

CROWN GALL

When we dug our crop in 1981, we found that 15% of the trees had crown gall on them. This was another problem that we had not encountered in our previous experience with 'Bradford' pear. In 1982 we dipped our grafts in "Agrobacterium radtobacter 84", a biological crown gall control. At this writing, we have not yet dug our trees, so we do not know if it will prove effective. If it does not, we will have to fumigate our soil with Vapam the summer before we plant.

DON SHADOW: How wet is the shingletoe?

STANLEY FOSTER: We put it in a barrel and fill it with water until it covers the shingletoe. When we are ready to pack we pull it out and squeeze every bit of water out we can.

PROPAGATION OF TREE PEONIES

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Propagation of tree peonies by grafting is highly successful on a commercial basis. Tree peonies, which are not trees but shrubs, can be divided into 2 main types. The first to be developed were the moutans or Japanese tree peonies. These belong to the species *Paeonia suffruticosa* which is native to Northwestern China and Tibet. For several centuries the Chinese selected and improved upon the wild plants. In about the eighth century A.D., the cultivated tree peonies were taken to Japan, probably by Buddhist monks. The Japanese, through years of cultivation, improved upon them and produced a race with single and airy semidouble flowers in a spectacular color range unsurpassed by any other flower.

The second type of tree peony and perhaps the one with the greatest future is the hybrids produced by crossing the Japanese cultivars onto the small yellow species, *P. lutea*, also native to China. This hybridizing was done in this country by Prof. Saunders of New York during the later part of the 1920's and for 3 decades thereafter. His work was continued by Nastos Daphnis of the Gratwick Estate, also in New York, and more recently by other hybridizers. These cultivars are just now becoming available to the gardening public.

The Japanese have become experts at the propagation of their cultivars by grafting. They export to this country, each fall, many thousands of one- and two-year-old plants.

It has been most difficult to import cultivars that are true to name from Japan and one generally receives an assortment of cultivars under a single name. Because of this it has become advantageous to propagate true-to-name plants in this country.

ROOTSTOCKS FOR TREE PEONY GRAFTING

Herbaceous as well as tree peonies can be used as a source of rootstocks. Most ideal are roots from the same cultivar as the scion to be grafted. Any cultivar of tree peony root can be used but this may lead to suckering with the result that the plants will then be mislabeled.

Other useful roots are those from herbaceous hybrids. Some hybrids, such as, 'Cytherea', 'Ludovica', 'Paula Fay' and other *P. lobata*¹ hybrids, form adventitious buds on root pieces so are not good because the resulting suckers may interfere with scion development. We have successfully used such roots but suckers did form on the rootstocks.

Several herbaceous hybrids do not form adventitious buds on the root pieces and are very satisfactory for rootstocks. Examples of this group are: 'Early Windflower', 'Red Charm', 'Requiem', and 'White Innocence'. These cultivars produce ample roots that readily form callus tissue which is necessary for uniting rootstock and scion. They are somewhat disease resistant adding further to their value as rootstocks.

Paeonia lacatiflora cultivars are the most important source of rootstocks. Most of our grafting is done with this species. Several of these cultivars produce an abundance of roots of the ideal size ($\frac{1}{2}$ to 1 inch in diameter) and show disease resistance as well. Examples of these are 'Mons. Jules Elie', 'Charles White', and 'Krinkled White'.

Rootstocks are prepared in the following manner: The clumps are dug with most of the roots attached and the soil is removed by washing with water. The terminal portions of the roots are cut off. Some of the longer roots can be cut into 4 inch sections thus increasing the number of rootstocks obtained from the clump. A good clump should produce at least 20 pieces. The rootstocks can be dug as needed or stored in slightly moistened sphagnum or other suitable media. Do not use roots from clumps that show any of the serious peony diseases, such as phytophthora or botrytis, or nematodes.

PRODUCING SCIONS FOR GRAFTING

It is necessary to maintain a block of stock plants to provide the scions for grafting. Our display garden contains about

¹ Bot. Ed. Note: *P. lobata* is a confused name applied to several species.

200 specimen plants, all properly labeled and maintained in a vigorous, healthy condition. This garden serves two purposes. First, it is a garden in which all the tree peony cultivars propagated by us can be viewed and studied. They can be compared and tested under our severe northern climate. Secondly, it is a source of scions for propagation.

The plants are maintained in a relatively weed free condition by the use of wood bark mulch and hand hoeing. We have used some herbicides but they must be used very cautiously.

The scions are gathered daily as needed. We do not store them for more than a day or two. If stored longer they are placed in plastic bags, labeled, and kept cool.

Long, vigorous stems of the current season's growth are selected. The leaves are removed, leaving about an inch of petiole on the scion. The stems are cut into sections containing at least 2 buds. Scions containing a single bud can be used but 2 buds are preferred.

GRAFTING TECHNIQUES

Grafting operations are begun as soon as the buds are well formed on the scion wood. In our area the plants are ready by August first each year. The Japanese tree peonies are the first to form buds and are thus grafted before the *P. lutea* hybrids. Since the grafts are planted soon after being made, the grafting operations are terminated in this area about the first week of September. The grafts must callus after planting and before cold weather.

To prepare the grafts a clean cutting surface is needed. We use a clean piece of cardboard. Sanitation is very important in the grafting room.

The triangular graft is the one used almost exclusively by us. A triangular wedge, which includes the scion bud results from two downward cuts ending in a point at the base of the scion. A notch of exactly equal size is cut from the top and down the side of the rootstock. The scion is fitted into the notch, in which the sides are smooth and in close contact. The cambium layer of the scion should line up with that of the root. The scion and rootstock are bound firmly in place by wrapping the joined parts with Miracle Tie plastic tape to exclude water and pathogenic organisms which could be present in the soil.

The completed grafts are labeled and placed in a plastic bag. A small amount of barely moist sphagnum moss is added to the bags to maintain adequate moisture as well as to absorb excess moisture due to sweating.

PLANTING THE GRAFTS

We try to plant the grafts within a day or two after they are made. Preparation of the planting beds is begun about 3 months before they are used. An area is selected on a gentle slope to assure excellent drainage. The beds are cultivated to kill weeds including grasses. Slow-release fertilizer such as Mag-Amp or Osmocote is added. Generous amounts of well decayed manure and peat improves the soil texture. These specially prepared beds are 10 ft wide and as long as needed. The rows are marked across the width of the bed. The rows are spaced 2 ft apart. The grafts are planted in an upright position, with the buds covered with 2 in. of soil. They are spaced 6 in. apart in the 10 ft. long rows.

As the bed is planted it is leveled and then covered with 2 inches of wood bark chips. A sheet of black plastic is placed over the wood chips to prevent weed growth. About November first the black plastic is covered with a foot of straw or old hay to further protect against alternate freezing and thawing which would injure the graft unions.

Early in the spring, about the time the crocus bloom, the hay or straw and black plastic is removed. The grafts start to grow early in the spring following their planting. Weeds are carefully controlled and the plants watered as needed. The plants are dug at the end of the second or third growing season and shipped to customers.

SEED GERMINATION

Tree peony seeds have a double dormancy. We plant the seeds in pots containing soil. The pots are placed in plastic bags to retain moisture and held at 65° to 75°F for 3 months. During this time the hypocotyl/root axis grows.

The pots are next moved to cold storage (42°F) for 3 mo. to break epicotyl dormancy. After cold storage the pots are moved to warm conditions (60°F), with lights, for epicotyl growth. Four or 5 years are required for the first bloom. At this time the best are selected for testing and first propagation.

Japanese cultivars are fertile; however, the F_1 *P. lutea* hybrids are nearly sterile. The F_2 may be fertile at the tetraploid level.