Genetic Concepts and Fruit Breeding

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Fruit breeding involves both hybridization among cultivated forms and crossing of cultivated forms with wild species. Commercially grown fruit plants are generally heterozygous. Heterozygosity often exists in some of the wild species of fruit plants chosen for crossing with the cultivated forms. Some vegetative and fruit characters of these crops are inherited quantitatively. In some cases the plants used in breeding vary in chromosome number. These facts are not always taken into consideration in the approach to breeding of fruit crops, especially in the hybridization of cultivated forms with wild species. Fruit breeders too often have limited themselves to a one generation cross and have looked for, one might say, the "ultimate" among F_1 offspring. Sometimes, by good fortune, there may appear among such progenies individual plants that possess some mediocre qualities that are considered "acceptable," but in fact do not have the desired high fruit qualities for which each particular kind of fruit is essentially grown. Unfortunately such plants are often introduced as varieties.

Very often, to obtain the fruit quality desired, the hybrid plants obtained from crosses between commercial varieties and wild species are back-crossed to the commercial variety parent, and, in that process, the characters wanted most from the wild parent are often lost. A breeder of fruits must keep in mind that the plants in an F_1 population resulting from such crosses will be heterozygous in such major characters as vigor of plants, many fruit characters, and, most significantly, for the character specifically wanted from the wild species. The F_1 population might consist of seedlings with various combinations of good to poor vigor, and good to poor fruit quality. At this stage, breeding should consist of selective sib-crossing instead of back-crossing, so that the character desired from the wild species is retained. The F_2 populations obtained by sib-crossing of F_1 individuals with various combinations of plant vigor and fruit quality should give maximum segregation of characters, and result in some plants that will possess the combination of vegetative vigor, good fruit quality, and the particular characters especially wanted from the wild species.

Fruit plants such as strawberries, pomes (apple, pear, etc.), and grapes have a large number of chromosomes. They may be considered as being basically polyploid plants, and they possess genetic factors in multiples for various characters. Therefore, large populations are needed in F_2 generations for maximum combination of the many desired characters. In fruit plants that have a low basic number of chromosomes, such as raspberries, currants, and peaches, a population of a few hundred seedlings might be sufficient. When crosses involve the use of two selected, high-quality fruit varieties which have been

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obtained through a long process of breeding and selection, relatively small progenies might give the results wanted; the parental plants in such cases may differ in only a limited number of characters. The need for large populations in the F_2 generation becomes paramount when a wild species is used as one of the parents.

In general, for fruit breeding to be more than mere chance and good luck, the work must be well organized; and breeders should consider a number of essential points, such as the following: 1) A breeder should have broad knowledge of the parent material chosen; 2) he should realize that **breeding is basically genetics,** and he should therefore understand the principles of genetics and their application, or he should have the guidance and advice of a competent geneticist; 3) the progenies must be critically examined and evaluated; 4) there should be ample space for raising adequate populations; 5) care should be taken that the main task of breeding does not become subordinate to incidental operational routine; 6) results desired, especially in tree-fruit breeding, are slow and may not be achieved during a breeder's life-time. Therefore, if possible, some measures should be taken to insure continuity of the project undertaken.

The purpose of fruit breeding should be to originate varieties with quality fruits. Characters such as productiveness, appearance, size, shipping quality, and keeping quality are important but should not be given preference over fruit eating quality. Without good eating quality, a fruit must be considered merely an ornamental.

Vesper, A New Fresh Market Strawberry for the Northeast*

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Vesper, a new strawberry variety, was released by the New Jersey Agricultural Experiment Station in July, 1962. Tested as N. J. 157, Vesper resulted from a cross of Utah Shipper and Jerseybelle made in 1955, and was selected from a seedling field in 1957.

Vesper is a very late-ripening variety, maturing its fruit from three to five days later than Jerseybelle. The fruit is very large, averaging slightly larger than Jerseybelle. The primary berries tend to be slightly rough, but later fruit is smooth. The fruit is medium firm from New Jersey northward, and has a medium tough skin. The berries, which have much the same appearance as Jerseybelle, are very attractive, with a glossy surface and prominent yellow achenes. The flavor is slightly superior to Jerseybelle as a fresh fruit. The fruit is not satisfactory for freezing processing.

Plants of Vesper are vigorous and make a full fruiting row, but they are susceptible to red stele root rot, verticillium wilt, and leaf diseases. Vesper

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