Student 6: High Not Achieved

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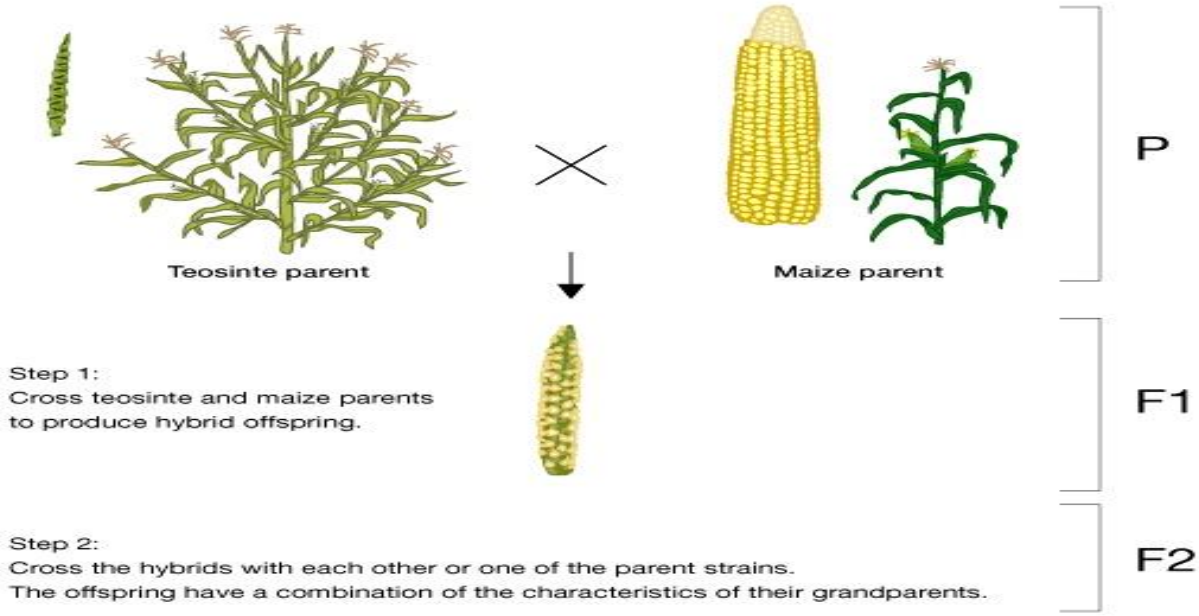
The history of modern-day corn begins at the dawn of human agriculture, about 10,000 years ago. Ancient farmers in what is now Mexico took the first steps in domesticating maize when they simply chose which kernels (seeds) to plant. These farmers noticed that not all plants were the same. Some plants may have grown larger than others, or maybe some kernels tasted better or were easier to grind. The farmers saved seeds from plants with desirable characteristics and planted them for the next season's harvest. This process is known as selective breeding or artificial selection. Maize cobs became larger over time, with more rows of kernels, eventually taking on the form of modern maize. (1)

More maize is harvested each year than any other grain. The thousands of maize varieties grown around the world provide food for people and livestock.

The identity of corn's wild ancestor remained a mystery for many decades. Through the study of genetics, we know today that corn's wild ancestor is a grass called teosinte. Teosinte doesn't look much like modern day corn, but at the DNA level, the two are very alike.



The Evolution of Corn (University of Utah)

Planting a seed from a corn plant that has one or more desirable features is not always reliable. Even though its phenotype may seem to be suitable, the genotype of its offspring may not be desirable. If the original plant had a recessive gene in its genotype there would (2)

be a chance of the seed being homozygous recessive. The particular phenotype expressed in the original corn plant would not be expressed in the new plant.
The offspring of selectively bred corn plants inherit similar genes from its parents. Crossing two members of the same species having either homozygous dominant or homozygous recessive genes almost guarantees a purebred offspring. Using a test cross, by crossing one organism that is showing the dominant form of a trait with another of the same species that is homozygous recessive for the same trait, it is possible to determine the other organism's genotype. (1)

When crop plants like corn by selective breeding, there is a noticeable in a decrease in their genetic diversity. The plants have similar genes with each other which then increases the risk of disease. Similarity within a species means that if the species comes into contact with a disease, there is a chance of the whole species being wiped out. This will have effects on other things like ecosystems if one species is removed from a food chain. (2)

Plants have an advantage over animals as a single cell may be able to grow into a plant. Corn can be cloned through transgenesis. Transgenic techniques insert DNA into a plant cell through protoplast fusion and biolistic or ballistic methods (gene gun). Cloning of whole corn plants can also produce crops with desirable features. Bt-corn is a type of genetically modified organism (GMO). A gene of interest which will have a desired characteristic is removed by the use of restriction enzymes. The gene is then cloned by PCR (polymerase chain reaction) or vectors and inserted into a host organism (3)

With Bt corn, the gene donor organism is a soil bacterium, Bacillus thuringiensis, and the gene of interest produces a protein that kills ECB (European Corn Borer) larvae. (3) The protein is very selective, generally not harming insects in other orders (such as beetles, flies, bees and wasps). The toxins rapidly damage the insect's digestive system, so damage to the corn plant is reduced or stops. (4)
Some transgenic plants have caused allergic responses in humans. There are no known serious human health effects associated with Bt corn. However, a biological implication of Bt corn is the possible negative effects it can have on populations other than those intended. A study found that Bt corn is also toxic for Monarch butterfly larvae. Bt corn can adversely affect non-target insects if they are closely related to the target pest, as is the case with Monarch butterfly. (4)

A biological implication of pest resistant Bt corn is that there is less genetic variation in the species. If all the corn plants have identical DNA they will all be affected by the same things such as diseases. The control of insects by Bt corn has many scientists worried that overuse of Bt corn could produce pests resistant to Bt toxins. (4)