

TREE QUALITY¹

by Klaus Vollbrecht

Planting trees is an act with long term consequences. Therefore only the best material should be used (Fig. 1). Trees of high quality are for the most part more expensive when purchased, but are, in the long run, the cheapest alternative. But what is good quality tree? Which criteria do we use to determine good tree quality? It is much easier to judge the quality of an industrial product than of a living tree. We can take apart a machine and review every detail to get an understanding of its quality. This is, of course, not possible with living material, and in a tree there are many invisible and unmeasurable properties. A good-looking tree, with an upright trunk, a well developed root system and a perfect crown, can be of poor genetic quality when it is of unsuitable provenance or has a low physiological status because of incorrect storage and handling.

In order to define what we mean by good or bad tree quality, we have to know many factors and analyse them carefully. We can divide the concept of tree quality into four major areas. These areas are genetics, morphology, physiology and pathology. Together these four features give a total picture of the quality of a tree.

Genetic Qualities and Properties

Under this headline we can discuss provenance, resistance against decay and diseases, incompatibility between a rootstock and a clone, shape and size and aesthetical properties. In countries, like the USA and Sweden, which cover a wide range of latitudes (25° resp. 14°), the provenance of a tree is of great importance for its hardiness. Many trees planted in Sweden are imported from other European countries. A lot of them are severely damaged by frost when they are planted in the central and northern parts of the country. What we need today is a declaration of provenance for our nursery stock, just as we have in forestry. The lively trade in trees from saplings to semi-mature specimens between European countries, makes it difficult to introduce such a declaration.

Resistance against decay and diseases is under strong, genetic control. In the future we may have access to trees which can form strong boundaries when they get damaged. Research has shown that, in general, cloned trees are better able to defend themselves against decay pathogens than those which are propagated from seeds.

Incompatibility between a rootstock and a graft is a greater problem than we often realize. When propagating trees, many rootstocks can be used, but their isoenzyme pattern does not always correspond to that of the graft. Large plantations of linden, beech and other trees have been decimated when an unsuitable rootstock has been used. In the future we should be more aware of this problem and only use rootstock which provide stable unions.

The size and shape of a tree is dependant on its genes. Instead of trying to change the size and form of a tree by pruning and perhaps using growth retardants, we should more often think twice before planting a particular tree. There are trees suitable for all kind of situations. By selecting and breeding we can enlarge the choice.

Cloned trees are genetically identical. This is of great use when trees should be uniform in growth. But in parks and the landscape, we mostly prefer a variety of trees. As earlier mentioned, clones



Fig. 1. To buy trees is a matter of confidence. This photo shows perfect linden trees in a German nursery.

1. Presented at the annual conference of the International Society of Arboriculture in Toronto, Ontario in August 1990.

have shown a great ability to form strong boundaries against invading pathogens. But here is also a danger involved. A disease can infect a clone and wipe out a large area of trees.

Morphologic Qualities

These features are easy to determine because they are visible and measurable. But it is important to emphasize that those measurements we make on a tree must always go hand in hand with a sound understanding of trees and the variations that are available. Without this understanding, good tree material might be rejected in an inspection.

Tree size. To save money, very often young small trees are planted. In a well protected situation, with excellent soil conditions this may be a good solution. But these young trees are often planted in a harsh environment, a common situation in the streets of our cities, where they have little or no chance to form good shade trees. Bad soil conditions and vandalism kill many young city trees. Larger trees are more costly initially, but make economical sense in the long run.

The root system. When trees are dug up in the nurseries for transplantation, a large percent of the active root system is lost. Nursery trees should be transplanted every third year in order to obtain a well ramified root system, with many fiberroots. Trees, with coarse roots or those where the roots are removed very close to the trunk, have a very small chance of surviving (Fig. 2). The diameter of the root system has to be in

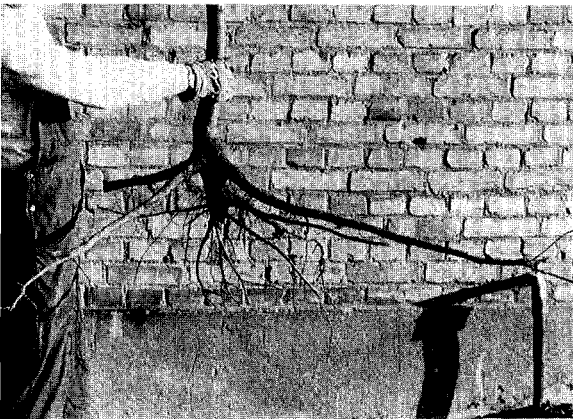


Fig. 2. This linden tree has never been transplanted. The coarse rootsystem makes it difficult for this tree to establish.

proportion to the diameter of the trunk. According to Swedish quality standards, the diameter of the root system *has* to be four times the diameter of the trunk. The diameter of the roots where they are cut, may not be more than 2 cm. The rootball on many balled and burlapped trees hides a poor root system. Container-grown trees suffer very often, especially when they are young, from a deformed and spiral-like root system, which makes the tree unstable in the future. Depot-growing is a method more and more commonly used in Europe. Field-grown trees are planted one or two years before they are sold in a container. The risk for root deformation is minimal.

When weak-growing rootstock is used for strong-growing trees, the ability to anchor the tree is reduced. In Europe quite often hawthorn, *Crataegus monogyna*, is used as a groundstock for whitebeam, *Sorbus aria*. Hawthorn grows too weakly to give whitebeam a good support.

The trunk. There is a general demand that the trunk of a tree should be straight, especially with respect to a street tree. The trunk should never be too long in relation to the total height of the tree. Half of the total leaf area of a young tree should be on the top two thirds of its total height (Fig. 3).

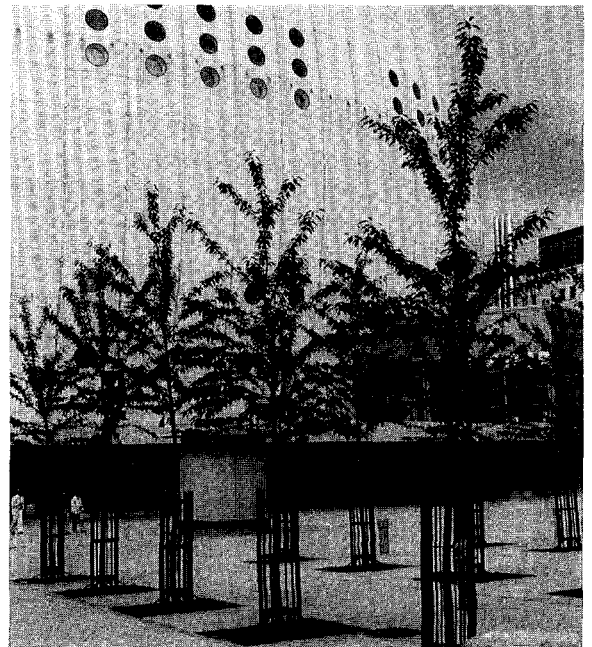


Fig. 3. At the prestigious new stadium Globen in Stockholm are these high-quality cherry trees, *Prunus avium*, planted.

Trees with a long stem and a small crown volume, have great difficulties in becoming established. The diameter (dbh), or circumference, of a trunk, is measured 130 cm above ground level. Trunks with mechanical wounds should not be accepted as being good quality.

The crown. When traffic consists of high sided

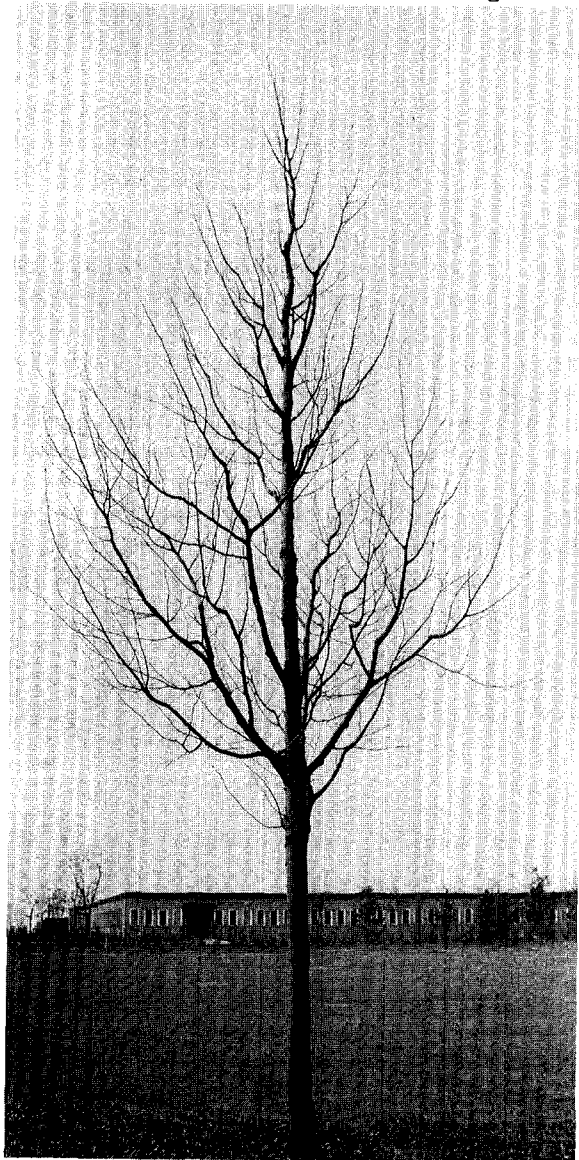


Fig. 4. A perfect *Tilia intermedia* planted at the University of Agricultural Sciences in Alnarp, Sweden.

vehicles, a free height of 4.5 m must be available. For this reason, road and street trees must have a central leader, which is a straight extension of the trunk. Trees with co-dominant stems should never be planted beside roads or streets. Trees with included bark between trunk and branches or between stems should never be accepted, because they will eventually divide and split. The relative density of the branches in the crown is of great importance (Fig. 4). A dense crown will often be a problem as the tree gets older.

Physiological Quality

Determining the physiological properties of a tree is the most difficult part of judging tree quality. Many errors committed in the nursery and on the way to the final point of planting, can be hidden. One-sided fertilization with nitrogen will result in weak plant material susceptible to the attack of pathogen and pest damage. Trees that are lifted with bare roots too early in the autumn, when they still are in leaf, have a lower ability to establish successfully than those lifted after leaf fall. Storing trees in coolhouses with improper climatical control can destroy the water balance in an otherwise perfect tree. Trees are very often transported on open vehicles exposed to wind and sunshine. Before planting many trees are lying unprotected in the open.

Pathological Quality

We should never accept trees which are infected with diseases of any kind or infested by insects. Diseased plant material will never develop satisfactorily and can be a threat for a whole area. When there is uncertainty about a disease, always ask for an inspection by a specialist.

It is costly to buy trees and it is expensive to prepare the site and plant them. We have a responsibility to our citizens. For this reason we shall only purchase the best trees money can buy.

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