# Induced polyploidy in magnolias— A progress report

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Summary: This article reports on 41 plants that show morphological characteristics of higher ploidy than found in untreated magnolias. They include 24 species plants and 17 hybrid plants. Each plant has an identification number and brief remarks on its origin. Most arose from colchicine treatment of germinating seed, but one came from treatment of branches of a named cultivar by a method first described in 1941 from Sweden (Jensen method).

In the winter of 1984-85 issue of MAGNOLIA, I reported on magnolia chromosomes and the method used to develop higher levels of chromosome numbers in these plants.

A second method of inducing polyploids was reported in the Fall 1988 issue of MAGNOLIA which was developed by Holger Jensen of Sweden. The article was entitled, "A new method for inducing 'bud mutation' by colchicine injection," and was translated from Swedish by Lennarth Jonsson. This method has an advantage over the seedling method because selected and named magnolias may be treated. Readers interested in developing polyploidy in magnolias by treating with colchicine are referred to these articles for more information.

By the seedling method there is no opportunity to treat material of known and tested horticultural potential. Thus in the list of 41 plants described, only one was produced by the Jansen method. This single exception is Tree #15-15, a decoploid or 10x form of the registered cultivar 'Sundance' which is a hybrid arising from the cross *M. acuminata* x *M. denudata*, and hence is a pentaploid or 5x. All the other 40 plants resulted from seedling treatment or progeny of treated seeds. In my view the Jensen method is preferable to the seedling treatment method for the reason given, i.e. one can use plants of known horticultural value.

Magnolia sprengeri *var.* diva
*at the Memphis Botanic Garden, Tennessee.*

It should be pointed out that the published description of the Jensen method does not give a specific concentration of colchicine solution to be used for magnolias. My experience is that a concentration of 0.025% colchicine is too high and causes tissue damage and death. I recommend that persons trying the Jensen method on magnolias experiment with a concentration nearer 0.01%

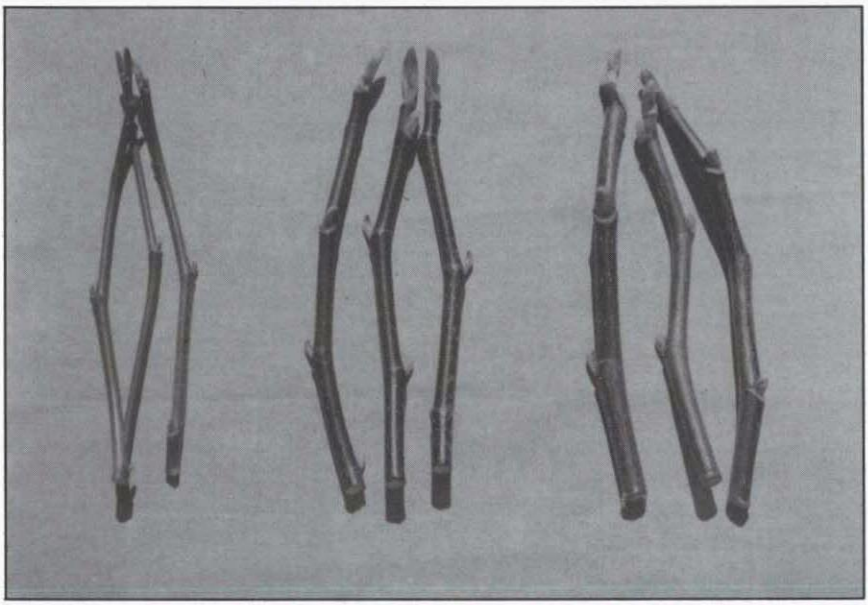
Another problem experienced with the Jansen method was my inability to find the tape called leucoplast in his description. I could never find a tape by that name. However, Steve Herje reported in a letter to me that surgical tape which he received from his medical doctor worked perfectly. It is probable that the Jensen method with these two suggested modifications will be the preferred method for inducing polyploidy in magnolias, even though it is more difficult and time consuming than the method I outlined for seedlings.

A clarification—

I should like to point out emphatically that no chromosome counts have been made on any of the plants described in the list below. It is only by actual chromosome counts that one can be certain of the ploidy of individual plants.

Consequently, for the 41 plants in this inventory, ploidy has been determined by visual, morphological means. These morphological means include characteristics such as: leaves with thicker texture, wider widths, and somewhat different texture; stem that are greater in diameter; flowers that have larger, thicker tepals. These changes in morphology are not difficult to recognize with a little experience. If one cares to make more critical examinations, he may do so with an inexpensive microscope by a simple examination of the pollen grains and/or stomate cells. Stomate cells and pollen grains of a tetraploid (4x) plant have twice the volume and 1 1/4 times the diameter of their respective diploid (2x) counterparts.

Higher ploidy levels are likewise determined by cells of relatively greater volumes and diameters in direct relationship to the chromosome number. I have not used these simple microscopic techniques because I am confident enough in the use of visual morphological differences. Despite this, I would encourage cytological investigations and will cooperate fully with anyone wishing to make exact chromosome counts.



*Twigs of forms of* M. acuminata.
L-R: *Fertile Myrtle (R3-29) 4x, Patriot (R12-35) 8x, and Laser (R11-29) 16x. This shows the morphological difference caused by increased ploidy levels.*

As more becomes known of the 41 plants in this inventory, it may become necessary to change their ploidy designations as given in the article.

In this article x = the basic number representing one complete set of 19 chromosomes in magnolias.

Species with high ploidy level—

Six magnolia species have been developed that show morphological characteristics of increased ploidy. There are 24 plants among these six species as follows:

| Species | Identification No. | Brief Description |
|---|---|---|
| 1. *M. acuminata* | 12-35 | Registered as 'Patriot' with a probable chromosome number of 8x or 152 chromosomes, a treated seedling of *M. acuminata* |

| | | |
|---|---|---|
| | | 'Fertile Myrtle' named by Phil Savage because of its superior parental value. |
| | 11-29 | Registered as 'Laser' with a probable chromosome number of 16x or 304 chromoosomes, a treated seedling of 'Fertile Myrtle.' |
| 2. *M. fraseri* | 14-4 | A treated seedling from a self-fertile plant selected by Frank Galyon. |
| | 14-5 | As above. |
| 3. *M. kobus* | 7-11 | This plant was formerly designated as 'Stellata tetra#1.' However, it is definitely a *kobus*, not a *stellata*. It originated from the Magnolia Society Seed Counter incorrectly labeled as *stellata*. |
| | 7-15 | Sold in the trade as 'Norman Gould' and developed by Dr. Janaki Ammal. However, in my view, it is a *M. kobus* and not *M. stellata* as so often designated. |
| | 8-17 | Formerly listed as 'Stellata tetra#2.' Origin as for 7-11. |
| | 10-21 | Named 'Janaki Ammal.' Source, Wisley. Origin as for 7-15, but a sister seedling. |
| 4. *M. sieboldii* | 3-12 | Triploid (or possibly tetraploid). Seedling of 'Genesis' (tetraploid *M. sieboldii*) x *M. sieboldii* 2x. Not seedling treated, but a straight cross between tetraploid and diploid. |

| | | |
|---|---|---|
| | 5-6 | As for 3-12. |
| | 8-3 | Tetraploid *sieboldii*. Registered as 'Genesis.' Originated from treated seeds which came from Hamilton, Ontario, Canada. |
| | 8-23 | Seedling of 'Genesis.' |
| | 13-14 | As for 3-12. |
| | 13-24 | As for 8-23. |
| | 13-38 | As for 3-12. |
| | 15-3 | This is a treated seedling of 'Genesis' x *M. sieboldii* (2x) and shows morphological characteristics of a hexaploid or 6x. |
| | 16-3 | As for 3-12. |
| | 17-6 | As for 15-3. Very large flowers with low fertility. |
| 5. *M. stellata* | 7-9 | Un-registered but designated in my garden as 'Two Stones.' Source of seed unknown. |
| | 11-13 | Seedling of 7-9. |
| | 16-9 | As for 7-9, rooted cutting. |
| | 17-17 | As for 7-9, rooted cutting. |
| 6. *M. virginiana* | 9-1 | Very slow growing, with extremely thick foliage, probably 8x. Source of seed unknown. |
| | 15-34 | Tetraploid. Grown from seed of my most evergreen *virginiana* which is arboreal in form, one of my tallest magnolias. |

Hybrid plants—

There are 17 plants from 9 different hybrid combinations.

| Hybrid | Identification No. | Brief Description |
|---|---|---|
| 1. (*Acuminata* x *denudata*) x (*cordata* x *denudata*) | 15-21 | Seed from Curt Hanson from cross made in David Leach's garden. |
| | 16-11 | Sister seedling of 15-21. |
| | 16-32 | Sister seedling of 15-21. |
| 2. 'Galaxy' x 'Iolanthe' | 14-7 | Vigorous—not yet flowered. |
| 3. 'Miss Honeybee' x 'Sundance' | 13-12 | This plant probably octoploid. |
| | 17-12 | Octoploid. |
| 4. *Sieboldii* x *tripetala* | 13-3 | Same cross as 'Charles Coates.' |
| | 13-25 | Same as 13-3. |
| | 15-28 | Same as 13-3. |
| 5. Tetra *stellata* x 'Norman Gould' | 10-13 | This is a hybrid seedling of tree #7-9 pollinated with pollen from 'Norman Gould' (tree #7-15). |
| 6. 'Sundance(10x)' | 15-15 | This is from a branch of 'Sundance' treated with colchicine by the Jansen method to produce a decoploid (10x). |
| 7. *Tripetala* x *hypoleuca* | 9-35 | Treated seed from tree #7-19, *M. tripetala* 'Bloomfield' x *M. hypoleuca*. Probably 4x. |
| | 13-13 | As for 9-35, but probably higher than 4x ploidy. |
| 8. 'Woodsman' x 'Forrest's Pink' | 11-15 | Not yet flowered. |
| | 15-27 | Sister seedling of 11-15. |
| | 17-7 | Sister seedling of 11-15. |
| 9. 'Woodsman' x 'Sundance' | 17-23 | Sister of 'Gold Crown.' |