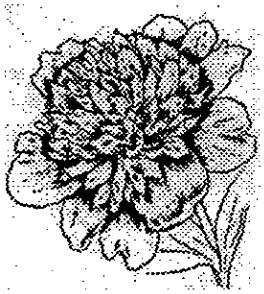
PÆONIA



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A QUANTITATIVE COMPARISON OF INTERSECTIONAL HYBRID POD PARENTS:

Donald Smith

By now, nearly everyone in the peony world has heard of *Martha Washington*, the superlative "I" hybrid seed parent which was discovered by R. Anderson more than a decade ago. When pollenated with pollen from Reath's A-199 (*Golden Era*) *Martha. W.* has proved to be a prolific producer of high quality intersectional hybrids. But, just how good is this plant when compared to other proven "I" hybrid seed parents?

In an attempt to find out, I conducted a comparison study during the 1993 and 94 seasons of four proven "I" hybrid seed parents. In order to obtain results which could be most easily interpreted, all pollenations where done using a single source of T. P. pollen (Reath's A-199/*Golden Era*). The pollen was stored in a refrigerator between each day's pollenations to reduce any deterioration in fertility over the 2-3 week period necessary to complete all pollenations. All crosses were carefully protected against contamination from all sources. The study included two white lactiflora varieties, *Miss America* and *Gertrude Allen*, and two pinks, *Martha Washington* and *Alice Roberts* (a large Japanese type). A fifth plant, HP1-61, reported by the late J. Dewey to be an excellent seed parent of intersectional hybrids had no useful sigma (all exhibited feathery tips) and thus yielded no seed. Therefore, the data from these crosses are not included in this report. The major results of this study are summarized in the following three tables.

Table 1

Cross	No. of Crosses	Total No. of Seeds	No. of Good Seeds	Seeds/ Cross	% of Seeds Started	% of Ruptured Seeds	Germination Rate (%)	Plants/ Cross
M. Wash. x G. Era	39	184	162	4.7	88	24.5	38	1.4
Gert. Allen x G. Era	14	42	29	3.0	69	9.5	21	0.3
A. Roberts x G. Era	9	26	18	2.9	69	23.0	28	0.4
M. Amer. x G. Era	6	6	5	1.0	83	0.0	40	0.3

Table 2

Cross	No. of Crosses	Total No. of Seeds	No. of good Seeds	Seeds/ Cross	% of Seeds Started	% of Ruptured Seeds	Germination Rate (%)	Plants/ Cross
M. Wash. x G. Era	39	184	162	4.7	88	24.5	38	1.4
Others x G. Era	29	74	52	2.6	70	13.5	25	0.3
All x Golden Era	68	258	214	3.8	83	21.0	35	1.0

Table 3
(Martha Washington x Golden Era)/(Others x Golden Era) Ratios

Seed Production Ratio	**= 1.9**
Germination Rate Ratio	**= 1.5**
Plant Production Ratio	**= 4.3**

Many of you may be quite astonished by the high rate of seed production from all of the crosses reported here, but let me assure you that the resulting seedlings provide convincing evidence in support of the validity of these results. One obvious conclusion from these data is that Golden Era (Reath's A-199) is an extremely effective pollen parent of intersectional hybrids. With regard to the comparison of seed parents, Martha Washington proved to be nearly twice as effective as the "others" in producing hybrid seed. In addition, these seeds also germinated and grew better than seeds from the "other" seed parents. Overall, Martha Washington produced more than 4 times as many hybrid plants/cross as the average of the "other" pod parents from this study. This was true, despite the fact that the percentage of ruptured seed was nearly double that produced by the others. Ruptured seed have a very low rate of germination, but are also the best early indicator that the cross has been successful and that most of the good seeds are true hybrids. Although I have no quantitative numbers to back it up , it has been my observation that the plants from the M. Washington x Golden Era cross are also generally stronger and healthier than those produced in other pairings. At a future time

I will try to conduct a similar comparison of a selected number of shrub peony hybrids which have been proven effective as pollen parents in the intersectional cross. For those who do not grow any of the varieties reported on here or just would like to experiment with other varieties, I have put together separate lists of "all" the pod and pollen parents reported in the literature to have sired at least one intersectional hybrid. However, I doubt that either of these lists are complete and up to date. Therefore, I would appreciate hearing from anyone who can add to either of these two lists. For the present however, since an adequate number of excellent double and semi-double "I" hybrids (with good petal quality and excellent foliage and plant habit) have been obtained from the M. Washington x Golden Era mating, this particular pairing will continue to be the mainstay of my intersectional breeding program for the foreseeable future.

Acknowledgement: I thank Roger Anderson, Don Hollingsworth, and Dr. David Reath for making these unique breeding plants available to me and other amateur breeders at very reasonable prices.

Proven Intersectional Hybrid Parents

Pollen Parents

1. Golden Era (A-199)
2. Alice Harding
3. A-198 (Reath)
4. Autumn Harvest (Seidl, AL-42)
5. Chinese Dragon
6. Alice in Wonderland
7. Golden Isles
8. Thunderbolt
9. Demetra
10. Tria
11. Banquet
12. Gauguin
13. Renown
14. D-256
15. D-105
16. D-106
17. Roman Gold
18. Golden Hind

Pod Parents

1. Martha Washington
2. Kakoden
3. Miss America
4. Gertrude Allen
5. Alice Roberts
6. Carr-East #2 (Hollingsworth)
7. Petite Rene
8. Vesper
9. HP1-61 (Dewey)
10. L2 (Seidl seedling)
11. L5 (Seidl seedling)
12. Stardust
13. Bu Te
14. Raspberry Sundae
15. Nippon Brilliant
16. Nippon Gold
17. Fairabault Gold
18. Shaylor's Sunburst

IDENTIFICATION OF INTERSECTIONAL HYBRID SEEDLINGS FROM FIRST YEAR FOLIAGE

Donald Smith

I have tried over the years to identify potential intersectional hybrid seedlings using the criteria outlined by the late Roy Pehrson in this newsletter (Pæonia, Vol. 5, No. 2, June 1974) more than two decades ago. Unfortunately, I have not found the list of distinguishing characteristics given in that article to be particularly helpful in identifying intsectional hybrids from their first year foliage. This is undoubtedly due to the fact that the single most important distinguishing factor, the leaf shape, was never described. Consequently, I have usually referred instead to an article by John Simkins in the APS bulletin (No. 213, Mar 1975, pg. 48) entitled "The Leaf is the Thing" which I have found very helpful. This article showed (with photographs) the leaf pattern of a number of first year seedlings including herbaceous and tree peonies and one "presumed" intersectional hybrid. As I have gained more experience from observing each "new class" of intersectional cross seedlings, I have developed great confidence in my ability to correctly determine the identity of candidate intersectional hybrids from a careful examination of the first year leaves. The key element in the proper classification of candidate "I" hybrid seedlings lies in the shape or pattern of the first year leaves. The color and texture and even the size of the leaves can serve as important additional distinguishing factors, but it is the leaf pattern which gives the clearest and most unmistakable indication of a seedling's identity. I use a very simple method which involves counting the total number of "leaf points" exhibited by each seedling. Leaf points are just that (i.e. points or tips on the leaves). A single unsegmented leaf has one point (even if that point is mostly rounded). A segmented leaf has one or more "cuts" and thus has multiple points (one more point than the number of cuts). Lutea hybrid tree peony seedlings, for example, exhibit foliage that is highly cut (segmented) and pointy with an average of ~ 18-22 leaf points per seedling (total for all three leaves) or 6-7 points per leaf. On the other hand, Lactiflora seedlings have several (generally 3-5) leaves which are mostly rounded and unsegmented (see Simkins article referred to above). As might be expected, intersectional hybrid seedlings fall somewhere between these extremes with leaf point counts in the range of 8-27. Table 1 gives a summary of the 1993 "class" of seedlings from the intersectional cross. The average number of leaf points for this group was 14. Examination of the data for other "classes" of intersectional hybrid seedlings gave very similar average leaf point values. These results are summarized and compared with other seedling groups in Table 2.

Table 1

Seedling Number IC-93-XX	Cross	Leaf Points	No. of Leaves	Stem Ht. (inches)	Foliage Size (inches)	Color	Foliage Texture	Growing Time (Days)	Fall Foliage Color	Comments
93-01	M.W. x G.E.	14	2+	2.5	2.5 x 3.0	LG		168		
93-02	M.W. x G.E.	20	3	4.0	2.5 x 2.8	LG	Wavy	221		
93-03	M.W. x G.E.	8	3	2.0	1.8 x 2.5	LG		196		
93-04	M.W. x G.E.	9	3	2.0	2.0 x 2.3	MG		217		
93-05	M.W. x G.E.	16	3	3.0	2.5 x 3.0	MG		212	Purple/red	
93-06	M.W. x G.E.	13	3	2.0	1.8 x 2.0	DG		288		
93-07	M.W. x G.E.	13	3	2.0	2.5 x 3.0	DG		288	Purple/red	
93-08	M.W. x G.E.	16	3	4.0	3.0 x 4.0	LG		265	Orange	
93-09	G.A. x G.E.	16	3	3.5	-	MG		---		Died
93-10	G.A. x G.E.	13	3	3.5	2.0 x 3.0	LG		~112		Weakling
93-11	M.W. x G.E.	14	3	3.5	3.5 x 4.0	VDG	V. heavy	245		
93-12	M.W. x G.E.	13	2	3.0	3.0 x 3.0	LG	Corduroy	208	Purple/red	2 stems
93-13	M.W. x G.E.	13	3	3.5	2.5 x 3.0	LG		219		
93-14	M.W. x G.E.	15	3	4.25	4.0 x 4.0	MG		282		Ruptured sd.
93-15	M.W. x G.E.	10	3	3.5	3.0 x 4.0	LG		234	Purple/red	
93-16	A. R. x G.E.	17	3	4.5	3.0 x 4.0	LG		309		
93-17	M.W. x G.E.	8	2	2.5	1.2 x 1.5	MG		208		
93-18	G.A. x G.E.	12	3	3.0	1.5 x 2.0	VLG		203	Brght. red	
93-19	M.W. x G.E.	14	3	2.5	2.0 x 2.5	LG		174	Red	
93-20	M.W. x G.E.	11	3	2.5	2.0 x 2.5	MG		228	Orange	
93-21	M.W. x G.E.	15	3	3.0	2.0 x 2.7	LG		224	Orange	
93-22	M.W. x G.E.	22	3	2.25	3.0 x 3.0	LG	Bumpy	178		
93-23	M.W. x G.E.	12	3	1.0	V. small	LG		~30		Died
93-24	M.W. x G.E.	27	3	4.0	2.5 x 3.8	LG		197	Lght. red	
93-25	M.W. x G.E.	17	3	3.5	2.3 x 4.0	LG		197		
93-26	M.W. x G.E.	11	3	3.0	2.5 x 2.8	LG		229		
93-27	M.W. x G.E.	12	3	2.25	2.0 x 2.5	LG	Corduroy	157		
93-28	M.W. x G.E.	11	3	3.0	2.0 x 2.5	LG		203		
93-29	M.W. x G.E.	12	3	3.0	2.0 x 2.5	LG	Corduroy	236		
Average		14	3	3.0	2.5 x 3.0	LG		223 ± 60		

M.W. = Martha Washington; G.A. = Gertrude Allen; A.R. = Alice Roberts; G.E. = T.P. Golden Era
LG = Light Green; MG = Medium Green; DG = Dark Green; VDG = Very Dark Green; VLG = Very Light Green

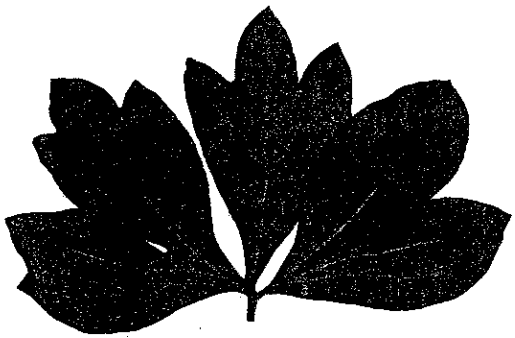
Table 2

Seedling Group	No. of Leaves	Range of Leaf Points	Average No. of Leaf Points	Color	Finish
P. Lactiflora	3-5	3-11	~5	DG	Glossy
T.P. Lutea Hybrids	3	18-22	~20	LG	Dull/Non shiny
"I" Hybrids 92 "class"	3	10-19	14.3	LG	Dull/Non shiny
"I" Hybrids 93 "class"	3	8-27	14.1	LG	Dull/Non shiny
"I" Hybrids 94 "class"	3	8-28	15.4	LG	Dull/Non shiny
Ave. of all "I" Hybrids	3	8-28	14.5	LG	Dull/Non shiny

Describing the leaf pattern of a "typical" intersectional hybrid seedling is rather difficult, in large part, because there is such a wide range of variation among individual specimens. As a result of this, I believe it is simpler and far more useful to show a number of examples of first year "I" hybrid foliage. A sample of some "typical" intersectional hybrid seedlings from the 93 "class" are shown in Figure 1. To obtain these images, the first year leaves of many seedlings were pressed (after normal fall die-back) in a standard flower press. After several months, the leaves were carefully removed and pasted onto ordinary white paper using rubber cement. The assembled sheet was then copied and reduced in a copy machine. The size of the final image being 2/3 of the actual size. To reduce breaking of the dried leaves during pressing, I sprayed the leaves with a few sprays of water containing a small amount of Chlorox bleach (~ 1/4 teaspoon per pint) and stored the foliage in a sealed Tupperware container for several days prior to pressing. This procedure sufficiently moistened the leaves so that they could be easily pressed with little or no breakage. The sample of seedlings shown in Figure 1 is a fairly good representation of the 93 "I" hybrid seedling "class". This set of sample seedlings spans nearly the full range of leaf point values (10-27) and has an average of 16 leaf points. This is only slightly larger than the average value of 14 observed for the entire 93 seedling group.

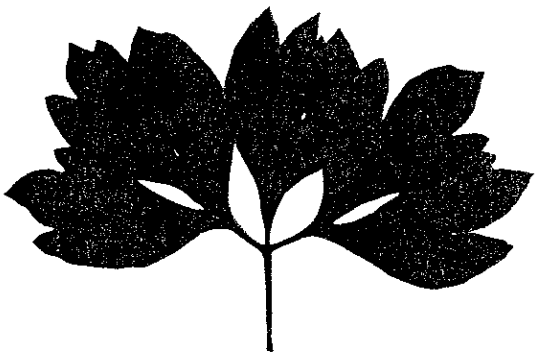
IC-93-12

IC-93-10



IC-93-15

IC-93-24



IC-93-25

Figure 1

Criteria for Identification of Intersectional Hybrid Seedlings From First Year Foliage

1. Leaf Shape or Pattern :

a) "I" hybrids are generally characterized by foliage which is relatively broad with numerous cuts and more or less pointed tips (points).

b) Pure Lactiflora seedlings are characterized by several (3-5) single-lobed leaves which are less broad and have more rounded ends (tips) with few if any cuts.

c) Some "I" hybrid seedlings exhibit a saw-tooth-edge which is typical of most tree peony foliage. This is a definite indicator of T.P. heritage. Only about half of the "I" hybrid seedlings exhibit foliage which can be described as truly tree peony like in appearance.

d) "I" hybrid seedlings average 14-15 leaf points. More than 12 -13 points is a definite indication of a true "I" hybrid. However, many seedlings with fewer than 12 leaf points (8-12) have turned-out to be true "I" hybrids. So this factor cannot be used as a definitive measure of hybrid status. Seedlings exhibiting big, broad leaves with relatively shallow cuts (as opposed to deep or full length cuts) are probably true hybrids regardless of the number of leaf points if they satisfy the other criteria outlined below.

2. Color :

a) "I" hybrid seedling foliage is generally light green in color (similar to T.P. Suffruticosa and T.P. Lutea hybrid seedling foliage). It is noticeably lighter in color than that of P. lactiflora.

3. Foliage Texture and Finish :

a) Nearly all "I" hybrid seedlings have foliage with a dull, non-shiny finish (again, similar to T.P. foliage). This is usually quite distinguishable from pure Lactiflora seedling foliage which is much glossier and shiny.

b) Many "I" hybrid seedlings have leaves which are noticeably bumpy (somewhat similar to corduroy) and some have leaves that are slightly twisted or wavy.

4. Size :

a) "I" hybrid seedlings are generally bigger and taller than their pure Lactiflora or pure tree peony counterparts. Many measure 3-4" across and are 3.5-4.5" tall.

The following article was submitted by Nancy Halas of Windsor, Ontario

PÆONIA BROWNII IS NOT A PEONY

1. An important characteristic distinguishing peonies from hellebores is their method of germination. Peonies are characterized by hypogeal germination whereas hellebores exhibit epigeal germination.

2. Peony Brownii is unfortunately not a peony, but is instead a hellebore.

3. Peony Tenuifolia may be the prettiest of all the hellebores, but since it exhibits epigeal germination it is, in fact, also a hellebore and not a peony.

4. Perhaps more of the hellebores will also cross with peonies, but hellebores are difficult for peony growers to raise because they need a different form of cultivation.

5. Peony Californica is very much a peony, and in fact, a Mr. Harry Pruet of California has reported some hybrids of P. Californica with other peonies. He has yet to report on a bloom, but the results should be quite pretty I would think.

6. Perhaps, these revelations will generate some new thinking in peony hybridization where I believe there has been far too much concentration of effort on a small number of very over-worked crosses.

7. However, crosses involving P. Brownii do not represent a totally new breeding direction but are merely an extension of an existing one. The link between peonies and hellebores has already been established through various crosses with P. Tenuifolia which, of course, have yet to be fully recognized or appreciated for what they really are.

8. "Pæonia" Tenuifolia probably belongs to the multifidus hellebore family.

9. "Pæonia" Brownii probably belongs to the vesicarius hellebore family.

Another question of some interest is "How do peonies travel (spread) all over the world"? Well, birds like to pick up seeds and stones and not all of these seeds are digested. Those which are not, are "dropped" just about anywhere migrating birds go.

Good luck to the new editor, Donald Smith, may he carry the relay handed to him by the Lanings who should be commemorated in some appropriate way for the unselfish contribution they have donated of themselves in the common pleasure of peonies.

Nancy Halas

Editorial Note: Peonies and hellebores are both members of the crowfoot family and are thus closely related species. Hypogeal germination refers to germination which occurs below the ground whereas epigeal germination refers to that which occurs upon or above the ground.