

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## Carolina LabSheets™

### Seedling Genetics (Corn)

From analysis of seedling phenotypes, you will determine the pattern of inheritance of a size mutation in corn. To do this, you will plant  $F_2$  seeds and observe the seedlings. This is an example of single gene inheritance and there are two alleles that can occupy the locus. Cases of single gene inheritance generally can be categorized as one of the following:

**Complete dominance:** In heterozygotes, only one of the alleles is expressed in the phenotype. For example, when drosophila with red eyes are crossed with drosophila having brown eyes, all the  $F_1$  flies are heterozygotes and have red eyes. If the  $F_1$  flies are crossed, the  $F_2$  show a 3:1 ratio of red eyes to brown.

**Codominance:** In heterozygotes, both alleles are expressed in the phenotype. For example, crossing a red camellia with a white camellia produces an  $F_1$  plant in which some flower petals are red and others are white. If the  $F_1$  plants are crossed, the  $F_2$  have red, mixed, and white flowers in a 1:2:1 ratio of plants.

**Incomplete dominance:** In heterozygotes, the phenotype is intermediate between the phenotypes of the parents. For example, when snapdragons with red flowers are crossed with snapdragons having white flowers, the  $F_1$  plants produce pink flowers. If the  $F_1$  plants are crossed, the  $F_2$  have red, pink, and white flowers in a 1:2:1 ratio of plants.

### Planting

1. Write your name on the outside of the planting flat. Fill the flat with pre-moistened potting soil.
2. Use a pencil or rod to make furrows approximately 2 cm deep and 5 cm apart. Space the seeds uniformly in the rows, 3 cm apart, and then cover the seeds to a depth of about 1 cm.
3. Put your planted flat in a plastic bag and place it under a light bank at room temperature (20–25°C). Avoid exposing the flat to direct sunlight, which can cause heat build-up in the plastic bag and damage or kill the seedlings.
4. After 5 to 8 days when the seedlings appear, remove and discard the plastic bag. Check the seedlings daily and add water as needed.

### Observing Seedlings

1. About 10 to 15 days after planting, when the seedling phenotypes are easily distinguished, observe the seedlings. How many different phenotypes for plant height do you see?

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2. Record the phenotype(s) you observe below.

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3. Of the three categories of dominance listed above, which one best describes the pattern that you observe? State your reasons for your answer.

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### Scoring Phenotypes

Score (count and categorize) phenotypes of the seedlings. Record your counts and those of the other teams in the data table below. Remember that if you are dealing with a case of complete dominance, there will be 2 categories of phenotype and one column will be blank.

#### Seedling Phenotypes

Team or Student	Phenotype 1	Phenotype 2	Phenotype 3
<b>Total</b>			
<b>Ratio</b>			

To determine the ratio, divide the smallest total into each of the totals, and round to the nearest whole. For example, a count of 529  $F_2$  drosophila yields 325 red-eyed flies and 104 brown-eyed flies.

$$325/104 = 3.13 \text{ or } 3$$

$$104/104 = 1$$

The ratio is 3:1

4. Are your results compatible with the ratio you would expect? Explain.

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5. What was the genotype of the plants that produced the seeds you planted?

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6. What was the phenotype of the plants that produced the seeds you planted?

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7. Show a Punnett square for the cross that produced the seeds.

## **Carolina Biological Supply Company**

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