A Review: Tissue Culturing of Important Medicinal Plants

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Abstract: The genetic biodiversity of traditional medicinal plants is under a continuous threat due to over exploitation environment unfriendly harvesting and loss of growth habitat and unmonitored trade of medicinal plants. Many Endangered plants are tissue cultured by callus growth and somatic embryogenesis. So tissue culture is the best way to conserve the medicinal plant and also the mass production of the medicinal plants. In the present days many medicinal plants are produce in in vitro conditions. By this techniques the desired characteristics are also attain. The productions of secondary metabolites by the plants are also done easily by tissue culture. The genetic transformation is also done by tissue culture.

Key words: Medicinal Plants • Secondary Metabolites • Tissue culture • UOG

INTRODUCTION

At present there are many well established herbal and plant medicine practices (Ayurvedic medicine in India) which are popular in many parts of the world. The World Health Organization (WHO) reported that 80% of people in the developing world use medicinal plants for their primary health care [1]. About 40% of compounds used in pharmaceutical industry are directly or indirectly derived from plants [2]. In last two decades there has been a great increase in research on medicinal plant. A number of new medicines have been discovered and advancements in production technology to harvest pharmaceutical important metabolites. During this period there has also been an increase in research publication on medicinal plants [3]. China and India are the largest markets for medicinal plants in the world. Other major exporters are the Republic of Korea, Chile, Brazil and Thailand [4]. Between 2006 and 2007 a rise in international market prices of many medicinal extracts and essential oils was seen [5, 6].

Tissue Culture Techniques: Micropropagation is the process of vegetative growth and multiplication from plants tissues or seeds. It is carried out in aseptic and favorable conditions on growth media, using various plant tissue culture techniques [7]. Tissue culture is based on concept of totipotency; the ability of plant cells and tissues to develop into whole new plant [8].

The advantages of In vitro micro propagation of medicinal plant are listed below: [9]

- Higher rate of multiplication.
- Environment can be controlled or altered to meet specific needs of the plant.
- Plant available all year round (independent of regional or seasonal variation)
- Identification and production of clones with desired characteristics.
- Production of secondary metabolites.
- New and improved genetically engineered plant can be produced.
- Conservation of threatened plant species.
- Preservation of genetic material by cryopreservation.

The most commonly used explants are shoot tips, nodal buds and root tips. Large explants can increase chances of contamination and small explants like meristems can sometimes show less growth [10]. Explants are cleaned by distilled water and sterilized using mercuric chloride, ethyl alcohol and liquid bleach [11-13]. Sterilization of laboratory instruments is carried out by autoclaving, alcohol washing, baking, radiations, flaming and fumigation [14]. A wide range of media are available for plant tissue culture, but MS [15] medium is commonly used [16]. Other media used are Linsmaier-Skoog (LS) [17], Schenk and Hilderbrandt (SH) [18], WPM (Woody plant medium) [19] and the Nitsch and Nitsch
Hashimoto et al. reported some time ago for about 70 species [34]. Transgenic cultures and plants have been modifying pathways to form pharmaceutically important compounds. To date, however, there has been little success in modifying pathways, leading to changes in flower color, or increased levels of antioxidative flavonol production in tomato [33].

The potential of metabolically engineered plant-derived secondary metabolites is high and has been well documented by modifying anthocyanin and flavonoid pathways, leading to changes in flower color, or increased levels of antioxidative flavonol production in tomato [33]. To date, however, there has been little success in modifying pathways to form pharmaceutically important compounds. Transgenic cultures and plants have been reported some time ago for about 70 species [34]. Hashimoto et al. [35] reported increased production of tropane alkaloids in genetically engineered root cultures. There are several strategies that can be used to enhance the production of desired pharmaceuticals by genetic engineering [36]. Oksman-Caldentey and Inzé [37] have reviewed the work on the production of designer metabolites in the post-genomic domain.

**Genetic Transformation:** Transformations is currently used for the genetic manipulation of more than 120 species of at least 35 families, including the major economic crops, vegetables, fruit trees, as well as ornamental, medicinal and pastures plants [38] based on *Agrobacterium* mediated, or direct transformation methods. The number of GM plant species increases continuously. The argument that some species cannot accept the integration of foreign DNA in their genome and lack the capacity to be transformed can not be accepted, in view of the increasing number of species that have already been transformed; however, the establishment of an efficient tissue culture system still forms the basis for genetic manipulation. Further evaluation of genes stimulating plant cell division or T-DNA integration and of genes increasing the competency of plant cells to accept the integration of foreign DNA in their genome continuously. The argument that some species cannot accept the integration of foreign DNA in their genome and lack the capacity to be transformed can not be accepted, in view of the increasing number of species that have already been transformed; however, the establishment of an efficient tissue culture system still forms the basis for genetic manipulation. Further evaluation of genes stimulating plant cell division or T-DNA integration and of genes increasing the competency of plant cells to *Agrobacterium* may improve transformation efficiency in various systems [39].

**REFERENCES**


