PAEONIA

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May the miracle
of the first Christmas
renew your heart with joy!

Chris

Lois

TWINS AND TRIPLETS

(Reprinted from Paeonia, V.3 #2, 6/72)

by Fred Cooper of Ottawa, Canada
November, 1971.

In the past I have only come across two or three twin seedlings that I can recall, and these were only regarded as curiosities. However, it is known that among such seedlings a small but reasonable percentage will be of changed ploidy. Thus from a tetraploid plant it is possible to obtain diploids, tetraploids, hexaploids, and octoploids and in addition aneuploids and homozygous plants.

This spring I carefully examined my 1970 crop of seedlings before planting out. In about 1800 seedlings I found 25 sets of twins and 3 sets of triplets -- about 3% overall. However, in some cases the frequency was surprisingly high: e.g. '**Roselette's Child**' x '**Rose Crystal**', 18%; '**Serenade**', open pollinated, 14%; and lacti x corsica F_2 selfed, 8%. On the other hand, many yielded no twins at all: e.g. '**Moonrise**', '**Good Cheer**', lacti x lobata, and tenuifolia x daurica. Pure lactiflora gave about 1%.

Even at the hypocotyl state either one or both twins in over half the pairs were "different" from "normal" single seedlings. Generally they were characterized by the slenderness of the hypocotyl, although in one case the hypocotyl was grossly swollen and short in length compared with the "normals". Top growth has pretty well confirmed these observations. I feel fairly certain that I have at least two plants that could be hexa- or octoploid, and one diploid (from a tetra). About 8 others, because of their form, bear close watch. None of the "weak" strains from the few pure lactifloras I had survive. It is possible they were monoploids, and hence had little survival value.

Obviously this method cannot compete with the colchicine technique for increasing ploidy, as we have no control over which plants or strains we would like to utilize. On the other hand it could be quite useful in obtaining haploids, aneuploid and homozygous plants that cannot readily be obtained by other methods.

MULTIPLE EMBRYO SEEDS

Chris Laning

Twins and triplets are to be under my careful observation this year since almost nothing is known about changes that could take place in seedlings resulting from the two or three plants developing from one peony seed.

To locate the twins, the indoor germination method must be used -- this means holding all the seeds in moist vermiculite until roots develop. It is easy to locate and pick out the twins and triplets from the larger (gross) collection of germinating seeds. Two types of

roots will be located in any collection of this type and I conclude from this that one type is "identical" and the other is "fraternal". The fraternal type will have one root that is heavy and one that is light (quite slender). In the identical twins type both roots are of the heavy (normal) type. There is a third type (usually found in triplets) which produces two -- and sometimes three -- slender roots. Of this type not any have survived to produce seedlings.

There is a batch of seeds dedicated to this project which will be given top priority. One thousand five hundred seeds of '**Roy Pehrson's Best Yellow**' are in damp vermiculite at present, the records of which will be written up in Paeonia as a progress report in the coming months and years.

It seems that rather high percentages of twins develop from our advanced generation hybrids. I have made no provisions for lactifloras as a test group so why don't some of you hybridizers try this!

About ten years ago, Roy Pehrson sent me a number of twins of various hybrids which developed into seedlings, but not enough attention was given so while the plants survived for several years, I lost track of them before any came into flowering age. I'll try to do better this time. It is the feeble small tin that needs great care -- maybe it (they) should be maintained in the "Intensive Care" unit where coddling can be provided.

Whether we can take advantage of the changes in ploidy, as Fred Cooper suggested as a new way of locating unusual plant material, or find it is only good for locating runts, observing the growing processes should prove educational. Well we might ask if runts are to be the forerunners of very dwarf peony plants!!

MINIATURE DWARF PEONIES

We may not be aware of the need for miniature peonies but it takes little imagination to see the delights to be offered by their development. Always we think bigger is better and doubles are to be preferred to singles. This being so, hybridizers have failed to consider the opportunities to be offered by undertaking such a goal. Little darlings placed on the table to be viewed at meal time offer a delight we have yet to experience!

Selecting the smallest seedlings in a large population of standard ones is expected to be the approved method, and over a long period of time this should result in the desired product of miniature peonies. Quite likely progress will be slow because stock must first be developed and low fertility which is associated with runts is a likelihood -- a thing to be expected.

An alternative route will be using of small types from small species. This too can be a long drawn out process since sterility is an evil ever present when crossing species. Many species with small phenotypes are not easily to be found -- where to get them?

(*continued on page 9*)

TREE PEONIES

Much labor and time has been expended on tree peony hybridizing with satisfactory results. We can duplicate the success Prof. Saunders experienced by using the method he used -- suffruticosa pollen onto *P. lutea* and P. *delavayi*. It would seem this tack to be more fruitful than hoping for future generations of seedlings from present-day lutea hybrids. While we can and do get an occasional seed, a fertile race of lutea hybrids remains beyond achieving!

In continuing the above process, it would be of help to locate *P. delavayi* and *P. lutea* clones that produce no fertile pollen. Then by the single process of isolating this clone (or clones) from suffruticosa plants, an exact record can be kept on parentages, and results of the various pollens used. It is not to be hoped that fertility in resulting seedlings will be superior to present-day lutea hybrids however.

While the end result of such a program as this will add to our collection of lutea hybrids, something is seriously lacking; we can't develop complicated crosses such as we have with the herbaceous lines. If any Paeonia reader has located or developed a fertile lutea hybrid, reporting this is your duty as well as privilege! And sharing is of top priority!!!

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The plants that grew from lutea and delavayi mix seeds that came from C. Graham Jones of England are now old enough to produce seeds. So, for the next few years I plan to raise 100 or more seedlings per year. 175 seeds are at present germinating in the basement which is the start of this program.

It will be most interesting to see just what variations and advancement can come out of this single strain. All that is required of each seedling (at present) is that it be fertile. Through selection, over many years, a fertile strain of beautiful P. lutea will be developed. Not many hybridizers appreciate small flowers, but just wait and see what can be done!!

- Chris

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ROY PEHRSON'S RECORDS

On studying the records of the Itoh cross attempts by Roy Pehrson for the year of 1972, and the handling of the seeds resulting from this effort in 1972-73, some valuable information can be gleaned! It appears that he tried a host of crosses involving various plants.

Roy used lactifloras for the pod parents of almost all of these attempts. Strange it is since he had access to a host of hybrids which he could as pod parents. Does this tell us something? -- lactiflora (a diploid) is one requirement for success of this extremely difficult (or rather, unproductive) cross. We must not come to this conclusion since we have not tested sufficiently the use of herbaceous hybrids as seed bearing parents!

Maybe the tetraploid hybrids offer a possibility of some small measure of fertility for the Itoh cross which seems now to be totally lacking. While I am at present checking out this possibility, nothing as yet can be reported.
Now it is interesting to note the various tree peony pollens that Roy experimented with in the search for new types of Itohs. He followed his own edict "try everything" and we will follow his example.

Cross		Frig on	Bagged	Sprout	Not Sprout
G. Dawn - Ludlowii	OK	Dec 15	Sep 04	13	4
Lacti - trip - Argosy	OK	Dec 22	Sep 20	1	1
Charm - Nino Tsukasi	No	Dec 22	Sep 20	1	1
Moon of N. - "A" old	No	Dec 22	Sep 20	7	0
S. Sunburst - Regent	No	Dec 22	Sep 20	7	4
S. Sunburst - B. Pirate	OK	Dec 22	Sep 20	7	1
G. Dawn - Del/Lut West	OK	Dec 22	Sep 20	2	1
Sanctus-Rush x Eldorado	OK	Dec 22	Sep 20	1	0
P. Rene D/L mix	No	Dec 22	Sep 20	1	0
G. Dawn - Regent	No	Dec 22	Sep 20	3	7
G. Dawn - Regent	No	Dec 22	Sep 20	3	1
Lac-SMC - Regent	OK	Dec 22	Sep 20	3	2
West - A. Harding	OK	Dec 22	Sep 20	24	1
P. Rene - Canary	No	Dec 22	Sep 20	1	3
Vesper - "A" old	No	Dec 22	Sep 10	8	6
Charm - tall Del	OK	Dec 22	Sep 04	2	0
N. Beauty - Argosy	OK	Dec 22	Sep 20	3	1
Vesper - G. Isles	No	Dec 22	Sep 10	14	9
Ama-no-S. - Argosy	OK	Dec 22	Sep 20	1	0
G. Dawn - B. Pirate	No	Dec 22	Sep 20	2	0
Moon of N. - Canary	No	Dec 22	Sep 20	6	0
V.G. Anemone - Argosy	OK	Dec 22	Sep 20	6	0
Vesper - Ludlowii	No	Dec 22	Sep 10	6	4
Vesper - t. p. s.	No	Dec 22	Sep 20	5	2
Vesper - A. Harding	No	Dec 22	Sep 10	13	7
Vesper - B. Pirate	No	Dec 22	Sep 10	26	17
Vesper - A. Harding	OK	Dec 22	Sep 20	6	7
Westerner - Regent	No	Dec 22	Sep 20	2	3
P. Rene - Regent	No	Dec 22	Sep 20	6	3
P. Rene - Regent	No	Dec 22	Sep 20	2	2
Mary Moy - Eldorado	OK	Dec 22	Sep 04	2	3
Lacti/Chalice - Regent	No	Dec 22	Sep 20	12	12
Gertrude Allen - Argosy	OK	Dec 22	Sep 20	12	8
Kate Barry - D/L #5	No	Dec 22	Sep 20	25	4
Plainsman - A. Harding	No	Dec 22	Sep 20	1	0
Kate Barry - Argosy	No	Dec 22	Sep 20	1	0
Kate Barry - Argosy	No	Dec 22	Sep 20	32	13
Moon of N. - Regent	No	Dec 22	Sep 20	27	25
Vesper - Regent	No	Dec 22	Sep 10	21	14
Ama-no-S. - A. Harding	No	Dec 22	Sep 20	4	2

Cross		Frig on	Bagged	Sprout	Not Sprout
Kate B - O/L #1 (yel)	No	Dec 22	Oct 01	83	20
G. Dawn - Ludlowii	No	Dec 22	Sep 20	4	1
Vista - Hino Tsukosa	OK	Dec 29	Oct 01	3	0
Ama-no-S. - Canary	OK	Dec 29	Sep 20	3	0
P. Rene - B. Pirate	OK	Dec 29	Sep 20	2	0
Plainsman - Ludlowii	No	Dec 29	Sep 20	4	1
Vesper - B. Pirate	No	Dec 29	Sep 20	2	1
Christine - Argosy	OK	Dec 29	Sep 20	2	2
S. Sunburst - Regent	No	Dec 29	Sep 20	2	0
Moon of N. - "A" old	No	Dec 29	Sep 20	26	22
Vesper - A. Harding	OK	Dec 29	Sep 20	18	---
Westerner - "A" old	No	Dec 29	Sep 20	2	0
Vesper - G. Isles	No	Dec 29	Oct 01	41	11
S. Sunburst - Regent	No	Dec 29	Oct 01	73	15
Akashigata x t.p.'s (v. doubtful)	No	Dec 29	Oct 01	66	17

"A" old - Saunders F2A - old pollen
Del/Lut - P. delavayi/Lutea or mix
t.p. - tree peony or rather suffruticosa mixed pollen
Ludlowii is a species

These records are most interesting but where are all the resulting plants? A bitter disappointment it was to him that only a few over 100 plants grew from this gross collection -- and very few actually bloomed before he died and most of these had "incomplete flowers", as he described them. Though they were true hybrids, most of them had little or no value since the flowers are poor and the plants are infertile.

But where are the plants? Well, I have maybe 20 of them and other hybridizers have received some of the better Itohs -- and then later his garden was open to the public to take of what was left as they chose. - Chris

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WINTER KILL

A basic problem with regards to the Itoh cross must be made known to all hybridizers, a problem that has frustrated me to no end!! And not only is the Itoh cross involved but many many herbaceous and suffruticosa crosses present the problem of not being winter hardy, also most species. Winter protection for the first year only is not enough, nor are one or two more years of protection adequate. I suppose Roy Pehrson lost most of his seedlings because of lack of winter protection.

Many plants are not reliably hardy for our Michigan winters of 30°F below zero.
Here is my problem list: *P. obovata*, *P. emodi*, *P. mlokosewitschii*, *P. coriacea*, and their hybrids when seedlings. We must protect our seedling plants for at least four years or until they bloom.

CORRESPONDENCE

Route 1, Box 50
Alsa, GA
11-06-84

Dear Chris,

Please find enclosed $2.00 and a copy of my letter to you dated Feb. 10, 1984 with your response.

If you get any seeds this season, I would be grateful for any tree peony seed and early blooming hybrid seed you could spare. I planted the tetraploid seeds you sent me mentioned in the letter. Am anxious to try my hand with them. The tree peonies I purchased from Dr. Reath last fall did very good. in fact several bloomed for me this spring including 'Age of Gold', 'Black Panther', suffruticosa (Rock's Var.), and 'Marchioness' (also 'Stolen Heaven' from Dr. Smirnow).

I have received some new plants from Roy Klehm and David Reath. This gives me about 30 T. peonies altogether. You can imagine how excited I was to see my first T. peony bloom in my own garden. nobody around even knows what they are since peonies are not grown here in my community. if I am successful, I believe others will want to join me in growing those varieties which will do best in the South.

I have about 165-170 rose bushes in my garden, but I am more enthused over the peonies. I keep reading about the work of Daphnis and Gratwick extending the work of Dr. Saunders. Do they have a catalog advertising the sale of their plants? These varieties appear to be prized very highly. Any other supplies of healthy and vigorous T. peonies you recommend would be greatly appreciated.

Whatever information and tips on growing peonies you can give will be most helpful and if there is anything I can do to help you and the American Peony Society in new venture with peonies in the South, please let me know.

In closing let me congratulate you being elected President of the American Peony Society. I serve on the Board of Directors of the National Wildlife Federation and I know you give a lot of your personal time to the organization. My profession is Associate Professor of Chemistry in the University of Georgia. I have taught Zoology, but I know little about Botany.

Thanks again, and good luck this year.

Sincerely,

Delano Deen

P.O. Box 59
Ashton, South Australia
Australia, 5137
21 October 1984

Dear Mr. Laning,

I was recently given your name by Neville Harrop of Hobart, Tasmania. He suggested you may be able to supply me with some herbaceous peony seeds.

I have a small holding - 3 acres - in the hills above Adelaide. The area is ideal for peonies and there are some peony trees on a few properties. I have experienced difficulty in obtaining herbaceous root stock and so I think I need to gather in some seed. I must say that I want to grow herbaceous peonies for cut flowers. I have 300 growing -- in their first year -- at the moment.

I don't understand plant genetics very well so far but I understand that hybrid seed is not suitable. Please can you tell me what you have available. I would be happy to buy a mixture because I am looking to buy a pint or two.

I have recently joined the American Peony Society and am looking forward to finding out more about these wonderful plants. Looking forward to hearing from you soon.

Yours faithfully,

David Sutton

P.S. The only other person I have ever heard of from Kalamazoo is Timothy Bernat -- paper maker. I myself am a paper conservator by trade.

Hi David –

The seeds you requested were sent via air mail today, November 22, though not in the amount you requested. The cost of packaging and mailing is $1.50 when sent to people in the U.S. and that means about 150-200 seeds.

Gathering seed pods, shelling, and packaging is time consuming, but seed distribution is a service of the American Peony Society which it offers to its members with no thought of profit -- just $1.50 to cover cost. This project doesn't plan on seed distribution by the pound or pint.

From my own peony plants I can supply seeds by the pound but for a profit -- that means $40.00 per pound plus postage. Hybrid and lactiflora seeds are available if ordered early in the fall (September) but the supply for this year is exhausted.

Lactiflora and hybrid seed do equally well here in the U.S. but the correspondents from "Down Under" don't indicate the extent of their success; see enclosed letters.

- Chris

Miniature Dwarf peonies cont.

We do have a few dwarf peonies that have been introduced and there are small tetraploids in the seedling beds; these offer a start for miniaturizing, and once the desired stock is accumulated, progress should be satisfactory.

The runts segregated out of the group of twins and triplets may yet offer a short-cut. We will have to consider this possibility which may provide yet another path toward our goal. As of today (two days before Thanksgiving), I have located five twins already and the project is just barely started. Maybe 50 or 100 twins and triplets will result from my large collection of germinating seeds.

There is a clone that gives inspiration -- a 'Halcyon' F_2. It is not a small plant but does afford an insight into greater things to come. The main bloom is about the same size of 'Halcyon' F_1 but in addition has a row of silver dollar size blooms just beneath the main bloom. Surely this is as artistic as anything I've seen in the peony line. We had better get going! Opportunities abound!

- Chris

OBSERVATIONS ON TWINNING IN PEONIES

Don Hollingsworth

Twinning, meaning the production of two offspring from one reproductive unit, has always been the subject of more than ordinary interest whenever the habit of the kind is to produce one per birth, per seed, etc.

Everyone is aware of "like" and "unlike" twins in humans and the source of the difference. In triplets or larger numbers there is the question of whether they are all one way or the other, or part like and part unlike. Twinning is commonly expected in sheep by persons who know the farmyard kinds, but for range production breeds have been selected to avoid twinning, as a matter of the economics in both instances. Cows rather infrequently give birth to twins, but they are normally welcomed as a favorable event. In horse matters, however, the birth process is unfavorable to twins, leading to a sad frequency of still births, and so on.

Now comes a small (yet select) number of persons who give enough attention to reproductive events of peonies to have seen that twins occur in this species also — two plants from one seed (maybe more).

Having "midwifed" numerous peony seeds through root germination under an attentive eye, I can say that twinning in peonies is a fairly frequent occurrence. Recently, I ran the first germination scores on geminating seed lots of 1984 crosses. It seemed that there might have been as much as three to five per cent multiple roots. In retrospect, it seems

unlikely that it is really that high, but there were quite a few. Do these multiple roots stand as good a chance of leading to surviving plants as singles? Or, is it somewhat as in sheep — more likely under rigorous conditions that singles will turn into survivors?

Also, do peony seeds give rise to both like and unlike twins?

Insofar as my twins have reached maturity, or at least of age enough to see they are either the same way or different, only unlike twins have been noticed. This confirms that peony seed production does not preclude the development of two (or more, presumably) embryos. These must be from two separate fertilizations in the same ovum when the resulting plants are unlike. Two such pairs have flowered and are decidedly different. (This does not rule out like twins in peonies, however.)

One pair are tree peonies, detected as two plants with intertwining stems and roots at first transplanting. These are tree peonies with obvious differences in flower and growth habit. The second showed up in a row of once transplanted seedlings of Roy's Best Yellow. Upon first bloom, these had been used for crossing and were assigned designations for records purposes — RB1, RB2, RB3, etc. Next time they flowered, -RB3 was seen to have two distinctly different flowers — in color, texture and form. When dug, there again was a pair of plants with stems and roots intertwined. Now there is an RB3A, also, and while originally suppressed by its earlier developing sibling, the slower one is the far better clone (and inherited the RB3 designation).

More recently I followed a seedling of Demetra x Reath A199 (1983 crop) which initially produced three roots but the third was either weaker genetically or else did not fare well in the competition for the available endosperm. Two shoots were eventually produced and this autumn one has developed fall color in the leaves while the other remained green. I take this to be an indication of their unlike makeup, although the call must be tentative as yet.

With respect to the possible desirability of twinning in peonies, it is certainly welcomed in the last case, being one of the relatively infrequent advanced generation hybrids of the Lutea Hybrids. However, I note that despite the observation of a frequent occurrence of twins at germination, there have been noticeably few show up as twin survivors at transplanting time. This suggests they have a lesser probability of attaining the two or so years of age for first transplanting (both surviving) as do their single counterparts.

While there has been some interest in the question of whether twinning is somehow associated with the occasional production of progeny having an elevated number of chromosomes, leading to tetraploidy from diploid parents, I know of nothing from genetic studies in other species or of peonies which seems to support this idea. And, there is a substantial body of published studies of chromosome aberrations in peony germ cell formation. (See APS Bulletin #236, Dec. 1930, for a bibliography listing such studies, along with, other peony references.)