Corn as an Introduction to Mendelian Genetics

A Carolina Essentials™ Activity

Student Worksheet

Overview

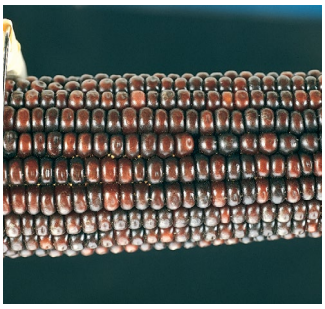
Johann Gregor Mendel is considered by many to be the father of genetics. During a period of 8 years, Mendel worked with over 10,000 pea plants and kept detailed records of the number and types of offspring. Mendel's analysis produced the mathematical patterns of inheritance and the 3 laws of heredity used today:

1. **The law of segregation**—Each trait is defined by a pair of genes and parental genes are randomly separated into sex cells. Offspring inherit 1 genetic allele from each parent.
2. **The law of independent assortment**—Genes are sorted separately so the inheritance of 1 trait is not dependent on the inheritance of another trait.
3. **The law of dominance**—Alternate forms of a gene will express the form that is dominant.

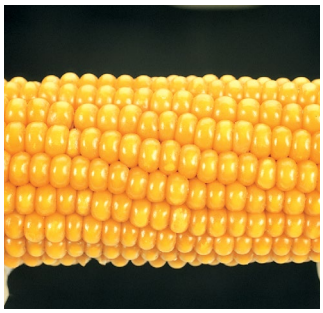
Corn is an ideal organism for studying Mendelian genetics. Instead of having thousands of individual plants, an ear of corn houses a generation of hundreds of offspring. Generally, an ear of corn has about 200 kernels, and each kernel on an ear of corn represents an offspring. The color of kernels is an inherited trait. How can Mendel's laws of inheritance be applied to corn?

MATERIALS

1 F_2 ear of corn per group
Calculator (optional)



Purple Starchy Parent (RR)



Yellow Starchy Parent (rr)

Phenomenon

Observe the parental generation of corn. What do you need to ask about the ears of corn to know what kind of offspring they could produce?

I need to ask:

Essential Question

Based on Mendelian genetics, what questions need to be asked and then answered to predict the phenotypic traits of offspring?

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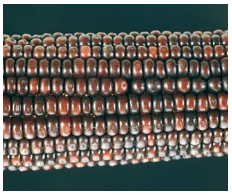
Activity Objectives

1. Ask then answer the questions necessary to determine the genetic relationships between parent, F_1, and F_2 generations of corn.
2. Test the answers to the questions above using Punnett squares.

Procedures

1. Observe the first generation, F_1, of offspring from the cross of a purple kernel parent and a yellow kernel parent. Record the observations in the data table.
2. Observe the F_2 generation of corn. Count the number of each different phenotype (color) of kernel.
3. Add the data to the class data table.
4. Record the class data.



F_1 Generation

Data and Observations

Corn Kernels Phenotype

	Phenotype (color)	Phenotype (color)
F_1		
F_2		

Count of F_2 Corn Kernels

F_2	Phenotype (color)	Phenotype (color)
Group		
Class Totals		
Class Percent		

Ratio of Purple to Yellow	

Analysis and Discussion

1. Based on your data for the F_2 generation, which phenotype appears to be dominant? What evidence supports that claim?

2. Based on your data for the F_2 generation, which phenotype appears to be recessive? What evidence supports that claim?

3. Which of Mendel's laws is being investigated? Support your answer.

4. Examine the questions you asked after observing the parent generation of corn ears. Place a check mark by the questions you could answer using the information from the data table. For the questions you didn't answer, write down notes about what it would take to get an answer.

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5. Use **R** for purple and **r** for yellow. List the genotype for the parent and F_1 generations.

6. Using a Punnett square, perform a cross between a homozygous purple parent and yellow parent.

7. Using a Punnett square, perform a cross between 2 F_1 offspring. Include the phenotype in each block of the Punnett square.

8. Calculate the ratio of phenotypes of the F_2 generation.

9. How do the calculated class phenotype ratio and the F_2 generation ratio from the Punnett square compare? Apply Mendel's laws to explain the differences or similarities.

10. Examine any questions you couldn't answer using the data on the genetic crosses. Place a check mark by any additional questions you could answer. For the questions you still did not answer, highlight or underline the ones that genetics may answer.