PÆONIA

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Recent Developments Affecting the Classification of Genus *Pæonia*

by D. R. Smith

The results of several recent studies affecting the classification of *Pæonia*, section *Pæonia* and section *Moutan* were discussed in some detail in the last two issues of the newsletter (*Pæonia*, V30, N3 and V30, N4). In particular, the landmark study of Tao Sang[1] has brought the full weight of modern scientific techniques to bear on the difficult problem of solving the very complex evolutionary puzzle of section *Pæonia*.

Similarly, recent studies by Tao Hong et al.[4,5] and De yuan Hong et al.[2,3] have helped to clarify the classification of section *Moutan*. By combining the results and conclusions from these various studies, a revised and substantially more accurate picture of the classification of the entire *Pæonia* genus can now readily be constructed. The new classification "tree" resulting from these inputs is shown in Fig. 1. The most important change from previous classifications is that there are now three sub-sections in section *Pæonia.* It is also noteworthy, that all of the species in sub-sections *Foliolatae* and *Intermedia* and two of the 5 species from sub-section *Pæonia* are of hybrid origin. These hybrid species can be divided into two groups, one where the maternal and paternal parents have been identified and the other where they have not. The parentages of the hybrid species in these two groups are given in Tables 1 and 2 respectively.

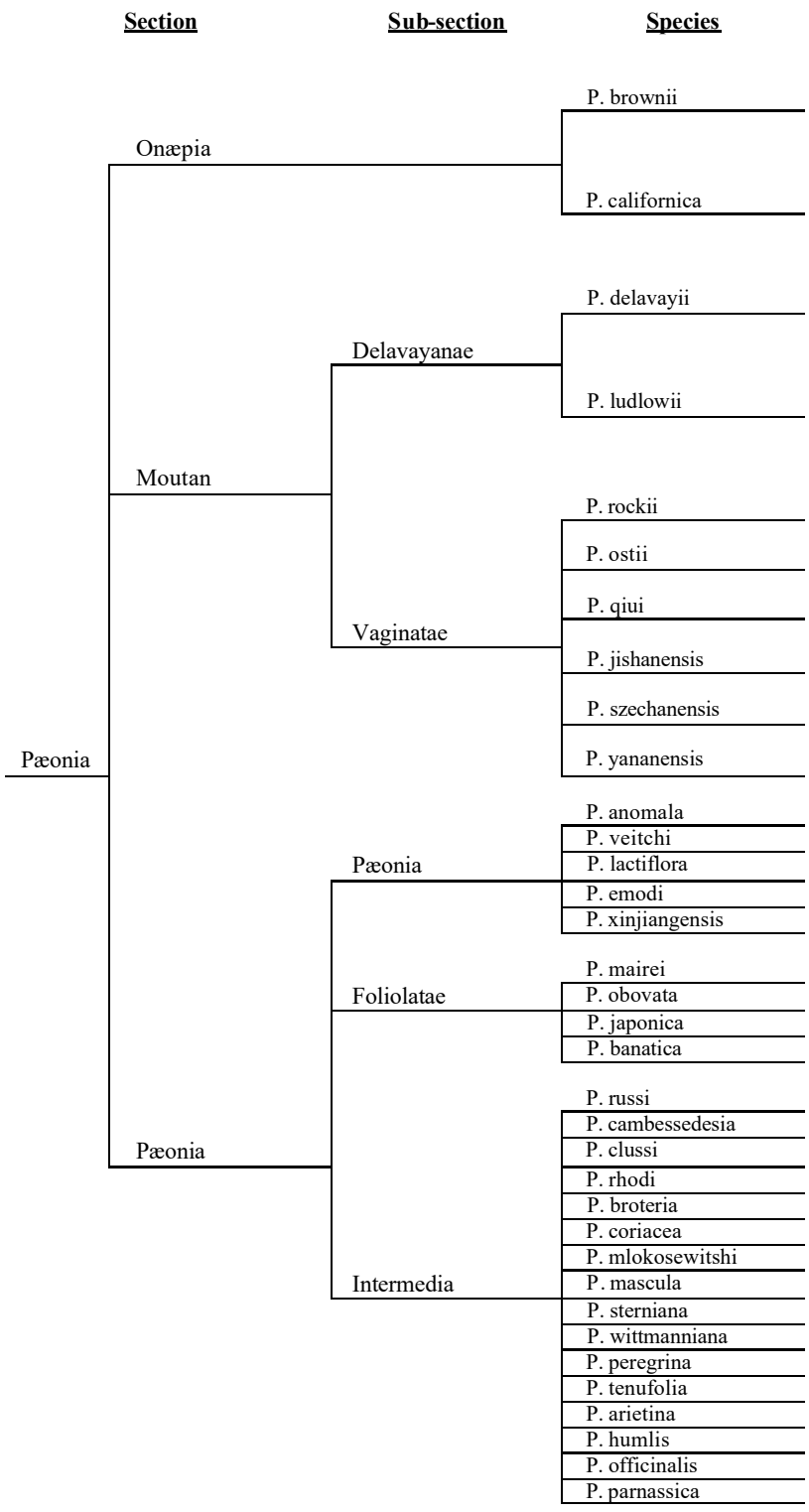

Fig. 1. Phylogenetic tree of Genus Pæonia based on the recent studies of Sang, Hong[†] et al. and Hong[*] et al.

[†]Tao; [*]De-yuan

Table 1. Parentage of hybrid peony species where paternal and maternal parents have been identified.

Maternal Parent		Paternal Parent		Hybrid Species
Lactiflora	x	Veitchii	=	Xinjiangensis
Veitchii	x	Lactiflora	=	Emodi
Emodi	x	Mairei	=	Sterniana
Unknown extinct species 3	x	Arietina-Officinalis Group	=	Tenuifolia
Arietina-Officinalis Group	x	Clusii-Mascula Group	=	Wittmanniana
Arietina-Officinalis Group	x	Mairei	=	Banatica
Arietina-Officinalis Group	x	Unknown extinct species 2	=	Obovata
Arietina-Officinalis Group	x	Unknown extinct species 2	=	Japonica

Table 2. Parentage of hybrid peony species where paternal and maternal parents have not been identified.

Parent 1		Parent 2		Hybrid Species
Anomala	x	Arietina-Officinalis Group	=	Peregrina
Lactiflora	x	Unknown extinct species 2	=	Clusii, Rhodia, Broteri
Lactiflora	x	Unknown extinct species 2	=	Coriacea, Mloko, Mascula
Lactiflora	x	Mairei	=	Cambessedesii, Russi
Unknown species A	x	Unknown species B	=	Arietina
Unknown species A	x	Unknown species B	=	Humilis
Unknown species A	x	Unknown species B	=	Officinalis
Unknown species A	x	Unknown species B	=	Parnassica

Arietina-Officinalis Group = Arietina, Humilis, Officinalis and Parnassica
Clusii-Mascula Group = Clusii, Rhodia, Broteri, Coriacea, Mlokosewitschi, Mascula

From this new information, we can get a clearer picture of the difference between hybrids and "hybrid species" (i.e., species of hybrid origin). The primary difference lies in how long ago the hybridization event took place. Isolated populations of hybrids, which survive (vegetatively, at first), will eventually become fertile and "true breeding" and will thus become new species. This can be an exceedingly slow process, which can take as much as a couple of million years. Mother Nature is definitely not in any great hurry to create new species.

Another interesting outcome of this new genetic information is a much better understanding of the heritage of and relationship between various interspecific hybrids. For example, Emodi is the pod parent of both *White Innocence* and the "Windflowers". But, we now know that Emodi originated from the cross (Veitchii x Lactiflora). Therefore, all three of these hybrids are backcrosses. *White Innocence* is ¾ Lactiflora and ¼ Veitchii whereas the "Windflowers" are just the opposite (¼ Lactiflora and ¾ Veitchii).

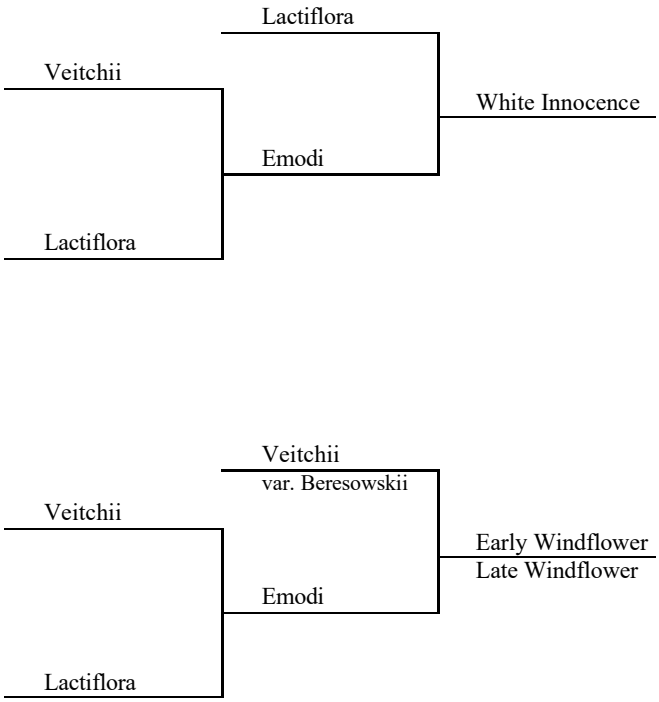

Fig. 2. Comparison of the parentage of three well-known Saunders herbaceous hybrid peonies.

References:

1. Sang Tao, Phylogeny and Biogeography of Pæonia (Pæoniaceae), doctoral dissertation, Ohio State University, 1995.

2. Hong De-yuan, Pan Kai-yu, and Yu Hong, Taxonomy of the *Pæonia Delavayi* Complex (PÆONIACEAE), Ann. Missouri Bot. Gard., 85 (4), 554-564, 1998.

3. Hong De-yuan, *Pæonia* (Pæoniaceae) in Xizang (Tibet), NOVON, 7 (2), 156-161, 1997.

4. Hong Tao, Zhang, J.X., Li, J.J., Zhao, W.Z. and Li, M.R., Study on the Chinese Wild Woody Peonies II. New Taxa of *Pæonia* L. Sect. Moutan D.C. Bulletin of Botanical Research, Harbin 12 (3), 223-234, 1992.

5. Hong Tao and Osti, G.L., Study on the Chinese Wild Woody Peonies I. New Taxa of *Pæonia* L. Sect. Moutan D.C. OP. Cit.14 (3), 237-240, 1994.

EXTINCT SPECIES IN *PÆONIA*, SECTION *PÆONIA*

By D. R. Smith

One of the more interesting results coming from the recent work of Sang[1], is the discovery of several species in section *Pæonia* that long ago became extinct. Although these species disappeared millions of years ago, it is incredible to realize that clear "footprints" of these ancient species still exist in the gene patterns of modern peonies that have descended from these species. There is even the possibility that some day these species could be re-created from these "footprints". According to figure 6 of Sang's dissertation[1], there are three extinct

species in section Pæonia (see figure 1, page 6, of "The World of Peonies According to Sang", Pæonia, V30, No. 3). Although these species are not clearly marked on the chart, they can easily be located by looking for "dead-ends" in the phylogenetic "tree". These three species are referred to here simply as Extinct Species 1, 2 and 3 or ES1, ES2 and ES3 respectively, where ES1 is the most ancient and ES3 is the most modern.

As discussed in the previous article (V30, N3), section Pæonia evolved during ancient times into two clades, a large clade whose descendants include P. anomala, P. lactiflora, P. veitchii, etc. and a small clade whose original ancestor (ES1) long ago became extinct. Fortunately, ES1 hybridized with an ancient member of the large clade prior to its extinction. As a result, all existing species in the small clade are of hybrid origin and thus there are no pure descendants of the small clade.

According to Sang's phylogeny chart (see Fig. 1 V30, N3, p6), ES1 became the paternal parent of ancestors of both P. mairei and another species now extinct, ES2. This left P. mairei as the purest existing representative of the small clade. As a direct consequence of all this, the genes of ES1 are only carried by P. mairei and its descendants and also the various descendants of ES2. Prior to its extinction, ES2 hybridized with a wide variety of other species. For example, ES2 hybridized with P. lactiflora and also with at least one member of the arietina–officinalis sister group. In addition, ES2 was the paternal parent of P. obovata and P. japonica and likewise also became a parent of the clusii-mascula sister group.

ES3, on the other hand, probably evolved from the large clade and appears to have only one descendant. From Sang's chart, ES3 hybridized (as the maternal parent) with an earlier representative of the arietina–officinalis sister group prior to its extinction. P. tenuifolia is the only known descendant of this mating and thus may be the only remaining species carrying ES3 genes.

I find all of this new information concerning the origins of the various species in section Pæonia incredibly fascinating. Unfortunately, however, the origins of some well-known hybrids still remain a total mystery. For example, it is altogether possible that one of these three extinct species had yellow flowers and roots and is one of the unknown parents of the famous yellow herbaceous hybrid, *Oriental Gold* (Smirnow, 1954) (see Pæonia, V26, No. 4, p. 2). It would appear that this clone was recently re-introduced in the fall of 1997 by White Flower Farm under the name of *Golden Wheel* (from the Chinese, *Huang Jin Lun*) (see Letters to the Editor and response, in Pæonia, V27, No. 3, p. 6). With results of DNA sequence data on *Oriental Gold* in hand, all speculation concerning the parentage of this unique plant could probably be put to rest once and for all. Unfortunately, such data seems unlikely to be available in the near future.

A Summary of My Hybridizing Results for 2000

by D. R. Smith

In 2000 I continued to concentrate on the intersectional cross in my hybridizing activities. As in the two previous years, I again did not collect or use pollen from *Golden Era* (Reath's A-199) in any of my crosses. Although *G. E.* is by far the most effective pollen parent for producing intersectional hybrids, I already have at least a hundred hybrids from this variety and thus have switched to other tree peony hybrids which have better, larger or more double flowers. As an alternative I used pollen from

three advanced generation lutea hybrids with very large double flowers of outstanding quality. These were *Zephyrus* (Daphnis), *Alice in Wonderland* (Reath) and a home grown hybrid I call *Smith Family Yellow*. The latter two are from the same cross but made in opposite directions. In addition to these three, I also used pollen from an unnamed Daphnis hybrid (D-67) and from the potaninii hybrid *Hélène Martin* (Cayeux).

A summary of the results for the intersectional crosses made during 2000 is shown in figure 1. Of the five pollens used (primarily on lactiflora var. *M. Washington*), *Alice in Wonderland* was clearly the most effective in producing intersectional hybrid seed. *Hélène Martin* and *Zephyrus* pollens were significantly less effective than the others. As in previous years, ruptured seeds accounted for a significant fraction of the total seeds produced from these crosses (77 of 177 = 44%).

Table 1. Summary of results from intersectional crosses made during the summer of 2000.

Herbaceous Pod Parent	Tree Peony Pollen Parent	# of Crosses	# of Seeds	Seeds per Cross	# of Good Seeds	# of Ruptured Seeds	% of Ruptured Seeds	# of Germ. Seeds	% Germ.	# of Seedlings
M. W.	A in W	10	63	6.3	34	29	46	18	29	16
M. W.	SFY	11	45	4.1	24	21	47	9	20	4
M. W.	H. Martin	24	30	1.3	25	5	17	18	60	8
M. W.	Zephyrus	12	16	1.3	9	7	44	8	50	5
M. W.	D-67	9	23	2.6	8	15	65	5	22	4
M. W.	i-Hyb.	13	0	0	-	-	-	-	-	-
HP1-61	A in W, SFY	6	0	0	-	-	-	-	-	-
Total		85	177	2.1	100	77	44	58	33	37

A in W = Alice in Wonderland (Reath, Tree peony hybrid) from cross of (Alice Harding x Golden Era)
SFY = Smith Family Yellow (Smith, Tree peony hybrid) from (Golden Era x Alice Harding) cross see Pæonia, V29, N3, p4.
D-67 = Daphnis unnamed tree peony hybrid with single yellow flowers
i-Hyb = Anderson Intersectional hybrid Morning Lilac
H. Martin = Hélène Martin (Cayeux, 1980, t.p. hybrid) from (P. potaninii var. Trollioides x Gessekai) see Pæonia, V27, N4, p3-4.

Notice:

I apologize for the very long delay in getting out this issue of the newsletter. Unfortunately, the next several issues will also be late as well. I am working hard to get back on track and I ask for your continued patience. Part of the problem is that there are fewer and fewer contributed articles and letters coming in and therefore I am forced to do more and more of the writing with each issue. Another reason for the delay is that I am spending time trying to put **Pæonia** on-line. Hopefully, this will be accomplished by early fall (maybe by the next issue) and all subsequent issues will be available on-line at <**Paeonianewsletter.com**>.