Orchid Tetraploids

by Sue Bottom, sbottom15@hotmail.com

Have you ever wondered what 4n on your plant tag means? It means the plant is a tetraploid, with four sets of chromosomes, as compared to the more common diploid that contains two sets of chromosomes or the less fertile triploid that contains three sets of chromosomes. Most orchid plants are diploids, which means they contain two complete sets of chromosomes, one from each of two parents. Plants that possess chromosome numbers that are multiples of the basic set are called polyploids.

As explained by Kamemoto et al:

> *An increase in ploidy in orchids is often accompanied by an increase in size of plant parts. Plants are stockier; leaves are darker green, wider, and thicker; and flowers are of improved form. Due to the increase in width and substance of sepals and petals, the flowers are often erect, sturdy, and compact, characteristics that are desired for exhibition purposes.*

Fred Clarke posted a picture of C. Leoloddiglossa 'Exotic Orchids' AM/AOS on Facebook, describing it as a 4n form. He had purchased ten mericlone seedlings, so they were theoretically all genetically identical. As he bloomed them out, he found one that exhibited tetraploid characteristics: the flowers had better form and color, the petals and sepals were wider and had better substance and the column was so wide that it caused the side lobes to open around it.

The typical diploid version of C. Leoloddiglossa 'Exotic Orchids' AM/AOS, photos courtesy of Fred Clarke

The tetraploid version of C. Leoloddiglossa 'Exotic Orchids' AM/AOS, containing an the extra set of chromosomes added during the cloning process

Tetraploids grow more slowly than diploids because they must make extra sets of chromosomes each time a cell divides, requiring the plants to expend more energy and nutrients to grow. Roy Tokunaga has talked about his trick for selecting tetraploids from

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trays of seedlings. He looks for the runts with wide leaves, in other words, plants that grow more slowly than the others but exhibit the vegetative characteristic of wider leaves. These may bloom a year or so after the rest of the plants in the cross, but he has often been rewarded with finding tetraploids amidst a large population of diploid seedlings.

Tetraploids are highly valued by hybridizers, particularly when tetraploids are bred with tetraploids to produce tetraploid offspring that tend to be very uniform, with larger flower size and enhanced fertility. Fred proved that the chance tetraploid converted Leoloddiglossa seedling was a tetraploid by selfing it. The cross was very fertile and produced a seedling batch of tetraploid Leoloddiglossas that looked so similar they might have been clones.

Hybridizers sometimes say that tetraploids are more stable than their diploid equivalents because they have received a double set of chromosomes from each parent, so any errors in transcription can be self corrected from the duplicate genome. Of course, genes are the ultimate determiners of heredity, so a poor set of genes in a tetraploid will accentuate those inferior qualities. Assuming the hybridizer has selected good tetraploid parents, he can produce a large crop of uniform plants well suited to a mass market. This type of breeding is of less interest to those hybridizers that are trying to tease out recessive colors or produce a crop of plants with varying colors or other attributes.

References:

Kamemoto, Haruyuki, Tanaka, R. and Kosaki, K, Chromosome numbers of orchids in Hawaii, University of Hawaii, College of Tropical Agriculture, Hawaii Agricultural Experiment Station, 1961

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