



THE SIGNIFICANCE OF CULTIVATING MEDICINAL AND AROMATIC PLANTS UNDER GREENHOUSE CONDITIONS

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INTRODUCTION

In 2004, it was projected that the global market for plant-based medications was worth more than \$15 billion. The demand is rising in both industrialised and developing countries, and the worldwide trade of plant-based pharmaceuticals is emerging as a key strength in the international economy. Nevertheless, the rapid expansion of the plant-based medicine industry has been followed by difficulties with efficacy, consistency, and quality that have resulted in major health hazards as compared to conventional field-grown or wild-harvested plants. The issues surrounding the cultivation, harvesting, and processing of traditional medicines for the creation of phyto-pharmaceuticals are covered in this article. We argue that it's essential to safeguard the security and effectiveness of plant-based medications as well as the genetic variety of therapeutic plants. An solution is the farming of medicinal herbs in controlled environments, which enables precise control of optimal climate factors with highest biomass and the production of medicinal metabolites, as well as guarantees that the plants are free from both abiotic and biotic toxins and have consistent biochemical statuses. The controlled conditions system also permits the application of certain, controlled environment stressors that, by causing organic biochemical

modifications in plants, can maximise the generation of therapeutic metabolites.

The Problems concerning Plant-Based Drugs

1. Abiotic and biological pollution: The amount and quality of therapeutic compounds in several plant species may be threatened by insect, fungal, and bacterial infection as well as pest and insect infestation. For instance, it has been demonstrated that Septoria infection lowers the level of glycoside, an essential ingredient in *Digitalis lanata*.
2. Artificial flavoring with weeds and unidentified plant material: Serious consequences for public health can result from switching plant species. The research makes it clear that the imperceptible physical differences between the species belonging of *Echinacea* sometimes cause difficulty for gardeners. For instance, *E. angustifolia* has frequently been misidentified as *E. pallida*.
3. Diversity in plant-based medicines: Wide variations in product quality across different brands on the market have been often documented, which has raised serious concerns among regulators, producers, and customers. The active chemical contents of medicinal plants that are produced in the field are exposed to a variety of variations in

conditions, which can significantly change their composition.

4. Phenotypic variation: Up till now, field-grown herbs and wild plant gathering have been the main sources of plant-based medication manufacture. Due to their high genetic variety, wild species of medicinal plants often account for a sizeable portion of the global genetic diversity.

5. Developing circumstances: The carbon ingested during photosynthesis is necessary for the synthesis of the fundamental structural components of active bioactive molecules. As a result, it has been demonstrated that the photoperiod, light intensity, and spectrum characteristics of the accessible light affect the medicinal purity.

6. Processing and storage procedures after harvest: Another reason for the variability in its medicinal contents is the treatment of plant materials before and after harvest, including drying and storage. The majority of botanicals are harvested in the summer or fall, which necessitates a convoluted system of purchasing, handling after harvest, importing, and transporting the raw plant materials. This compromises the final product's quality due to improper handling and post-harvesting procedures.

7. Customer exploitation: The aspects of consumer deception cannot be completely eradicated because the majority of therapeutic plants are still harvested from the wild. It is highly challenging to gauge the scope, propensity, and gravity of possible scams in the lack of stringent regulations governing the classification of medicinally active ingredients.

8. Natural species destruction: The susceptibility of wild species of herbal medicines to overharvesting and extinction

has drawn attention. Across the world, and over 2,000 taxa of herbal medicines are now under risk of extinction. For instance, the Convention on International Trade in Endangered Species of Wild Fauna and Flora lists services and manages (CITES).

Alternate Method: Growing in Managed Atmosphere

An option is the growing of plants in agricultural fields or greenhouses to assure the security and effectiveness of plant-based remedies and to ensure the conservation of the genetic variability of medicinal plants. Yet, it is challenging to grow plants in an open area or conservatory without the interference of pollutants, seasonal changes in temperature, light, UV, rainfall, and other environmental conditions. As was already indicated, each of these variables may have an impact on the amount of the therapeutic metabolite. Furthermore, the environment has already been severely damaged in traditional agriculture and horticulture due to decades of heavy application of pesticides, herbicides, insecticides, fungicides, and fertiliser, endangering even the expansion and growth of the wild plant density.

Specific benefits of this technique as a substitute method for growing medicinal plants include:

- 1) Mass manufacturing with supervision over raw material supply and delivery window
- 2) Freedom from restrictions imposed by the environment, the seasons, geography, and politics
- 3) Regardless of the external environment, optimised and regulated relative humidity, air temperature, air current speed and CO₂ concentration

- 4) Lessening the use of agricultural and land resources
- 5) Increase growth as well as pharmaceutical concentrations in carefully monitored, ideal conditions
- 6) Because the system's functioning is essentially independent of the local weather, consistent high-quality manufacturing of medicinal plants and worldwide standardisation of plant-based therapy may be created and attained.
- 7) To enhance the grade of medicinal plants, air temperature, photoperiod, and light quality can be controlled to hinder or promote flower growth as needed.
- 8) The production time may be drastically shortened
- 9) It is possible to universally characterise the biochemical makeup of the active components in a given medicinal plant.
- 10) Biotechnology allows for the selection of unique, stronger copies and genetic improvement.

CONCLUSION

A reliable supply of top-notch plant materials is the primary requirement for the continued development of high-quality premium phytopharmaceutical products. This article describes how medicinal plant growing in controlled circumstances has advanced the development of phytopharmaceuticals significantly. It is possible to produce large amounts of consistent, standardised, and optimised plant sources safe against both abiotic and biotic pollutions by using such a controlled conditions system. It is possible to select, breed, and clone better individual genotypes, as well as characterise the biochemistry of medicinally active ingredients,

making this technique extremely versatile and offering tremendous promise for further improvement.