PAEONIA

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REQUIRED READING:

1. "The Peonies" by John C. Wister, $3.50 from American Peony Society, 250 Interlachen Rd., Hopkins, MN 55343
2. Bulletins of the American Peony Society.
3. History of the Peonies and their Originations.
4. The Best of 75 Years; 3 & 4 ed. by Greta Kessenich, and available from the American Peony Society.

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TRANSPLANTING SEEDLINGS

Greta Kessenich

There are special days and that pleasure was mine about three weeks ago, when Lois and Chris Laning came from Kalamazoo, Michigan, for the weekend. Kalamazoo is about 700 miles from Minneapolis. The weather was nice and time was spent in the garden looking at various plants and the results of some treatment that had been given individual peonies.

The evening stretched into the night hours, discussing peonies, seed distribution and all that goes with the growing of seedlings. Chris had brought a cardboard flat of one year old tree peony seedlings for me. A treasure for anyone to receive.

To me, a year-old seedling is really a critical stage to transplant, so I asked him just how I should treat these seedlings. He responded by saying, transplant them now and keep them from freezing this winter.

A long time ago, I received a very strict introduction in planting seedlings from a little old lady that had spent a lifetime among her flowers and excelled with seedlings and seed sowing. The results of her method were all around, so there was no reason to discount anything she said. So it was and I have followed her advice. In transplanting any seedling at this stage, the root must not be damaged, not even the slightest tip of the slender root. If it is, your plant is set back and your plants (peonies and iris) just sulk.

(Continued on page 10.)

PRODUCING ITOH HYBRID PEONIES

by Don Hollingsworth

One of the most tantalizing and challenging interspecies hybrid crosses in the genus Paeonia is Lactiflora (Chinese ponies) x Lutea Hybrid peonies. The cross is tantalising because it is capable of giving strong yellow colors in a herbaceous plant, a goal long sought in peony grower circles. It is challenging because it is very erratic in both seed production and in the adequacy of flowers produced by the hybrids.

The American experience has been that a diligent operator may make the cross on hundreds of flowers and get no true hybrids. Another time or another hybridist may make a few crosses and get several true hybrids. The late Roy Pehrson made the cross more than any other American hybridist, whose work is known, and produced well over a hundred of the hybrids. I have made the cross many times and have perhaps a dozen plants, either matured or showing good prospects of attaining flowering, remaining from approximately thirty first year seedlings which showed the characteristic leaflets of the hybrid. The others either died, have remained weak, or already have been discarded because of severe weakness. Bill Seidl, Chris Laning and John Fiala have reported successful production of the hybrids and there may be others.

The cross was discovered by Mr. Toichi Itoh, a plantsman in Japan, who is reported to have used the Chinese peony '**Kakoden**' crossed by pollen of Lutea Hybrid '**Alice Harding**'. The resulting hybrids and the story of their parentage were introduced in the west through the efforts of Mr. Louis Smirnow. Later, hybrids from pollen of a Japanese tree peony were also announced from Japan. Little is known of the latter as yet in North America, although the photographs which have been published and observer statements indicate the plants have foliage which is like the Chinese peonies and not intermediate between the two species as is typical of the hybrids. This would be merely interesting except that both Roy Pehrson and Chris Laning have reported successful production of the hybrids using Japanese tree peony pollen. In so far as I know of Roy's and Chris' plants, their leaf form and habit is typical of the other Itoh hybrids. This observation, taken along with my own experience in the difficulty of precluding contamination in crosses on Chinese peonies, necessarily leaves open, I believe, the question of what is the species parentage of the latter Japanese introductions.

If it is disappointing to wait until the seedlings grow, waiting a year or more after collecting seeds from the hybrid crosses only then find they are not hybrid, how much greater potential of disappointment is there when after growing the hybrid plants another four or five years they are found to produce aborted flowers on plant after plant? This happened to Roy Pehrson. Roy pioneered in studying the Itoh cross and one of the things he did early was to collect a very large amount of tree peony pollen from flowers exhibited at the national meeting of the American Peony Society. Owing to the northern location, peony flowers were still opening in his garden when he returned home and he was able to make the crosses and obtained numerous hybrid seedlings. Roy apparently continued to make use of heretofore untried varieties in making the Itoh cross. While I do

not know how many of his plants proved able to produce good (complete) flowers, I am of the impression the number is small. Eventually, when I had the use of Lutea Hybrid varieties other than '**Alice Harding**', I have also experienced more or less severely aborted flowers. Already knowing of the Pehrson experience, I was not surprised, but nevertheless disappointed.

Those of us who couldn't easily get at other sources of pollen when we first started making the cross (or simply set out to repeat Mr. ltoh's cross) and used '**Alice Harding**' pollen, were indeed fortunate. So far, '**Alice Harding**' is almost entirely responsible for the production of hybrids in which highly desirable flower forms have appeared. While the hybrids from AH tend to have their flowers on arching stems, some embedded in the foliage, the colors are often excellent and the forms are generally good, although some have unacceptable aborting of petal development. A hint of this can be seen even in most of those having good flowers. Note the petal edges. They will be serrated or toothed, the appearance as though the flower developed as a series of parallel cell lineages, growing in strips from the base outward. The finished result often appears to have resulted in a failure of equal control as to the point at which the elongation of the strip is terminated. In the more severe instances of aborted petals the edges of the petals will be wispy, as though the ability to grow simply fizzled out. This aberration of form is also seen in other interspecies peony hybrids which I produce, some of the '**Good Cheer**' hybrids being notable in this respect.

My recommendations on how to combat the aborted flower potential of Itoh hybrids involve selection of parent varieties to be used in the cross. In the first place, emphasize the use of Lutea Hybrid '**Alice Harding**' pollen, a logical choice since its hybrid progeny have been largely acceptable. Secondly, watch for other Lutea Hybrids to try which have very heavy petal substance and graceful, full blown form, not tight or tucked on the petal edges, for example. In selecting Chinese peony varieties for the cross, again look for those which have excellent petal substance and large petals with well-formed ends, being relatively free of wispiness or serration. I like to produce yellow flowered progeny so I also have a personal preference for white and blush flowered seed parents.

Japanese, anemone or bomb flowered seed parents have been advocated because they are generally free of pollen. However, don't overlook pollen-bearing forms. Some of the biggest petals are found in singles, and some of the best of petal substance.

Another selection criterion is to use varieties which have proven they can produce satisfactory progeny of the cross. I can mention '**Gertrude Allen**', white anemone, and '**Miss America**', white SD, of the named varieties which have been successful. My best specimen (#205) is out of an old variety which is found around very old homesteads, a blush and white anemone which has very disease resistant foliage.

Combatting the erratic fertility of the cross is, I believe, a matter of learning to overcome a pollen incompatibility factor. My own study of this suggests strongly that the cross takes on very hot days. Heat is known to reduce pollen incompatibility in certain other

species and it is reasonable to suppose that peonies may have developed the same solution to the need for resistance to inter-species cross pollination in the wild. My early successes in producing Itoh hybrids are known to have been crossed on dates when the 24-hour average temperatures were 10 degrees (F) or more higher than normal for the date, being 75° or higher. One can simply save the available pollen until the desired temperature level occurs, or take other steps. Unfortunately there is never a date some seasons when the 24-hour average is above 75°F. Accordingly, a more positive approach would be to construct some plastic covered walls and roof for setting up a temporary greenhouse over some plants which you want to use for producing seeds of the Itoh cross. It should have ventilation capability, either thermostatically controlled or closely attended and manually controlled. This won't necessarily be simple, but there is no doubt it is achievable at modest cost. Such an effort will make it possible to check whether there really is a heat reduced barrier to pollen tube growth in this cross.

Another interesting question which doesn't have anything to do necessarily with fertilizations is where are the white Itoh hybrids? Genetically, the yellow flowered Lutea Hybrids are expected to have the yellow color in only a single dose. Accordingly, the germ cells produced should come up with or without the genetics for yellow flower color in equal numbers. How come then we don't have an equal number of white flowered progeny?

One other consideration in selection of Chinese peony varieties is length of stem and erectness of posture. Particularly when using '**Alice Harding**' as pollen parent, length of stem is a problem. However, all Lutea Hybrids are prone to have outfacing flowers, presumably the legacy of the lutea species parent. While the reachy stems of many Chinese peonies are usually an aggravation, they may be a boon in the production of Itoh hybrids.

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MAYBE AN ITOH HYBRID BACKCROSS

by Don Hollingsworth

Can Itoh Hybrid peonies be bred to produce an advanced generation strain — fertile, of course? Hopes for this were hailed with an appropriate fanfare more than a decade ago. What has been tried? What can be gleaned from the results so far which may help guide next steps? Please send your results, comments and ideas.

I can report the possibility of a "maybe" backcross — how's that for hedging! Early on, when my first seedling Itoh commenced flowering, a few backcrosses were made using very doubtful quality pollen on Japanese flowered and anemone form Chinese peonies. Seeds were harvested and, when they grew, the foliage and growth habit seemed entirely lactiflora as also happens when making the Itoh cross. Most of these plants flowered in 1982 and seeing the flowers confirmed the previous observation. Three plants were deemed acceptable in flower and capable in stigma form for trial as pod parents. The

culls were dug a few days ago and torn apart to obtain grafting roots. While cleaning the mixed roots, it became apparent that some of the pieces had a hard core, like tree peony roots, which is quite different from the typical lactiflora peonies. Whether there is a real backcross hybrid lying out there in the trash pile, we may never learn, but the possibility certainly gives me some much needed encouragement to make some more tries. (I'll also go back to the trash pile to see if the plant can be resurrected from some of the mutilated crown pieces.)

Getting a backcross seedling that appears to be identical to the predominant ancestor species is well within logical expectations. Admittedly, it is not what we're looking for. For, unless we obtain plants intermediate in form, we will not have anything new. However, this result tends to confirm the possibility of fertility, even though that fertility may be low. Low fertility is no great barrier to a serious breeder. It just predicts that we will have to work more diligently in order to obtain a representative number of progeny by which to evaluate and plan next steps.

Perhaps the greatest barrier we have to face in attempting to breed from the Itohs is the lack of knowledge about fertility potential of the various clones. However, there are sources of fertility information in the random occurrences of nature. I have a cull Itoh F. (from Pehrson) which sometimes makes an empty hull of a seed. There are Chinese peonies around the area in which it grows, so that might be the source of the pollen which was responsible for the fertilization. Or, possibly there was some of its own pollen present. This season, I used pollen collected from a different Itoh hybrid seedling on a couple of dozen of its flowers, but there were no results. The pollen may have been worthless; no pollen germination trial was run on it. Or, perhaps the pollen incompatibility barrier which has been hypothesised in the Itoh cross itself is also operating in the progeny. It was never unusually warm here during the 1982 peony flowering season, as I believe is necessary for the fertilisation of the Itoh cross to take place,, I will continue to try the Pehrson plant for seed production, I expect many of the others may occasionally produce a seed when suitably mated.

This lack of specific knowledge about fertility of various clones largely makes it necessary to "fly blind." In such instances, we can make use of probability logic. Try a relatively large number of different clones for the project, make as many different crosses as is possible and make them as many times as possible. I realize that because there aren't many people that have more than a few of these hybrids, it tends to discourage one from placing much hope in the possibility of useful results. Remember, however, it just takes one seed to make the progress, when it is the right seed. That seed may just as readily occur on an isolated plant with one flower as it would on a plant in the garden of someone who has enough materials to make many tries. Probability also works out on the total of all real chances which occur, not just at the level of the individual operator. Of course, it is at the level of the individual operator that motivation exists. Yet, it is the total of what all do which counts, ultimately.

I am inclined to feel the most significant barrier to the potential for success in any difficult crosses of peonies lies in the extent to which there are people who are motivated

to try. Possibly the most powerful motivator is recognition that there is a potential for success. One may complain that peony breeding is inherently slow because of the long life cycle, and the low rate of propagation further aggravates the slowness by making distribution slow. However, there are a lot of Itoh hybrid peonies now in the hands of growers. If several people will diligently pollinate all flowers and collect pollen from them which, in turn, is used in making more crosses, the chances of obtaining a breakthrough will be greatly enhanced.

I believe one of the most logical approaches for transferring the lutea yellow-color into plants of good herbaceous form is to use the Itoh Hybrids with selected Chinese peonies. Make the cross both ways, assuming you can collect some Itoh pollen. The other pollen should be readily obtainable. My recommendations are to select parent plants on the same criteria as when selecting the matings in the Itoh cross itself — the same sorts of lactiflora (Chinese) peonies — and use the same principles of pollination that apply in using the Lutea Hybrid pollen.

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TRIP TO MINNESOTA

by Chris Laning

Helen Pehrson, Roy Pehrson's sister-in-law, informed. me that Roy insisted that the proper time to transplant peonies is before little white roots begin forming in early fall. She said that August 15 to 30 is the only proper time for digging and transplanting herbaceous and tree peony (suffruticosa) plants, according to Roy, and if I had wanted to rescue any remaining plants, "Come early, before the general public would begin digging." The entire area is to be plowed and seeded into grass, a lawn being easier to maintain than a weedy peony patch.

So — to Lafayette, Minnesota, we (Lois and I) did go. It was in the middle of August when we left Kalamazoo and sun attended our entire trip. But no, I didn't have to dig in a downpour — the sun, powerful that it is, promptly made me wet from the inside out. Hot! Five hours after starting to dig, I had retrieved 35 plants. These were what I thought to be of interest and possibly of value for our hybridizing projects. While none of these has a satisfactory flower, if a seed can be gotten from any one plant, the trip will have been profitable, since most of these are lactiflora by suffruticosa (not the same as the Itoh cross). Three or four plants are '**Nippon Brilliant**' (a lactiflora) x T. P. mix, some are lacti x P. delevayi and x P. lutea and x P. potaninii variety - tall yellow, a few also are from lutea hybrids. Not any plant that I dug had an identification or stake so the only thing known is the general fact that they are T. P. crosses. Leaf size, shape and texture along with plant and root structure indicate the tree peony parentage and that is all we have to go on. Oh, and buds in the axils of the stems is another indication of the cross.

Very little peony material and few records of Roy's hybridizing labors could be found. There was no follow-through in hybrids he developed. I wonder if anybody other than Dr. Saunders has ever been able to keep peony hybridizing records beyond the F_1 and F_2 generations.

The evening and overnight stay at the Pehrson home, along with an excellent noon meal (actually we ate at 1:30 that day) made for a very enjoyable occasion. Helen was a gracious hostess and her son was a nice guy to visit with.

Sunday afternoon was dedicated to traveling to Greta Kessenich's home in Hopkins, Minnesota. Here we found Greta awaiting our arrival. If judging the success of our overnight stay by the food she served, she is great; if by the gardening conversation, she is an expert; if by the great numbers and varieties of plants along with their healthy condition that she maintains, she is a work-horse. Really, we felt very comfortable in her home.

Two topics that were of special worth were: her spraying program (wish she had elaborated, in greater detail), and the great care needed in handling the roots and root tips of plants in the process of transplanting. Quite a lot of discussion was generated on these and other subjects and one could feel that she knows what she is talking about (and she talks a lot).

Greta, will send me seeds (rose hips) from her magnificent rose bushes soon. Why raise roses from seed? Well, I can then have the kind I like -- singles and semi-doubles.

Thank you for a profitable and enjoyable stay, Greta!

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BOTRYTIS AND PHYTOPHTHORA BLIGHT

by Greta Kessenich

There was a time in the past when botrytis was practically unknown in Minnesota. Winter was in moderation with the usual days of zero to -25° F. Always ample amount of snow covering; that came early in the season averaging from 18 to 24 inches or more. This gave the peonies the best of insulation from the sub-zero temperature. In the spring, warm days came, the snow melted, and the eyes appeared. No hard freezing and then thawing and we all had a good peony bloom. There was always a slight trace of botrytis but not at all alarming.

I have heard the question, "What is botrytis? How can you tell if a plant has botrytis?" In answering those questions now, I will say that when it strikes you will know, and it will not be long until it haunts you daily in trying to find a remedy. There is not only botrytis, but the dread phytophthora blight is even worse. It resembles botrytis in a way but the foliage turns almost black and the leaves hang limp. This disease travels down the stem into the crown. Botrytis has its effect in the early spring as new small plants develop, they turn wilty and die. As the plant matures and large buds are about to open, the entire stalk falls because of a lesion causing a rot that girdles the stalk.

Peony growers in a given area sometimes feel that this occurs because of something they have done or not done. It is well to have ample space between your rows of peonies, clean up the garden in the fall and do away with all foliage, but even that does not solve the problem because who can control Mother Nature when cold rains come in the spring, the ground remains wet, little sunshine and it either freezes or it gets very hot, followed by a freeze. This is not the type of weather that any perennial enjoys. This breeds disease, not only in peonies but roses, iris and most hardy of all perennials, the hosta.

Many gardeners hesitate to mention that problems have occurred in that given spring but be assured that if this occurs in your garden in a given area, it also prevails in other gardens.

In different years I have sprayed with fungicides which would ordinarily take care of all foliage disease and dry up any rot using Benlate, Captan, Zineb and Phaltan. I have had a regular spray program, as with roses, beginning with the early hybrids when the first pink eye was seen and also spraying plants before any eye was showing. This continued every ten days until the plant was full of foliage.

If there were any noticeable results in the check of the diseases, I felt it was only due to the different degree days in the temperature each year and not in the spray used. The disease continued but not to the same extent. The spray must have had some good effect but I am of the opinion that the soil must be cleaned up before the disease is checked as it harbors this disease and remains over the crown and as the eyes push forth in the spring they are already affected.

A good soil fungicide is Terrachlor as it disinfects the soil. I have used this fungicide in the area of iris when it became affected with soft rot, due to the weather conditions. When one plant became affected, this disease seemed to travel in an area around it. Treating the soil as well as the plant soon checked this problem. Peonies are affected in the same way, perhaps one or two show the symptoms and very soon a plant nearby and it continues.

This fall when the foliage is cut down, all the peony area will be sprayed with a good drench of Terrachlor, hoping this will be a help and the answer in the control of botrytis and phytophthora blight.

Again we do not rule out the severity of weather in early spring.

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SEED DISTRIBUTION —

This is a list of seeds which are available at present. Others will be listed in the December issue after other contributors' seeds arrive.

Rushlight F_3
Tetraploid mix
Quad. F_3 x Rushlight's Child F_2
Archangel F_2
Serenade F_2
Quad F_2 x Moonrise F_2
Quad F_3 x Silver Dawn F_3
Archangel x Nancy F_2

SOME HAZARDS IN LATE PLANTING OF PEONY SEEDS

by Don Hollingsworth

Modern research in peony seed germination has helped to predict the probable reasons behind the Japanese lore which held that the drying of peony seeds before planting in the fall will result in a severe reduction of seedling production. (This statement paraphrases the basic statement of this teaching which appears several times in our Peony Society literature.) This emphasis in the translation is that peony seeds must not be allowed to dry from the moisture of the pods but should be planted immediately.

The practical use of the new findings is that as dry peony seeds planting is done later in the season, the more valuable it will become to keep the soil from freezing on them, for as long as possible. The usefulness of this procedure ends as it gets late enough in the fall for the soil to remain continuously cold. By then, seeds will not develop from the dry state to the point of root germination, since this usually requires a certain amount of "warm" period development.

We now understand it is not that drying destroys the ability to germinate. It never did make sense with what else we see about peony seeds naturally overwintering in the pods of standing stems. What drying does is to delay development, which is what has happened to seeds which fall naturally from dried pods during late autumn or winter. However, we often let that course of events commence, then turn around and put the seeds into germination environment while the season is still warm enough to reawaken development. With this delay there is a greatly increased hazard that in the spring they will be caught in mid-development having root germinated but without having received the conditions necessary for bud dormancy to be reduced before the soil becomes too warm in spring for it to continue.

While the temperature required for reduction of bud dormancy in the peony species is not established, the phenomenon is very well described for orchard trees. The observation of many peony hybrids and species during controlled seed germination processing suggests that the physiological process of bud dormancy reduction in *Paeonia* is very similar to that of orchard trees, including the temperature ranges at which the chemical reactions take place.

For purposes of fruit tree variety evaluation, a unit of measurement for classifying the dormancy reduction time requirement has been defined. This is the chill unit — one hour at 46° F. At lower and higher temperatures, down to 32° and up to 59°F, the amount of time per chill unit becomes progressively longer. Below 32° the effect may be negligible and above 59° the effect may be negative, increasing the level of dormancy. The chill unit requirement in orchard trees varies by genus (800 and 1300 for peaches and apples, respectively) and varies by individual variety to some extent. Progress has been made in producing peach varieties with a lower chill requirement, which allows them to be successfully grown further south.

Peony varieties are known to vary in their readiness to grow in the spring, some emerging shoots at the first warm weather, others emerging much more slowly. I believe this is no more than partly due to bud dormancy reduction, for we also see an effect of growing temperature levels in the order of bloom among varieties. Flowering develops in a different sequence in a prolonged cool spring than in an early warm-up spring in my area.

Germinating peony seedlings show a threat range of difference in how quickly the plumule will commence to develop (this is the event which I take to signal the approaching readiness to grow). They seem to vary both within a given cross and by species background.

Thus, a given planting, done at a particular time of year that falls in the hazardous time, may or may not give poor results, depending on a complex of factors which includes genetic tendencies, seasonal conditions and management. Management choices yield results on a probability basis. What would be a bad choice with a particular seed lot in one season may not prove to give bad results with another seed lot in the same season or the same seed lot in a different season. So, working from the perspective of probability, we can say it is safest to hold seed dry until spring or early summer next year or to carry them under indoor controlled conditions if to be started this fall. This assumes the handler has an effective system for doing indoor germination, of course.

However, if one is intent on autumn planting of the seeds, even though some are not ready to harvest until September, then we can say your chances are best if you avoid letting them dry from the pods, either on the plants or after harvesting, then cover the beds and insulate them as well as you can muster against freezing. That is what I am doing this year, because I have not been able to keep up the work necessary for the indoor germination procedure. If I don't like the results I get, I can either go back to indoor processing or hold seeds over until the following summer to plant. Or, I can use a combination of these procedures, e.g., early harvested seeds to the soil, precious or rare seeds to indoor processing, others hold over.

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TRANSPLANTING SEEDLINGS, continued from page 1

When annuals, zinnias and marigolds are grown in flats or in a row in the garden, then pulled apart for transplanting, the shock is so great that seed sown at the same time will overtake the transplanted seedlings.

We see more and more nurseries planting various flowers in individual peat pots so they can be put directly in the ground (bottom removed) with no setback. So it is with our peony seedlings, that tender root must not be damaged in the slightest. Should it happen you have lost time and your effort in growing that particular cross. Sowing seeds directly in the ground is different because the seedlings are left for two or three years, then transplanted. Should seeds be grown in clay pots, then a gentle stream from the hose should wash away the planting medium with the pot on its side and with very careful handling the seedlings can be transplanted.

My cardboard flat of seedlings will be set in the soil, very damp and with a sharp knife cut around the bottom, after putting some soil around the plants, holding 'them in place. Then carefully remove the bottom of the box. The seedlings will be left as they are now growing. There will be no setback from individual handling.