Plant Production in Containers: Roots, the next step forward.

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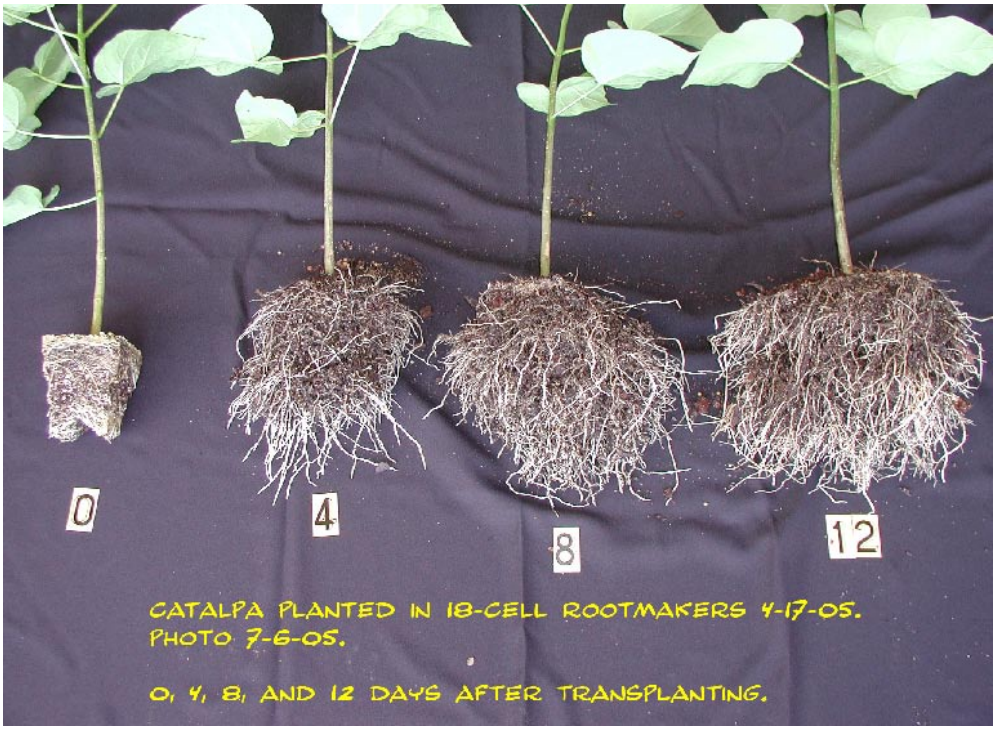
Large strides forward have been made in container growth media, micronutrients, slow release N-P-K fertilizers, weed control, watering systems and more. The next 'frontier' is improvements in root branching and root development throughout the growth medium and not just a thin layer of circling roots inside the pot sidewall. Having a fibrous root system throughout the growth medium improves water use efficiency, absorption of nutrients and reduces nutrient leaching, plus roots are more insulated from extremes of heat and cold and plants establish more rapidly for your customer. Root pruning to stimulate branching can be safely and effectively accomplished by air-root-pruning, constriction pruning and root-tip-trapping. Very young and actively growing root tips respond by producing many more secondary roots compared to pruning of older roots. With plants grown from seed, the critical time for most effective root pruning can be in as little as 3 to 5 days following germination. If this window of opportunity is missed, there is no going back.

Most water and nutrient absorption occurs at or just behind the white root tip. One root tip can absorb X amount of nutrients in a given period of time. If that root tip can be stimulated to branch to make 10, 50 or 500 root tips, nutrient absorption increases proportionally. With conventional containers some 80 to 90% of the active root tips grow in a narrow zone typically no more than one-fourth to one-half inch thick, pressed against the container sidewall. If root branching occurred but the new roots were also pressed against the sidewall, nutrients would soon be depleted in that zone and oxygen would also become limiting. On the other hand, when root tips grow out from the base of the plant and are stimulated to branch as a result of air-root-pruning or root-tip-trapping when they reach the sidewall, branching typically occurs back along the young root about four inches. The '4-inch rule' appears to apply to all species when roots are young and reactive. For example, in a study conducted during June 2005, Catalpa tree seedlings grown in 18 cell RootMaker® trays were transplanted into three gallon containers, 12, 8, 4 and 0 days before root growth was evaluated. Only 12 days following transplanting and large numbers of roots had grown out from the original root ball in all directions reaching the sidewall and bottom of the container (see photo). The reason for the massive number of roots produced was air-root-pruning in the 18 cell RootMaker® tray. If this large number of roots hits the side of a smooth conventional container and begins to circle, little is gained. On the other hand, if this large number of roots contacts the sidewall and is again either air-root-pruned or pruned by root-tip-trapping, the resulting mass of additional branch roots infiltrates the entire mass of growth medium for maximum absorption of water and nutrients to support top growth.

Air-root-pruning results when actively extending root tips are guided into openings in the container sidewall where the tip dehydrates and dies. Secondary roots quickly develop back along each pruned root. The dead root tip has effectively been cauterized and is unlikely to be colonized by a pathogen. The key to air-root-pruning is the design of the container in such a way that root tips are guided into openings without having the openings so large and numerous that rapid evaporation and salt accumulation becomes and issue. All RootMaker® containers have been designed to provide maximum air-root-pruning with minimum sidewall openings.

Root-tip-trapping is accomplished using a spun bonded fabric laminated on one side with white poly. When root tips contact the sidewall of containers made using this material, the tip is trapped and can no longer extend. The trapped root tip will typically stop elongating, become pudgy, then lose hormonal control over root development and secondary branch roots develop. The advantage of this root-pruning technique is that no water is lost through the container sidewall and roots are fully contained, even when the container is in the ground or snugly inside another container. Plus, when used above ground, the white outer coating reduced root zone temperature by about 20 degrees F. *This cooler temperature allows root growth on the side of the container exposed to sun and avoids the problems associated when roots are killed by heat.*



Root girdling or constriction pruning is effectively accomplished in field soil where roots are allowed to grow through a fabric container wall where all openings are precisely 5/64 inch. Young root tips extend freely through the myriad of openings in the fabric, but as soon as they increase in diameter ever so slightly they become girdled or constriction pruned. Because the roots are young and actively growing, secondary root branching occurs in a similar manner to air-root-pruning or root-tip-trapping. In the ground the roots are allowed to function outside the container wall and absorb water and nutrients. Water and nutrients are transferred to the leaves via the central xylem tissues. However, the constriction limits downward movement of sugars from the leaves at the inside wall of the fabric. This accumulation of sugars causes nodules to form that have many root buds. When the tree is harvested and the fabric removed, root growth out from the nodules is robust.

For more information visit www.lacebarkinc.com or read Plant Production in Containers II