

Some Plant Propagation Methods Used in China

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During 1989, the University of British Columbia Botanical Garden signed a 5-year agreement with the Nanjing Botanical Garden, People's Republic of China, for cooperative programs in research, plant exploration and educational programs. In 1991, I was invited by Dr. He, Shan-An, Director of Nanjing Botanical Garden, to give presentations, and workshops on propagation and new plants with commercial potential.

Besides visiting other gardens, arboretums, and mountain forests, I did have the opportunity to visit some nurseries to see the propagation techniques used. Much of it was very traditional and facilities were well below the standard used in the Western world. Nonetheless, I was impressed with their enthusiasm and skills.

The nursery at the Nanjing Botanical Garden contained a wide variety of plants from their research programs and wild collections. One program is the hybridization of *Taxodium* for urban planting. A number of hybrids were made using *T. distichum* var. *imbricatum* (syn. *T. ascendens*), *T. distichum*, and *T. mucronatum*. The best hybrid was *T.* 'Zhongshan' (purple mountain) which had high resistance to air pollution, salts, and alkalinity. It is propagated by open-ground, whip grafting onto 3-year seedlings of *T. distichum*. Each graft is covered with an individual polyethylene bag, secured just below the graft itself. This provides a humid environment and protection against wind.

Part of the Garden's mandate is conservation measures to protect rare and endangered plants. *Parakmeria lotungensis* (Magnoliaceae) is included in this program. This evergreen tree, growing up to 30 m with large, white flowers, is scattered in sub-tropical areas of China and known for its high-quality wood and potential for horticultural cultivation. *Parakmeria lotungensis* is whip-and-tongue grafted onto *Magnolia denudata* to quickly multiply selected clones from different provenances. Similarly, a rare clone of *Liriodendron chinense* from Sichuan is whip-and-tongue grafted onto *L. tulipifera*. It was a pleasure to observe the Garden's master grafter so carefully cut the tissues to obtain exact matching of the cambial tissues. The method used was identical to the diagrams from the late Robert J. Garner's book, *The Grafter's Handbook*.

Castanea mollissima (Chinese chestnut) is becoming increasingly important as a commercial crop. Different clones are propagated using a rind graft onto *C. mollissima*. Mature, fruiting plants of *Actinidia deliciosa* were being crown-rind grafted to quickly establish new clones for fruit production.

The grafting knives are hand-made from hardened steel—with or without wooden handles. The blades are ground to produce 5 to 10 mm of cut surface. (I was given a gift of these knives and reciprocated with a Tina 606).

Micropropagation of rare and endangered plants is another important method used at the Nanjing Botanical Garden. A natural woodland area is set aside for the endangered plants to be grown. Plants being investigated include *Magnolia biloba* and *Idesia polycarpa* var. *vestita*. The Hangzhou Botanical Garden is working with the very rare *Carpinus putoensis* and *Disanthus cercidifolius* var. *longipes*. This

Carpinus is in danger of extinction, with only one tree remaining on a mountain in Putuo Island. It will propagate by seed, but its seed have a short longevity. Cutting propagation has been partly successful. The *Disanthus* is found in the Nanling mountains and propagation is by seed, with little or no success from cuttings. Both these species are prime candidates for tissue culture research.

In Nanjing, I visited two or three of the municipal nurseries whose main purpose was to provide plants for city and highway plantings. The plants grown were mainly limited to *Acer palmatum* f. *atropurpureum*, *Juniperus chinensis* 'Kaizuka', *Platanus xacerifolia*, *Loropetalum chinense*, and evergreen azaleas. Particularly interesting was the red-flowered *L. chinense* 'Rubra'. There was considerable variation in the size and color of the flowers, which were most attractive against the new purple-red foliage. Propagation was by cuttings under mist. Due to poor sanitation and the variable water supply, a considerable number of cuttings perished.

Also at the municipal nurseries, crops were raised from seed to provide summer bedding plants. The range of crops I saw was mainly limited to *Calendula* and *Dianthus*. They also grew *Cyclamen* and azaleas for decoration at important festivals.

Low polyethylene tunnels (sun-frames) were made from twisted bamboo and used for rooting of some hardwood cuttings during the fall. Charcoal was used to cover open-ground seed beds of *Berberis* and *Pyracantha*. In general, herbaceous perennials were grown mainly in open-ground beds, with division being used for propagation.

There were definite problems in the varied growth of container-grown plants, due mainly to the poor structure of the potting mixes. A gray clay formed the basis of the mix that included a number of different substances—crushed clinkers from coal-burning fires, rice husks, recycled sewage, and chopped straw. For small plants, perlite was sometimes added. For growing lotus plants, human hair was collected from barber shops and mixed with the clay. For fertilizer, bone meal and other organic matter were mainly used. Once these soil mixes dried out they became very hard, making it difficult to re-moisten the mix.

China is showing much greater interest in joint ventures with western companies to promote plant exports, including davidias, tree and herbaceous peonies, and young bonsai plants—the latter is now a popular export to Europe. Sales within China are mainly to municipal institutions and newly constructed hotels.

Author's Note: An excellent reference book on rare and endangered plants in China is *China plant red data book—rare and endangered plants*, ed. Fu Li-Kuo, Science Press, Beijing and New York.