

Roots: Key to Improving Efficiency of Organics

By Dr. Carl Whitcomb

Plants grown using organic fertilizers are sometimes criticized for slow growth compared to their chemically grown counterparts. But this gap can be closed by improving the root system. Nutrient levels in soils using organic systems and fertilizers are typically low compare to chemical fertilizers. Nutrient absorption occurs primarily at the white root tips. One root tip can absorb a given amount of nutrients in a day, week or month. If one root can be stimulated to branch and create 10, then branching of those 10 to create 100 and beyond ---- nutrient absorption is similarly improved.

Root systems of any plant can be transformed into a more efficient complex by starting with seed germination in Root-Maker® propagation containers (Figure 1). This transformation begins a few days after seed germination when the tip of the taproot reaches the bottom and is air pruned. When a root tip is guided into an opening and exposed to air it dehydrates and dies. Air-root-pruning has the cultural advantage of pruning without toxic chemicals or creating open wounds. Unlike a cut root, an air-pruned root tip has been effectively cauterized, leaving little chance of pathogen entrance. The tip of all roots, but especially the tip of a vigorous taproot produces hormones that suppress production of secondary roots along the root axis. The same phenomenon is in progress above ground --- repeatedly remove tips of branches of a shrub and soon you have a thick hedge. Root-Maker® container designs not only air-root-prune at the bottom, but also at strategically placed openings in the sidewall. The end result is at time of transplanting a network of root tips aimed to grow in all directions radially as well as downward (Figure 2).

Organic fertilizers are dependant on microbial activity for decomposition and nutrient release. Oxygen and temperature play key roles in microbial activity. Therefore, nutrient release is greater near the soil surface. By creating a fibrous root system that expands into soils near the surface, nutrient absorption improves.

Another factor that benefits from improved root structure and branching is symbiotic mycorrhizae association. Mycorrhizae colonize only healthy roots with energy (sugars) to share. By improving nutrient absorption and transfer to leaves, a greater quantity of energy is produced and shared with the root system.

Plants propagated in cone-shaped plugs or conventional round containers that encourage circling roots and minimize root branching typically grow taller and more slender and have fewer flowers and

fruits (Figure 3.). By contrast, plants propagated in Root-Maker® containers are shorter with stouter stems and more flowers and fruits. An improved root system pays dividends in all aspects of plant growth, health, flowering and fruiting. Plant growth and productivity is all about energy and an improved root system is a major contribution.

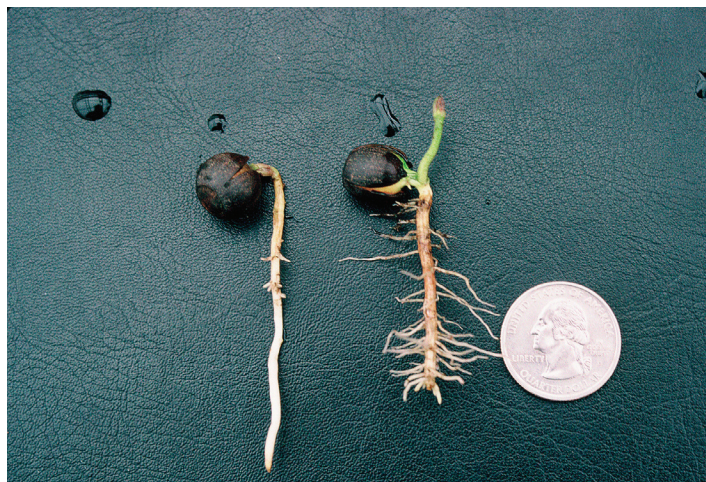


Figure 1. When a seed germinates the primary or taproot rapidly extends downward to secure the new plant in place and access moisture critical to survival. Both oak seeds germinated four days earlier. Note the unchecked taproot to the left that has yet to develop secondary root branching. By contrast, the taproot at right was air pruned four inches below the seed. With dehydration of the tip of the taproot, secondary roots quickly form along the vertical axis and began expansion horizontally.



Figure 2. These catalpa tree seedlings were grown in 18 cell RootMaker® containers, then transplanted and allowed to grow for 12, 8, 4 or 0 days. Not only were the seedlings quickly established, but root-soil contact is far greater than with conventional production. Perhaps it could be called -- No nutrient left behind.



Figure 3. Roots of a oak seedlings with well developed root system ready to plant in the field. Plants removed from plug trays (left) versus 32 cell RootMaker® tray (right) as they looked when removed from the container and after 10 days of root extension. Typically, nearly all roots from a seedling grown in a plug-type container grow downward. By contrast, roots from plants propagated in RootMaker® containers produce roots that grow radially as well as downward.