

Student Instructions

Seed Savers and Genetic Inheritance

Background Information

In the 19th century, a monk named Gregor Mendel conducted a series of experiments to determine how 'traits' or features of pea plants were passed on from generation to generation. He carefully studied seven traits of successive generations of pea plants to discover how many had traits such as smooth seeds or shriveled seeds. Eventually he came to the conclusion that these traits were passed from generation to generation through an inheritance of some kind of 'factor' (today known as genes). He also discovered that individuals possess more than one factor, even though only one is seen in any individual. For instance, two parents who both had smooth seeds might produce offspring with shriveled seeds. For this to happen, the parents must have been hiding a 'factor' (gene) for shriveled seeds.

Today we know that there are dominant and recessive genes. A typical example is the gene for eye color in humans. The two most common eye colors are brown and blue. We know that brown eyes are dominant, thus, if an individual has even one gene for brown, they will have brown eyes. Blue eyes are recessive. In order to have blue eyes, both genes must be for blue.

In this lab you will solve an example of a Punnett square, a tool that researchers can use to determine the likelihood of any particular trait showing up in a population. To do this, imagine that you are a farmer who loves sunflowers. One year you buy a packet of seeds and plant them. When they bloom, you discover that some of the seeds produce white flowers while the rest produce yellow. The white flowers are very beautiful and you want to produce more of them. Understanding the genetic basis of those flowers will help you to increase your crop of white flowers the next year.

Procedure

Genetic Traits are usually listed as letters. Capital letters represent dominant genes, lowercase letters represent recessive genes. At the top of a piece of paper, let's write a genetic code for two flowers: one white and one yellow. We will use an uppercase Y to represent yellow, and a lowercase y to represent white (you can use a w, but geneticists use the same letter to avoid confusion later on. Thus, the top of your page should look like this:

	Parent A	Parent B
Parent generation:	YY	yy

Mendel realized that only one of the two traits of each parent was handed down to the next generation during sexual reproduction. Thus, Parent A will hand one Y (yellow gene) down to the next generation and parent B will hand one y (white gene) down to the next generation. Thus, the second generation (called F1 generation) will look like this:

F1 generation	Yy	Yy
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Write that down on your piece of paper underneath the parent generation as your teacher has shown you. In the next generation things start to get complicated, as there are a number of possibilities. To figure out the likelihood of any possibility, we can make a chart called a Punnett square. Copy the following down onto your piece of paper:

Then, insert each of the four combinations into the following Punnett Square:

Now solve for the rest of the Punnett Square.

Answer the following questions

1. How many different types of gene combinations did you find? List all the possible combinations.
2. How many of each combination did you find?
3. How many flowers have each of the following appearances:
 - Yellow with strait petals
 - Yellow with ruffled petals
 - White with strait petals
 - White with ruffled petals
4. If the farmer lets nature take it's course, what percentage of the total crop would you expect to be the highly prized white with ruffled petals?



Watch the AFG Video Segment 'Seed Saver' now, and then answer the following questions:

1. If the flower farmer wants to produce more of the valuable seeds, how might he or she do it faster than allowing nature to take its course?
2. In what circumstances do you think this might be a good idea?