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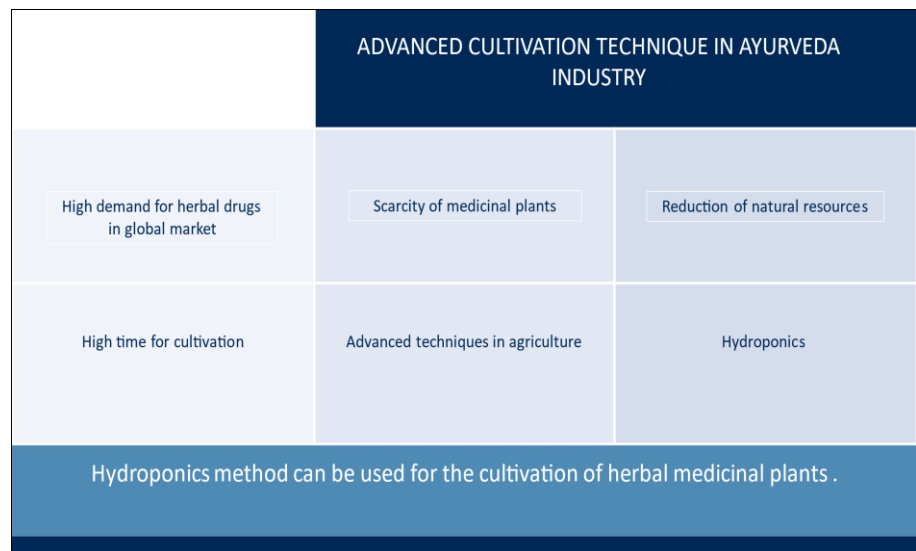
## Advanced cultivation techniques in Ayurveda industry

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### Abstract

International demand for Ayurveda products is increasing rapidly. Global market of herbal medicines is estimated at US\$ 248 Billion by 2030, growing at a CAGR of 6.8% over the analysis period 2023-2030. To compensate the high demand supply also should be increased. Scarcity of raw materials especially medicinal plants is an alarming factor in the manufacturing industry of herbal medicines. Usually, medicinal plants were collected from local areas and forest areas. Urbanization, deforestation, natural calamities, over exploitation etc drastically affected the availability of resources. It is the high time for the cultivation of medicinal plants. Advanced cultivation techniques can be adapted in this area also. Agrotechnology is successfully practising in vegetable cultivation. Agrotechnology can be tested in medicinal plants especially herbs, that can give a solution for the scarcity up to a certain level. Reviewing of articles related to agrotechnology, medicinal plants gave an eye opening about which type of plants and which technology is most suitable for medicinal herbs. Hydroponics system is found to be more suitable since it is a soilless and spaceless method. Literature suggests that hydroponics offer high yield, better quality and enhanced bioactive compounds.



**Keywords:** Medicinal herbs, Agrotechnology, hydroponics, cultivation of medicinal plants, tissue culture

### Introduction

The demand for Ayurvedic products is increasing both in the domestic and international market. The global Ayurveda market size is estimated to grow by USD 7.19 billion at a compound annual growth rate of 16.01% between 2022 and 2028. Ayurveda is an ancient system of life, the oldest surviving medical system in the world. Ayurvedic science is not merely a traditional Indian form of medicine but a perennial naturopathic system of healthcare that has survived the test of time as well as the modern science and methods of treatments. Consumers all over the world are becoming more health-conscious and seeking alternatives to conventional medicine.

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Ayurvedic products are considered as natural and safe, to those looking for holistic approaches. Many consumers prefer these products due to their safety and minimal side effects compared to synthetic drugs. The globalization of trade has made Ayurvedic products more accessible worldwide like any other products. Companies specializing in Ayurvedic medicine have expanded their distribution networks, making these products available in international markets through online platforms, specialty stores, and mainstream retailers.

Government of India have taken steps to promote Ayurveda and regulate the quality and safety of Ayurvedic products by introducing a special ministry as AYUSH. This has enhanced consumer trust and confidence in these products, contributing to their acceptance in international markets. With increasing concerns about synthetic chemicals and their impact on health and the environment, there's a growing demand for natural and organic products. Ayurveda is increasingly being integrated into modern healthcare systems, offering complementary solutions alongside conventional medicine. This integration has expanded the market for Ayurvedic products, as healthcare practitioners and consumers recognize the value of combining traditional and modern approaches to healthcare. Companies marketing Ayurvedic products have invested in branding and marketing efforts to position their products as premium wellness solutions. This includes highlighting the traditional heritage of Ayurveda, emphasizing the natural and holistic aspects of these products. Rise in products demand increased the demand for raw materials also. Habitat destruction caused by urbanization, agricultural expansion, and pollution has led to declines in wild medicinal herb populations. Limited land availability for conservation and cultivation possesses challenges for preserving this valuable medicinal herb. Conservation efforts focused on protecting natural habitats, promoting sustainable land management practices, and supporting cultivation initiatives can help to face these challenges and preserve medicinal plant biodiversity.

Developing new cultivation techniques for medicinal plants is a need of time. High demand of medicinal plants in traditional medicine, pharmaceuticals, and wellness products aims to high production of plants. It is reported that certain species of medicinal plants have already become extinct through over-harvesting, and other species are endangered.

New innovative cultivation techniques can help to meet this increasing demand sustainably. Climate change poses challenges to traditional agricultural practices. New cultivation techniques that are able to withstand the climate variability, such as drought-resistant varieties or techniques for optimizing water use, can ensure consistent yields despite changing environmental conditions. Advanced cultivation methods can enhance the yield and quality of medicinal plants. Techniques such as precision agriculture, genetic engineering, and optimized nutrient management can increase productivity and improve the concentration of bioactive compounds in plants. With the limited availability of land, it's essential to maximize the efficiency of land use for medicinal plant cultivation. Innovative techniques like vertical farming, hydroponics, and aquaponics are to be introduced in this area. Hydroponics technique can be tried for bulk cultivation of medicinal herbs with annual life span. As per the knowledge from FRLHT status and sustainability from the wild resources shows that around 24 per cent of species occur as trees, 20 per cent as shrubs and 56 per cent as herbs (FRLHT 1997).

Hydroponics cultivation and medicinal value assessment of medicinal herbs will help to overcome the scarcity of medicinal herbs to a certain extent at least in case of herbs. Evidence suggest that controlled environment cultivation used in this method reduces heavy metal accumulation and increase biomass production. Literature also suggests that hydroponics offer, high-yield, better quality, and enhanced bioactive compounds. Even in urbanised environments also plant cultivation is possible. Hydroponics method is successfully practicing in vegetable cultivation herbs. Trial should be done to find whether it is applicable for medicinal herbs.



**Fig 1:** Medicinal Herbs useful in Ayurveda industry

## Conclusion

The rising global demand for Ayurvedic products, projected

to grow significantly by 2028, reflects a broader shift toward natural and holistic healthcare. As consumers seek safer alternatives to synthetic drugs, Ayurveda's integration into modern medicine enhances its appeal. However, this surge in demand poses challenges, particularly in preserving medicinal plant biodiversity threatened by habitat loss and overharvesting. Innovative cultivation techniques, such as hydroponics and precision agriculture, are essential to sustainably meet this demand while maximizing land use. These advancements will not only ensure consistent supply but also enhance the quality and efficacy of Ayurvedic products, supporting a healthier future.

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#### **Author's contribution**

Dr. Vimala worked on the medicinal aspect and the others gave insight in the technological aspect.

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