

Colchicine-Treated Orchids

By John Doherty

In the recent past, there has been a relative flurry of discussion within various orchid-growing circles regarding the presence of colchicine-treated plants and their place in orchid competitions. The AOS judging system falls under this broad and varied umbrella, warranting further discussion among our members.

The issue at hand concerns what some people feel to be an unfair advantage conferred upon orchids treated with colchicine at very young stages of development. This advantage most obviously manifests itself when the plant flowers: size is increased, and, in many cases, so is color intensity as well as substance. All of these traits are fortunately held in high regard among orchid growers, thereby garnishing numerous awards for treated plants in a variety of forums, including the AOS judging system. Recent examples of this include an assortment of awards to a number of *Dendrobium cuthbertsonii* clones, colchicine-treated as seedlings, and very likely tetraploid. Many of the recent awards conferred on phragmipediums can also be attributed to colchicine treatment during the propagation phase. Changes in size, substance and color intensity have been astonishing, and so acknowledged by the AOS judges.

A summary of the conflicting viewpoints on colchicine-treated plants and their place in the judging system, based on assorted comments collected by the author, follows.

CON

- “These plants are steroid plants.”
- “It is not fair for these plants to compete against those that have not been colchicine-treated.”
- “There should be separate classes for polyploid (*author: colchicine-treated*) plants.”
- “No awards are possible once a treated plant has been awarded, because regular ones will never measure up to the new size standard.”

PRO

- “All is fair in love and war.”
- “Anyone can have their plants treated.”
- “Do we need to have separate classes for plants that are fertilized and plants that are not fertilized?”
- “It is impossible to delineate within the judging system between various ploidy levels among orchids, as there naturally is tremendous variation. Colchicine-treated plants fall within this natural variation.”

Before an accurate assessment of these viewpoints can be made, one must understand exactly what colchicine is, how it is used and what it does. Colchicine is a naturally occurring chemical, derived from a plant (*Colchicum autumnalis*) that has a very interesting effect on cell function: it inhibits microtubule formation. This is not exciting news to the average person. What it means, however, is that when a cell duplicates its chromosomes and then tries to divide, yielding two daughter cells, it cannot. Microtubules are the cellular machinery that pulls the two daughter cells apart. This does not occur, yet the chromosomes have already been doubled. This means that the new cells have twice as many chromosomes. Because chromosomes function as the blueprint for life, directing all cellular functions, they cause twice as much size (sort of), twice as much petal thickness (sort of), etc. In most instances, the net effect on the plant is primarily a slower-growing plant. Because there is twice as much genetic material to copy each time a cell divides (seen as growth), growth takes longer. Leaves tend to be broader, and thicker. Flowers tend to be larger, deeper colored, and of a heavier substance. These are the characteristics sought. As always, however, the devil must be paid for such miraculous aesthetics. One of the costs is as previously discussed: decreased growth rate, many times excruciatingly so. In addition, polyploids cannot breed fertile offspring with normal diploid plants. From a breeding perspective, this can be problematic, as you may be continually generating a series of mules. The one saving grace, however, is that mules can be treated with colchicine with a good chance of restoring their virility, one of the motivational factors in the development of the process.

So the questions remain: Is it fair for these plants to be in competition with other nontreated plants? The absolute answer to that question has been, to this point, successfully left to the discretion of the individual judging teams. If ever faced with such a plant, as you likely will be, the following points should be borne in mind:

- 1) Colchicine-treated plants are genetically different from nontreated plants. They have more chromosomes. Not genetically engineered chromosomes (a certain topic for future articles as we will surely soon be faced with transgenic orchids), simply more. As discussed, this can be both good and bad.
- 2) More is not always better. Hypothetical genes for dwarf growth habit are also doubled; with the good comes the bad. Everything exists in duplicate, not just the favorable genes.
- 3) Colchicine is not like steroids in humans, so parallels cannot be drawn. It goes one step further, to the genetic level. Steroids can be compared to fertilizers, or more appropriately growth hormones like auxins or cytokinins. There currently exist no regulations against hormone-treated plants in the judging systems.
- 4) Colchicine-treated plants are polyploid. Polyploidy is a naturally occurring phenomenon that likely occurs in nearly every genus of cultivated orchid at some point, due completely to natural factors. One of the most famous paphiopedilums, *Paphiopedilum Maudiae* 'The Queen', AM/AOS, is a natural tetraploid.
- 5) Orchids are a gargantuan plant family, exhibiting an equally mammoth assortment of genetic diversity. Within this assortment, there already naturally exist a number of ploidy levels, including that most often produced by colchicine treatment: tetraploidy.
- 6) Implementation of genetic discrimination may be difficult. There currently is no quick, reliable method for ascertaining ploidy level. Absolute confirmation can only be attained through lengthy, involved laboratory analysis; analyzing a plant when it is brought in for judging is, unfortunately, no more authoritative than speculation.
- 7) Finally, and most importantly: Size is only 10 points on the judging scale.