Journal of Experimental Sciences 2011, 2(10): 60-61
ISSN: 2218-1768
Available Online: http://jexpsciences.com/

journal of
experimental sciences

Biotechnology and conservation of medicinal plants

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Abstract

Plants have been an important source of medicine for thousands of years. Medicinal plants are the most important source of life saving drugs. Even today, the WHO estimates that up to 80 per cent of people still rely mainly on traditional remedies such as herbs for their medicines. Medicinal plants are resources of new drugs. Approximately one quarter of prescribed drugs contain plant extracts or active ingredients obtained from plant substances. Many of the modern medicines are produced indirectly from medicinal plants, for example aspirin and digitalis. Plants are directly used as medicines by a majority of cultures around the world, for example Chinese medicine and Indian medicine. Plants are directly used as medicines by a majority of cultures for example Chinese medicine and Indian medicine. Studying medicinal plants helps to understand plant toxicity and protect human and animals from natural poisons. This paper reviews the role of biotechnology for conservation of medicinal plants.

Keywords: Biotechnology, *In vitro*, organogenesis

BIOTECHNOLOGY

Biotechnology is a technology based on biology, especially when used in agriculture, food and medicine. Biotechnology is a scientific method with the organisms to produce new products or new form of organism. Biotechnology is a technique that uses living organism or substance of organism to make or modify product, to improve plants or animal or to develop micro-organism for specific uses. The genetic modification, which leads to improvement of organism, is necessary for production of certain product.

Conservation of medicinal plants through Biotechnology:

Biotechnology has emerged as the most powerful weapon for the conservation of medicinal plants. Biotechnology helps in conservation of plants without affecting main features of the plants. The process of conservation of medicinal plants became very easy with use of biotechnology. There is several techniques in biotechnology for conservation of medicinal plants. Some of these techniques are:-

- Tissue Culture.
- In-vitro Regeneration.
- Callus-mediated organogenesis.
- Genetic Engineering or Genetic Transformation.
- Regeneration through somatic embryogenesis.
- Conservation through cryopreservation.
- Development of Beneficial microbes.

TISSUE CULTURE

The propagation of a plant by using a plant part or single cell or group cell in a test tube under very controlled and hygienic conditions is called "Tissue Culture". It plays an important role in conservation of medicinal plants in different ways like:-

- By quickly producing mature plants.
- By producing multiples of plants in the absence of seeds or necessary pollinator to produce seeds.
- By regenerating whole plants from plant cells that have been genetically modified.
- By producing plants from seeds that otherwise have very low chances of germinating and growing etc.

In vitro regeneration

In-vitro propagation of plants holds tremendous potential for the production of high-quality plant-based medicines4.conservation of medicinal plants[1]. This can be achieved through different methods including micro propagation. Micro propagation has many advantages over conventional methods of vegetative propagation. With micro propagation; the multiplication rate is greatly increased. It also permits the production of pathogen-free material by the plants. Numerous factors are reported to influence the success of *in-vitro* propagation of different medicinal plants[2].

Callus-mediated organogenesis

- Plant callus is a mass of undifferentiated cells derived from plant tissue.
- Callus cells are those cells that cover a plant wound.
- To induce callus formation, plant tissues are surface sterilized and then plated onto in vitro tissue culture medium.
- This so formed callus is now used for the production particular organ of he plant or plant itself.
- The castor-bean, one of the medicinally important crops, largely cultivated by this technique. Satheesh and Bhavanandan

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have reported the regeneration of shoots from callus of *Plumbago rosea* using appropriate concentrations of auxins and cytokinins[3].

Genetic Engineering or Genetic Transformation

Term genetic transformation refers the ability to move DNA or gene into an organism and thereby alter its genotype or genetic makeup. Common Plant Transformation Methods are:-

- Agrobacterium tumefaciens - transfer of DNA from bacteria to plants.
- Electroporation - electrical impulses are used to increase membrane and cell wall permeability to DNA contained in the surrounding solution.
- Microinjection - injection of DNA directly into the cell nucleus using an ultrafine needle.
- Poly-ethylene-glycol - plant cell protoplasts treated with PEG are momentarily permeable, allowing uptake of DNA from the surrounding solution.

Regeneration through somatic embryogenesis

Somatic embryogenesis is a process where groups of somatic cells/tissues lead to the formation of somatic embryos. This resembles the zygotic embryos of intact seeds and can grow into seedlings on suitable medium. This technique has been demonstrated in many medicinal plant species. Embryogenic calluses and germination of somatic embryos in nine varieties of *Medicago sativa* has been achieved[4].

Conservation through cryopreservation

The cryopreservation of in-vitro cultures of medicinal plants is a useful technique. Cryopreservation is long-term conservation method in liquid nitrogen (–196 °C) in which cell division and metabolic and biochemical processes are arrested. Since whole plants can regenerate from frozen culture, cryopresevation provides an opportunity for conservation of endangered medicinal plants. e.g *Rauvollfia serpentine, D. lanalta, A. Belladonna.*Cryopreservation is long-term conservation method in liquid nitrogen (–196 °C) in which cell division and metabolic and biochemical processes are arrested. A large number of cultured materials can be stored in liquid nitrogen[5].

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