**Effects of Colchicine on Phragmepedilums**

The effect of colchicine allowed for the doubling of chromosomes of some species and primary hybrids. The Doubling creates a plant called a tetraploid or 4n.  These tetraploids are excellent breeders as they are quite dominant for flower shapes, color and form. Fred Clarke email 3/20/19

**What is it? Colchicine** is a toxic chemical that is often **used** to induce polyploidy in **plants**. Basically, the **colchicine** prevents the microtubule formation during cell division, thus the chromosomes do not pull apart like they normally do. ... Orchid growers will often sell polyploidy **plants** that are larger or have larger flowers and better color.

This medication is used to prevent or treat gout attacks (flares). Usually gout symptoms develop suddenly and involve only one or a few joints. ... **Colchicine** works by decreasing swelling and lessening the build-up of uric acid crystals that cause pain in the affected joint(s).

Don Wimber transformed chemically P. besseae using colchicine into tetraploids and these were given to the Eric Young Foundation in Great Britain, thus instrumental in treating the first plants of

Besseae and its hybrids.

Phrag. besseae (BES-say-ee) is the only Phrag. with such solid brilliant reddish color, and thus it has been used in hybridization to try and apply the beautiful color to other types of Phrag. Nearly all red Phrags get their color from P. besseae.

How do you know - You can't tell just by looking. You might see an unusually large or well-coloured flower that you suspect is 4n but you'd need to have it tested to be sure or hopefully the info would be included on the tag. You'll never see 2n on a tag because that is the normal state. If you breed a 4n with a 4n, the result will be 4n. If you breed a 4n with a normal plant (2n) the result will be a 3n. 3n are usually sterile plants. Some plants are naturally 3n or 4n but this is unusual. The vast majority of 4n orchids you see will have been treated with Colchicine.

To quote silence882 from another site "Colchicine is a mitotic inhibitor that stops a cell from dividing at metaphase (after the chromosomes have been doubled). Seeds are treated with it prior to flasking in an attempt to induce polyploidy. It's not a precise process and as a result, germination and growth percentages are much lower when colchicine is used. The plants that result from this process can be triploids, tetraploids, pentaploids, etc. or they can be aneuploids (having an irregular chromosome count). Aneuploids and anything greater than 4N usually fail to germinate or die well before reaching flowering size. Occasionally, 3N or 4N plants with deformed blooms will appear, but they are rarely genetically stable.

Triploids generally result in larger blooms on larger, faster-growing plants, but they are either sterile or far less fertile than diploids.

Tetraploids generally result in even larger blooms, although flower count is reduced. Plant size increases and growth slows down, so seedling-to-blooming time is increased. The fertility of tetraploids is generally much greater than that of diploids, although crossing them to diploids results in mostly 3N offspring. Paphanatics was experimenting with polyploid Maudiae-types and noted that deflasking-to-blooming time increased from 2 years in diploids to up to 5 years in tetraploids.

Most of the 3N and 4N seedlings offered for sale were not colchicine-treated, but rather are crosses which were made using plants which are confirmed tetraploids. Crossing a 4N by a 4N will give mostly 4N offspring, although they are sometimes 3N or 2N. Crossing a 4N by a 2N will result in mostly 3N offspring, although 4N or 2N plants can be produced".

**N (Haploid)**- Describes a nucleus, cell or organism possessing a single set of unpaired chromosomes. Gametes are haploid.

**Polyploidy-** cells or organisms contain more than one copy (ploidy) of their chromosomes. Polyploidy occurs in animals but is especially common among flowering plants, including both wild and cultivated species.

**Gametes**-Specialized haploid cells produced by meiosis and involved in sexual reproduction.
Male gametes are usually small and motile (spermatozoa), whereas female gametes (oocytes) are larger and nonmotile.

**2N (Diploid)**- A cell with a full set of genetic material, consisting of chromosomes in homologous-(corresponding in structure, position, origin, etc.) pairs and thus having two copies of each autosomal genetic locus- (The position of a gene or chromosome segment on a chromosome. Alleles are located at identical loci on homologous chromosomes). A diploid cell has one chromosome from each parental set.
Most animal cells have a diploid set of chromosomes. The diploid human genome has 46 chromosomes. The gametes (eggs and sperm) contain a single set of chromosomes (haploid).
 **4N (Tetraploid)**- Having four times the haploid number of chromosomes in the cell nucleus.

**3N (Triploid)**- Having three times the haploid number of chromosomes in the cell nucleus.

Crossing between species or genera of orchids isn’t exactly trivial. In paphs, for example, different species have different chromosome numbers. Which is why primary hybrids are easy to make, but these hybrids don’t always breed well (perhaps the plant is 2.2N or 1.9N - not ideal for dividing in half and getting a nice even number!). Phals, on the other hand, generally all have the same number of chromosomes but there are **apparently** other problems in breeding species (and hybrids) with large chromosomes to those with small chromosomes.

**The future?** The successful mastery of tissue culture techniques for slipper orchids in the near future will facilitate the doubling of ploidies so that triploids can be changed to hexaploids (6n) which are readily fertile, and pentaploids and other odd-numbered ploides can also be doubled, resulting in fertile individuals with even-numbered ploidies in each case.

Polyploides typically grow more slowly, achieve larger size, exhibit greater vigor and adaptability, and are usually composed of cells of greater volume than their diploid counterparts. For this reason, polyploids are in great demand by hybridizers and horticulturists in every area of plant science and culture.

Plants:

Phrag. besseae

Paph. Maudiae "The Queen" (perhaps the best Maudiae ever) is widely assumed to be a triploid. However, it isn’t particularly (if at all) fertile".

References:

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