

# Ten Factors to Improve Nursery Production

By Carl Whitcomb PhD, Lacebark Inc, Stillwater, OK

## CONTAINERS:

1. Micronutrient deficiencies in Containers. The pH of the growth medium means very little. If you incorporate Micromax micronutrients, they are present. If you do not, your plants suffer. Since there are few micronutrients present in the components used for container growth media, raising or lowering the pH has little effect.

Focus on nutrition. If you add the proper nutrients to the growth medium – and adjust for the chemistry of your irrigation water --- pH takes care of itself and will almost always be in the desired range of 4.5 to 5.5 which is ideal. On the other hand, if you simply focus on pH, you can have the ‘correct pH’ and be far from proper nutrition.

You **must** know the chemistry of your irrigation water. With every irrigation, the water evaporates or is used by the plants. The dissolved minerals in the water stay behind and accumulate. In most cases, if the dissolved minerals are allowed for in the nutritional program, plant growth is good. If not, problems arise. For example, the blanket recommendation commonly made and written is to add 8 pounds of dolomite per cubic yard in order to supply calcium and magnesium. However, if your irrigation water contains 70 to 80 ppm calcium, best plant growth results from adding **zero** dolomite. Plants get all they need from the irrigation water. If you add 8 lbs of dolomite **and** have 70 ppm calcium in your irrigation water, the **excess** calcium quickly ties up the micronutrients and your plants become stunted and chlorotic. On the other hand, if your irrigation water contains only 30 ppm calcium, you must supply the difference between that level and the optimum.

2. Long term slow release of nitrogen, phosphorus and potassium consistently produces the best plants with the fewest problems. The Osmocote coating(s) best for your crops depends on the temperature those crops experience. Remember, Osmocote is a plastic-resin coated dry fertilizer to begin with. Once wetted, the Osmocote becomes a mass of miniature water balloons. As the temperature increases, the resin coating of the balloon expands and becomes thinner – and – more nutrients diffuse out. As the temperature decreases, the plastic coating contracts and becomes thicker and fewer nutrients are released per unit of time.

Remember, a white container or container surrounded by mulch or partially or completely in the earth will be much cooler vs. a black container exposed above ground.

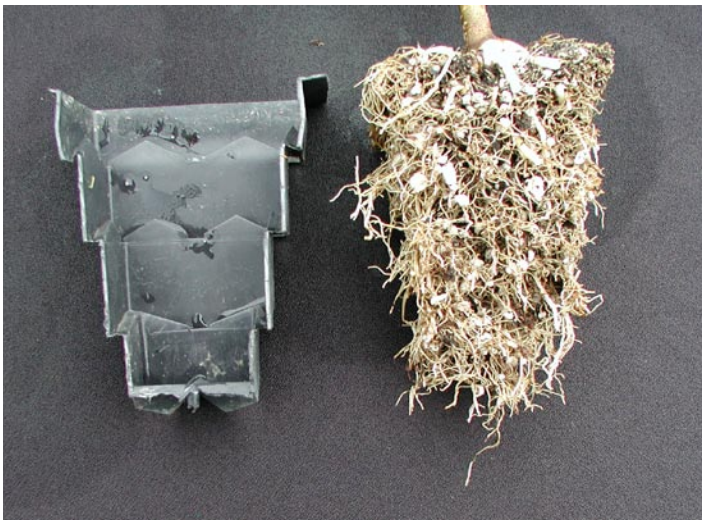
3. Forget about leaching the container growth medium. If you leach to control ‘salts’, you are applying too many or the wrong salts. When you match the release of the Osmocote

formulation to the needs of your crop properly, there is little or no excess to leach. I put my soluble salt meter on the shelf decades ago and it is covered with dust. For example, if you are on a liquid feed program, any element in the fertilizer not used by the plant accumulates, such as chlorides when potassium chloride is used. Likewise, any element provided in excess of what the plants needs will accumulate. The key is to avoid unwanted elements or excesses. The safest and least frustrating way to avoid these problems is to use slow release fertilizers.

4. Moderate and timely watering is superior to heavy and infrequent watering. Unless – you have poor quality water. In a study of watering regimes in north central Oklahoma, I compared applying the same quantity of water during a 24 hour period, but divided the water up into 1, 2, 3, or 4 applications. Clearly two waterings per day were superior to one. Three waterings were superior to two by a modest amount. There was no advantage to applying the water in four applications instead of three. The advantage of three waterings is that the moisture suitable for growth can be maintained without restricting oxygen availability to roots. Remember, roots require oxygen to function and grow and give off carbon dioxide. If oxygen is limiting and/or carbon dioxide is in excess, root functions are reduced. Only when your irrigation water contains excess salts is an occasional heavy watering and leaching beneficial.
5. Pruning is always stunting – relative to the amount of growth that would have been produced if no pruning had occurred. You just paid to grow that stem, twig, branch or leaf, so why cut it off? Further, any time the top of a plant is pruned, even at a modest level, abruptly roots stop growing. Root growth does not resume until new top growth resumes. Light but frequent pruning is superior to heavy infrequent pruning – if pruning is required at all. Remember, a plant runs on energy, just like everything else. Anything you do that disrupts energy accumulation by green tissues, you pay a price for. Is it practical to not prune at all? Yes. With many crops, if the nutrition of the stock plant, liner, mix, water chemistry, slow release fertilizers and other factors are properly synchronized, little, if any, pruning is needed. Pruning is a crutch nurseries often use to try to make up for weaknesses in other areas of their cultural practices. One of the most effective ways to reduce labor, save money and improve crop quality is to focus on the big picture.
6. Once each growing season, every container grown plant should be sold, shifted into a larger container or thrown away. One of the prices we pay for the convenience of growing plants in the artificial environment we call a container is the fact that space is limited and roots develop differently from natural soil and time is critical.

In order to provide sufficient drainage and oxygen for root growth in a container, the mix must be coarse in texture. This allows roots to extend aimlessly and develop few secondary branch roots compared to Mother Nature's soil. When roots contact the sides of conventional containers they are deflected and begin to circle. [Killing the root tips and overdosing the plants with toxic levels of copper is not the answer.] Air-root-pruning or root-tip-trapping stimulates far more root branches and stops circling and without toxicity. When a root tip is air-root-pruned or the root tip is trapped and can no longer extend, secondary branch roots develop back about 4 inches from the tip. Remember, the 4-inch rule to develop the best root system in containers. [For detailed information about all of these topics, read Plant Production in Containers II, by CEW. To order, go to [www.lacebarkinc.com](http://www.lacebarkinc.com).]

7. Air-root-pruning and root-tip-trapping stimulates root branching and stops root circling without toxicity. Copper treated containers are only for the misinformed or those that do not care about their customers or the environment. Nearly all nutrient absorption and most water absorption occur at or near the root tip. One root tip can absorb a given amount of water and nutrients per hour, day, week or month. By stimulating roots to branch and multiplying the number of root tips --- support for the plant top is also multiplied. **Improving the root system by stimulating root branching and stopping root circling is one of the most effective ways to improve plant growth, overall plant quality and customer satisfaction (Figure 1).**



*Figure 1. Root development from a 32-cell RootMaker cavity.*

**FIELD:**

8. Growing trees in the field in good soil provides superior stem strength, branching and overall quality compared to growing entirely in containers. The combination of starting young seedlings or cuttings in containers, then growing in the field to market size, then finishing in containers provides the best of both worlds. Air-root-pruning containers stimulate root branching of seedlings or cuttings far superior to what occurs in nature. Continue

air-root-pruning in larger containers the first growing season and 4 to 6 foot well branched oak seedlings can be ready to take to the field in September. To keep the plants in containers over the winter means elaborate structures and risk. By planting into the field near the end of the first growing season, the overwintering problem is eliminated and the young trees will be well established before the stress of the next summer. By growing the trees in knit fabric containers (knit grow-bags) root branching and energy accumulation continues. When the trees reach salable size, pull them from the soil while dormant or harvest with forks on a skid steer, strip the fabric and finish in containers (Figures 2 and 3). Trees grown this way and placed in containers in May are generally fully rooted and ready for sale all summer long and into the fall. **The time to sell shade is when shade is a reason to buy.**



*Figure 2. Soot system removed from knit fabric container and washed.*

9. Starting tree seedlings or cuttings in RootMaker® air-root-pruning containers provides huge benefits --- IF --- you are attentive to plant growth and development. Leave the seedlings or cuttings too long in the container, any container, and they become crowded, stunted and weak stems result. Growing in RootMaker® air-root-pruning containers **does not** mean you can leave seedlings longer. In fact, with the additional root branching, the seedlings benefit from transplanting **sooner**. Focus on what is best for the plant instead of 'when we get around to it'. The more the root system branches the more nutrients can be absorbed and transferred to the leaves. Provide what the plant needs and let the plant respond.
10. Trees were not designed to be staked. Staking is a crutch to be avoided as much as possible. If the stems of young trees are not sufficiently strong to support the tops --- look back at how they were grown. If container grown, they were likely too close together for too long, in a container

too small or without sidewall air-root-pruning or received excess nitrogen relative to other nutrients. If bed grown or field grown they were likely too close together for too long. The lower limbs and leaves are the **primary** support for stem and root growth. **Removing lower limbs and leaves before good stem strength and taper develops will always drop you into the staking quagmire.** Leave the lower limbs ON (the only exception being those especially aggressive ones) until one growing season prior to harvest in order to get maximum benefits.



*Figure 3. These trees spent the first year in RootMaker containers, then 3-4 years in the field, then finished in RootTrappers.*

Remember, there are a myriad of interacting factors in growing top quality nursery stock with excellent root systems and in a shorter time. No one item or factor is a cure-all. However, the more you improve on **all** factors the better off you will be.

(As published in The Nursery Book, 2009. Pages 6-10.)