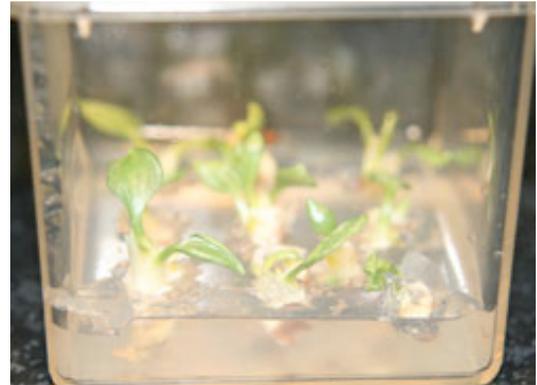


Tissue Culture for Dummies – A Very Brief Discussion of a Complex Topic

Have you gone into your favorite nursery, or any of the big box stores, and seen tables loaded with seemingly identical plants? Did you wonder where they all came from? How did they get so many Hostas that all look alike, or Rhododendrons, or Hebes, or New Zealand Flax? We have choices of many different plants that would have been rarities a few years ago. The answer to how these plants were propagated is tissue culture.

Tissue culture is a term that actually includes several different techniques that all have in common the propagation of mature plants from the cells of plants, as opposed to from seeds. We all actually practice tissue culture when we divide plants or take cuttings and give one of the resulting plants to our neighbor – we have divided the tissue of one plant and obtained two or more whole identical mature plants from it. We have propagated two plants where there was only one. Taking this process to extremes, tissue culture done in labs to obtain thousands of identical plants is called “micropropagation”. It starts with very small amounts of plant tissue – therefore the “micro” part of the word.



Explants growing on gel media.

There are several reasons this is done:

- To obtain many identical copies of unusual plants (i.e. variegated or unusual colors) or rare species
- To quickly produce many mature plants
- To produce many plants in the absence of pollinators to produce seeds, or when plants do not come true from seed.
- To produce plants from genetically modified cells
- To produce many plants when seeds do not germinate easily (i.e. orchids)
- To clean plants of viral or bacterial infections and obtain disease free plants for horticultural or agricultural purposes

The piece of the plant that begins the process of tissue culture can be from almost any part of the plant, although for most species, particular parts of the plant work better than others. The piece chosen is called the “explant”. The ability of plant cells to produce mature plants from single cells is called “totipotency”. For most instances, the best material for the explant is the meristematic tissue or growing tips, like the stem tip, auxiliary bud tip, and root tip. Once the explant has been chosen, there are four basic stages of tissue culture.

Stage I is explant initiation, or establishing the explant and getting it to grow. This is the trickiest part of the process. The explant must be cleaned, and preferably sterilized. This is to prevent contamination of the growth

media with bacteria while the explant starts to grow. Then the explant is placed in sterile gel media that contains all the nutrients required for growth. This again is tricky, since sterile technique must be used, and different plants require different chemical balances in the growth media. The growth media typically contains sugars, salts, vitamins and nitrogen sources. The explant grows in this media until it shows growth, typically small leaves. This can take some weeks or even months.

Stage II is the multiplication stage. When the explant shows sufficient growth, it is removed from the media again using sterile technique, and divided into many additional starts. These starts are then placed in nutrient gel media. Theoretically, this process can go on to produce hundreds, thousands, or millions of the identical plant, sometimes in less than one year.

Stage III is rooting. At Stage III, the small plants have small leaves, and need to grow roots. The media mixture needs to stimulate root growth, so depending on the specific plant needs, the plants are moved to sterile media with root hormones.



Multiplication Stage



Stage IV is acclimatization or hardening off. In this stage, the plants are moved to potting soil and grown on to a size to be sold.

Tissue culture is performed in large and small labs, and even in kitchen labs. The requirements are the ability to set up sterile conditions for cutting plants to obtain the explant, to make or obtain and sterilize media for growth, and to grow on and multiply the resultant new plants into saleable commodities. The history of tissue culture goes back into the early part of the 20th century and

experimentation and learning continue today. There are many applications of tissue culture that are studied in universities and botanical gardens. Plants that are propagated by tissue culture are true to type, vigorous and disease resistant. They can be less expensive than conventionally grown plants and provide us with more affordable and greater choices in our nurseries. Tissue culture is also used in many countries to provide commercial growers with disease free agricultural products. In Africa, tissue culture provides bananas, passion fruits and sweet potatoes for bumper harvests. Tissue culture impacts our lives in more ways than we realize now, and in the future we will see even more applications of this marvelous way to propagate plants. Get ready for your neighbor to give you a thousand starts of her favorite plant!!

References

Plants from Test Tubes, An Introduction to Micropropagation by Lydiane Kyte and John Kleyn, Timber Press 1996

Wikipedia "[Plant Tissue Culture](#)"

[Kitchen Culture Kits, Inc.](#)