

An Overview of Studies on Plant Chimeras: Progress in the Development of New Chimerical Plants[©]

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Plant chimeras were first noted in the middle of the 19th century. These unusual plants appeared by chance in gardens from grafted fruit trees and ornamental trees. The "Bizzarria" orange, [*Citrus* 'Bizzarria' (*C. sinensis* + *C. unshiu*)], a chimera between the citron and the sour orange, and "Adam's laburnum", (+ *Laburnocytisus*), a chimera between a laburnum and a broom, are historically famous. In the early 20th century, H. Winkler, a German botanist, created a new plant that was composed of two genetically different tissues — the tomato and the nightshade. He named it "chimera" from Greek mythology, according to which, the word "chimaera" describes a creature that is a combination of the lion, the goat, and the dragon. Until recently, various plant chimeras were created with experimental species of herbaceous plants, i.e., from the family Solanaceae, to produce new composites with the desirable characteristics of both plants for the purpose of studying chimerical structures.

In recent years, studies of plant chimeras have been primarily carried out in two areas. (1) The first is fundamental biology in which the objective is to understand the mechanism of gene expression due to cell interaction. (2) The other is practical research in which plant chimeras are developed experimentally. To appreciate and develop these plants it is essential to understand chimerical structures and the mechanisms of gene expression. Plants with plastid mutation in specific tissues, called "variegated chimeras", are practical in ornamental plants (Marcotrigiano, 1997); they are also useful in basic studies. Progress in the development of new chimerical plants is most likely to occur in fruit trees and ornamental plants that are propagated vegetatively (by grafting) because the chimera is not maintained in seed propagation in the subsequent generation.

Chimeras developed between an orange and the Japanese summer orange, which were created in Japan a decade ago (Ohtsu and Kuhara, 1994), received a considerable amount of attention. The skin of the fruit from one of the chimeras was similar to that of the Japanese summer orange; however, the interior of the fruit was similar to that of the orange. In some countries, experiments have been conducted with a berry, the kiwifruit, and a grape to achieve this goal. Another interesting proposal has been presented to develop a desirable chimera of the yellow *Camellia*. These studies, however, have not been successful yet.

Recently, we succeeded in synthesizing chimeras between an orange and *C. unshiu*, satsuma mandarin (Sugawara, et al., 2002). Their horticultural traits are currently being investigated.

There is hope that new plant chimeras will be available for practical cultivation of other fruit trees.

LITERATURE CITED

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