# How New Fruit Varieties Originate

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Plant improvement is nearly as old as agriculture. References were made in the earliest Chinese literature and the Bible to the importance of taking seeds cuttings, and scions from the best individual plants. One of the early Chinese emperors is said to have originated the Imperial rice by preserving and propagating a superior form which he noticed in a field.

There are two broad groups of plants, from the standpoint of how they are reproduced. First, there are the grains, vegetables and grasses such as beans, peas, oats, wheat and corn, which propagate true-to-seed, except for simple fluctuating variations. A second group are those which are propagated by the use of such vegetative parts as bulbs, tubers, grafts, cuttings, runners and the like. Tulips, for example, are reproduced from bulbs; apples, pears, peaches, and other tree fruits, from grafts or buds; currants, gooseberries, cuttings; and strawberries, from runner plants.

It is important to understand that if we plant 100 seeds of Golden Bantam corn, we will get approximately 100 plants of the same kind; but if we plant 100 peach seeds of any variety, we will get 100 different kinds of peaches. Because of this situation, the fruit grower cannot plant seeds of the Elberta peach to obtain trees of that variety, or seeds of the Jersey blueberry to propagate that variety. Instead, he usually depends on the nurseryman to grow the trees and plants for him by means of budding, grafting, rooting of cuttings, or other means of vegetative propagation.

New fruit varieties originate in one of three ways—as chance seedlings, by hybridization, or as a result of mutation. By far the greatest number of the fruit varieties now grown were discovered as chance selections. Practically all of our apple varieties originated as chance seedlings in orchards, fence corners or back yards.

The Elberta peach is an outstanding example of a chance selection of great value. This variety originated on the farm of Samuel H. Rumph, of Marshallville, Georgia, in 1870. It is the most widely planted peach in the world.

The famous Bartlett pear was discovered in a woodlot in England, about 1799, by a schoolteacher named Stair.

The McIntosh apple came from a chance seedling found on the McIntosh farm in Dundas County, Ontario, Canada. It was first propagated about 1870. The widely grown Delicious apple originated as a chance seedling on an Iowa farm over sixty years ago.

Chance seedlings will undoubtedly continue to play an important part in the development of new fruit varieties. Since our common fruits do not propagate true-to-seed, there is always a chance that a good variety could come from a peach pit thrown in some fence corner, or from an apple seed growing from an apple core tossed into a field by a boy on his way to the old swimmin' hole.

The second, and probably the most widely used method of developing new fruit varieties at present, is by

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hybridization, a simple definition of which is as follows: "Hybridization is the crossing of varieties or species to produce new individuals. This crossing is done at blossoming time by controlled methods whereby the pistil or female part of the flower is fertilized by the pollen or male part of the flower of another variety. In the seed that develops are found the various inherited characters of both parents. If the seed is planted, and the resulting seedling brought into bearing, the combination of the characters of both parents as expressed in the new individual can be observed." (Source of definition is unknown.)

Hybridization was practiced in ancient China with various flowers; in Italy during the Roman Empire, with roses; and in the 17th Century in Holland, with tulips and primulas. The artificial pollination of the date palm was mentioned in the writings of Theophrastus, when the study of plant culture was just beginning. However, the sexuality of plants was not established until it was proved experimentally by Camerarius in 1691.

The first hybrid of which there is a record, was made in 1729 by Thomas Fairchild, an English gardener, who crossed the carnation with the Sweet William. The exact knowledge of hybridization dates from about 1761, when Koelreuter began publishing his observations; but his work had little bearing on practical plant breeding.

The systematic breeding of plants may be said to have begun with the work of Knight and Von Mons, early in the 19th century, both working principally with fruits.

Although the early hybridizers of fruits were more or less groping in the dark, they made some valuable contributions to our list of fruit varieties. At least two early pioneers in America deserve mention. Charles Mason Hovey, of Cambridge, Massachusetts, developed the Hovey strawberry (1836), which is generally regarded as the starting point for commercial strawberry growing in this country. Ephraim Wales Bull, of Concord, Massachusetts, selected the Concord grape in 1849 from 22,000 seedlings that he had grown over an 11-year period. This variety is known throughout the world, and its value to the horticultural industry has been so great as to defy accurate measurement. It is sad to relate that despite his great contribution, Ephraim Bull died in poverty and neglect, and broken in spirit.

Sometime during the middle of the 19th century, an Austrian monk, Gregor Mendel, experimented with peas in his little monastery garden. The following description of his work appears in the U.S. Department of Agriculture Yearbook for 1936:

"Mendel did a simple but revolutionary thing that apparently had not occurred to previous workers who had been trying to solve the secrets of inheritance. He carefully sorted the progeny of his parent plants according to their characters and counted the number that inherited the same character. By doing this, he discovered that when the things he was studying were handed on by the parents, they were distributed among the offspring in definite mathematical ratios, and in no case was there a significant variation from these ratios. For the first time, Mendel established definite laws of inheritance."

Mendel reported his results at a little meeting of scientists, and in 1866 they were printed in an obscure Austrian journal; but no one appreciated the significance of his discoveries until 1900, when three botanists, Correns, DeVries and VonTschermak,

independently came across Mendel's paper, and had it republished.

The breeding of plants on a scientific basis dates, therefore, from the rediscovery of Mendel's Laws of Inheritance in 1900. Although 61 years is a comparitively short time in the history of agriculture, the results already accomplished by scientific breeding are great; and we are only upon the threshold of what can really be done. Many important fruit varieties now on the recommended lists are the result of controlled crosses. These will be discussed in more detail in another article.

The third way in which new fruit varieties originate, sometimes to the great advantage of the fruit industry, is through mutation, which involves permanent changes in the hereditary make-up of cells of the plant.

In the nucleus of each cell there are small bodies known as chromosomes. The number, size and shape of the chromosomes are the same in all somatic (body) cells of a given plant, and, with rare exceptions, throughout all plants of a particular variety.

Growth depends initially upon cell division. During cell division, the chromosomes also divide in a singularly exact and orderly fashion. Occasionally, however, for some unknown reason, there is a rearrangement of the chromosomes in a cell, or a change within individual chromosomes. This change is maintained in the new cells. If a bud should originate from the tissue in which the change has taken place, a branch could develop which is different in habit of growth, or in the appearance or composition of the fruit. This is a mutation.

The apple mutates rather freely, and a number of important varieties have originated in this way, especially the red sports of certain varieties. The peach mutates occasionally, but the resulting mutants often lack stability, and undesirable variations from the original mutation keep appearing. The sour cherry mutates freely, and one or two mutations of Montmorency may prove of value, although most of them are only of academic interest. The small fruits such as the strawberry, raspberry and blueberry seldom mutate, and none of horticultural value are known.

The possibility of improving plants by artificially inducing mutation has so caught the fancy of plant breeders that many attempts are being made to bring about chromosome changes and new desirable variations, by means of X-ray and other kinds of radiation, and by the use of certain drugs such as colchicine.

There is much that needs to be done to improve our present fruit varieties. None of our varieties is perfect. Each one has one or more weaknesses that could be corrected to advantage. The possibilities are excellent for developing varieties with greater hardiness, more resistance to diseases and insects, better flavor, more desirable flesh characteristics for processing, higher vitamin content, and other improvements.

Great contributions can be made by the plant breeder toward the solution of all of these problems. It should be realized, however, that improving fruit varieties is a very slow process, and takes much work and patience. Variety improvement programs should therefore be set up to continue for a long period of years. If such programs are developed on a long-term basis, and are reasonably well financed, they will return a very high rate of interest on the investment, financially, and provide the public with more desirable fruit.