



Importance of Biotechnology in Endangered Medicinal Plants

(Ms. Anamika Tiwari, *Ms. Priyancka Arora, Dr. Ajay Kumar, Dr. Dinesh Chand Agrawal and Dr. Vivek Srivastava)

Department Of Biotechnology, Faculty of Engineering and Technology, Rama University, Mandhana, Kanpur, Uttar Pradesh, India

* priyancka.fet@ramauniversity.ac.in

From thousands of years plants have been important source of medicine and also identified as the source of many modern medicines. It is estimated that approximately one quarter of prescribed drugs contains plant active ingredients which can be modeled on plant substances. The most popular analgesic, aspirin was originally derived from species of *Salix* and *Spiraea* and therefore some of the most valuable anti-cancer agents such as paclitaxel and vinblastine are derived solely from plant sources. However medicinal plants are also one of the most important sources of life saving drugs for the majority of the world's population. Medicinal plants are nature's hidden and unexplored treasures for humanity since immemorial time and over 35,000 have been used virtually in all human cultures around the world. The cultivation of medicinal plants for food, health care and cure databases back to the late Mesolithic of early Neolithic age roughly about 10,000 BC. Medicinal plants represent a wide variety of plant groups ranging from algae, fungi, lichens and flowering plants. The drug-yielding medicinal plants are classified on the basis of the morphology of the plant part from which the drug is extracted. Although in today's world a number of medicinal plants are vanished which cannot be found any region.

The role of Biotechnology in plants indicates about different types of tools which are usually important for multiplication and genetic enhancement of the medicinal plants. The biotechnological tools are important to select, multiply and conserve the critical genotypes of medicinal plants. By the help of Biotechnology techniques several endangered medicinal plants can be obtained such as the process of in-vitro regeneration and genetic transformations. The biotechnological method plays an very important and essential role in in-vitro cultures and clonal propagation for the production of enormous number of identical plants. The micro-propagation is considered to have the greatest commercial and economical importance for the rapid propagation and ex-situ conservation of rare, endemic and endangered medicinal plants. The biotechnological tools are highly powerful and power-packed methods for modifying genetic information and gene expression are available today, to obtain new valuable compounds with new properties.

Some of the most common biotechnological techniques are listed below:-

- The in-vitro regeneration of plants holds the tremendous potential for the production of high quality plant based medicines which can be achieved through different methods including micro-propagation, callus mediated organogenesis, regeneration through somatic embryogenesis, production of secondary metabolites from medicinal plants.

- The genetic transformation is the recent and advance technique of biotechnology which is used in development of medicinal plants. Transformation is currently used for genetic manipulation of more than 120 species of at least 35 families, it also includes the major economic crops, vegetables, ornamental, medicinal, fruit, tree and pasture plants with the help of using *Agrobacterium* mediated or direct transformation methods
- Callus mediated organogenesis is the induction of callus growth and subsequent differentiation and organogenesis is accomplished by the differential applications of growth regulators and the control of conditions in the culture medium.
- Somatic embryogenesis the process where the groups of somatic tissue leads to the formation of somatic embryos which although resembles the intact of the seeds and can grow into seedlings on a suitable and appropriate medium.
- Cryopreservation of in-vitro cultures of a medicinal plants is a very useful technique which involves the long-term conservation method in liquid nitrogen (-196 degree Celsius) in which cell division and metabolic and biochemical processes are arrested.

The most common biotechnological tools used in endangered medicinal plants are micro-propagation and in-vitro callus induction. The two examples of utter most endangered medicinal plants species with have been treated with biotechnological tools have been listed below:- (*Thymus persicus*) and (*Curculigo orchioides*)

Thymus persicus

The genus *Thymus* L. (Lamiaceae) comprise of 3 hundred species of herbaceous annuals and perennials which are widely distributed throughout the old world. These medicinal plants serve as a natural source of monoterpenes-phenolic oils, oleoresins & fresh and dried herbs used for many centuries in traditional medicine due to their antiseptic, carminative, antimicrobial, antiviral and anti-oxidative properties. This genus is represented in the flora of Iran by 14 species including *Thymus persicus* Jalas which are endemic in nature. The plants aerial part is interesting source of pentacyclic triterpenoids which is betulinic acid (BA), oleanolic acid (OA) and ursolic acid (UA). The BA, OA and UA are highly valuable compounds because of their wide spectrum of biological activities like anti-inflammatory, hepatoprotective, antitumor, anti HIV, antimicrobial, antifungal, antiulcer, gastro protective, hypoglycemic and anti-hyperlipidemic.

Although this endangered medicinal plant is treated by the IVP (In-vitro propagation) IVP protocols have already been established for *Thymus* species, such as *T. vulgaris* and *T. longicaulis* and *T. lotocephalus*. Recently micro-propagation of *T. persicus* is performed via direct organogenesis. The present work reports an efficient protocol for achieving high-frequency shoot induction and plant regeneration, starting from a callus culture of *T. persicus* and for the reintroduction of the produced plants into their natural habitat.

Curculigo orchioides

Curculigo orchioides Gaertn family hypoxidaceae also known as “Kali musli” is a monocot with tuberous root sacks. This species is a stem less perennial herb of a medicinal importance and native of India. The plant is one of the first plant species which appears in the forest after the first shower of rains and also the last to disappear on completion of monsoon. “Kali musli” is reported to have hypoglycemic, spasmolytic and anti-cancer principles. The rhizome of this endangered medicinal plant is also prescribed for the treatment of piles, jaundice, asthma, diarrhea and on pimples. The species of plant have been become endangered due to depletion in the natural habitat which supports the vegetation. There are some of the following major factors for the depletion of medicinal plants which are as follows:-

- a. Extensive denudation of the forest floor which is caused by cattle gazing and collection of leaf litter.
- b. The removal from the wilderness for tuberous roots which are highly priced in the market for its metabolic enhancing principles and aphrodisiac formulations.
- c. The poor seed settling and germination.
- d. The high incidence of viral and bacterial diseases affecting rhizomes.
- e. The use of plant as a substitute for safe musli.

The endangered medicinal plant is treated with the micro-propagation biotechnological technique with the help of MS medium and as a result the multiple shoots were obtained from the meristem tip culture which was supplemented with BA. After that the in-vitro plantlets were transferred to pots.

