Questing for the Perfect Landscape Tree©

William Flemer III
Princeton Nurseries, P.O. Box 185 Allentown, New Jersey 08501 U.S.A.

The title assigned for this talk is a somewhat ambiguous one. What are landscape trees, shade trees, or yard trees? The requirements for trees to be planted on municipal streets are more exacting than those for trees used in parks or industrial and home landscape plantings. Street trees must be able to be pruned up and free of branches for at least 12 ft or higher so that they will not interfere with pedestrian or vehicular traffic. Those useful for more open landscape locations do not need to develop such high clear trunks and in some locations can have their branches descend to ground level, being in effect very large shrubs. To succeed on city streets, especially congested inner city streets, trees must be very tolerant of air pollution, reflected glare from street, sidewalk, and building surfaces.

They must also be very drought tolerant because, except for special irrigation arrangements, they must rely on natural precipitation falling on minimal tree lawns or small planting pit surfaces. Except for a few dangers like the newly introduced Asiatic longhorn beetle, pest resistance is not as essential for city trees because summer heat and air pollution are very inimical to insects and fungus as well as to trees.

While relatively few street trees have showy flowers, park or landscape trees include many genera and hundreds of clones with splendid flowers. Trees with attractive fruits are unsuitable for planting on streets which have sidewalks or paved pedestrian areas because the fallen fruits are a nuisance underfoot. However under park-like conditions trees like many of the best crab apples which are spectacular fruiters give two seasons of beauty, flowers in the spring and fruits in the fall.

In a country like ours with such great extremes in climate zones there can be no ideal national tree. Those which are among the best in Zones 8 through 10, will not survive the first winter in Zones 3 and 4. Similarly the trees, which will take really cold winters in the north, will die or only barely survive in the hot areas of the south. Even in a country as small as Scotland, palm trees will thrive on the west coast and few deciduous trees will grow on the east coast. The use of evergreen trees for street planting must be restricted to southern areas. Live oaks and evergreen magnolias are the glory of streets in Charleston and Savannah. Cold-hardy evergreens like pines and spruces are never planted as street trees, because patches of ice can persist in their shade and create traffic and pedestrian hazards.

The perfect landscape tree, if there could be one, would be vigorous, adaptable to a wide range of soils, immune to insect and fungus pests, drought tolerant, with showy flowers, and attractive bark and leaves. Obviously no such tree can exist for the country as a whole so the tree breeder must work within the confines of his own climate area. Intra- and inter-specific hybridization and selection from the progeny are fruitful methods for tree improvement.

Some really important hybrid trees have occurred spontaneously such as the London plane (*Platanus* ×*hispanica* syn. *P.* ×*acerifolia*) a cross between the oriental plane (*P. orientalis*) and the American sycamore or buttonwood (*P. occidentalis*). It

holds its foliage in wet spring seasons when the native Sycamore loses all its first crop of leaves and yet it is much more cold hardy than the oriental plane, which is of Mediterranean origin. Its hybrid vigor was early recognized and it was being planted in England in 1670.

Another important hybrid is the yoshino cherry (*Prunus* ×*yedoensis*), again a natural hybrid of unknown origin, presumably *P. serrulata* × *P.* ×*subhirtella*. It is of ancient origin and one specimen, the carefully perserved Usuzumi specimen, is over 1000 years old. Hybrid trees and clonal selections do not come "true" from seed as do naturally occurring species. For this reason almost all ornamental tree breeding has been limited to genera which are amenable to vegetative propagation —cuttings, grafting, or budding. Thus it is frustrating to work with genera or species which present real problems in vegetative reproduction particularly the oaks (*Quercus*) and chestnuts (*Castanea*). For example, ever since the chestnut blight wiped out our indigenous American chestnut (*C. dentata*) in its native range there have been many attempts to cross it with the Chinese chestnut (*C. mollissima*) which is highly resistant to the blight. Hybrid progeny have been produced which combine the magnificent stature of the American with the blight resistance of the Chinese species. But there the story ends because, the F-2 generation segregates out with many trees exhibiting the worst traits of each parent and no stable hybrid race exists. Chestnuts are notoriously difficult to graft with high rates of incompatability and are impossible to root from cuttings.

The development and perfection of tissue culture propagation has opened the door to the multiplication of selected cultivars on an immense scale. However, not all genera can be produced by tissue culture. Oaks for example have given negative results. Furthermore reproducing via tissue culture can, with some plants, greatly increase the rate of mutation and can result in producing quite different progeny from those originally started. This is impossible to detect in the tiny plantlets produced and, without realizing it, the producer/grower can supply stock, which is far from true to name. Rhododendrons have been particularly susceptible to unwanted mutations and I well remember seeing a greenhouse of *R.* 'Nova Zembla with extreme variations from very dwarf plants to very tall ones.

Cross breeding for resistance to disease is an important step in creating the ideal landscape tree. An outstanding example is Dr. Elwin Ortons' group of hybrid dogwoods. Faced with the ravages of anthracnose disease on our native *Cornus florida*, Elwin made the very difficult cross with the oriental dogwood, *Cornus kousa*, which is not susceptible. The hybrids also exhibit remarkable hybrid vigor. The original plants in the Rutgers University Arboretum are disease free although surrounded by woodlands full of infected native dogwoods. Our native redbud (*Cercis canadensis*) is susceptible to a very disfiguring bark canker. Don Egolf at the National Arboretum crossed *C. canadensis* with the Chinese rebud, *C. chinensis*, which does not get the canker and created highly resistant hybrids. Similarly, he crossed two species of crape myrtle (*Lagerstroemia*) to create a group of beautiful clones which do not get the serious attacks of mildew which affect *L. indica* in the humid southern states. My own efforts at Princeton in crabapple breeding used the tea crab (*Malus hupehensis*) as one of the parents to produce hybrids which are resistant to the apple scab fungus, a plague in the humid East.

The next step in breeding new landscape trees is the technique of transplanting genes from one plant to another. It has already been applied to the big field grain

crops like soybeans and corn. The technique, which has been perfected, has raised an uproar in both this country and Europe because of alleged dangers in the food supply for human consumption. The final outcome is in doubt, with many European countries banning imports of American grain.

The methods of trans-gene implantation were quickly worked out for corn and soybeans because of the enormous volume of these field grain crops and the obvious financial rewards involved. As yet there has been no effort in the field of landscape trees because the volume of production is so small that there is little financial incentive to undertake the cost of a program. The new technique promises the elimination of serious or lethal diseases of important landscape trees, diseases like Dutch elm disease, chestnut blight, oak wilt, ash yellows, and lethal yellowing of palm trees. In addition trans-genetic implantation could prevent the infection of several diseases in the same species. The incorporation of ginkgo genetic material in our oak species such as red oak (*Q. rubra*) could control its many diseases. What is particularly intriguing is that such a modification is transmitted in the seeds of the tree species, being carried on from one generation to the next. Clonal selection for superior trees, and their vegetative propagation can be carried on as it is done at present. The research needed to apply this new technique to landscape trees is expensive and time consuming but it is well worth the effort. The new method could obviously be applied to fruit trees for the elimination of diseases such as the citrus scab disease, and fireblight in pears, but here the same objections would arise as in the case of grains. For landscape trees there would be no problem.

The perfect landscape tree remains an unattainable ideal, but that should not discourage the energetic plant breeder. Crossing promising parent trees with a definite objective in mind is far better than working without a purpose. Tree breeding is not a road to quick results. Large numbers of crosses must be made so that large seedling populations result. These must be planted out and grown on for selection many years down the road, and this requires ample field space. Once promising trees are selected, these must be propagated vegetatively in quantities of several hundred each and grown on in adjacent rows. This step indicates, which clones are really superior to sister seedlings grown under identical conditions. Some good looking original clones may exhibit varying degrees of incompatibility with understocks for example. The most promising handful of clones should be spaced out and grown on. Clones, which appeared to be ideal as young trees, may reveal serious problems as they mature. An example of this problem is the Bradford callery pear (*Pyrus calleryana* 'Bradford') which appeared to be the ideal landscape tree at first but later proved to be very brittle in full foliage during summer storms. It is still a first choice for inner city planting or protected streets and locations, but is no longer planted as a highway tree on exposed sites.

It used to be possible to have municipal shade tree departments plant out new clones, for testing under actual street tree conditions. However municipal budgets for street tree planting have been sadly reduced and the number of experienced and interested tree wardens has dwindled. In larger towns and cities, shade tree planting is now put out to bid involving a very limited number of clones or species.

One other source for superior trees should be mentioned. This is carefully examining trees on city streets for exceptional individual trees. Many trees, which are commercially important, originated in this manner. Ed Scanlon, when he was the Commissioner of Shade Trees of Cleveland, Ohio, introduced a number of

superior trees to the trade by this method, among them the Cleveland Norway maple (*Acer platanoides* 'Cleveland') and the Chanticleer callery pear (*P. calleryana* 'Cleveland Select'). Horace Wester, who was the plant pathologist for the National Capital Parks, spent most of his professional life observing and treating street trees in Washington D.C. He made many selections including *Ulmus americana* 'Washington' and *Aesculus* ×*carnea* 'Fort McNair', a red-flowering horsechestnut with superior foliage retention. Such superior trees, which have been amply tested, under actual street conditions deserve introduction and propagation as named cultivars.

Even if the hypothetical perfect landscape tree were found, it would be a grave mistake to plant it exclusively in all street and park plantings. The advent of a new pest or fungus would play havoc with such a monoculture. For a great many cities the American elm was believed to be the ideal shade tree, and when the Dutch elm disease struck it was an aesthetic and financial catastrophe. This is not to say that the quest for the perfect landscape tree should not be vigorously pursued. Startling improvements in beauty and pest resistance lie ahead for the devoted tree breeder.

Can I Use Municipal Waste Compost in My Propagation Media?©

Calvin Chong
University of Guelph, Department of Plant Agriculture — Vineland, Vineland Station, Ontario, L0R 2E0 Canada

In unleached media consisting of between 15% and 75% by volume of municipal waste compost mixed with peat or perlite, cuttings from four of nine evergreen taxa were tolerant (rooting enhanced or unaffected) of salt levels up to 0.60 dS·m^{-1} (0.2 dS·m^{-1} desirable threshold). The other five evergreen taxa were intolerant (rooting adversely affected). In corresponding leached media, cuttings from most of seven deciduous taxa rooted as well as or better in the compost-amended media compared with 100% perlite or 100% peat. Best rooting occurred with between 45% and 75% compost in the rooting medium. A tendency for better rooting in compost with perlite than with peat was due largely to lower water and higher air porosities with perlite than with peat.

INTRODUCTION

Composts are commonly used in nursery potting mixes, but seldom in rooting mixes, indicated Gouin (1989), who successfully used sewage sludge compost in rooting media. Inconsistent quality, excessive soluble salts, high pH, and inexperience are major deterrents for using composts (de Bertoldi, 1993).

Since the mid-1980s, we have been investigating the use of wastes and composts as soil amendments and in nursery potting mixes (Chong, 1999a), and of selected wastes such as raw paper mill sludge as rooting medium amendments (Chong et al., 1998). Results of two rooting trials (Chong, 1999b; 2000), herein summarized, indicate that municipal waste compost has potential for use in propagation.