Jatropha curcas In Vitro Propagation

Camille González*1, Lauren Kong*2
Ben Tabatabai3, Kamal Chowdhury*4, Matt Reitzel3, Shobha Potlakayala3, Alison Shuler3, Sairam Rudrabhatla3
1University of Puerto Rico - Rio Piedras, Ponce de León Ave., San Juan, PR 00925
2Mills College, 5000 MacArthur Blvd., Oakland, CA 94613
3Penn State – Harrisburg, 777 W. Harrisburg Pike, Middletown, PA 17057
4Clairol University, 400 Magnolia St., Orangeburg, SC 29115

Abstract

Jatropha curcas, a member of the Euphorbiaceae family, is a plant native to tropical regions. Its ability to grow in varied conditions and its high oil content make it one of the world’s most promising non-food biofuel crops. The present study was geared towards developing an efficient tissue culture protocol for Jatropha. Four different types of media, varying in concentration of growth regulators and carbon source, were used for callus induction. Preliminary results suggest that maltose may be a preferable carbon source for callus induction from leaf explants for certain growth regulators combination. In contrast, no considerable difference was observed for cotyledon and hypocotyl callus induction. By developing an effective tissue culture and transformation protocol, cold tolerant Jatropha can be produced to grow in temperate climate.

Materials and Methods

Jatropha Embryo Germination

Jatropha NBM and MC seeds were surface sterilized and the embryos were germinated on JEG5 growth media and incubated under light.

After one to two weeks the cotyledons and hypocotyls of the resulting plants were excised and planted on Jatropha Callus Induction 1-S/M media plates and incubated in a dark growth environment.

Jatropha Callus Induction

Leaf explants from a 3 year old Jatropha plant were collected, surface sterilized and plated on Jatropha Callus Induction media alternating between 5 different concentration of growth regulators and/or different carbon source. The plates were incubated in the dark to induce callus formation.

Results

More than 90% cotyledon and hypocotyl explants from both seed sources produced callus. Hypocotyl explants responded slightly better in sucrose medium. For leaf explants, an interaction between growth regulator concentration and carbon source was observed. The rate of calli formation observed in media JCI 5M (90% calli formation), JCI 5S (70%), JCI 2M (72.5%), and JCI 2S (52%) was observed to be considerably higher than the other media. These findings suggest that utilizing maltose instead of sucrose in combination with growth regulators present in JCI 2 and JCI 5 media might provide a more effective medium for Jatropha tissue culture.

Conclusion and Future Works

Future works will involve regeneration of Jatropha plants from callus, optimization of transformation protocol to introduce cold tolerance gene (CBF3), and regeneration of transgenic plants for growing in temperate climate.

References


Acknowledgments

The National Science Foundation
The Pennsylvania State University – Harrisburg for providing the necessary resources and facilities.
The Central Pennsylvania Laboratory for Biofuels and all its members for their assistance and collaboration on this project.

* Contributed Equally