Tissue Culture in Medicinal Plants

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Since ancient times, mankind has been dependent on plants for food, shelter, medicine and many other uses. The World Health Organisation (WHO) reported that 80% of people in the developing world use medicinal plants for their primary health care. The massive demand of medicinal plants is depicting quite fast due to deforestation, over exploitation and unscientific collection of flora of medicinal and aromatic plants. To cope up this situation, plant tissue culture is the promising technique. Small pieces of tissue (named explants) can be used to produce hundreds and thousands of plants in a continuous process (micropropagation). A single explant can be multiplied into several thousand plants in relatively short time period and space under controlled conditions. Tissue culturing of medicinal plants is widely used to produce active compounds for herbal and pharmaceutical industries.

PTC is the aseptic culture of cells, tissues, organs and their components under defined physical and chemical conditions in vitro. The theoretical basis for plant tissue culture was proposed by a German physiologist, Gottlieb Haberlandt in1902, who proposed concept of tissue culture technology for which he is regarded as the father of plant tissue culture.

Medicinal plants is under a continuous threat due to over exploitation, increasing demand for good quality raw materials, decreasing wild sources of medicinal plants and most of medicinal plants either do not produce seeds or seeds are too small and do not germinate in soil. Different techniques in plant tissue culture may offer certain advantages over traditional methods of propagation, such as the production of exact copies of plants that produce particularly good flowers, fruits, or have other desirable traits, quickly produce mature plants, the production of multiples of plants in the absence of seeds or necessary pollinators to produce seeds, the regeneration of whole plants from plant cells that have been genetically modified, the production of plants in sterile containers that allows them to free from microbes to ensure the desired development

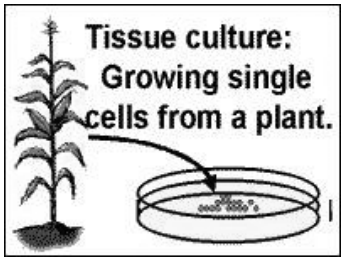
PTC is an integral part of the plant biotechnology and is an alternative to conventional methods of propagation. It plays a vital role in biodiversity conservation and economic development globally Plant tissue culture technology is being widely used for large scale plant multiplication. Plant tissue culture techniques

have in recent years, become of major industrial importance in the area of plant propagation and disease elimination.

The most commonly used explants are shoot tip, nodal buds and root tips Plant cells have certain advantages over animal cells in culture systems. Unlike animal cells, highly mature and differentiated plant cells retain the ability of totipotency the technique which refers to the ability of a single cell to express the full genome by cell division.

The steps to do the plant culture

Plant cells can be removed from various parts of a plant and placed on media in petri plates. The media does not contain the growth hormones normally present in a plant that tells the cells which tissue to develop into. As a result, the cells do not differentiate and instead form a mass of cells called a callus that is not differentiated into at the tissue level.

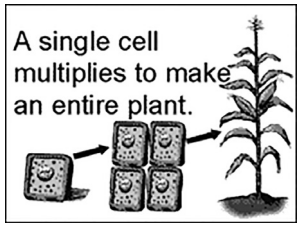


Cells are taken from plants and grown into undifferentiated masses called callus.

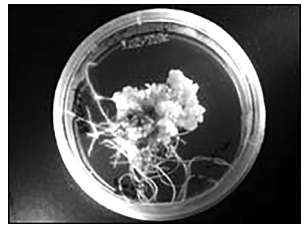
Immature embryos are removed from seeds and placed on media. Callus cells will then begin to grow from them.

Callus is masses of undifferentiated cells.

Since plant cells are totipotent, growth hormones can be added to the media triggering the callus cells to develop roots, shoots and eventually entire plants. Plants regenerated from tissue culture will be clones genetically identical to the cell they originated from.



Single cells can be regenerated into entire plants.



Growth hormones can be added to the media and the cells will begin to divide and differentiate into plants.

Regenerated plants are then transferred into test tubes. Once they have reached a certain size, they will be transplanted into soil.

List of some Medicinal plants In-vitro culture

Species Name	Explants	Reference
Acorus calamus	Rhizome tip & Rhizome segment	Yadav et.al., 2011
Aloe vera L.	Shoot apex	Cavallini et al.,1991
Azadirachta indica A. Juss	Nodal stem segment	Chaturvedi et al.,2004
Bacopa monniera (L.)	Leaf, inter-node & nodal stem segment	Tiwari et al.,2000
Catharanthus roseus (L.)	Shoot tip	Bajaj, et al.,1988
Digitalis lanata	Shoot tip ,Meristem	Erdei et al., 1981
Glycyrrhiza glabra L	Shoot bud, Shoot tip & nodal stem segment	Thengane et al.,1998
Hyocyamus niger L.	Petiole	Cheng and Raghwan, 1985
Ocimum basilicum L.	Axillary bud	Ahuja et al.,1982
Rauvolfia serpentina (L.)	Nodal stem segment	Chaturvedi, 1979

Conclusion and Discussion

Presently tissue culture is a best way to conserve the medicinal plant and also the huge production of the medicinal plants as well to produce plants of superior quality and long term negative impact an environment can be prevented.