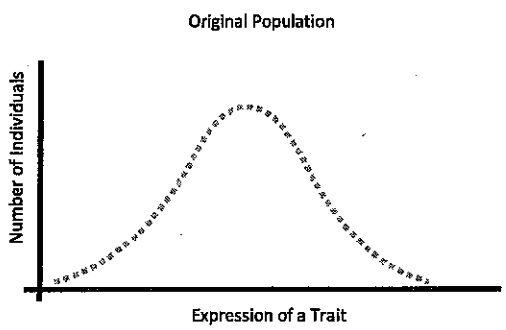
NAME ________________________________

DATE ________________________________

Wisconsin Fast Plants®: Hairy's Inheritance Competing to Make the Hairiest Fast Plant

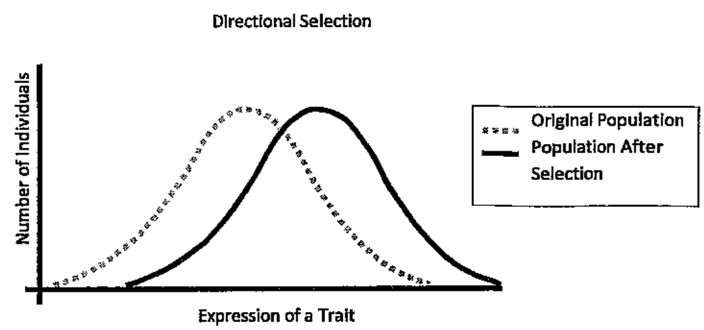
Background

Humans breed a variety of organisms, from roses to dogs, selecting for those with traits that they find desirable. For example, people have bred greyhounds for speed, selecting for the fastest dogs, and over time causing the population of greyhounds to change to consist mostly of fast animals. Human selection of organisms for a specific trait is known as *artificial selection*. It is theorized that this selection process has been occurring for nearly 10,000 years, since the domestication of the first crops.

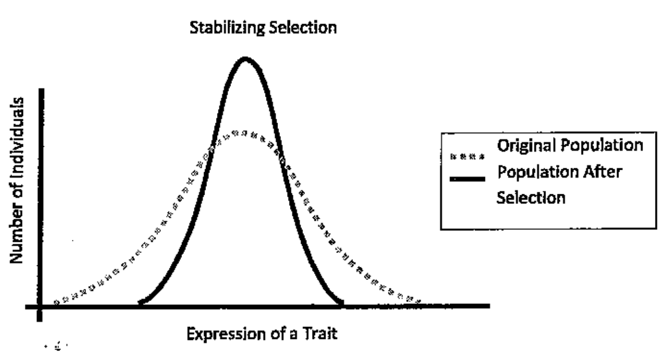


Charles Darwin drew parallels between artificial selection by humans and what he observed taking place in nature. In contrast with artificial selection, he called this process *natural selection*. Agents of natural selection are numerous and varied. They include predators and prey; terrain, climate, and other environmental factors; and the multitude of differences between individuals within a population. Much like artificial selection, certain traits are selected for; however, in natural selection, these traits are the ones that result in the greatest reproductive success.

Organisms with traits that are more reproductively favorable will be more likely to live and pass on their genes to another generation. Organisms with less favorable traits are less likely to survive and produce viable offspring. Based on this unequal reproductive success, the favorable characteristics are likely to be carried into future generations, leading to gradual changes in the population.



One form of natural selection is directional selection, which occurs when an extreme phenotype is favored. An example of directional selection is the way that the peppered moth population of nineteenth-century England changed with the advent of the Industrial Revolution. Before the Industrial Revolution, most peppered moths were predominantly light-colored. The trees the moths most often were found on had light-colored bark and lichen cover, so lighter-colored moths blended in better, avoided predation more effectively, and were more likely to survive and reproduce. By the late 1800s, however, it was clear that a dark-colored moth was becoming more common in the woods surrounding industrial areas, as the trees became stained with soot and the lichens died, turning the tree trunks a darker color. In these moth populations, the darker individuals were more suited to the environment and better able to survive. In this instance, the dark phenotype was favored, leading to a shift in the population toward dark coloration.

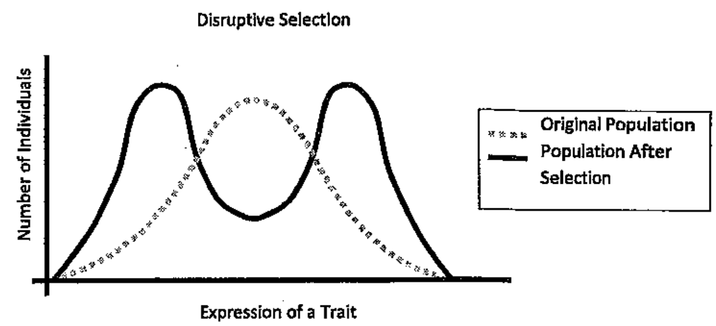


Another form of selection is called stabilizing selection. This occurs when an intermediate phenotype is favored

©2011 Carolina Biological Supply Company/Printed in USA.

and extreme phenotypes are selected against. This can be seen in human birth weights. Low-weight babies and high-weight babies have higher mortality rates, and the babies most likely to survive and reach reproductive age are those having a weight in the intermediate range. As such, the trait for intermediate birth weight is passed on, but low and high birth weight traits seldom are. This stabilizes the population around intermediate birth weight.

Disruptive selection is a form of selection in which the intermediate phenotype of the population is selected against, while the extreme phenotypes are better able to survive. The African swallowtail butterfly provides a good example of disruptive selection. The African swallowtail population has three different forms that mimic bad-tasting butterflies that are generally avoided by predators. Intermediate individuals do not resemble the bad-tasting butterfly and therefore are not avoided by predators. They are selected against and their intermediate phenotypes are not passed on. This method of selection is often credited with speciation, the formation of new species.



Overview

The number of leaf hairs, or trichomes, possessed by a plant is a quantitative trait; that is, leaf hair number is measurable and shows continuous variation within a population. An example of a quantitative trait in humans is height. Quantitative traits typically are polygenic (controlled by more than one gene) and often are greatly affected by environmental factors. It is unknown how many genes control leaf hair number, and even why certain plants have leaf hairs.

In this lab, you will act as the agent of selection on your population of plants by selecting for the trait of hairiness. You will allow only those plants that display the most hairs to reproduce and pass on their genetics to their offspring.

Materials

- Wisconsin *Fast Plants®* seeds
- watering trays
- water mats
- anti-algal squares
- growing quads
- potting soil
- quad wicks
- slow-release fertilizer pellets
- plant labels
- distilled water
- beesticks or pollination wands
- permanent marker

©2011 Carolina Biological Supply Company/Printed in USA.