

Micropropagation: The Ultimate Power Tool

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INTRODUCTION

The concept of micropropagation as a power tool is, admittedly, a silly idea, but consider the similarities. We like power tools because they get the job done quickly, save labor and resources, yield more uniform results, and generally make projects easier.

Power tools can also do great damage if you are not careful. The key to taking advantage of power tools is in learning how to use them properly to maximize results and minimize risks. One must wear the proper safety equipment. One must also continuously screen the procedures and product to make sure that what you end up with meets or exceeds the industry standards for quality. After all, only quality sells long term.

The following are some of the ways micropropagation is being used effectively in the trade today. Many of the largest and smallest nurseries in the United States view micropropagation as an essential power tool which helps them maintain their competitive edge by growing better plants more efficiently.

New Introductions. Perhaps the most obvious use for micropropagation is to get a “jump start” on growing the newest and hottest items quickly. Micropropagation cuts 3 to 10 years off the time it takes to bulk up new selections and get them to market. For example, micropropagation was used by one of our customers to establish layer beds of a new apple understock. In the same amount of time his competition had bulked up a few thousand rootstock using conventional propagation methods, our client sold over 1 million micropropagated rootstock. The world is always looking for something new and exciting. If you happen to have lots of a new product before your competition does, than this translates to money in your pocket. It also tends to build your reputation as a leader in the industry and cause customers to come back to you year after year for other plant items.

In some cases, growers use micropropagated plant material to establish mother (stock) blocks and to fill in production shortages while mother blocks are still too young to be productive. In many other cases, micropropagation remains the method of choice for a number of reasons.

Rapid Response To Market Demand. Large cutting blocks or scion orchards are time consuming and expensive to establish and maintain. It is often difficult for growers to adjust quickly to the rise and fall in popularity of a given plant. We maintain our stock block in a 3 m × 3 m (10 ft × 10 ft) cold storage unit. If our customer gets a call for an additional 10,000 liners of a particular blueberry, for example, the customer simply calls us and asks when is the earliest we can provide microcuttings, adds the time he needs for the greenhouse growing and calls the buyer back with a delivery date. He never has to tell his customer no. We call this “dial-a-date delivery.”

Clean Plants. Micropropagation is inherently a cleaner system. Since the plants are grown in culture, diseases are not transmitted from the field into the greenhouse and on to subsequent generations. A single disease-free mother plant can produce unlimited disease-free daughter plants. Conversely, each virus-free plant in a field-grown mother block must be retested on an annual basis in order to maintain virus-free status. Testing fees add significantly to the expense of maintaining large mother blocks in the field. In Oregon, such fees are rapidly escalating. With lilies, insects are vectors for debilitating virus problems. By planting clean stock in the field, one can greatly limit such losses.

Ease of Propagation. Bud incompatibility on budded or grafted stock, and poor rooting percentages with softwood or hardwood cuttings makes micropropagation the method of choice or the only option on many difficult-to-propagate plants such as *Syringa* and *Cercis*. Some *Acer rubrum* cultivars such as 'Karpick' and 'Bowhall' are absolutely impossible to root from cuttings. Unreliable seedling availability and poor or unpredictable bud stands on *Betula*, *Tilia*, and *Morus* are problems growers are able to avoid by planting micropropagated material. Growing plants on their own root system offers major advantages for plants such as *Corylus avellana* 'Contorta' (contorted filbert), where suckering of understocks can be a major problem.

Sometimes micropropagated material provides the grower with a nucleus of "juvenile" material from which additional cuttings can be more easily rooted. Each year the customer starts over with a fresh batch of starter material from the lab.

Efficiency—Making Every Plant Count. As competition has increased in the marketplace over the past several years, growers have not been able to raise prices in order to maintain profitability. Greater emphasis is being placed on improving production practices, making every dollar spent on labor and resources count.

The bottom line in evaluating any production scheme is how many salable plants you end up with after planting, growing, pruning, digging, and grading. Losses due to seedling mortality, poor bud stands, crookedness, terminal bud loss, and poor root quality cause growers to not only lose the revenue and time they have invested in growing the stock, but also the revenue which would have come from the sale of the lost stock. Losses in various large bare-root nurseries typically runs 15% to 20% or more. For example, of the 750,000 trees planted by one grower, they were throwing away about 150,000 by grading time. By switching to micropropagated stock, they figure they are gaining about 50,000 of those trees back into the salable column. Figuring at a low-end value of \$7.00 per tree (estimate very low, since this particular grower sells a combination of 1- and 2-year finished stock), this translates to \$375,000 of additional income. Spending a little more on the front-end adds up to much larger profits when the whole picture is accounted for. Why waste time, energy, equipment, and resources tending plants that will end up as discarded inventory?

Faster. Research done at various universities indicates that it is possible to grow tissue-culture-produced plants much more quickly to size than is traditionally done in nurseries with conventionally propagated plants. I planted a 1-gal blueberry plant in my backyard last week that has 13 canes averaging 8 to 18 inches each. The plant came out of our lab in February 1994. Eight months ago it was 1 inch tall with no roots on it. Such rapid growth requires optimization of all

growing conditions including fertilizer, light, and heat. Several field growers are now producing well-formed, small branched trees of *Prunus serrulata* 'Kwanzan', *Morus alba* 'Chaparral', and others in 1 year instead of 2 years.

Greater Uniformity. While cultural practices play a huge role in the ultimate performance of any block of plant material, the overall consensus of our customers, when asked why they prefer micropropagated *A. rubrum* and *Betula* in the field, is primarily the overall survival rate and secondly the reliability and consistency of the product when it is harvested 2 to 3 years later. The plants are not necessarily bigger, but the size and quality is more uniform and dependable.

Superior Branching. Because the internode length is greatly reduced on micropropagated plants, there is generally more opportunity to develop a fuller, better branched plant. Indeed, this is also one of the reasons why survival is often greater. If something happens to destroy the terminal bud, (for example: damage caused by freezing, hungry rabbits, or poor pruning), there are other buds below available to choose from. One grower accidentally sprayed a young block of *A. rubrum* liners twice with Surflan. The stems of the young micropropagated liners were girdled right at soil level. All was not lost, for the grower dug the soil out from around the base of the plants, removed the damaged tops and the buds below the girdling all pushed out again. The grower lost some height on his crop, (about 1 to 2 ft), but shorter plants are better than no plants at all. Having more buds to choose from also allows a grower to cut back closer to the ground producing straighter trees.

The better branching is a real advantage when it comes to growing well-formed shrubs. *Hydrangea quercifolia* Snow Queen® from rooted cuttings tends not to develop many branches at an early age, while micropropagated plants are easily developed into a bushy habit with routine pinching.

SUMMARY

Micropropagation should be considered a power tool for many reasons. Growers are learning more and more how to use it wisely to help their operations become more efficient and effective. Perhaps the most basic reason of all is that it makes producing a crop that much easier.