

Commercial Plant Tissue Culture — Past and Future Perspectives[®]

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INTRODUCTION

Instead of focusing on the minutiae of commercial plant tissue culture (TC), I've elected to provide you with a broader perspective of the TC industry focusing on its early years through to today's commercial applications, finishing with our Rancho Tissue Technologies (RTT) perspective on the future of commercial plant tissue culture. Having been in the U.S.A. TC industry for over 20 years, RTT has the technical background and experience to offer valuable insights into this important part of the horticulture industry.

PLANT TISSUE CULTURE

The Early Years. In the early years of commercial plant TC, the main focus was on the propagation of orchids and tropicals such as *Alocasia*, *Colocasia*, *Spathiphyllum*, *Syngonium*, *Anthurium*, and *Philodendron*. Consumers were very interested in plants that gave a “lush tropical look” and these were mainly indoor/outdoor water-loving foliage plants. At the time, water availability was of little importance.

Over time, improvements in plant TC technologies allowed for the optimization of TC protocols resulting in an expansion in the number of crops that were put to TC. Some factors that contributed to this expansion include:

- The emergence of new synthetic hormones and increased knowledge of the interaction of hormones and their effects on plant cultures.
- The commercial availability of pre-packaged culture salts.
- Improvements in gelling agents.
- Numerous publications on plant tissue culture protocols.

Growers have continuously pushed for more tissue culture introductions as consumers have become more discriminating about the plants they purchase.

Offshore Labs. As the market for tissue culture products has expanded and labor costs have increased, production operations have moved to lower cost areas such as Asia and South America. The price per microcutting from an offshore lab can be as cheap as $\frac{1}{4}$ the price of the same unit here in the United States of America. However, often times there are some factors that are compromised as discussed below:

- Quality standards set for ready-to-ship microcuttings may differ from those in the United States (e.g., plantlet size, root quality)
- Reliability from some off-shore labs to fill orders is weak at times
- Plants are not always free of bacterial or fungal contaminants which may lead to high losses upon planting
- Many off-shore labs tend to produce low cost, nonprotected plant taxa

Predicting a Shift in the Market. Initially it was thought that it may be a setback for U.S.A. labs to compete with offshore labs on some crops, but it has not turned out to be that way. The U.S.A.-based labs have been able to remain profitable in this competitive market for several reasons. We are able to observe the market closely and make changes in our production as markets shift. We also possess the appropriate technology to produce high-quality, difficult-to-grow crops. In addition, there has been an increased demand from growers and consumers for U.S.A.-produced plants. About 15 years ago, RTT decided to expand its focus beyond water-loving tropicals to include water-wise crops. We became more aware of the importance of introducing TC crops that possessed low water requirements.

A SUCCULENT BREEDING PROGRAM

Over the past 15 years, RTT has worked very closely with Rancho Soledad Nurseries (RSN) to introduce numerous TC succulent taxa into the horticultural market. We have established a highly successful succulent breeding program that focuses on producing exciting new *Aloe*, *Agave*, *Echeveria*, and bromeliad taxa. The idea to develop a succulent breeding program came from Jerry Hunter, owner of Rancho Soledad Nurseries and a true visionary in the field of horticulture. He founded RTT with his daughter Heather May in 1987 and continues to assist in the selection of plants to be cultured by RTT. Rancho Tissue Technologies owes much of its success to Jerry's invaluable contributions. Kelly Griffin has been curator at RSN for 8 years and is a breeder of *Agave*, *Aloe*, *Echeveria*, and bromeliad plants. Since age 11 he has been tinkering with succulents and has helped RSN and RTT make significant contributions of new succulent taxa into the horticultural market. Table 1 lists several of our new tissue cultured succulent introductions.

The goals of our succulent breeding program are to amplify or introduce desirable characteristics to selected species or cultivars. It also aims to identify characteristics that are lacking in an existing hybrid and add those characteristics to create superior hybrids. We have approximately 4 acres set aside for trialing new succulent hybrids or species selections and this area also serves as a great garden display. Plants are evaluated throughout the year for performance, survival, and aesthetic appeal. Once new hybrids or clones are selected for introduction into the market, they are initiated into TC and multiplied until we have a sufficient quantity that allows us to go into production (Fig. 1).

INTO THE FUTURE

Currently, there is an increase in the demand for water-friendly plants. As we make new succulent introductions into the horticultural market, several factors are taken into account. New introductions must possess consumer appeal. Consumers are more educated than ever about the plants they purchase and this is a criterion that we take into great consideration when making selections for breeding. Introductions must also be novel and practical, with distinctive shapes and appealing forms. It is also important that we select grower friendly taxa that are fast-growing, hardy, and pest-free. We are currently expanding our breeding program to include the following: more colorful foliage, summer-blooming aloes, fragrant aloes, thornless agaves, variegated aloes and agaves, and we will continue to expand our line of small aloes for indoor use.

Table 1. Some new Rancho Tissue Technologies tissue-cultured succulent introductions.

- Agave* ‘Little Emperor’ PPAF
- Agave impressa*
- Agave parrasana* ‘Globe’ PPAF
- Agave potatorum* ‘Cameron’
- Agave sebastiana* ‘Silver Lining’ PPAF
- Aloe* ‘Cherry Vanilla’
- Aloe* ‘Christmas Carol’ PPAF
- Aloe* ‘Delta Lights’
- Aloe* ‘Orange Marmalade’
- Aloe* ‘Sunset’ PPAF
- Aloe pillansii*
- Aloe rubroviolacea*
- Dyckia* ‘Burgundy Ice’
- Echeveria cante* ‘White Cloud’ PPAF
- Echeveria subrigida*

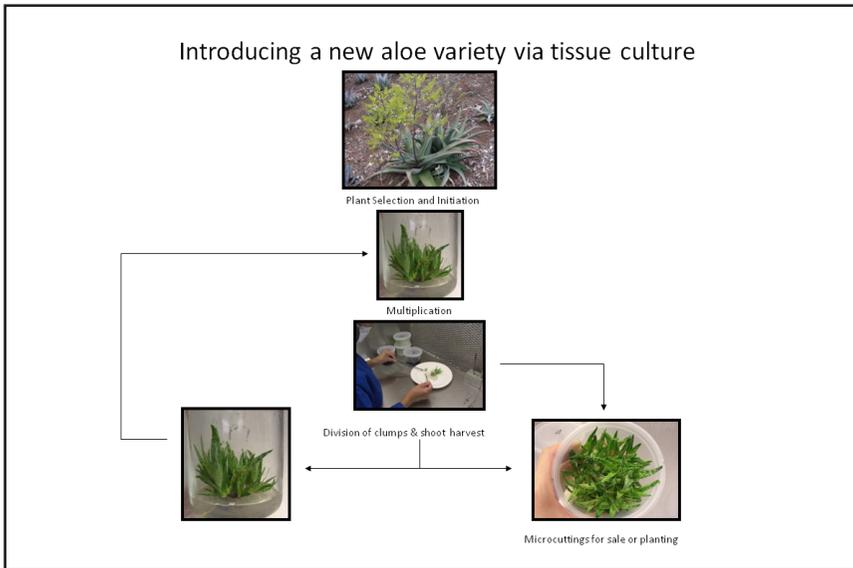


Figure 1. Diagram shows the overall process of how RTT introduces new succulent taxa.

As we look into the future of commercial plant TC, we foresee a continued demand on the tissue culture industry to produce millions of plants every year. A major contributing factor to this pressure for TC plants is the state of food supplies. Inevitably, we must begin to look for alternatives to crops that are currently produced for food. An example is the current identification of mango (*Mangifera indica*) as a viable replacement for *Citrus* crops due to the current devastation being caused by the Asian citrus psyllid (*Diaphorina citri* Kuwayama). The increased demand for biofuels is also a driving force in the demand for TC crops. *Jatropha curcas*, *Pongamia pinnata*, and oil palm are just a few of the crops that are currently being explored as reliable biofuel sources. It is clear that plant tissue culture will be instrumental in the production of the millions of plants needed to supply these major driving forces.