CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

Desiree Ho

Project Number

S1906

Project Title

Cloning African Violets through Autotrophic Tissue Culture

Abstract

Objectives/Goals

Traditionally, tissue cultured plantlets use sugar provided in the medium for energy because the jars in which they are housed are sealed. My objective was to test if sections of African violet tissue would grow at an accelerated pace and have a decreased chance of contamination when provided a sugarless gas-permeable environment.

Methods/Materials

Materials include CO(2) testing solution to determine gas permeability of various plastics, heat sealer to make small plastic bags, 60 glass vials, pressure cooker to sterilize, 4 g Murashige and Skoog medium, 1-Naphthaleneacetic acid (synthetic auxin hormone), 6-Benzylaminopurine (synthetic cytokinin), and coconut water (natural cytokinin).

The CO(2) system is constructed from a bottle with yeast, sugar, and water attached to a bubble counter to gauge gas production, connected by airline tubing to the growth chamber. Ninety sterilized plant sections were housed individually in glass vials covered with gas-permeable Ziploc bag plastic (Autotrophic 1, or A1), small bags made from Ziploc plastic (Autotrophic 2, or A2), and vials sealed by the original screw cap with added sugar (Mixotrophic, or M).

Results

Overall, the explants in A1 and A2 had contamination rates 4 times lower and survival rates 2 times higher than those of M. However, the explants in the M experimental group haddeveloped calli (undifferentiated tissue, the precursor to shoots and roots) with larger biomasses. On the other hand, regardless of the original hormone supplement provided, 83% of the calli in autotrophic conditions differentiated into green shoots with the potential of maturing into adult plants, while 67% of the M group produced roots, which are more difficult to work with and have less potential.

Conclusions/Discussion

I developed a new method of plant propagation through the use of Ziploc bags and CO(2) generated from materials adapted from the fishkeeping hobby. My original hypothesis was partially supported; A1 was the most successful because of its structural stability, while A2 was similar but secondary in success and the M group was least productive. This unique, cost-effective technique may be applied to the cultivation of plant medicines, production of economically significant crops, propagation of fragile or sterile plants, and conservation of endangered species.

Summary Statement

This project investigates the effect of varying levels of gas permeability and carbon sources on the growth and differentiation of cloned African violet plantlets.

Help Received

I designed and performed the experiment at home by adapting information from previous publications focused on different plants and procedures.