PÆONIA

AN INTERNATIONAL NEWSLETTER FOR PEONY HYBRIDIZERS

Volume 27, No. 4 **Fall 1997**

Editor and Publisher:

Donald R. Smith
46 Exeter Street
W. Newton, MA 02165

Subscription Rates:

U. S.	Outside U. S.
5 yrs. -- $25.	$35.
10 yrs. -- $45.	$65.

Table of Contents:

BREEDING TREE PEONIES FOR FRAGRANCE PART II

by Don Smith

Success in breeding fragrant tree peonies would be greatly enhanced if genes for fragrance were present on both sides of a given cross. To achieve this in back-crosses with suffruticosa varieties it would be helpful to have on hand a list of fragrant Japanese (and Chinese) tree peonies. However, whereas lists of fragrant herbaceous peonies are extremely common, similar lists of fragrant tree peonies varieties are rather hard to come by.

Fortunately, several commericial sources of Chinese tree peonies have included information on fragrance in their catalog descriptions of listed varieties. From these recent catalogs I have compiled a list of fragrant Chinese tree peonies, broken-down into three catagories, Very fragrant (VFr), Fragrant (Fr) and Lightly fragrant (LFr). Unfortunately, I have no information on the usefulness of any of these varieties as parents. However, in some cases I have been able to indicate (based on photographs) which varieties have stamens and/or carpels. Many, if not most, of these varieties are probably fertile to some degree and all are commercially available from one or more U.S. sources. These fragrant tree peony varieties are listed below:

To my disappointment, I was not able to come up with a similar list of fragrant Japanese tree peony varieties. Fortunately however, one of our group, Theresa Griesbach, sent me a list of

fragrant Japanese tree peony varieties obtained from a book by Michael Haworth-Boothe (see Letters to the Editor on p. 6). This is the first list of fragrant Japanese tree peony varieties that I have seen. Those who are aware of other fragrant varieties are encouraged to write so that I can try to build a "complete" list of all fragrant suffruticosa varieties for future use. I do not know how many of these varieties are available commercially or which ones have proved to be useful parents, but once again, most probably have useful fertility. One of the varieties listed, *Kokamon*, is the seed parent of the extremely fragrant (rose-scented) Daphnis hybrid, *Leda*. And *Leda*, when used as a seed parent with *Shima Daijin*, produced the very fragrant new cultivar *Marilyn Jones* (APS Bulletin No. 295, Sept. 1995). These results suggest the possibility that heavy rose fragrance in tree peonies might be transmitted through the female parent by the mechanism of maternal inheritance. *Marilyn Jones* will probably not be available for some time to come, but it does appear to be fertile both ways and will likely prove to be much more fertile than its pod parent *Leda*.

Fragrant Chinese Tree Peonies

1. **Tao Hua Fei Xue** (Snow Kissed Peach) VFr (has both stamens and carpels)
2. **Qing Long Wo Mo Chi** (Green Dragon Lying on a Chinese Inkstone) VFr (has carpels)
3. **Fen Dan Bai** (Phoenix White) VFr
4. **Bai Yu** (White Jade) VFr
5. **Wu Long Peng Sheng** (Black Dragon Holds a Splendid Flower) VFr
6. **Yu Ban Bai** (Jade Plate White) VFr (has both stamens and carpels)
7. **Qing Xiang Bai** (Subtle White Fragrance) Fr
8. **Sweet Green Ball** (no chinese name given) Fr
9. **Yao Huang** (Yao's Family Yellow) Fr
10. **Zi Lan Kui** (Grand Duke Dressed in Blue and Purple) Fr
11. **Ye Guang Bai** (White Light that Shines in the Night) LFr
12. **Lan Tian Yu** (Blue Sky Jade) LFr
13. **Er Quao** (Twin Beauty) LFr (has stamens and carpels)
14. **Fen Zhong Guan** (Supreme Pink) LFr
15. **Yin Fen Jin Lin** (Glistening Silver Pink) LFr
16. **Zhi Hong** (Rouge Red) LFr

An analysis of the list of registered herbaceous varieties in the book "Peonies, Outdoors and In" indicates that of the 1289 peonies registered up to 1959 there were 237 (18.4%) varieties which were listed as fragrant to some degree (from very to slightly). Of these fragrant peonies, only (53) were listed as having a pleasant (sweet or rose) fragrance. These amount to only about 4% of the total.

By comparison, of the approximately 170 hybrid tree peonies registered since Professor Louis Henry produced the first lutea hybrid in 1897, at least 36 (21%) are reported to be fragrant. How many of these 36 could be described as having a strong, pleasant fragrance is uncertain due to a lack of specific information. However, it is interesting to note that, of these three dozen fragrant varieties, more than 80% are advanced generation hybrids.

By dividing the hybrid tree peonies into two groups, 1) first generation hybrids (F_1's) and 2) advanced generation hybrids, we can make an interesting observation concerning fragrance. In the advanced generation group, nearly 50% of the hybrids are reported as being fragrant, whereas only about 6% of the F_1's are listed as having a fragrance. Therefore, advanced generation hybrids are at least 8 times more likely to be fragrant than their F_1 counterparts. It is important to note that this result occurs without any deliberate attempt to breed for fragrance. It seems clear that these results could be greatly improved with a conscious effort to breed for fragrance by using only fragrant varieties as parents.

In Part I of this article, I listed a number of fragrant hybrid tree peonies that had demonstrated useful fertility as either pod or pollen parents. In Table 2, I list 6 additional

fragrant hybrids that have also shown some fertility. They are all F_1 hybrids and all are commercially available.

Table 2. Additional fragrant hybrid tree peonies that have been reported to be useful parents.

Variety	Pollen	Pod
Age of Gold	?	X
Alhambra	?	?
Black Panther		X
Gauguin	?	X
Tria	?	X
Vesuvian		X

SHADES OF ORANGE IN PEONIES

by Harold Entsminger

Looking to the future, chalcones found only in p. potaninii, var. Trollioides may unlock the treasure of clear-orange shades in peonies. Unlike p. lutea, where carotenoids are found as water insoluble pigments preventing their mixing with anthocyanidins, chalcones of Trollioides are miscible with red anthocyanidins. They could be responsible for bright orange coloration in peonies. Carotenoids and anthocyanidins occupy different cell layers within each flower petal. This causes dusky hues and shades rather than true orange colors, like in the Daphnis hybrid, Nike.

The task then, put before orange hybridizers, is to create a race of peonies, herbaceous, suffruticosa, lutea, lutea hybrids all mixed together with chalcones, so that new colors emerge and colors already present in one variety can be seen in hybrids of every other.

Imagine orange and other unknown colors in peonies all mixed together, in varieties with huge flowers from single to double. Hardy plants that have such qualities as being stoleniferous, propagating easily, with beautiful bushes, with thick, to the ground, deep green foliage that turns color in the fall. The theory is that these, as yet unseen, varieties are possible.

Don Hollingsworth, of Missouri, believes that orange varieties will eventually be produced, and when they are that red anthocyanidins will be in their make-up. He says probably crossed with yellow. Trollioides? Perhaps Trollioides will cross with one of the better herbaceous reds of today, such as Carina, Alexander Woollcott, Old Faithful, Diana Parks or with tree peonies like Nissho or others.

But, are such crosses actually possible? We can't know until we try them. But at least, Don Hollingsworth, F. C. Cooper, Don Smith and myself believe that they are.

A little research can sometimes save us years of hybridizing. So let's see if anything has been done in this area. Nothing appears in the American registry, but in France a hybridizer by the name of Jean Cayeux took an important first step when he produced the hybrid Hélène Martin (1980) from the cross potaninii Trollioides x Gessekai. He succeeded where others had failed.

Hélène Martin is a plant with single flowers that are of great size 8-9" on a mature plant. The flower is white at the edges with yellow deeper in the bloom and gold veining radiating up from the carmine center flares. Hélène is scented and pollen fertile, very possibly pod fertile as well. It is stoleniferous and a robust grower, well at least in France. It is available from Pivoines Riviere, La Plaine 26400 Crest, Drome, France. Priced about $80.00 U.S. plus shipping for a 2 year old plant.

Hélène Martin is being well received by American hybridizers. It is now grown on both coasts, as well as in Americas' mid-section and in the far North. American hybridizers see great potential in Hélène Martin, because it is proof positive that some of these crosses are possible, resulting in the best traits of both parents, even in the F1 hybrids (i.e., fertility, hybrid vigor, large flowers, etc.). What if someone now crosses Hélène Martin or Trollioides to say Nissho or some other fine red? Will this produce the first truly orange peony by the next century? We seem to be on the verge. Chalcones mixed with anthocyanidins may be the key that opens the door.

received 11/24/97

Editorial Comment:

The new tree peony hybrid mentioned by Harold Entsminger in the previous article is pictured on page 13 of the latest Riviere catalog. This plant is reported to be fairly short with attractive, light green foliage that is deeply notched (divided) and flowers that are very large like those of its pollen parent, Gessekai. From the photo in the catalog, the flowers appear to be almost white with a faint yellow streak in the center and a small red flare at the base of each petal. The green carpels in the center are highlighted by a circle of purple filaments capped with yellow anthers. The flower appears to be single with approximately 15 petals. The price per plant (for 2 yr. old divisions) is 395 francs or about $80.00 US. I believe that this is an outstanding breeding achievement in lght of the fact that p. potanini has proved to be a such a reluctant parent.

The following is my best attempt at translating the french description of this variety given in the Riviere catalog:

> A very large flower with iridescent (like Mother of Pearl) white petals streaked in their light red center with (darker) crimson splotches. The crimson/purple filaments at the base are topped with golden yellow stamen. The lush foliage is light green and is very serrated. A floral variety of great merit.

It is my understanding that Harold Entsminger has talked directly to Mr. Riviere about this new hybrid. He reports that Riviere has indicated that pollen of Hélène Martin is fertile when used on other tree peonies. I have obtained one of these 2 yr. plants from Riviere (through H. Entsminger), however, it will likely be several more years before this plant is large enough to flower. In the meantime it will be interesting to see how this unique new hybrid grows in the New England environment.

A Method for Indoor Winter Storage of Peony Seedlings

by Don Smith

Many hybridizers have no doubt experienced the joy of success only to be later disappointed when that special seedling then failed to re-appear following a hard winter. This happened to me a number of years ago with my first true intersectional hybrid. I have continued to wonder ever since whether this seedling would have survived to maturity if it could only have been brought through the first winter successfully. As a result of this experience I was determined to find a way to increase the winter survival rate of my first year seedlings. Since I was already germinating and growing all of my seeds and first year seedlings indoors, it seemed reasonable to try to winter-over these same seedlings indoors as well.

This article reports on a simple method that I have developed for accomplishing this objective. I have used this method with excellent success on three successive classes of intersectional seedlings. Over this three year trial period, this method has resulted in an average survival rate of over 95% (130 of 136 seedlings). This method will be described below.

To begin, I traded a hybrid tree peony for a used refrigerator for my basement. This second refrigerator was to be used for the sole purpose of "wintering" peony seeds and seedlings. To avoid the need for continuous attention and watering throughout the winter, I decided that the seedlings would need to be sealed to prevent the constant loss of moisture, similar to the indoor method used to germinate seeds. Both clear plastic bags (Zip-loc) and clear plastic containers (Rubbermaid) were tried and proved successful for this purpose.

My germinated seeds are removed from the refrigerator in the spring once a plumule is visible. These seeds are then planted in separate 4" plastic pots and the resultant seedlings are grown indoors under artifical lights until they "die-back" in late fall. At this point they would normally be planted outside in a permanent site and left until blooming began.

Following the indoor method, the seedlings are placed in the refrigerator for the winter and then planted outside the next spring instead. I use plastic Rubbermaid containers that are approximately 15" L x 10" W x 5" H in size. These have an air-tight seal (cover) and can be easily stacked one on top of another. Each container holds six (6) standard 4" plastic pots (which measure 4" in diameter x 3.5" high). A normal size refrigerator (18-20 cu. ft.) will easily accommodate 8-10 of these containers (i.e., 48-60 plants) plus several boxes of germinated seeds.

My procedure is as follows:

Once the seedlings have died-back naturally, the leaves are cut off leaving only a short piece of stem above the soil line. Next, the plants are watered until they are moist, but not dripping wet. Then, each plant is sprayed once or twice with a solution of water which contains a small amount of Clorox bleach (1/4-1/2 teaspoon to approx. a pint of water). This is the same mixture that I use to moisten the sphagnum moss when germinating my seeds in plactic bags (see Vol. 25, No. 4, p. 2). Next, six 4" pots are placed in each container, the cover is put-on and pressed down to form a good tight seal. I usually try to push out a little air to form a slight vacuum inside the container. The containers are then labeled as to contains and date and placed into the refrigerator. I try to maintain the temperature at one or two degrees above freezing (33-34° F), but the temperature always varies a little from one place to another inside the refrigerator, so it is best to check the temperature at a number of different locations first. Then, you should try to adjust the refrigerator settings so that the coldest location is ~33-34° F. Having done this, some of the warmer locations will probably be around 38° F or more. These warmer temperatures are not really a problem, but will result in earlier growth in the spring (i.e., the warmer the temperature the shorter the dormancy period). The important point here is to keep the baby plants from freezing during the first winter.

Once the plants are safely in the refrigerator for the winter, there is nothing more to do until spring. Those plants kept at 33-38° F will remain dormant for up to ~240 days with the average time being about 160 days. A few plants will begin to grow in as little as 100 days or less. Once the stems have emerged from the buds and are visible above the soil, the plants can be removed from the refrigerator and placed under artifical lights until it is safe to plant them outdoors. The majority of intersectional seedlings have their primary bud at or slightly above the soil level, so it is quite easy to monitor the growth of these seedlings.

In addition to refrigerator storage, I have experimented with several other ways of "wintering over" intersectional peony seedlings that have also proved to be successful. In one of these methods, I placed the plastic containers of plants on the bottom steps of the bulkhead entrance to my basement. The heat from the basement keeps this location from freezing, but the temperature varies quite a bit depending on the outside temperature. This is especially true during the warmer days of early spring.

In yet another experiment, I placed containers of seedlings into large coolers which were left on an unheated breezeway. The coolers prevent the plants from freezing and at the same time also maintain a more uniform temperature range throughout the winter and early spring. Both of these methods have proved very successful, but have also resulted in a significantly shorter dormancy period. Plants kept on the breezeway or on the bulkhead steps averaged only about 115 days of dormancy. This is almost a month and a half shorter than for seedlings that were stored in the refrigerator.

Larger plants (2-3 year old plants) can also be "wintered over" in a similar way by using ordinary plastic bags. For this purpose, I use large (2 gallon size) Zip-loc freezer bags, but other types will probably work just as well. Two 5" plastic pots fit easily into one of these 2 gallon bags. Simply, place the watered pots in the bag, spray with the Clorox solution, squeeze some air out of the bag and seal the Zip-loc. The survival rate for older plants stored in this manner has also been better than 95%.

You might not want to use this method for all of your 1st year seedlings as I do. But, if you have a few very special seedlings that you don't want to risk losing to the elements, you may want to try one of the methods described above .

Advanced Generation Tetraploid Herbaceous Hybrids as Pod and Pollen Parents in Intersectional Crosses

by Don Smith

The recent success reported by Harold Entsminger (Vol. 27, No. 1, p. 6 and Vol. 27, No. 2, p.1& 3) with the reciprocal intersectional cross (Theresa x Prairie Moon) motivated me to increase my efforts to use herbaceous hybrids in the intersectional cross. I was aided in this effort by Chris Laning who sent me not only plants of his Sunny Boy and Sunny Girl but also a great quantity of mixed pollen from his large collection of advanced generation tetraploid hybrids. I used this pollen (which I refer to as Laning AGT or simply AGT) and also pollen from

Sunny Boy and Sunny Girl on numerous hybrid and suffruticosa tree peonies. Overall, I made 52 reciprocal crosses using F_1, F_2, and advanced generation tree peony hybrids as pod parents. These crosses yielded 152 seeds for an average of 2.9 seeds per cross. A summary of these crosses is shown in Table 1. These results are in good agreement with those previously reported for this type cross (see *Pæonia*, Vol. 25, No. 1, p. 1). Six crosses using these pollens on suffruticosa varieties produced another 3 seeds for a total of 155 seeds. More than 90% of these seeds floated when placed in water. Despite this, more than half of these seeds (88) were "started" using the standard indoor germination method. To date not one of these seeds has germinated, nor do I expect that any will in the future. Although this result is very disappointing, it is, nonetheless, completely consistent with my prior experience with this type of cross.

Sunny Boy and Sunny Girl were also used as pod parents in crosses with hybrid tree peonies. A total of six crosses using pollen from A-198, A-199 (Golden Era) and a white suffruticosa variety gave no seeds. This result is also consistent with my past experience.

Clearly, this is a very difficult line of breeding and any success will be the result of considerable work and persistence and/or some very good luck. Breakthrough success here will probably again come from the identification of a few "special" clones (e.g., Golden Era, Alice Harding, Martha Washington and HP1-61) such as occurred with the original Ito intersectional cross. With this in mind, I have tried to increase my "luck" with this type cross by obtaining Prairie Moon on the chance that it is indeed one of these "special" plants.

Table 1. Summary of the reverse intersectional crosses made in 1997.

Cross	No. of crosses	Total seeds	Seeds per cross
F_1 T. P. x Tet. H.H.	25	18	0.7
F_2 T. P. x Tet. H.H.	22	80	3.6
AG T. P. x Tet. H.H.	5	54	10.8
Suff. x Tet. H.H.	6	3	0.5
Total	**58**	**155**	**2.7**

F_1 = Alice Harding, Age of Gold, Thunderbolt
F_2 = A-198, A-199, Exotic Era
AG = Alice in Wonderland, Ruffled Sunset, and Hesphestos

LETTERS TO THE EDITOR

Letter from Theresa Griesbach 3 Nov. 97

Thank you for your fine newsletters. I have little experience with plant breeding, but I have spent the past few years researching which peonies would be the best studs for my breeding project. I read with interest your article on fragrant tree peonies and would like to mention a book; The Moutan or Tree Peony by Michael Haworth-Boothe. In it there is a list of cultivars, a few of which are said to be fragrant:

Asahi-Minato
Ayagoromo
Fuji-No Mine
Kirin-Nishiki
Kogyokuden
Koka-Mon
Koukamon
Kuma-Gai
Ouchimine
Rimpo
Saigyo-Zakura
Shiko-Den
Shuchiuka
Tama-Fuyo
Tama-Sudare
Toga-Wakan
Tomo-Shiraga
Tsuzure-Nishiki

If anyone has these plants I would be grateful if I could buy scions.

I am most interested in reblooming peonies. Mr. Hollingsworth mentioned in Pæonia Vol. 19, No. 4 that he had lutea/delavayi seedlings which rebloomed.

If anyone has these or information about where to get lutea, delavayi or lutea/dalavayi seed or knows of rebloomers other than the Saunders F_1's please contact me at this address:

Theresa Griesbach
N5504 Hwy E
Iron Ridge, WI 53035

I would love to correspond with anyone, beginner or advanced, regarding peonies or peony hybridizing.

Sincerely,

Theresa Griesbach