Advanced techniques of conservation and cultivation

Kulkarni D.V. ¹*, Pawar Renuka Shahaji ², Kudale Ruchita Raghunath ³

1. Professor and Head of Dept.,
2. P. G. Scholar,
3. P. G. Scholar,

Dravyaguna Dept., Government Ayurvedic College, Osmanabad, Maharashtra

*Corresponding author: e mail: dvkulkarni13@gmail.com

Abstract

Since ancient times, various plants are being traditionally used, as medicine throughout the world. These plants are cultivated as well as collected from wild. Some important medicinal plants, which have source of wild, are difficult for collection. The best way to provide the plants needed for medicinal purposes is to cultivated rather than collecting them from wild. Now a days, some medicinal species are in risk of disappearing due to man-made and natural calamities. So there is need of conservation of medicinal plants to maintain sustainable development by protecting and using biological resources in ways that do not diminish the world’s variety of genes, species, habitats and ecosystems. Medicinal plants can be cultivated by cutting, layering, grafting and budding and conservation mainly included activities like collection, propagation, characterization, evaluation and eradication, storage and division. On the other hand, some modern techniques have been also established for the better growth and maintenance of medicinal plants such as In-Situ & Ex-Situ conservation, Germplasm technique, cryopreservation technique, tissue culture technique. This review gives information about various cultivation methods to reduces misidentification and adulteration of medicinal herbs and also shows importance of modern techniques of conservation, management and sustainable utilization of medicinal plants for human health care. This information will definitely useful for quality of herbal medicinal products and reduced uncertain therapeutic effects.

Keywords:
Cultivation; conservation; Medicinal plants; Advanced techniques.

Introduction:

Medicinal plants play significant role in the health care system. The traditional health care practice is mainly dependant on medicinal plants and they collected from wild. The Indigenous knowledge associated with the conservation and use of medicinal plants is also endangered at this condition.¹¹

World Health Organization (WHO) study (2002) clearly reveals that the use of medicinal plant is likely to increase globally in herbal medicine.

Medicinal plant species is diminished by deforestation, population growth,
urbanization. So difficulties from collection of plants from forest and the problem in fronting of heavy demand of medicinal plants so necessary for cultivation and conservation of medicinal plants.²

Domestic cultivation is only option that is possible to decrease pressure on wild population and solve problems in the production of herbal medicines.³

Loss of medicinal plants can be fulfilled with the help of conservation and cultivation of herbal medicines. Now a days, there is increase in demand of herbal medicine but supply is short. So the best way to provide the plants needed for medicinal purposes is to cultivate them.⁴

At present, modern medicines have their own limitations. People are aware about its side effects and preferring ayurvedic medicines for treating diseases. Preparing good herbal products to satisfy public demand is need of time. For quality products, well identified and authenticated herbs are needed. In ayurvedic formulation, rare and wild habited herbs are involved. It is very difficult to collect such herb for preparations. For this good cultivation and conservation practice is needed.

AIM:
- To study of protection, preservation, management of natural resources.

Objectives:
- To discuss Advanced techniques of cultivation and conservations.
- To increase public awareness through this advanced techniques.

Material and Methods:

Need for conservation and cultivation:

The aim of conservation is development by protect biological resources and save worlds important medicinal plant species.

The demand of medicinal plants is increasing with growth in human needs. According to Walter and Gillett; 34,000 species of the world flora are endangered with destruction as a result of excessive use.

Medicinal plants are diminished because of deforestation, urbanization; growing population so cannot provide original herbs. In result of this adulteration, substitution are done and unable to perform desire effect so there need time for conservation and cultivation of medicinal plants.

Herbal plants use and demand increased like cosmetics, food, industry, so naturally present plants reduced day by day and old agriculture techniques are not enough for increasing demand so we can used advanced techniques of conservation and cultivation.

Only a few medicinal plant species are being cultivated, so this is not sufficient for increasing demand and growth of population since this condition need for used Advanced techniques of conservation and cultivation.⁵,⁶

Advanced techniques of conservation -

1] In-Situ and Ex-Situ conservation– Sharma and other describe that In-Situ conservation included of species in their natural habitats. Ex-Situ conservation involves outside the native habitat it include methods like seed storage, DNA storage, pollen storage, in vitro conservation.⁷

2] Germplasm Technique for conservation– Venkata Naveen Kasagana and other describe The species with recalcitrant seeds in live gene banks in
fields poses tremendous problems in terms of required land space and labour input during annual testing and documentation.\[8\]

**Advantages –**

1. Needs small space for storage
2. Pest attack in culture vessels is prevented

**Disadvantages –**

1. Some species do not produce viable seeds
2. Some species seeds deteriorate rapidly due to seed born pathogen

**3] Cryopreservation technique for conservation – [8]**

Venkata Naveen Kasagana and other describe that viable material storage at ultra-low temperatures (-196\(^0\)C) and using liquid nitrogen or nitrogen gas, based on following unique combination.

- Chemically inert
- Relatively low cost
- Non toxic
- Non – flammable
- Readily available

New cryopreservation techniques –

1. Encapsulation and dehydration
2. Vitrification
3. Encapsulation and vitrification
4. Desiccation
5. Pregrowth
6. Pregrowth and desiccation
7. Droplet freezing

Cryopreservation procedures - Three different procedure have been used for cryopreservation of plant cells.

Two – step freezing – This procedure involve an incubation of cells in a mixture of cryoprotectants which causes moderate dehydration of the cells, followed by a slow freezing step .(for ex: 1\(^0\)C / min down to app -35\(^0\)C).

Vitrification – Procedure is based on severe dehydration at non-freezing temperatures by direct exposure to concentrated cryoprotectants and it is followed by rapid freezing.

**4] Tissue culture techniques – [8]**

Venkata Naveen Kasagana and other describe that following step in Tissue culture techniques

1] Cell suspensions –

**Pre- treatment:** standard medium containing 6% mannitol and cultured under standard conditions.

Cryopreservation: A double strength cryoprotectants solution (1M dimethyl sulfoxide + 1M glycerol + 2M sucrose) is prepared and one volume of cryoprotectants solution is added to one volume of cell suspension and the mixture is incubated on ice for 1hr.

Storage – The ampoules are in or over liquid nitrogen.

Thawing- The ampoules are dropped into sterile water at about 40\(^0\)C. With a ratio of 4 ampoules to 150 ml water.

Regrowth- After 5-6 days, the cells alone are transferred to agar medium.

2] Zygotic embryos:

Pregrowth: The embryos are removed from the seed then put on Petri dish and open to a sterile airflow in a laminar flow cabinet for 3h.
Cryopreservation: Plastic ampoules containing the embryos are absorbed in liquid nitrogen.

Thawing: The plastic ampoules are transferred to a water bath at 37-38°C. Then sited on moist sterile filter paper in petri dishes for 10 days.

Regrowth: The embryos are added After 10 days for a standard growth and stimulate growth into plants zygotic embryos.

3) Adventitious buds:

Pregrowth: Uniformed nodes (5 mm in length) containing an adventitious bud are removed from stem sections of plants.

Cryopreservation: Nodes are transferred to plastic ampoules then immersed in liquid nitrogen and stored under liquid nitrogen.

Thawing : Nodes are thawed in a water bath at 25°C.

Regrowth: Because of their size, nodes can be shifted individually to a standard growth medium and the adventitious bud is stimulated to develop as a shoot.

Advantages of tissue culture

a. To quickly produce mature plants.

b. The absence of seeds production of multiples of plants

c. The whole plants are regenerated from plant cells that have been genetically modified.

METHODS OF CULTIVATION: [9]

1] Corms: In a corm, the storage organ is swollen base of the stem and this is wrapped in thin scale-leaves, has an axillary bud

e.g. Colchicum, Saffron

2] Rhizomes:

In underground stems, the older parts of rhizomes die off. The bud borne on the detached younger portion thus become separate new plants.

e.g. Ginger, Turmeric

3] Runners:

The stem raises along the ground and grows roots and erect flowering shoots from lateral buds at many of its nodes. The growth of the stem is continued through terminal bud.

e.g. Peppermint, Strawberry

4] Offsets:

These developed from the axial of the leaf, short thick horizontal branches are present and rosette type of leaves and a cluster of roots at their bottom is its specific character.

e.g. Aloe

5] Stolon :

A creeping stem that roots at nodes.

e.g. Liquorice, Strawberry

6] Suckers:

A short arising from a root of a woody plant. e.g. Mint, Pineapple

CONCLUSION :

It helps the Conservation and cultivation of endangered Spesies of medicinal herbs and their habitats for livelihood security through conservation and cultivation of wild medicinal herbs based on sustainable harvesting and by implementing various conservation techniques.

Medicinal plant species is diminished by deforestation, population growth, urbanization. There are difficulties from collection of plants from forest and the
problem in fronting of heavy demand of medicinal plants. Hence it is necessary to cultivate and conserve the medicinal plants.

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