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Tissue Culture Propagation of *Aronia melanocarpa*

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Summary

A micropropagation system suitable for a student lab is described using black chokeberry (*Aronia melanocarpa*). Explants formed five to six shoots in four to five weeks of culture. Rooted explants were moved to plastic boxes where they were hardened-off.

INTRODUCTION

The first experiments with plant tissue culture propagation occurred in 1902 but proved unsuccessful. By 1936 there was a renewed interest especially with the recognition and use of the plant growth hormones: auxins, cytokinins, and gibberellins. Experiments included taking established pieces of roots, thoroughly cleaning and placing in a nutrient broth of minerals, vitamins, sugars, mysterious entities from yeast extract, coconut milk and other sterilized plant derivatives. Murashige and Skoog made the first significant leap in mid 1960s. In the late 1960s new technologies were developed to grow plant tissues in aseptic culture.

Advantages of tissue culture

- Speed: Tissue culture is a quick process. In weeks, one can produce thousands of plantlets.
- Heath: Plants are disease free from being produced in a sterile environment.
- Flexibility: Plant growth can happen year-round, regardless of season.
- Space: Cultivators can grow ten times the plants in one-tenth the space of a regular grow operation.

- Innovation: Suspension culture opens the door for mutations and genetic engineering.

METHODS

The following content is based on plant propagation and physiology class, Spring 2021, At the Barnes Arboretum Horticulture Program. Instructor: H. William Barnes.

Plant tissue culture is defined as: The in vitro culture of plant protoplasts, cells, tissues or organs under controlled aseptic conditions which lead to cell multiplication or regeneration of organs or whole plants.

Other forms of asexual reproduction like, cutting, budding, and grafting are known as in vivo clonal propagation of plants. In vivo clonal propagation can be expensive, difficult, and unsuccessful. Plant tissue culture production or micropopagation is an alternative approach to in vivo production. The commonly used explants in micropropagation for initiation of the culture are meristem, shoot tip, and axillary buds. This tissue is multiplied in vitro (in glass).

Steps in the process include:

- The first step in micropropagation is the selection of stock or elite plants having desirable characters for their multiplication on a large scale.
- The next step in the process is to surface sterilize the tissue using various chemicals.
- After surface sterilization the explants are inoculated onto a medium and supplemented with various growth regulators, vitamins, and sucrose. *Aronia melanocarpa* (black chokeberry) was selected for the experiment and it was tissue cultured in a canning jar.
- The next step is the multiplication of explants. Each explant produces five to six shoots in a period of 4 to 5 weeks. Roots form with help from hormones and plants begin to form complete plantlets.
- Next the plants are hardened off. This involves the plants becoming resistant to stress, moisture, and disease. Plantlets must be protected from direct sunlight and humidity decreased. The plantlets develop roots during this period and cuticular wax is also formed in the aerial tissues.
- Finally, the plantlets become suitable for transfer to the field.

Aronia melanocarpa (black chokeberry) was selected for the experiment and it was tissue cultured in a canning jar. Roots form with help from hormones and plantlets begin to form complete plants. Each student got a small plastic container, tweezers and soil to fill the box (Figure 1).

Figure 1. Each students received a small plastic container, tweezers and soil to fill the box. Small, 3-inch-long plantlets were careful placed in soil using the tweezer.

Small, 3-inch-long plantlets were carefully placed in soil using the tweezer and pressed a bit to steady them. Each box was filled with 6 to 8 plant pieces (Figure 2).

The boxes were closed with an airtight lid as part of the hardening off process. The small boxes of plantlets were then placed in a large plastic container in the greenhouse to finish hardening off (Figure 3).

Figure 2. Each box was filed with 6 to 8 plant pieces. The boxes were closed with an airtight lid as part of the hardening off process.

Figure 3. The small boxes of plantlets were then placed in a large plastic container in the greenhouse to finish hardening off.

SOURCES

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