Effect of four root-pruning nursery containers on biomass, root architecture and media temperature©

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The nursery industry is transitioning away from standard plastic containers in attempts to reduce production costs and use of petroleum-based products and to improve plant health, root architecture, and transplant success. This study evaluated the effect of four root-pruning containers: Air-Pots®, Light Pots™, Root Pouch Pots, and Smart Pots on plant biomass, root architecture, and medium temperature, relative to standard plastic containers. Two deciduous woody shrubs were used: *Amelanchier* × *grandiflora* 'Cole's Select' and *Rhus aromatica* 'Gro Low', with six replicates of each container/species combination randomized in a complete-block design. All four root-pruning containers promoted root branching that limited circling and produced more fine roots than the standard plastic containers. The two porous-fabric containers, Smart Pot and Root Pouch Pots, displayed little to no root growth along the sides of the containers while Air-Pots and Light Pots demonstrated somewhat more, but still significantly less than the standard plastic containers. In the Air-Pots roots growing along the container sides were much shorter than those in the standard plastic container, generally terminating at one of the side holes and, thus, would not be considered detrimental to plant landscape establishment and growth. Serviceberry roots in the Light Pots displayed a strong gravitropic response, growing downwards once they were exposed to light at the container sides. This root architecture could also be considered less detrimental to long-term growth relative to the root circling typical in standard containers. An important observation of this study that was first reported by J. Altland in 2007 is that primary roots touching the side of the root-pruning containers at the time of planting often produced inward-growing roots, resulting in root structures that could lead to girdling roots later in the plant's life. Thus, at the time of planting it is important to prune roots so they are several inches away from the side of the container. For both species, dry weights of shoots were highest in the Air-Pots and lowest in the Smart Pot containers. While shoot weights ranged from 72 to 90 g in sumac, greater differences were observed in serviceberry shoots, which were nearly 66% greater in the Air-Pots (494 g) relative to the Smart Pot (298 g). The root-pruning containers also had significantly lower media temperatures measured on the sun-exposed side, with the lowest temperatures observed in Smart Pots, where medium temperatures were as much as 35°F lower than in plastic containers (121.4 vs. 86.3°F). The low medium temperatures and dry weights of shoots in Smart Pots were likely due to evaporative water loss through the highly-permeable fabric. Because all containers received the same amount of water each morning via drip irrigation, greater water loss through the highly-permeable Smart Pot containers could have resulted in mild water stress during mid and late day, leading to lower shoot biomass. This supports the findings of other studies that observed greater water requirements for plants grown in porous containers. Dry weights of roots were not reported, as fine roots of both species grew into porous medium components such as composted bark and perlite, making it unfeasible to separate the medium from the roots without removing large amounts of fine-root mass. Therefore, when media typical to nursery container production are used in such studies, root biomass data will be unreliable and, if reported, should probably be viewed with skepticism.

Literature cited

Altland, J. (2007). Root pruning: a touchy subject. Digger *May 2007, 28*.

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