



PÆONIA



AN INTERNATIONAL NEWSLETTER FOR PEONY HYBRIDIZERS

Volume 27, No. 3

Summer 1997

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Subscription Rates:

<u>U. S.</u>	<u>Outside U. S.</u>
5 yrs. -- \$25.	\$35.
10 yrs. -- \$45	\$65.

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BREEDING TREE PEONIES FOR FRAGRANCE

by Don Smith

Japanese tree peonies (*p. suffruticosa*) are among the most beautiful of the flowering plants known to man. Unfortunately, they are much less popular than they deserve to be, especially in the U.S. I believe that part of the reason for this is due to their lack of fragrance. People expect beautiful flowers to smell beautiful and are usually disappointed when they do not. Fortunately, this is a problem that can now be remedied. We are in a position to breed fragrance into the tree peonies in the same way that yellow flower color was bred-in, through the use of *p.*

lutea and its hybrid progeny. Therefore, someone interested in hybridizing tree peonies should consider trying to develop a race of fragrant tree peonies as a long term goal. This goal should not be that difficult to accomplish because much of the ground work has already been accomplished by others.

P. lutea has a pleasant lemon-like fragrance (also described by some as 'lily-like') that is sometimes passed on to its hybrid offspring. Crossing *p. lutea* with *p. suffruticosa* (*p. lutea* x *p. suffruticosa*) has resulted in a fair number of fragrant hybrid tree peonies, many of which are currently available. For example, the Daphnis advanced generation hybrid, *Leda* (Kokamon x BC2), has a very strong, wonderful, rose-like fragrance that is among the best in the peony

world. Unfortunately, Leda is not especially fertile when crossed with other hybrid tree peonies and particularly when back-crossed with *p. suffruticosa*. It has yet to produce a single viable seed for me used either way. However, Zlatana Draskovich has reported some success using this plant as both a pollen and pod parent (see APS Bulletin No. 295, Sept. 1995). In addition, a few other fragrant tree peonies have also shown useful levels of fertility. By interbreeding these fragrant varieties and backcrossing them with *p. suffruticosa*, we can begin to produce a new race of fragrant hybrid tree peonies that approach the Japanese varieties in both flower size and quality. A list of some fragrant varieties that may have usable fertility is given in Table 1 below. All of these plants are commercially available.

Table 1. Fragrant tree peonies that have been reported to be useful as parents.

Variety	Pollen	Pod
Alice Harding	X	X
Anna Marie	X	X
Chinese Dragon	X	X
High Noon ? (see p. 5)	X	
Icarus	X	X
Leda	X	X
Nike	X	
Pluto	X	X
Ruffled Sunset	X	X

ANALYSIS AND COMMENT ON THE 1986-96 PEONY CHECKLIST

by Don Smith

In the June 1989 issue (Vol. 20, No. 2) of the newsletter, Bill Seidl summarized the peony hybridizing progress for the ten year period from 1976-86 in an article entitled "The APS 1976-86 Checklist: Summary and Analysis". During that period there were 422 peonies registered with the APS. Of this number, 367 (87%) were herbaceous varieties including both lactiflora and herbaceous hybrids. After receiving the new APS Check List, "Peonies 1986-1996", a few months ago, I thought it might be interesting to analyze

the results for the latest ten years and compare them with those reported by W. Seidl for the previous decade. The results for the 1986-96 period are shown in the table below along with a summary of those reported by Seidl for the 1976-86 period. The new results are broken-out by year as well as by originator. Although the results for 1986 are listed in the table, they are not included in the total numbers. All registered peonies for the period were grouped into one of three general categories, herbaceous, shrub peonies or shrubaceous. Herbaceous peonies were separated into two categories, lactiflora and hybrids. Likewise, the shrub (tree) peonies were also separated into two groups, suffruticosa and hybrids. For the sake of completeness, all intersectional hybrids that were named and distributed during this period are included in the table despite the fact that many of these were never registered with the APS and thus do not appear in the check list. In addition, it should be noted that 5 intersectional hybrids introduced by Anderson in 1986 are listed instead for 1987 since they were not included in the 1976-86 checklist.

For the ten year period from 1987-96 there were 35% fewer peonies (275 vs. 422) registered compared to the previous ten year period. In particular, registrations of herbaceous peonies were down by more than a factor of 2, while registrations of shrub peonies and intersectional hybrids both increased significantly. As a result of these trends, herbaceous peonies made-up only 58% of the total registrations for the period. Not surprisingly, the largest increase occurred in the intersectional group which accounted for more than 10% of the total for the period. Whereas the results for the 76-86 period were dominated by a single hybridizer (Krekler), those for the 87-96 period show a much more even distribution among more than a dozen serious breeders. In addition, registrations for the 1987-96 period were much more evenly distributed among the five different peony groups than was observed for the earlier period. Taken together, these are probably an encouraging signs for the future, as is the fact that registrations for the last two years are more than double the yearly average for the 87-96 period as a whole.

Combining the results for both periods gives a 20 year total of less than 700 registrations (696), which corresponds to an average of just 35 new peonies a year. Of this total, less than 20% (136) were shrub peonies. That's less than 7 per year over two decades. These numbers are especially remarkable when we consider that there are over 1200 new daylilies registered each year. Further analysis and conclusions are left to the reader.

Hybridizer or Year	Herbaceous		Shrubaceous	Shrub Peonies		Total
	Lactiflora	Herb. Hyb.	Intersectional	Suffrut.	Hybrids	
1986	14	7	0	2	0	23
1987	7	5	5	1	2	20
1988	7	2	1	1	4	15
1989	8	5	5	0	2	20
1990	1	2	0	1	0	4
1991	6	1	0	0	0	7
1992	9	11	1	6	0	27
1993	3	5	0		1	9
1994	8	8	0	14	0	30
1995	35	5	11	10	15	75
1996	10	23	8	9	17	67
1987-96 Totals	94	67	31	42	41	275
Anderson	5	1	21			27
Bigger	4					4
Daphnis					15	15
Draskovich	4				8	12
Entsminger		2		2	1	5
Glasscock		4				4
Hollingsworth	1	17	1			19
Klehm	49			7		56
Krekler/Klehm	4	2				6
Laning		3	1	1	2	7
McFarlane				2	2	4
Menard	1	2				3
Pehrson	2	7	2			11
Reath		5			4	9
Seidl	1	4	4	1	8	18
Smithers				10		10
Tischler	10					10
Varner	2	6		2		10
Unknown		2				2
Others	11	12	2	17	1	43
1987-96 Totals	94	67	31	42	41	275
% of Total	34%	24%	11%	15%	15%	
1976-86 Totals	189	178	2	15	38	422
% of Total	45%	42%	0.5%	3.5%	9%	

CONTINUED OBSERVATIONS OF TWO
RECIPROCAL CROSS INTERSECTIONAL
SEEDLINGS

by Don Smith

In the previous issue of this newsletter I wrote about two unique new intersectional hybrids which have resulted from somewhat similar breeding. These are the first known hybrid progeny to come from a reciprocal intersectional cross. These two intersectional hybrids are similar because the seed parent in each case was an F₁ lutea hybrid and the pollen parent was a herbaceous type. The first plant resulted from the cross (Age of Gold x lactiflora var. Martha Washington). The second came from the cross (Tessera x Prairie Moon). Age of Gold and Tessera are both F₁ hybrid shrub peonies from the cross (p. lutea x p. suffruticosa)*. Despite the similarity in their breeding, I predicted that these plants would be quite different in their appearances. Since both of these plants are now 2 years old, it is possible for the first time to accurately assess their true characteristics.

My Age of Gold x M. Washington seedling looks very much like other 'normal' (forward direction) intersectional hybrids except that it is much larger than any other 2 yr. old plants that I have grown. (It is about the size of a typical 3 yr. old intersectional plant.) The overall plant habit is more shrub-like than herbaceous. The foliage is similar to many intersectional hybrids and is also more like the hybrid tree peonies than the herbaceous types. The foliage exhibits some leaf spotting but is, nevertheless, still extremely vigorous and healthy.

Harold Entsminger reports that his Tessera x Prairie Moon seedling "looks very much like Prairie Moon, I can't believe how much!" Obviously, these plants are very different from each other.

Based on these preliminary observations it does appear that my predictions for these two hybrids are substantially correct. I will continue to report on the progress of these plants as they grow to maturity.

* I find it rather interesting that there seem to be no known progeny from the reverse of this cross (p. suffruticosa x p. lutea), despite the fact that the late William Gratwick claimed to have succeeded in making this cross "the other way" (Hybridizing Tree Peonies, Handbook on Breeding

Ornamental Plants, Brooklyn Botanic Gardens, Special printing of Plants and Gardens, May 1964, p. 26).

QUESTIONS AND ANSWERS

I frequently get questions from readers. When I believe that the answers to these questions will be of general interest to most peony hybridizers, I will try to answer these questions in the newsletter. The following two questions were submitted by a reader from New York.

Question 1: Re herbaceous peonies

Approx. half of the crosses made this year looked promising with big fat carpels - some as big as a thumb, but when harvest time came they were empty. I always assumed that if fertilization did not take place, the ovary would not develop; but here it's like being "a little pregnant". The ovary (pod) developed but the ovules stayed immature.

Question 2: Re tree peonies

My plant of *Age of Gold* had 5 good blooms. I collected and dried anthers the same as I do for herbaceous types, but was not able to get any (useful) measurable amount of pollen. Is *Age of Gold* stubborn this way?

I will answer both of these questions together, since both problems are related. Both phenomena are fairly common among interspecies hybrids, but can also occur in intraspecies hybrids as well. To begin, I refer the reader to my article entitled "Unreduced Gametes in Interspecific Hybrids" in the Winter 1996 issue of the newsletter (Vol. 27, No. 1, p.4). In that article when describing the "rules" that apply when crossing diploid species, I stated that "the most characteristic feature of interspecific hybrids is sterility to a greater or lesser degree." It is now time to elaborate some on this statement. This lack of fertility referred to above can be manifested in a number of very different ways as a result of dysfunctions which can occur at various points in the fertilization process. For

example, male fertility can be adversely affected in interspecific hybrids in several specific ways. In the most extreme cases, there are simply no male sex organs at all (no anthers or filaments). In less extreme cases, anthers are present, but these produce little or no pollen. This is apparently the case with *Age of Gold* and numerous other F1 lutea hybrids, including *Marchioness* and *Silver Sails*. However, this type of sterility can vary significantly from one year to the next. In some years useful amounts of pollen are produced while in others there is practically none. When adequate amounts of pollen are produced by such hybrids, it sometimes can be quite fertile. *Alice Harding* is one example of an erratic pollen producer with pollen that is often very effective. It may be that *Age of Gold* is really in this category as well. In other cases, the stamen bear abortive anthers that are commonly called staminodes. These are nearly or completely void of pollen. Sometimes the stamen are aborted to the point where they are fully transformed into small narrow petals called petalodes. These are also nearly always absence of any pollen. In still other cases, there may be adequate amounts of pollen produced from normal anthers, but the pollen grains produced are mostly shriveled and deformed. This effect can be easily observed by examining the pollen under a ordinary microscope (X15-100). Even when normal-looking pollen grains are produced, they may still lack the ability to grow the pollen tubes that are necessary for the sperm cells to reach and fertilize the egg. Indeed, even after successful fertilization has occurred, there are still many chromosomal and genetic abnormalities that can cause failures to occur. Viable pollen does not guarantee that the pollen contains viable gametes. And so it goes, step-by-step down to the lowest (genetic) level. Dysfunctions can occur at any point along the way.

A similar set of reproductive dysfunctions can also occur on the female side as well. Once again, in the most extreme cases, there are simply no female organs, the carpels being totally absent or partially or completely transformed into petals. In other cases, normal looking carpels are present, but they are non-functioning. Often, normal looking carpels will "develop" (grow) after pollination, but will contain only undeveloped seeds at harvest time. Here, the dysfunction occurs at or just before the point of seed development. This is a fairly common occurrence with many intersectional hybrids and is often seen with shrub peony hybrids (lutea hybrids) as well. In still other cases, seeds begin to develop normally but never become fully formed. At harvest time they are hollow and/or

underdeveloped. This is nearly always the result when shrub (tree) peonies hybrids are crossed with herbaceous peonies in the reciprocal intersectional cross (lutea hybrid t.p. x herbaceous).

Fortunately for the hybridizer, most of these dysfunctions are not absolute and exceptions sometimes occur. In every infertile hybrid group, there always seems to be one or two individuals that exhibit a greater degree of fertility than the group as a whole. However, rarely does this increased fertility occur on both sides in the same plant. Once these exceptional individuals have been identified, we can continue to make progress by concentrating our attention on these particular plants.

So, should you give up on trying to use *Age of Gold* as a pollen parent?

I would say no. *Age of Gold* is known to be one of these exceptional plants in the lutea hybrid group. It has proved to be one of the most fertile of all the F1 hybrids when used as a seed parent. In addition, and despite the general rule stated above, it may also be exceptional as a pollen parent as well. Although my experience is similar to your own, there is evidence from others that *Age of Gold* can produce, not only useful amounts of pollen, but pollen that is also very effective.

As evidence to support the above statement, I refer you to a newsletter article by Don Hollingsworth from 1978 entitled "Higher Than Expected Pollen Germination Rate In Two F1 Hybrid Peonies" (Vol. 9, No. 3, p. 3). The following paragraph is taken directly from this article.

'Age of Gold', of the Lutea Hybrid tree peonies, has never been used here before, because there is so little evidence of pollen in the anthers. This year my friend, Fred Lemkuler, challenged my allegation that it is worthless as a source of pollen, so I was constrained to attempt a test. Although I gathered all the anthers available, there was only a little pollen from the batch. However, the germination was very good, almost as good as that of the best germinating Lutea Hybrid F2 pollens that I have tested. 'High Noon', on the other hand, yields a great deal of pollen, but I did not achieve a single pollen tube in the several batches tested. The inescapable conclusion is that 'Age of Gold' probably makes as many good pollen grains as any other Lutea Hybrid F1! One Gratwick/Daphnis F2 was no better than the best previously tested F1, 'Tria' and 'D-300' an F2, gave a little pollen which tested about like that of 'Age of Gold'.

LETTERS TO THE EDITOR

The following letter was received from James Langhammer of Royal Oak, MI.

Dear Mr. Smith

Having been frustrated the past several years in my efforts to replace 'Oriental Gold', I was first intrigued by your thought-provoking overview of the cultivar in *Pæonia* 26(4) and then stunned upon receipt of White Flower Farm's Fall 1997 catalog. Apparently my luck may not be completely exhausted.

Your discussion of 'Oriental Gold' gave me the impression that you had not grown it personally. Is that True? or do you have personal knowledge of it? I grew it for many years with very little success. At first it grew sluggishly with some increase of the crown. I was able to divide it and share it with a friend. Eventually my original plant died and I retrieved a division from the friend. This replacement grew for more than ten years with a single four-foot tall flowering stem each year! Eventually I tried to relocate it and lost it again. In the meantime my friend's plant did not survive when he relocated to a new home. Obviously my track-record was not very good.

'Oriental Gold' always intrigued me with its apparently different form of chlorophyll. Perhaps the fact that this plant may have originated in China - not in Japan! - will open some new insights to its history.

Please enter a subscription to *PÆONIA* for 1997 in my name. Thanks.

Jim Langhammer

The following descriptions of 'Golden Wheel' are taken directly from the Fall 1997 White Flower Farm catalog.

"Among the 31 new varieties spread out through this edition are several truly choice plants that we are extremely pleased to have available for the first time this fall. The foremost, from the standpoint of personal satisfaction, is *Pæonia* 'Golden Wheel', the exquisite and exceedingly rare yellow herbaceous Peony we found in, and have imported from, mainland China. It was bred in the imperial gardens more

than two centuries ago, and we are the first nursery ever to offer it in North America. It's a truly lovely thing, with clear pale yellow blooms on 2 ft. stems above lush foliage. You will pay dearly for our plants, because we did, but you will be glad to have them, as we are."

"**P. 'Golden Wheel'** Peonies have been revered in China for over 2,000 years yet in an age in which store shelves are crowded with goods made in China, Chinese peonies remain almost unknown in the West. We braved miles of red tape, hair-raising rides through the Chinese countryside, and business luncheons featuring fried scorpions and blue chicken feet to secure one of the great prizes in horticulture: the yellow herbaceous Peony, 'Huang Jin Lun' or 'Golden Wheel'. Its 6 in flowers are a delicate shade of pale primrose yellow and are carried on 24 in. stems just above lustrous foliage of a complementary yellowish green. This jewel is rare even in its homeland, and on this continent it's exclusively ours."

"'Golden Wheel' is the only double yellow herbaceous Peony we've seen in 47 years in the business."

This variety is pictured on pages 2 and 70 of the Fall 1997 catalog.

Jim Langhammer seems quite certain that 'Golden Wheel' is the same plant brought from Japan by Louis Smirnow and registered with the APS in 1954 as 'Oriental Gold'. He states in a letter to Steve Frowine of White Flower Farm "I grew 'Oriental Gold' for many years and am very familiar with its flower form and plant habit. Your photos and plant description (of 'Golden Wheel') would appear to fit 'Oriental Gold' perfectly."

If 'Golden Wheel' has the yellow roots and yellow-green emerging stems that are so characteristic of 'Oriental Gold', I would be very inclined to agree with Jim's conclusion on this issue.

Editorial Note:

I apologize for the long delay in getting out this summer issue of the newsletter which should have reached you sometime in August. I have been extremely busy of late and just could not find the time to finish it up. Unfortunately, the fall issue will very likely be late arriving as well.