabidopsis*.
3. Formulate a hypothesis to test based on your research question.

AGAMOUS WORKSHEET - Complete this worksheet as part of Assignment 2

Table 1. Data sheet to calculate the ratio of plants displaying the reference phenotype versus the mutant phenotype.

	# Plants with reference phenotype	# Plants with mutant phenotype	Reference to Mutant Plant Ratio
Group 1			
Group 2			
Groups 1 + 2			



1. How might combining the data from both groups affect the ratio of reference to mutant plants determined by your group? Explain your reasoning.

Answer the questions below after combining the class data.

2. Did combining the data from both groups cause the ratio to change?
3. If so, explain how and why the ratio changed.
4. Why is this important to the process of science?
5. Based on the ratio obtained by the class, is the *ag-1* allele dominant or recessive?

## AGAMOUS WORKSHEET

Table 2. Complete the Punnett square below. This will serve as evidence to support your finding from Question 5.



	A	a
A		
a		

1. Which offspring will display the reference phenotype?
2. Which offspring will display the mutant phenotype?