Polyploid Magnolia sieboldii *'Pride of Norway'*

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Over a period of 17 years, Dr. August E. Kehr corresponded with me both by letters and later by e-mails. We discussed especially ploidy in *M. sieboldii.* In this article I will discuss what ploidy is, how it is done and why it is done with specific emphasis on the named cultivar 'Pride of Norway.'

Magnolia sieboldii is *diploid.* According to Treseder (1978): "In Magnolias the base of X chromosomes number is 19. Some are *diploid* (two fold) with 2n=38 chromosomes in their somatic cells." On page 208, "Other ploidy levels may be *triploid* (three fold) with 2n=57 chromosomes, *tetraploid* (four fold) with 2n=76 chromosomes, *pentaploid* (five fold) with 2n= 96 chromosomes, *hexaploid* (six fold) with 114 chromosomes, *heptaploid* (seven fold) with 2n=133 chromosomes, *octoploid* (eight fold) with 152 chromosomes."

The highest number of chromosomes registered is 16 fold (*Magnolia acuminata* 'Laser'), or as Kehr referred to it, 16x. In this article, I use Kehr's terminology. For example, when I use 2x, I will be talking about a diploid, 3x will be a triploid, 4x a tetraploid, 6x a hexaploid, and so on. Please compare this with the "fold" (in parentheses) used by Treseder.

In his work, Dr. Kehr used colchicine, a very toxic compound, found in *Colchicum autumnale.* He made a solution in water using colchicine, DMSO and a few drops of liquid dish washing soap. At first he treated the whole seedling, but found out that it was the growing point that should be treated, not the whole plant. Over the years he perfected his method, and finally he learned to treat the germinating plants when the cotyledons were developed and the true leaves were merely visible. Over a period of two weeks the new leaves were kept moist in a humid environment. When the fluid was absorbed more of the solution was added.

After this treatment, some of the seedlings stopped growing for 2-3 weeks, which was a good sign. If, later on, the leaves became broader and larger this most certainly meant that the ploidy level was doubled and that the treatment was successful.

Magnolia 'Colossus

By using this treatment, a diploid (2x) seedling could become a tetraploid (4x). A hexaploid could be created by crossing a diploid with a tetraploid and then double the chromosomes in the resulting seedling with the colchicine treatment. (2x) x (4x) = 3x + colchicine treatment = 6x. Ploidy levels higher than 6x are not recommended for *M. sieboldii* as this seems to cause inferior plants with poor qualities.

As you may have figured out, polyploidy means that the ploidy level is higher than normal and that the numbers 4x, 8x are more common than 3x, 5x, or even 6x. A doubling of the chromosomes from 5x to 10x results in a decaploid. An example of this is 'Sun Ray,' which is a result of an experiment by Kehr by injecting Colchicine into cambium layer. This is the only time Kehr used this method to induce polyploidy in magnolias).

What are the potential advantages of polyploid *M. sieboldii?* A significant advantage is that it is possible to make crossings with more magnolias if the ploidy level is increased. Kehr has made a crossing between the supposed hexaploid *M. sieboldii* #17-6 and the evergreen *M.* × 'Sweet Summer' (the latter is a crossing between *M. virginiana* and *M. grandiflora* 'Samuel Summer'). This crossing is sensational and could probably not be done with a diploid *M. sieboldii.* This crossing has broad leaves, but has not yet bloomed. However, I have a plant with a flower bud! I'll let you know when it blooms. In our climate I am growing it in a cold house (conservatory). I purchased the plant from Pat McCracken.

The second advantage is that polyploids usually (but not always) have larger flowers of heavier substance than non-colchicine treated plants. Kehr was frustrated with his octoploid *M. kobus.* He named it after a relative, but was happy when I renamed it *M. kobus* 'Octopus' (because it was octo-ploid and had very long branches like an up side down octopus). It has no special ornamental value except for a nice narrow form with very small leaves and small flowers at an early age.

Another advantage is that polyploids can take more drought and cold than diploids. This makes it possible to grow magnolias in locations with harsher climates. According to Kehr, it is well known

that most natural occurring polyploid plants are more common in habitats with harder and colder climates,.

Polyploids may occur sporadically caused by radiation, electric wires or other factors. According to a Swedish study, the numbers of polyploidy plants increased under high voltage wires.

Polyploidy can be measured but this is a very time consuming task. All the same, several counts have been carried out (refer to Treseder (p. 208-209) and Faber & Faber (1978)) and other specialists have written papers dealing with this matter.

Kehr never counted the chromosomes under microscope. During 20-30 years he gained so much experience that he used morphological characteristics as a measurement. He studied the form and the size of the leaves, flowers and twigs. He also studied the surface of the leaves. The polyploid plants often had thicker leaves with larger cells on the surface.

He also claimed that the pollen grains could tell something about the ploidy. The polyploids had larger, more rounded, pollen grains. I have studied the pollen grains of *M. sieboldii* 'Colossus' (#13-3) (presumed hexaploid) and *M. sieboldii* 'Pride of Norway' (#17-6) (presumed tetraploid) under a microscope. The pollen grains are of the same size. My opinion is that both plants are hexaploids because I compared them with *M. sieboldii* 'Genesis,' which is presumed to be a tetraploid. 'Genesis' grows into a large shrub, and the flowers are of a heavier texture than diploid *M. sieboldii.* I have observed extra tepals.

The original plant #17-6 had varying ploidy levels on different parts of the plant. When Kehr cut scions from this plant (upon my request), he cut scions from the best part of the plant (meaning the part with the larger leaves and flowers. The scions were sent to Switzerland for propagation. I tentatively named resulting plants '6x' because Kehr wrote in a letter that #17-6 was a hexaploid. However, he later claimed it was a tetraploid—he may have mixed up his information. At any rate, Kehr let me name #17-6 'Pride of Norway.' Although 'Pride of Norway' is not identical with #17-6, it is probably identical with the best part of #17-6 (if this part still exists. Therefore, 'Pride of Norway' and #17-6 are *not* synonyms.

I have grown "Pride of Norway" for several years, and it is even better than the showy 'Colossus.' Both have very large flowers (with ex-

Magnolia 'Pride of Norway'

tra tepals) and enormous leaves up to 1 ft. long. The second crop of flowers on "Pride of Norway" in late August is special. The flowers are very large at this time, and they face the ground because they are so heavy. This plant must be planted so one may look up at it. As it gets larger, the value of this very showy plant increases. It may take some years before the flowers reach their true dimensions.

'Colossus' is very difficult to find in the nurseries; it is almost always sold out. Thus, when 'Pride of Norway' becomes available, buy when you see it; I believe it will be extremely popular.

I also believe that 'Colossus' and 'Pride of Norway' may be very useful in crossings. I would be very interested to know if seedlings have been raised from either of these showy cultivars.

Other polyploids may occur in nurseries and collections. They may be unnamed plants or tentatively named plants (such as the form *polyploid number 1, polyploid number 2*, used by Eisenhut). These plants are not any of the cultivars described by me in this article. I am also afraid that the true 'Colossus,' which I got from Patrick McCracken, may be mixed up in European nurseries. (I cannot forget the mix-up with 'Daybreak' in the U.S.) It would be unfortunate to establish mislabeled plants as happened with 'the little girls' and, of course, roses.