PAEONIA

Volume 24, No.2 Summer Issue, 1994

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Kalamazoo, MI.

Suggested yearly contribution:
$2.50 in the U.S.
$3.00 in Canada
$4.00 in Europe, New Zealand, and Australia.

TILL VERSUS NO TILL

The season for peony blooming was excellent. Only 9/10th inch of rain fell in May and no rain by the 10th of June. Peony blooms remained in grand shape for the whole flowering season offering making hand-pollination a joy (dry and warm).

But what about the drought? Well, more than 60 years ago while working for a truck gardener (celery farmer), I learned that the drier the season, the more often to cultivate. Using this experience this year, a dust mulch was maintained by rototilling often so at no time was dryness found two or three inches below the surface. Also, no weed seed germination was possible on the fluffy dry surface.

It was interesting to note that the No-Till corn crop suffered quite a bit but the cultivated corn looked beautiful. No-Till works here in Michigan in a wet and in an ordinary year, though not this year!

Fertilizing:

After the beauty of the spring blooming season we will not relax our cultural efforts. Now is the time to feed the established peony plants to ensure a good flowering season next year. If 12-12-12 fertilizer is used, only a light application next spring will be needed. Good fertile soil provides food for a beautiful season next year with plants that are robust. Use a small handful of chemical fertilizer per plant or a little more if broadcast over the whole area.

Transplanting:

Divide established bushes every four or five years if increase in numbers is wanted. While dividing isn't necessary, there is a gradual decline of the advanced generation tetraploids after ten years because these tend to be robust growers, in some cases rampant! Sometimes I wonder just how big a bush an Itoh would develop into if it were not divided for many years. With the high cost of each division no one wants to wait to find out (we can't resist the money the Itoh can provide). Suffruticosa (tree peony) is a difficult plant to increase. Even with grafting, the process is slow since even a three or four year old graft is small and the price isn't!

Raising tree peonies from seed is almost as quick as grafting though named varieties do not come true from seed. However, all my seedlings of T.P.'s are beautiful — as also are my children.

(FROM WYE COLLEGE)

Tree Paeony - (a) Mountain (Chinese)
(b) Single flowered

The Plant -

Paeony suffruticosa is a woody deciduous species belonging to the Moutan group of the family Paeoniaceae. Hybrids and cultivars are grown principally for their large showy flowers and also for the production of root bark, extracts of which are used in oriental medicine.

The Problem -

Seeds - Paeony suffructicosa (with the exception of 'Joseph Rock') does not breed true from seed so faithful reproduction of cultivars must be through vegetative propagation.

Grafting - The slow process of grafting is one reason why tree peonies are rare and expensive in many countries and the growth pattern restricts the availability of scion material.

The Solution -

Develop a micropropagation blueprint which provides a rapid bulking of a single variety. Paeony suffructicosa var. Papaveracea.

Tree Paeonies -

The woody species of paeony comprising Paeony suffructicosa, P. delavayi and P. lutea have been in cultivation for over 1000 years. They are valued for their appearance and medicinal compounds. Buds from a 60 year old plant of P. suffructicosa var. Paraveracea were used for investigating a micropropagation system.

Micropropagation –

Stage I: Single bud culture

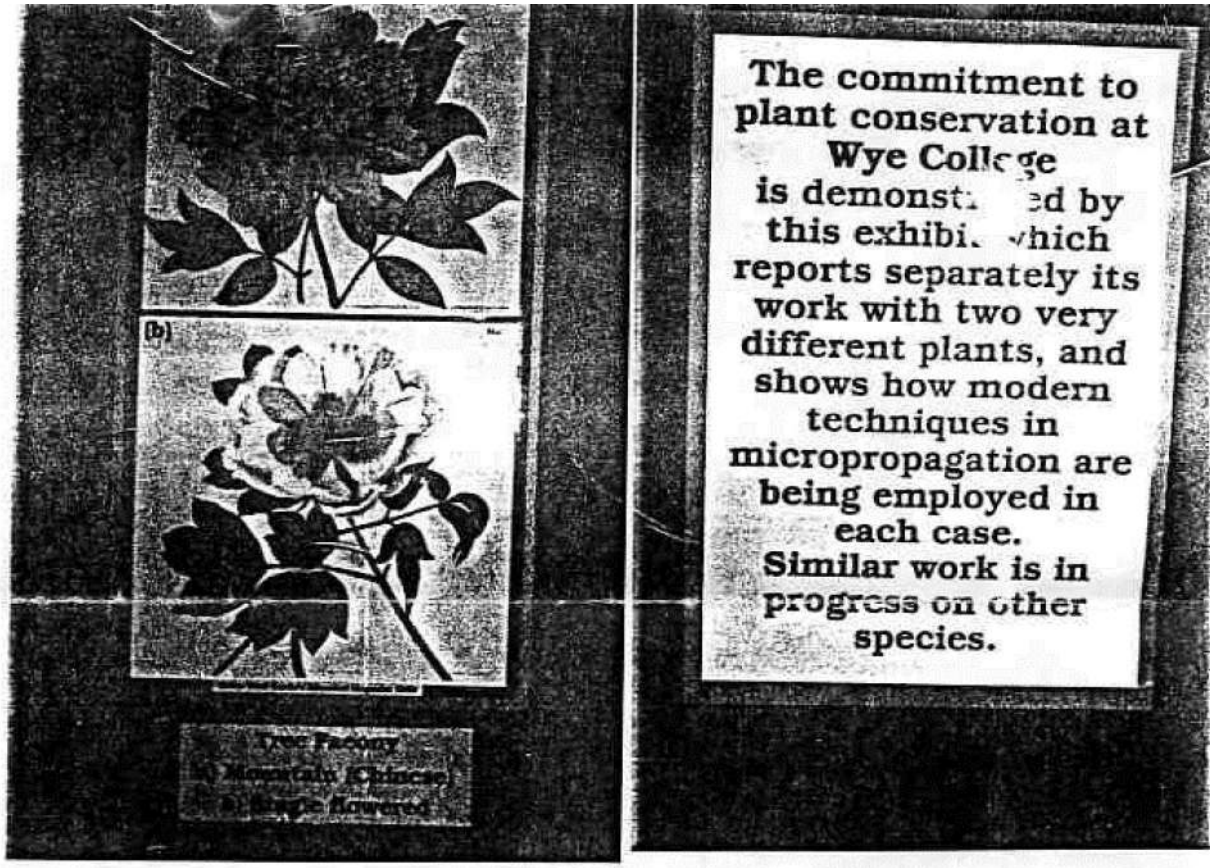
The process begins with mother plant axillary buds grown on a medium supplemented with the growth regulators BAP and 2iP.

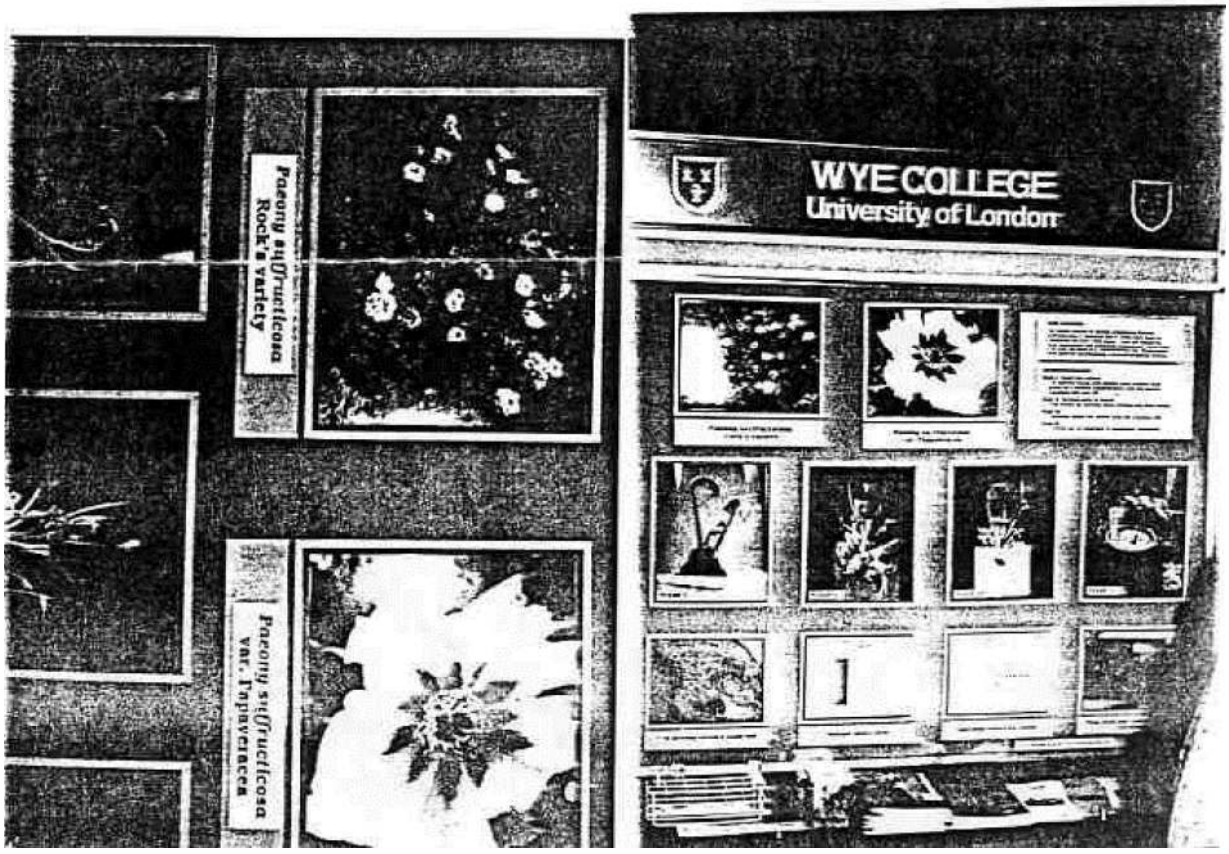
Stage II: Multiplication of shoots

Buds within the growing shoot develop and form shoots.

Stage III: Individual shoots are rooted using the regulator IBA.

Stage IV: Plantlets are acclimatised to glasshouse conditions.


(b)
The commitment to plant conservation at Wye College is demonstrated by this exhibit which reports separately its work with two very different plants, and shows how modern techniques in micropropagation are being employed in each case. Similar work is in progress on other species.


Paeony suffruticosa Rock's variety
Paeony suffruticosa var. Papaveracea
WYE COLLEGE
University of London

Stage IV
Stage III
Stage II
Stage I
Stage IV
Plant form and flower is identical to mother plant
Individual shoots are rooted
Multiple shoots form
Buds develop within a single bud

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June 5, 1994

Dear Chris,

Many thanks for sending the March issue of your PAEONIA letter. In the meantime we have been busy teaching, travelling and recording peonies by pictures and notes.

To talk about sharing something: the F_4 plant you kindly sent me last fall bloomed very pretty and is the most dwarf peony I ever saw. Due to a severe night frost in April I was unable to cross it with my P. off. 'Mollis', as all pollen of the Mollis plant was destroyed, as well as all the pollen of the other early peonies.

At the end of May we travelled to Great Britain to see some gardens and the Chelsea Flower Show, one day spending at Kew Gardens. The P. mollis in Kew Garden had already finished blooming, but the leaves of the Kew plant are totally different from our plant. So lets still talk about P. off. 'Mollis' as long as we do not know the exact status of our plant.

At the Chelsea Flower show we were absolutely thrilled by the exhibition of the Wye College. I'm sending all the information we could collect. This is a milestone in propagation and of great commercial value. I'm going to send this information to our brother Hong Tao as well, knowing, all of you will be excited to hear they have succeeded.

We do not only grow species but hybrids and some tree peonies as well. This year bloomed a tree peony seedling for the first time, a cross of P. rockii cv x 'Taiyo'. It's so pretty that I'm afraid we have to try to propagate it by grafting and have to learn how to do it.

Another pretty seedling of our garden is a very dark single P. lactiflora hybrid, darker than 'Chocolate Soldier', RHS-Colour Charts 187 A, 110 cm high, dark red and stiff stems, long blooming with up to three buds, very sun and weather resistant, but no fragrance, sorry. It increases very slowly. Kees Sahin, who visited with us recently was thrilled by it. Do you think its worth registering or are there other such dark Lactifloras? As you're able to visit the conventions of APS you have seen more hybrids than I ever will see in my life.

The seeds you sent me some years ago have bloomed for the first time this year, but it is too early to make any descriptions. I suppose the somewhat hectic period of the bloom of the peony is finished for you also and you've got time to answer my questions. All the best to you and Lois.

Irmtraud

SUFFRUTICOSA

(From Volume 10, No. 1 of PAEONIA, March 1979)

Tree peony propagation is a tricky proposition in colder parts of the country (as in Kalamazoo, Michigan). By following the same techniques as used in producing herbaceous seedlings, we have run into serious difficulties.

Rooting T.P. seeds indoors is a simple matter! This is done exactly as with herbaceous seeds. And this is wrong!! With this method the sprouted T.P. seeds must then be planted out of doors, and this the seeds consider to be transplanting and they don't like it! Another thing they don't like is prolonged freezing weather. Only the very strongest of seedlings will survive this treatment; alas, the strongest ones are usually the singles.

If, after one year's growth you find that they need to be transplanted because they are becoming crowded — you goofed! They don't want to be transplanted!: and most of them will die. Or maybe you'll wait 'til after the second year with the transplanting. Not more than half of the seedlings will survive. Three year olds, if given winter protection along with summer care, will offer a good percentage of survival. Could we have a "tap root" problem here?

Probably Paeonians living in California, Washington, and Oregon can plant T.P. seeds directly in the open garden thereby sidestepping our problems. Mild climates and T.P.s get along together very well.

- Chris Laning

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DOUBLE FLOWERED EARLY HYBRID PEONIES, A BREEDING ACHIEVEMENT

(From Volume 10, No. 2 of PAEONIA, June, 1979)

At the recently held 1979 American Peony Society National Convention, Chris Laning exhibited several early hybrids having genuine doubling. By "genuine" I mean the types of doubling required for a Chinese peony to be classified for show purposes. For all too long there has been a tendency for wishful thinking to show up in describing the flowers of interspecies hybrids. Since most are single, having only one row of petals, as little as two rows of petals have sometimes been used as justification for calling a flower "semi-double". Several rows of petals coupled with a tendency to stay partly closed have sometimes been called "double". However, it has been typical that the hybrids have retained a fully formed center ball of stamens that is clearly separate from the petals. The exceptions have been largely in these midseason hybrids which involve in their ancestry the double flowered forms of the officinalis peony, wherein the stamens are all transformed into petalodes of approximately equal dimensions, making anemone and bomb type flowers.

The season of the officinalis peony is just before that of the Chinese peonies (Paeonia lactiflora), leading to hybrids that come midway in the overall calendar of flowering. When I speak of Chris' early hybrid doubles I am referring to peonies which flower with '**Archangel**'

(a Macrophylla Hybrid) and earlier, entirely ahead of the Officinalis Hybrids and their close kin. Chris not only has bomb type flowers of early hybrids but also types that are directly comparable to the Chinese peony full doubles and semi-doubles.

"Laning's Best Yellow," as his previously exhibited full double seedling is still called, is from the cross of an advanced generation plant of the Saunders Quadruple Hybrids with '**Moonrise**'. The flower is of good full double form. Although it has anthers (as do many of the full double Chinese peonies), the flower-in-flower form is fully elaborated as is necessary to get past the semi-double form —the inner flower being substantial. Upon opening, the petals are relatively short, enabling one to clearly see the flower-in-flower configuration. There are several rows of petals at the outside, then a row of stamens, inside of which are several more rows of petals (carpels of the outer portion are either absent or transformed so that they merge nicely with the inner petals). Another band of stamens and inner carpels (more or less distorted) make up the center of the flower. After the petals grow, the flower takes on a domed, ball form as is often seen in Chinese peonies. In the fully developed flower, the sexual parts are obscured by the petals.

The lesser flowers (side buds and those on smaller stems) are likely to be more semi-double and will frequently give normally formed carpels, suitable for pollination and seed production.

Flower color is a muted light yellow that is more intense than that of '**Moonrise**'. An extra bonus is the pink flare at the base of each petal, which, though obscured in the fully developed flower, contribute a bright spot in lesser flowers and at petal fall.

The plant is of medium height, 30 inches or so in a second year division, and the flower is carried a little above the main mass of foliage. Leaflets are clear green and somewhat rounded, reminiscent of that of '**Moonrise**'.

The flowers appear along with those of '**Archangel**', ten days or so after the very earliest peonies come on, but still ahead of the prevalent midseason, red flowered-hybrids.

This peony promises to become a great influence upon the quality and variety of flower form in the early hybrid peonies.

Chris also displayed a fine group of early hybrid semi-doubles and bomb doubles which have as pollen parent an "F_3" of '**Silver Dawn**' and are from pods of the advanced generation quads. The colors have ranged to peachy and apricot tones, always with the pastel effect from a yellow or creamy undertone.

The Colors seen on the seedling table predominantly reflected the pastel hues of the early hybrids, accented by a few flowers of '**Good Cheer**' Hybrids, Itoh Hybrids and of the more traditional Officinalis Hybrids and Chinese peonies. To spectators, the colors were sometimes unbelievable. One was overheard telling a companion that "they color them up" for the show, presumably finding an answer to the question of "how" in the knowledge that carnations and daisies will take up colored dyes through their stems.

Real doubles are showing up among the early herbaceous hybrid peonies. Fine pastel colors are also present. This makes it possible to foresee outstanding show table flowers in fine new colors and fully double form. Therefore, attention to flower quality ?substance, petal form and all the other dimensions of beauty ?is now of more critical importance in selecting clones to be retained for further breeding.

- Don Hollingsworth

ED. NOTE:

The plant described by Don Hollingsworth is a great plant for hybridizers. It has been named and registered as '**Sunny Boy**'. It is pictured on page 131 in the book "The American Hybrid Peony". If you don't have the book, get it from Greta Kessenich. '**Sunny Boy**' is listed in the Klehm Nursery Perennials for $75.00.

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EASY DOES IT!

(From Volume 10, No. 3 of PAEONIA, September, 1979)

Chromosome breakage;
Linkage and cross-over;
Spontaneous meiotic chromosome breakage;
Sports and mutations;
Unreduced gamates;
Damaged and misaligned chromosomes ---------------

Chromosomes are made up of thread-like strings of genes, many, many genes! Ten chromosomes are found in each cell of a diploid peony. Twenty chromosomes are contained within each cell of a tetraploid peony. The genes (DNA) that, make up a chromosome are the superintendents which instruct the production managers (RNA) to produce the type and quantity of enzymes and proteins that are to be utilized, also the sequence and quantity.

Each gene (or group of genes) has a specific function. So you can easily imagine that any great or small change or damage to this governing body can have a marked effect on the plant and its descendents. Quite likely evolution of the species is an end result in certain cases.

All these processes present new and unusual possibilities, but, probably a more productive way of obtaining new patterns and colors —and a good deal less involved —is the raising of plants from hybrid seeds. The cross Quad F_3 x Silver Dawn F_3 is one that has great potential for variation, and beauty seems to be its main theme. Two rows in my-garden —of this cross Quad F_3 x Silver Dawn F_3, commenced blooming three years ago. Many nice blooms were noted that year, but last year and this year were years of surprises in those two rows. Blooms shown at the American Peony Society show at Champaign, Illinois, drew a lot of attention, convincing me that they were outstanding.

May I send you a few seeds from these plants?

- Chris

Re: MICRO PROPAGATION

What is to be gained by micropropagation, and how involved?

The process is exacting and difficult to develop seeing a number of institutions and private companies in the U.S.A. have up to the present time been unsuccessful in their attempts in micropropagation of suffruticosa (tree peony) and also herbaceous sorts with their hybrids

Since the process from the initiation of propagules to the resulting flowering of the plant is labor intensive, we cannot expect to find the cost of a potted plant developed by this process to be cheap! But expect to get just exactly the plant being offered. In a few years micropropagation may challenge other methods such as division and grafting. The success that Wye College is experiencing makes me happy! Happy! Happy!

If and when micropropagation is found desirable, maybe as in tree peony, herbaceous peonies can provide axillary buds by removing the top one-third of a half grown stem of lactiflora (and maybe hybrids) and buds will develop in the leaf axils. A short time later the buds develop into shoots. Can these shoots be rooted? —I don't know, but at least buds can be made available for micropropagation if desired.

- Chris

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PEONY SEED GERMINATION

One of the most important challenges in hybridizing peonies is the germination of the seeds and carrying the seedlings on to maturity. Since a minimum of four years is necessary, it is often a problem to keep the crosses properly labeled.

The seeds are gathered when fully matured and are then dried for one or two weeks. In the past we have encountered fungous infections of seeds that are planted before fully matured. The infection first appears on the seed surface and from there penetrates the seed coat and enters the endosperm, then quickly destroys the entire seed.

The matured seeds are planted in flower pots containing good garden loam soil. The seeds are covered with at least one half inch of soil. Since the soil is not sterilized it is moistened with a water solution containing one tbsp. of Chloradane 50% powder (an insecticide) and one tbsp. of Captan (a fungicide) in one gallon of water. The insecticide is used to prevent the development of angle worms in the soil, the fungicide to prevent fungous infections of the seed. A recent article appearing in the American Nurseryman mentioned that Captan interferes with the germination of some seeds. Since this is the first year I've used Captan, I'm not sure of its effect upon the germination of peony seeds.

We use 5 1/2" azalea plastic pots which are about the right size to accommodate up to 50 seeds. Each pot is labeled with a plastic label containing the cross number, the parentage of the cross, and the number of seeds. The cross number is placed on the outside of the pot. A notebook is used to record the above information for each cross.

After the seeds are planted and labeled, the pots are placed in a plastic bag, sealed, then held in the furnace room for about 3 months. The temperature averages between 60-70°F. During this period the seeds develop the hypocotyl (primary root) and later the secondary roots grow and permeate the soil mass within the pots. Towards the end of the 3 month period roots will appear in the drainage holes of the pots. The progress can be further noted by carefully removing the soil mass from the pots and the roots can be seen on the surface of the soil.

At the end of the 3 month period each plastic bag is opened and about 4 oz. of clean water is added to the soil. The bags are resealed and the pots are then placed in a frost-free cellar where the temperatures are near 40°. It requires about 3 months of cool temperatures to break the epicotyl dormancy. Near the end of this period the pots must be watched closely as seedlings of some crosses will start to grow. If left too long in the dark cellar the growth becomes too spindly. Fluorescent lights have been installed in the cellar. As each cross starts to germinate above the ground the pots are placed under the light to prevent spindly growth of seedlings grown in the dark.

At the end of the 3 month cool period the germinating seeds are ready to be lined out. In early May the soil mass containing the germinating seeds is carefully removed from the pot, disturbing the soil as little as possible, and planted in outside beds as is used for grafts. Each cross is spaced one foot apart and labeled with durable labels on steel stakes. The rows are spaced 2 feet apart.

As the outside temperatures begin to rise in May the seedlings will start to grow. This is a critical period for the seedlings. Excessive sunshine may burn the newly developing leaves so shade is necessary. We use three wooden shingles placed on the East, South and West side of the seedlings. When the seedlings have grown for 6-8 weeks the shingles are removed to permit a maximum amount of sunshine. The seedlings must be carefully watered during summer dry periods. Weeds must be controlled. Not all seeds will germinate the first year; some will start during the second season.

The seedlings are permitted to grow for 2 or 3 years in these beds and are then lined out individually in nursery rows. Precious crosses are given the wider spacing. The rows are spaced 10 feet apart to permit tractor cultivation. Wood shavings as a mulch have been very beneficial. It provides winter protection and prevents the soil from packing too firmly over the young seedlings. The seedlings are able to grow more easily in the spring. The mulch is used for at least two years. A light application of Treflan (5 1/2) greatly assists in the control of weeds in the nursery rows.

The above method, is used for herbaceous as well as tree peony crosses. A couple advantages of germinating seeds in this manner are:

1. The newly developing roots are capable of absorbing nutrients from the soil.
2. Less transplanting shock in moving the whole soil mass from the pots to the transplant beds.

David Reath, Vulcan, Michigan