

## **SCOPE & SIGNIFICANCE OF “PLANT TISSUE CULTURE” (PLANT PROPAGATION) TECHNIQUE IN AYURVEDA, ITS MERRITS & DEMERRITS & ITS REFERENCES IN ANCIENT CLASSICS**

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### **ABSTRACT:**

One of the prerequisite for the success of primary health care is the availability and use of suitable drugs. Plants have always been a common source of medicaments, either in the form of traditional preparations or as a pure active principal. An endangered species is a native species that faces a significant risk of extinction in the near future throughout all or a significant portion of its range. Such species may be declining in the number due to threats such as habitat destruction and climate change. Therefore, the management of traditional medicinal plant resources has become a matter of urgency. An ever increasing demand of uniform medicinal plants based medicines warrants their mass propagation through plant tissue culture strategy. Plant propagation is the process of creating new plants from a variety of sources: seeds, cuttings and other plant parts. Plant propagation can also refer to the artificial or natural dispersal of plants.

**KEYWORDS:** Tissue culture, Biotechnology, Vrikshayurveda, Krishiparashara

### **INTRODUCTION:**

For the success of primary health care is the availability and use of suitable drugs. Plants have always been a common source of medicaments, either in the form of traditional preparations or as a pure active principal. An endangered species is a

native species that faces a significant risk of extinction in the near future throughout all or a significant portion of its range. Such species may be declining in the number due to threats such as habitat destruction and climate change.

Medicinal plants participating remarkable role in primary health care of the people over the world. Forest is a main source for collection of the traditional medicinal plants. Presence of plant species in certain ecological areas is related to several ecological factors like water, temperature, light, pH etc. and also by various biotic factors.

India has a very rich plant biodiversity, many of which are medicinally useful. The rich resource is disappearing at an alarming rate as a result of over exploitation. Therefore, the management of traditional medicinal plant resources has become a matter of urgency. An ever increasing demand of uniform medicinal plants based medicines warrants their mass propagation through plant tissue culture strategy.

Plant propagation is the process of creating new plants from a variety of sources: seeds, cuttings and other plant parts. Plant propagation can also refer to the artificial or natural dispersal of plants whereas cultivation means to grow them in a better manner.

### **SCOPE & IMPORTANCE:**

Biotechnology has rapidly emerged as an area of activity having a marked, realized as well as potential impact on virtually on all domains of human welfare, ranging from food processing, protecting the environment to human health. As a result, it now plays a very important role in employment, production and productivity, trade, economy, human health and quality of human life throughout the world.

Tissue culture consists of growing plant cells as relatively on organized masses of cells on an agar medium (callus culture) or as a suspension of free cells and small cell masses in a liquid medium. Tissue culture is used for vegetative multiplication of many species and in some cases for recovery of virus free plants.

### **REVIEW ON TISSUE CULTURE**

#### **HISTORY:**

Plant tissue culture encompasses culturing of plant parts on an artificial medium. The plant parts can be a single cell, tissue or an organ. It is also referred to as micro propagation. Plant tissue culture was practically implemented for the first time by Haberlandt, a German scientist, in 1902. Later in 1934, Gautheret found

successful results on in-vitro culture of plants.

In 1902, Haberlandt reported culture of isolated single palisade cells from leaves in Knops salt solution enriched with sucrose. The cell remained alive for up to one month, increased in size, accumulated starch but failed to divide. Efforts to demonstrate totipotency led to the development of techniques for cultivation of plants under defined conditions. This was laid possible by the brilliant contributions from R.J.Gautheret in France and P.R.White in USA during 3<sup>rd</sup> and 4<sup>th</sup> decades of 20<sup>th</sup> century.

Presently plant tissue culture is practiced for two main purposes viz., regeneration of plants and formation or production of useful secondary metabolites. Regeneration of whole, fertile plants from selected or biotechnologically engineered cells has been achieved in many cases. It is done mainly with the technique of organogenesis and in few cases with embryogenesis. Plant regeneration technology is applied for various purposes like production of virus free plants, germplasm storage and studies on plant biology.

## **MERITS AND DEMERITS OF PLANT TISSUE CULTURE:**

### **MERITS:**

- To produce many copies of the same plant then which may be used to produce plants with better flowers, odors, fruits or any other properties of the plants that is beneficial to the human beings.
- To produce plants anytime we want, although the climate is not appropriate.
- If there is a plant with partially affected tissue, it is possible to produce new plant without infection.
- Very helpful in genetically modified organism studies.

### **DEMERITS:**

- If large scale production is being thought, the cost of equipments is very expensive.
- The procedure needs special attention and diligently done observation.
- The infection may continue through generations easily if possible precautions are not taken.

### **ANCIENT ASPECT OF TISSUE CULTURE:**

Vrikshayurveda is one of the best forms & have huge concept in every field for the plants. New technologies developed for the conservation of medicinal plants in the form of tissue

culture is now necessary to prevent their extinction from the earth. Vrikshayurveda mainly deals with various species of trees, their healthy growth & productivity. The text mentions about 170 species of plants including herbs, shrubs & trees. Special references are made to procuring, preserving treatment of seeds & plant materials. Seed treatment, prior to sowing, to ensure successful & vigorous germination were given lot of importance. The most noteworthy fact in Vrikshayurveda is that it applies the tridhatu theory of ayurveda (the science of life) to plants. Kapha, pitta and vata are considered as the basic components of the plants, too, as of humans and the theory that a balance of the three indicates health and imbalance caused due to variation of anyone or more of them indicate disease is extended to plants too, justifying its title Vrikshayurveda. Even the treatment material prescribed in many cases is the same or similar to that of humans. Surupala, generally considered plants as equal and in some respect even superior to humans as stated above. But in this he treats them specifically equal to humans.

Surapal's Vrikshayurveda is a systematic composition starting with the glorification of trees and tree planting. It then proceeds to discuss various topics connected with the science of plant life such as procuring, preserving, and treating of seeds before planting; preparing pits for planting saplings; selection of soil; method of watering; nourishments and fertilizers; plant diseases and plant protection from internal and external diseases; layout of a garden; agricultural and horticultural wonders; groundwater resources; etc. All these observations lead one to accept the text as an independent, full-fledged work on the subject of Vrikshayurveda.

The text explains following points as:

1. Bhoomi Niroopana- Explains the classification ,fertility & selection of the soil
2. Beejotpatti Vidhi- About classification & preservation of the seeds
3. Paada Vivaksha- About morphology & physiology of the plants
4. Ropana Vidhi- Cultivation of the different plants like Vriksha,Gulma,Lata etc

5. Nishechana Vidhi- About irrigations & preparations of special organic manure

This is one of the valuable reference we find in those era about the agriculture technique, horticulture technique & arbori horticulture. This reference highlights about the propagation of plants, their treatment in diseased state & factors which influences for their growth. This reference is a boon in today's era & can be correlated with the modern micro propagation technique (Tissue culture).

Another classical reference is by name "**Krishiparashara**". Two aspects must be taken into account while discussing the identity of the author: (i) Parashara being a gotranama; i.e., a family name, it can be shared by several individuals belonging to the Parashara clan; and (ii) in ancient India the followers of a certain school of thought used the same name which was usually the name of the founder of that school. The author of Krishi-Parashara was perhaps earlier than the 6th century AD but certainly not later than the 11th century AD. Leaving Parasharas associated with the Vedas, Mahabharata, and Artha-

sastra outside the present context of Krishi-Parashara, on account of their antiquity, Varahamihira's references to Parashara as an authority on agriculture, astronomy, astrology, and meteorology become the starting point for fixing the date of the author of Krishi-Parashara.

The word 'krishi' has also these shades of meaning and through them takes us to the very root of this epoch-making discovery of agriculture that revolutionized man's life on earth. Agriculture necessarily involves hard work.

'Krishi ' a derivative of the same root means' cultivated land'. The meaning of the word is further extended to indicate 'inhabited land' since cultivation brought with it inhabitation. The nomadic culture came to an end and people began to settle down wherever they undertook cultivation. Ultimately the word 'krishti' came to mean 'the inhabitants of a cultivated land'. In this sense the word indicated a particular race of people. Thus it is clear that the word 'krishi' shows an inter link between agriculture on one hand and man's history of civilization on the other.

The book is written for the benefit of farmers. Thus it is the theory of agriculture expounded in such a manner that the farmers would benefit by its application to their profession. It is in a way a farmer's almanac containing astronomical and meteorological data arranged according to the seasons and months of ancient India. It is the farmers' ready reckoner containing the basic data of geographical and climatic conditions, which can help him in planning and managing the activity of farming

In meteorology, Parashara has laid down some Principles of studying the climatic and atmospheric conditions through careful observations. He has advanced several methods and theories of rain forecast. His main technique of rain forecast is based on the position of the Moon and the Sun.

Basic rules for general management of agriculture are eloquently expressed. Detailed instructions to farmers regarding procuring and preserving seeds, plowing, sowing, water management, weeding, plant protection, harvesting, threshing, measuring food grains and storing them are given in a scheduled form

along with precautions to be taken from time to time. Knowledge of climatic conditions largely dependent on astronomical theories, vigilance, hard work, and love for the agricultural profession are stated to be the essential qualities of a successful farmer.

#### **DISCUSSION:**

Biotechnology comprises the controlled and deliberate application of simple biological agents- living or dead cells or cell components- in technically useful operations, either of productive manufacture or as service operation.

Thus the main features of biotechnology are the utilization of biological entities (micro-organisms, cells of higher organisms - either living or dead), their components or constituents (e.g. Enzymes) in such a way that some product can be generated. This product should obviously enhance human welfare.

The term tissue culture is commonly used in a very wide sense to include in-vitro culture of plant cells, tissues as well as organs. But in a strict sense, tissue culture denotes the in-vitro cultivation of the plant cells in an unorganized mass e.g., Callus culture. Another term, cell culture is used for

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in-vitro culture of single or relatively small groups of plants cells, e.g., suspension culture. Clone multiplication of large number of plants within limited time and space without interruption of external climate.

**CONCLUSIONS:**

- Through plant tissue culture we can conserve the extinct medicinal plants.
- This also helps for the good qualitative and quantitative production of medicinal plants.
- Drugs which are distributed at a particular region can be cultivated and made easily available, which are rarely available (irrespective of climatic conditions).

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