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Perspective

Role of Micropropagation in Medicinal Plant Tissue Culture

Yong Cheol Kim*

Department of Herbal Medicine, University of Science and Technology, Daejeon, South Korea

DESCRIPTION

Only a portion of herbal products are made from grown biomass; medicinal plants are still the primary source of treatments for many diseases. The majority of the supply for treatments comes from wild harvests, and these techniques endanger species variety as well as the quality and security of the finished goods. In order to address the problems with the supply of therapeutic natural substances, it is important to demonstrate the value of turning medicinal plants into crops and the use of micropropagation as a way to mass produce high-demand biomass. Plant tissue culture technology has been a crucial tool in crop improvement and development for more than a century. It allows for the production of disease-free plant material, the acquisition of transgenic plants, the breaking of dormancy, and the micropropagation of elite plants with highly desirable chemotypes, which results in more uniform plant production. This technology allows for the preservation of elite, rare, and endangered plant species' *in vitro* germplasm, the implementation of breeding programs for a wide variety of crops and encapsulated seeds, the study of plant biosynthesis through cell and root cultures, and the interaction between endophytes and the hostplant. High-demand plants confront several difficulties: The case for growing rare and elite high-yielding medicinal plants is strongly supported by the loss of species variety brought on by overharvesting and environmental degradation that affects native populations.

With the aid of contemporary plant tissue culture techniques, exceptional plants may be rapidly multiplied through the *in vitro* process of micropropagation. Although it is well recognized for its usage in the agronomy, horticulture, and forestry sectors, this study concentrates on a less well-known subject: the necessity to cultivate medicinal plants as crops. Pharmaceutical crops were classified into three groups: those used to produce Small Therapeutic Molecules (STMs), Standardized Therapeutic Extracts (STEs), and Big Therapeutic Molecules (LTMs). To assure the growth of functional food plants as a crop, this review also looks at micropropagation.

For agricultural purposes, micropropagation enables the bulk production of genetically identical chemotype plants. The tetracyclic oxindole alkaloid working on the central nervous system and the pentacyclic oxindole alkaloid impacting the immune system, may have different therapeutic qualities in Cat's Claw. Both alkaloid combinations have an antagonistic immunological impact, making them potentially inappropriate for therapeutic use. Chemical characterization is necessary before harvesting and maybe even before growing in order to produce safe and effective Cat's Claw phytomedicinal. In order to standardize a certain chemotype, micropropagation also enables the selection of plants depending on the chemical profile. The chemical makeup of *Lippia sidoides Cham* (also known as *Lippia origanoides*) varies depending on the location of cultivation. The main ingredient in essential oils derived from crops produced in northeastern Brazil is *thymol*, but the main ingredient in *L. sidoides* collected in Lavras, Minas Gerais, and in So Gonçalo do Abaeté, Minas Gerais, Brazil, is 1.8-cineole, isoborneol, and bornyl acetate. Standardized *L. sidoides* essential oil is advised for topical use as an antiseptic on the skin, mucous membranes, mouth, throat, and vaginal washings. Chemical polymorphism in thymol and carvacrol is controlled by genotype. The type of industrial application and biological characteristics are likely to be influenced by phenotypic diversity. Clones of thymol or carvacrol were planted to assure a high-quality biomass for products that would be safe and effective. Finally, micropropagation is effective in easing consumption pressure on wild populations that might be in danger. For instance, the genetic diversity of Stryphnodendron polyphythum Mart. natural resources has been diminished by the extraction of barbatimo bark for the production of phytomedicine. This Brazilian tree's bark is frequently used as a phytomedicine for wound healing because of its anti-inflammatory, antioxidant, and antibacterial properties. The therapeutic effects of the bark are attributed to the proanthocyanidins contained in it. The parameters for in vitro germplasm conservation to lessen pressure on the barbatimo species' endangered status.

Correspondence to: Yong Cheol Kim, Department of Herbal Medicine, University of Science and Technology, Daejeon, South Korea, E-mail: yongcheol@ac.kr

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