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Evolution of plant production in containers

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Abstract

This paper highlights some of the historical research that led to containers that can improve the root system, rather than just acting as root packaging. Prior to 1968, plant containers, which had once been metal cans, were mainly smooth, injection-molded, plastic pots that created circling, congested roots. To this day, many nurseries fail to provide their customers with root systems without these problems.

In 1968, Dr. Whitcomb grew trees in bottomless milk containers. This created root pruning, but only at the bottom of the containers, so additional designs were tested. In 1970, a “slotted” container with openings in the sidewall was tested, but the side pruning was minimal and water loss was excessive.

Experiments on pot-in-pot production were evaluated in 1973 and showed root circling and escape using this production method. Also that year, copper was tested as a root pruning method, but results revealed stunting and nutritional interference.

In 1983, a porous, aboveground fabric container was tested. It would later earn a patent in 1985. However, with inconsistent pruning, some root escape, and water loss when used above the ground, additional designs were needed.

Based on additional studies, an injection-molded, plastic container that created root tip trapping without holes was patented in 1984. A container with a V-shaped rib for air root pruning was patented in 1985. A unique, 4-pack design of a propagation container that created root pruning throughout the container was patented in 1988. This engineering led to the design being applied to 1-gallon and 3-gallon injection-molded containers in 1989. Similarly, a patent was awarded for an improved design of 60-cell, 32-cell, and 18-cell propagation trays in 1996.

A new and improved “tree bag” design with precise openings and more consistent pruning was released in 1990. (Later, in 1997, this fabric container would be sewn to fit cinder blocks as an additional, stable method of production.) Also in 1990, a patent was awarded for an expandable, air-root-pruning container.

In 2003, a white, soft-sided, bilayer fabric was tested, resulting in a root-branching, water-conserving container. In 2010, this design earned a patent, with a faster-draining design earning a second patent in 2011. 2004 brought the release of an improved design of the expandable root-pruning container, which was awarded a patent in 2009.

Research conducted during this 40-year period not only revealed flaws in designs, but proved that root pruning can be achieved in containers via several methods: air root pruning, constriction pruning, and root-tip trapping. With these multiple methods, containers were designed that efficiently create better root systems, whether above the ground, on the ground, below the ground, or on benches. These patented containers reduce production times for growers, conserve water and nutrients, and produce plants with a higher success rate after transplanting and during establishment.

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