

*Grantham*—a male type selected as a pollinator because of its abundance of pollen-bearing flowers. This form produces no fruit.

*Loma*—Selected from a row of budded trees of unknown origin in Santa Barbara.

*Coffin*—Another fine pod-bearing type from Santa Barbara.

*Nichols*—A hermaphroditic type bearing exceptionally heavy crops of good sized

Pods near El Cajon in San Diego County. Pods 5-6 inches long, rather thick.

Fourteen other locally selected seedlings are under test in the Vista planting, but have not yet produced fruits.

Among the varieties imported from the Mediterranean area which are now being tested and observed in California are Tilliria, Feminello, Sykea, Sandalawi, Cypriot, Mekis, Sipanski and Amelo. None of these has produced fruits as yet.

## Polyploidy in the Apple

### Found Seven Years After Colchicine Treatment

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In April 1942 six one-year-old apple trees of the varieties Baldwin, Delicious, McIntosh, Stayman and Winesap, were treated with colchicine. The technique used was essentially the same as that recommended for the pear<sup>4</sup>. Although polyploidy was detected in limited areas on some leaves during the first growing period following treatment, no branches were found on any tree where polyploidy could be detected. In the fall of 1942 the plants were taken out of the greenhouse and planted in the orchard.

In 1949, most of the trees bore fruits in moderate number for the first time. On one side of a McIntosh tree certain branches bore large, flattened fruits; of which some were smooth but most were irregular in shape, similar to "giant" fruits and quite typical of diploid-tetraploid periclinal sports of apple<sup>1, 5</sup>. Cytohistological examination of a shoot tip from that region of the tree showed polyploidy in a chimeral form; the epidermis and the outer cortex (about six cells thick) of the stem were diploid and the remaining tissue was tetraploid. In this partial polyploidy the sex tissue in the flower remains normal diploid. Com-

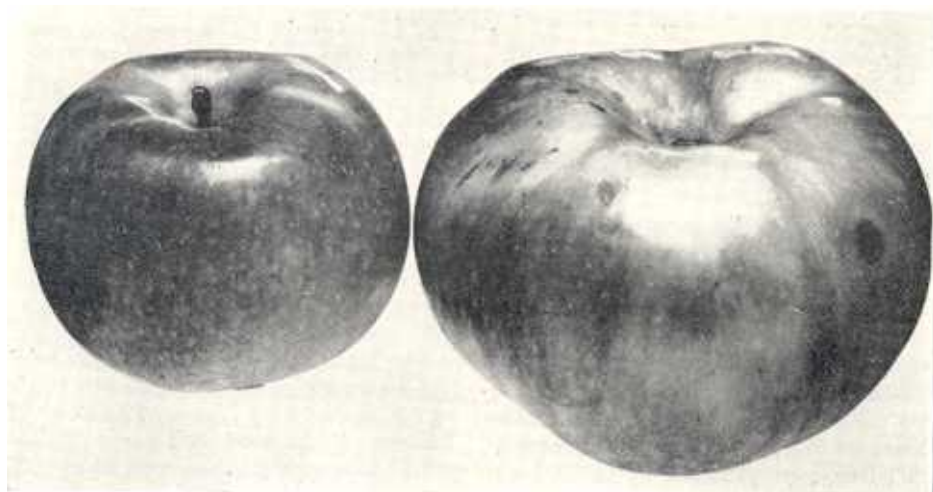
plete tetraploidy may be obtained from such chimeral polyploidy material through adventitious budding technique<sup>5, 6</sup>.

Internal polyploidy in cranberry<sup>2</sup>, peach<sup>3</sup>, and pear<sup>4</sup> has been diagnosed with reasonable ease by characteristic changes in their leaves. In the apple this method is less successful because of the irregularities in shape and size of the leaves. Flowering and fruiting of the apple occur on older plants than in cranberry, peach and pear. These older apple trees are tall and the branches badly entangled. The trees were not pruned for fear of cutting off polyploidy branches. Failure to recognize polyploidy at early stages of growth makes the problem of pruning difficult. As has been pointed out, changes in size of the flower parts, due to polyploidy, have not been very obvious in other plants mentioned. This is probably the case in the apple also, making visual detection of polyploidy through such small changes in the flower even more difficult.

Polyploidy in the apple can be detected most readily by three fruit criteria (Figure 1): (1) Increase in size (about twice the normal size); (2) flattened shape; (3) irregularity in contour. This is often due to internal diploid-tetraploid periclinal condition in parts of the affected tree. The flattened fruit shape, along with increase in size, has so far been the most useful criterion in the detection of induced or naturally occurring polyploidy in the apple.

The apple is the fourth fruit plant that we have been able to polyploidyize by colchi-

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--Courtesy *Journal of Heredity*

FIGURE 1. NORMAL AND GIANT MCINTOSH

The fruits of 'giant' sports of apple are quite commonly characterized by large size, flattened shape, and irregularity of contour. (Our cut about one-half natural size.—J. C. McD.)

cine treatment. This was more difficult than on the cranberry, peach, and pear, and our results have been meager. The success reported here at least shows that colchicine can be effective in inducing polyploidy in the apple as in many other plants. However, to ensure success, a dozen or more trees of each variety may have to be treated; and a much longer period of time may be required before polyploidy in the apple can be detected and isolated. To facilitate earlier blooming and fruiting in the apple, it may be possible to put bud material to be treated in some dwarfing stocks.

#### Literature Cited

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### A Tetraploid Sport of Delicious Apple from Idaho

Thanks to Dr. Leif Verner of the Agricultural College, Moscow, Idaho, who sent us the material, we now have a large-fruited apple sport of the Delicious variety to be added to similar sports of McIntosh, Ontario, Wealthy, and Yellow Transparent varieties for breeding of triploid and tetraploid sorts. A study of shoot tips from budded material of this new sport in April, 1950, showed it to be tetraploid in all internal tissues and diploid in the epidermis; therefore, it is sexually tetraploid and ready for breeding on polyploid levels.

In England a pear variety, Fertility, is known to be self-sterile; a tetraploid sport of it was found to be self-fruitful. The Delicious variety of apple is also known to be self-sterile; whether tetraploidy has made this variety self-fruitful, like the tetraploid sport of the Fertility variety pear, has yet to be determined.

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