Preventing root defects during nursery tree production

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Trees with poor root systems are more likely to die after planting in the landscape

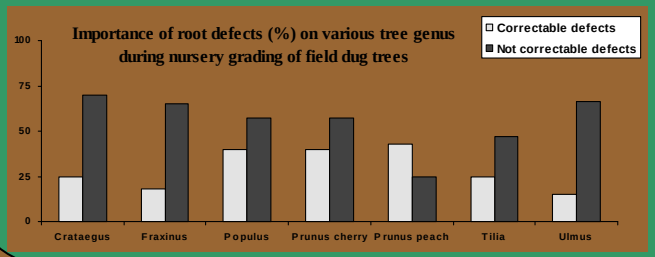
Below left: Two *Sorbus* trees (mountain ash) planted in May, pictures taken in August. The tree to the left shows bud break but no new growth, the tree to the right is actively growing.

Right: the root system of the two trees. The tree not growing has poor roots and few new roots. In commercial operations, tree mortality from poor roots can reach 10 to 20% of total planted.

Below:
A *Pinus* tree (pine) growing poorly was removed 8 years after planting. The root system shows the outline of the original nursery container. Few roots have developed outside the original root ball.

Correcting root defects during nursery propagation

In 2009, field grown nursery trees, dug in fall for winter storage, were visually examined for quality of root systems.
Of 658 trees examined, 33% had root defects that were correctable (such as circling roots and kinked roots), but 50% had one or more defects that may not be correctable ahead of replanting in the landscape (chart below).
The most common structural root defects were unbalanced roots (62% of all "not correctable" defects) and descending roots (21%).



Trials are underway in nursery propagation to develop roots that grow straight, laterally from the stem, with extensive fibrous roots.

Picture above:
Acorns of *Aesculus* (horsechesnut) and *Quercus* (oak) are grown in standard containers and "newer" containers with open sides and bottom.

Picture below:
Close-up of tested containers with softwood cuttings of *Acer* (maple). Repeated impact pruning help reduce the formation of faulty roots.

Common root defects in nursery tree production

Root faults start early in the plant life, sometimes during propagation from seeds, acorns or cuttings. For example, circling roots form in containers, either during propagation or plant production. As roots touch the container wall, they continue to grow following the container wall, developing a circular pattern.

Circling roots
A circling root grows around the stem or another root. It may become a stem girdling root, a root that wraps around the trunk. As stem and root grow in diameter, they compress against each other. This root problem is a common reason for tree mortality in the landscape.

Descending roots
The majority of roots are pointing downwards. These aggressive growing roots will continue to descend instead of growing laterally in the soil.
Even if cut back, the new growth will continue to descend. This root fault is difficult to correct.

Unbalanced roots
This tree has inadequate root distribution around the stem. After replanting, new root growth will occur mostly on the side with existing roots. When mature, this tree is more likely to topple during wind storms.
The unbalanced development often starts during propagation, for example from poor seed or cutting placement in the tray.

Below left: Ascending roots
These roots are deflected and grow upwards. They may or may not grow towards the stem and become stem girdling roots. It is possible to remove this defect.
Below right: Kinked roots
These roots have been deflected towards the tree stem. It may not be possible to remove this defect.

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Further references:
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