

Air-Root Pruning: A Great Step Forward in Propagation and Liner Production

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Summary

Air-root pruning systems have considerable propagation and production advantages in producing superior plants of greater commercial value. In air-root pruning the liner pots and propagation flats redirect roots to leave the growing media and desiccate which stimulates greater branching of new roots. Advantages of air-root pruning include improved root architecture with denser, more fibrous roots,

reduced transplant shock during upcanning/transplanting, and greater stress resistance in the finished crop with a more extensive root system. While air-pruning was first developed to improve growth and transplanting of coarse-rooted taxa – it can also be beneficial for greenhouse-grown vegetables, herbs, and flowering plants. It all begins in propagation with air-pruning of primary roots of the liner crop.

INTRODUCTION

Air-root pruning can significantly enhance root system development of woody plant species (trees, shrubs) during propagation and liner production. When propagated and grown in standard plastic flats and liner pots - coarse-rooted taxa propagated from seed - can form crooks and root circling of primary roots (Gilman, 1990; Miller and Basuk, 2018). This can lead to root girdling and a poor-quality crop (**Fig. 1**).

Specialized containers/pots that air root prune can redirect root architecture – leading to a more fibrous, easily transplanted, desirable plant. It all begins in propagation with air-pruning of primary roots of the liner crop. Air root pruning has also been beneficial for greenhouse-grown vegetables, herbs, and flowering plants.



Figure 1. A problem with coarse rooted woody taxa can be root girdling (arrows) that leads to an undesirable, poor-performing plant in the landscape.

WHAT IS AIR-ROOT PRUNING?

In air-root pruning the liner pots and propagation flats redirect roots to leave the growing media and desiccate which stimulates greater branching of new roots (**Fig. 2**). Roots, like shoots, have apical dominance – controlled by auxin. When primary roots are redirected to leave the propagation, liner or container media - the root apices are “pruned” after they protrude and come in contact with air. This leads to a

decrease in auxin production and a relative increase in cytokinin levels, thereby triggering the plant to produce more lateral roots near the pruned area. This altered auxin/cytokinin hormonal balance favors lateral root initiation (Aloni et al., 2006). Subsequently, apical root dominance is broken, encouraging secondary roots to regenerate from primary roots – creating a more fibrous root system.

What is Air Root Pruning?

- Roots leave the growing media and desiccate.
- Root will be stimulated to branch
- New roots will reach air
- Repeat!



Figure 2. In air-root pruning the liner pots redirect roots to leave the growing media and desiccate which stimulates greater branching of new roots.

ADVANTAGES OF AIR-ROOT PRUNING

Some of the advantages of air-root pruning include: reduction or elimination of circling roots, reduced incidence of root disease, increased oxygen exchange with roots, more rapid growth of the root system, increased rooting success with recalcitrant plants,

faster turn-over of propagation space, increased root surface area for greater access to water (Jacobs et al., 2009) and nutrients, a denser, healthier root system for reduced transplant shock, and a quality root system – resulting in fewer plant losses during transplanting (**Fig. 3**). Air-root pruning can also be done with larger containerized plants (**Fig. 4**).

Why Use Air Root Pruning in Propagation?

- Reduction or elimination of circling roots
- Reduce the incidence of root diseases
- Increase oxygen exchange with roots
- More rapid growth of root system
- Increase rooting success for difficult plants
- Quicker turn of propagation space
- Increased root surface area means increased water & nutrient uptake
- Dense healthy root system reduces transplant shock
- Quality roots result in fewer plant losses upon transplanting

Figure 3. Some advantages of air-root pruning.



Figure 4. Air-root pruning can also be done with larger containerized plants. Notice the fibrous white roots.

Downsides and Adjustments Needed with Air-Root Pruning Systems

There are few downsides to utilizing air-root pruning systems. However, water-

scheduling will need to be adjusted since there is greater evaporative losses from the containers – and greater water use. It is best not to mix different systems with different irrigation demands in the same growing area (**Fig. 5**).

Downsides, not many

- Adjusting watering schedule
- Best not to mix types of systems
- Adjusting your soil mix
- Scheduling; best results are achieved when plants are shifted on time.

Figure 5. Potential downsides and adjustments needed with air-root pruning systems.

Soil media will need to be adjusted. Adhering to production schedules during propagation and liner production – shifting or upcanning when needed is important. Propagation flats, liner pots and containers may be more costly – but the enhanced growth and development – and production of a superior plant can justify the expense.

CONCLUSION

Air-root pruning systems have considerable propagation and production advantages in producing superior plants of greater commercial value. Air-root pruning has been utilized for more than 50-years (Carlson, 1974). However, Whitcomb (2006) with his Rootmaker® propagation flats/containers/liner pots was instrumental in getting the nursery/green industry to adapt

commercial air-root pruning systems <https://rootmaker.com/rootmaker-system>.

A number of other commercial companies have since introduced their air-root pruning products (**Figs. 6 and 7**) including:

Rediroot® <https://rediroot.com/>,

Proptek® <https://www.proptek.com/>,

Anderson Band® www.andersonpots.com,

Ellepot® <https://www.ellepot.com/>,

Fibercell® <https://bccfibercell.com/>,

Accelerator® <https://plantproducts.com>.

Air-pruning is an important component in modern propagation and production systems.



Figure 6. (left) Growcoon is a unique cutting and seed plug holder, composed of a biodegradable material that holds the media, and (right) Fertilpot propagation cups are for use in our RediRoot® propagation trays for the purpose of reducing transplant shock without compromising air-pruning technology.



Figure 7. (left) Rootmaker® and (right) Rediroot® are other commercially available air-pruning, liner container systems.

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