Cooperative Extension Service
Biotechnology Outreach Program
College of Tropical Agriculture and Human Resources
University of Hawai'i at Manoa

Biotech In focus

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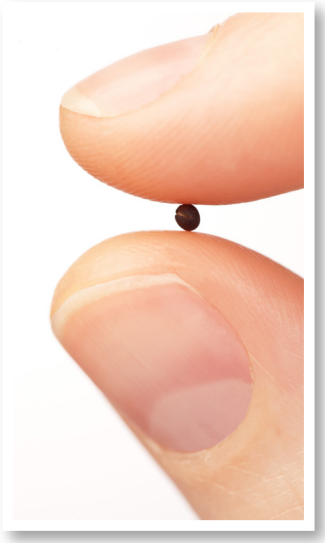
Improving Crops - Plant Breeding in The Early Years

Farming might be the most important job on the planet. Growing crops is hard work under the best of weather and soil conditions, with the right balance of water, light, temperature, and soil nutrients.

When things go wrong, farmers turn to a broad range of tools to meet humanities demand for food and natural fibers. Some of the tools farmers use have been invented in our lifetimes, while others have been practiced for thousands of years.



One tool is as old as farming itself. When groups of people began to grow their own domesticated food around 10,000 years ago, they recognized early that each plant in a field was different. Some had fruits or seeds that were larger, better tasting, or easier to harvest and store. Others could survive bad weather or insects and diseases. Those "better" plants tended to be preferred and cultivated more than others.

These useful plant characteristics are called **traits**. By saving seeds from the plants with the best traits to grow next season, farmers began to improve their crops through **selection**, the simplest form of **plant breeding**.

For more information and past issues, please visit our website at www.ctahr.hawaii.edu/biotechinfocus

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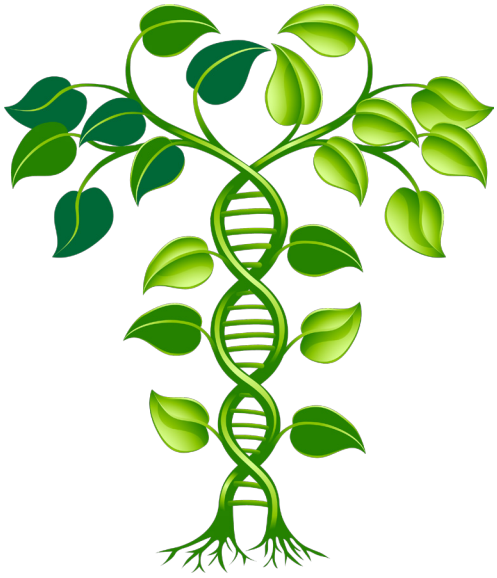
TRAITS AT WORK

Let's say a family grows tomato plants. One day, they visit the field to find that a nasty fungus has invaded, and all but five of their plants are dead. One or more traits in each of those plants stopped the fungus in its tracks. If the five plants survive long enough for their fruits to ripen, the family can save the seeds inside. They've lost this year's crop, but with luck at least some of the tomatoes they grow from seed next year will inherit resistance to the fungus.

Breakthrough

Crop breeding made a significant breakthrough about 300 years ago with the recognition that pollen is the male parent of a seed. Now farmers could put pollen from a plant with good traits on the female flowers of another plant with good traits.

Combining Traits



When they planted the resulting seeds, they looked for offspring that combined the good traits of both parents and then bred those offspring to make even better plants.

Controlled Crosses

This type of **classical plant breeding** through controlled mating (**crosses**) is routinely practiced today. The two plants that are being crossed must be able to reproduce together, so this method only works for plants that belong to the same species or to closely related species.

For our family of tomato growers, this is great news. Now they can breed their fungus-resistant tomatoes across many generations of plants. By selecting and breeding only the resistant plants, they can create a tomato population in which every plant is resistant. If a new fungus, or a bacterium, or a virus comes along, they will need to repeat the process so long as they have some survivors to use as breeding stock. Over time, their tomatoes will acquire the traits needed to survive many threats. But why does this process work? And how can we improve it? Our next brochure will explore how classical breeding went high-tech in the 20th century.

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