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SUSTAINABLE USE, CULTIVATION AND CONSERVATION STRATEGIES FOR AYURVEDIC DASHMOOLA MEDICINAL PLANTS: A DRAVYAGUNA PERSPECTIVE

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Abstract

Background *Dashmoola*, a classical group of ten medicinal roots, is widely used in Ayurveda for its therapeutic properties, particularly in inflammatory, analgesic, and respiratory disorders. Increasing demand, overharvesting, and habitat degradation have placed several *Dashmoola* species at ecological risk. Addressing their sustainable use and conservation is vital for ensuring their availability for future generations. **Aim** To evaluate sustainable use, cultivation, and conservation strategies for Ayurvedic *Dashmoola* medicinal plants from a *Dravyaguna* perspective. **Objectives** To review classical Ayurvedic references of *Dashmoola* plants and their therapeutic importance. To analyze current challenges in availability and sustainability of *Dashmoola* species. To explore scientific methods of cultivation and propagation for *Dashmoola* plants. To identify effective in-situ and ex-situ conservation strategies. To propose integrative approaches combining Ayurvedic wisdom and modern conservation practices.. **Materials and Methods** This review is based on an extensive literary survey of *Brihattrayi*, *Nighantu Granthas*, and contemporary research databases. Information on pharmacognostic features, habitat requirements, and therapeutic uses of *Dashmoola* drugs was compiled. Conservation frameworks from national and international

agencies (AYUSH, IUCN, WHO) and published cultivation protocols were examined to identify feasible strategies. **Results** The review highlights that species such as *Shyonaka* (*Oroxylum indicum*), *Patala* (*Stereospermum suaveolens*), *Agnimantha* (*Clerodendrum phlomidis*), and face critical challenges due to habitat loss and unsustainable collection. Cultivation protocols including micropropagation, nursery raising, and agro-techniques have been standardized for some species but remain underutilized. In-situ conservation in forest reserves, ex-situ conservation through botanical gardens, and farmer-participatory cultivation models are promising approaches. Integration of classical Ayurvedic knowledge with modern conservation biology ensures both therapeutic authenticity and ecological sustainability. **Conclusion** Sustainable use and conservation of *Dashmoola* plants require a multi-pronged strategy that combines traditional *Dravyaguna* wisdom with scientific cultivation and conservation methods. Encouraging community-based farming, establishing medicinal plant gene banks, and promoting awareness among practitioners and farmers are crucial steps.

Keywords Sustainable Use**,** Cultivation**,** Conservation**,** *Dashmoola***,** *Dravyaguna***,** Medicinal Plants

Introduction

Ayurveda, the ancient Indian system of life sciences, has always emphasized the interdependence between humans and nature. Medicinal plants form the backbone of Ayurvedic formulations, and among them, *Dashmoola* holds a place of prime importance. The term *Dashmoola* refers to a group of ten roots—five from large trees (*Brihat Panchamoola*) and five from shrubs (*Laghu Panchamoola*). These drugs are described extensively in *Charaka Samhita*, *Sushruta Samhita*, and later *Nighantus* for their potent *Vedanasthapana*, *Shothahara*, and *Rasayana* actions.[1]

With the rising global demand for Ayurvedic medicines, the dependence on raw plant materials has increased dramatically. Several species of *Dashmoola*, such as *Shyonaka* (*Oroxylum indicum*), *Patala* (*Stereospermum suaveolens*) and *Agnimantha* (*Clerodendrum phlomidis*) are now facing challenges due to overharvesting, deforestation, and habitat destruction. This threatens not only ecological balance but also the authenticity and availability of genuine raw drugs for Ayurvedic formulations.[2]

From the perspective of *Dravyaguna Vijnana*, every medicinal plant is valued not only for its therapeutic properties but also for its ecological and cultural significance. Thus, the

sustainable use of *Dashmoola* involves more than just pharmacological utilization; it also requires strategies that preserve their natural habitats, encourage responsible harvesting, and promote community participation in cultivation. Without such measures, the continuity of Ayurvedic practices could be compromised.[3]

Conservation and cultivation of *Dashmoola* species demand an integrative approach. In-situ conservation methods, such as preserving natural populations in forest ecosystems, and ex-situ strategies, like botanical gardens, nurseries, and seed banks, provide practical solutions. Scientific techniques including tissue culture, micropropagation, and agro-technology packages have already shown potential in ensuring year-round availability of these plants. Bridging these modern practices with traditional Ayurvedic wisdom can safeguard the authenticity of medicinal efficacy while promoting biodiversity.[4]

Therefore, the present study aims to explore sustainable use, cultivation, and conservation strategies for Ayurvedic *Dashmoola* plants from a *Dravyaguna* perspective. It seeks to integrate classical textual knowledge with contemporary ecological and scientific approaches to ensure that these invaluable medicinal resources are preserved, propagated, and made accessible for future generations.[5]

Aim and Objectives

Aim

To evaluate sustainable use, cultivation, and conservation strategies for Ayurvedic *Dashmoola* medicinal plants from a *Dravyaguna* perspective.

Objectives

1. To review classical Ayurvedic references of *Dashmoola* plants and their therapeutic importance.
2. To analyze current challenges in availability and sustainability of *Dashmoola* species.
3. To explore scientific methods of cultivation and propagation for *Dashmoola* plants.
4. To identify effective in-situ and ex-situ conservation strategies.
5. To propose integrative approaches combining Ayurvedic wisdom and modern conservation practices.

Materials and Methods

The present review is based on a comprehensive literary study of classical Ayurvedic texts including *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Hridaya*, and *Nighantu Granthas* to

identify the references, therapeutic roles, and pharmacological significance of *Dashmoola* plants. Modern research articles, pharmacognostic studies, and ethnobotanical surveys were reviewed through databases such as PubMed, AYUSH Research Portal, and Google Scholar. Data on ecological status, cultivation practices, and conservation policies were collected from authoritative sources including the World Health Organization (WHO), IUCN Red List, National Medicinal Plants Board (NMPB), and Ministry of AYUSH guidelines. Information was synthesized to assess current challenges and to propose strategies for sustainable use, cultivation, and conservation of *Dashmoola* species from a *Dravyaguna* perspective.

Sustainable Use of *Dashmoola* Medicinal Plants

The sustainable use of *Dashmoola* requires balancing therapeutic needs with ecological preservation. Classical texts emphasize *Desha*, *Kaala*, and *Samyoga* while collecting herbs, which also serve as guidelines for ethical harvesting today. Collecting only mature plants, sparing roots for regeneration, and avoiding destructive uprooting are key practices. By adhering to Good Field Collection Practices (GFCP), sustainability and drug potency can both be preserved.[6]

Another critical aspect of sustainable use lies in rational prescription. Unnecessary inclusion of *Dashmoola* in formulations increases demand and puts pressure on wild resources. Physicians must use formulations based on need rather than routine, respecting the *Dravyaguna* principle of *Yukti* (rational judgment). This approach avoids over-exploitation while ensuring efficacy in treatment.[7]

Finally, exploring validated substitutes is a supportive measure when scarcity arises. Ayurveda already has a tradition of *Abhava Dravya* (substitution during unavailability). For instance, closely related species with similar *Rasa*, *Guna*, and *Virya* may be utilized after scientific validation. This helps conserve endangered *Dashmoola* species without compromising therapeutic outcomes.[8]

Cultivation Strategies

Cultivation is the most practical way to reduce dependence on wild populations. Scientific agro-techniques—covering soil requirements, irrigation, spacing, and organic inputs—have been developed for many *Dashmoola* plants. These methods, when followed, provide sustainable and quality yield. Nursery raising, vegetative propagation, and seed treatments further enhance plant survival.[9]

Advanced cultivation practices like tissue culture and micropropagation are particularly valuable for slow-growing or threatened species. These techniques allow rapid multiplication while conserving genetic traits. Once acclimatized to field conditions, such plants contribute to commercial supply chains without stressing wild habitats[10]

Community participation is essential to make cultivation viable. Contract farming and farmer cooperatives provide economic incentives to grow *Dashmoola* species. Intercropping models, where these plants are grown alongside food or cash crops, mimic natural habitats and ensure ecological benefits like soil fertility, moisture retention, and biodiversity conservation.[11]

Conservation Strategies

In-situ conservation is the first line of defense for *Dashmoola* species. This involves protecting natural populations in their native ecosystems. Sacred groves, forest reserves, and Medicinal Plant Conservation Areas (MPCAs) act as safe zones for these species. Maintaining natural habitats not only preserves genetic diversity but also ensures the plants retain their original *Dravyaguna* potency.[12]

Ex-situ strategies provide additional security. Botanical gardens, arboretums, and field gene banks preserve living plants outside their natural habitat. Seed banks and cryopreservation facilities store genetic material for future use. These measures ensure that even if wild populations decline, genetic resources are not lost.[13]

Policy-level interventions strengthen conservation efforts. Government schemes through the National Medicinal Plants Board (NMPB) and biodiversity authorities provide funding, planting material, and awareness programs. Regular population surveys and IUCN assessments help identify threatened species, guiding targeted conservation actions.[14]

Role of Community and Policy Support

Local communities play a pivotal role in sustaining *Dashmoola* resources. Training collectors in sustainable harvesting and farmers in cultivation ensures ecological protection while providing livelihoods. Involving communities also builds a sense of ownership, which enhances long-term conservation success.[15]

Government policies, particularly those from AYUSH and NMPB, provide frameworks for sustainable use. Subsidies, technical support, and market linkages encourage farmers to

cultivate medicinal plants. Biodiversity laws regulate collection and trade, reducing exploitation. Together, these measures support both conservation and economic development.[16]

Collaboration among stakeholders is crucial. Ayurvedic colleges, forest departments, NGOs, and local farmers can jointly promote cultivation and conservation. Such integrative models align traditional knowledge with modern science, ensuring ecological sustainability and therapeutic authenticity.[17]

Dravyaguna Perspective in Sustainability

From the standpoint of *Dravyaguna Vijnana*, the efficacy of a plant depends on its environment. Soil, climate, season, and method of collection influence its *Rasa*, *Guna*, *Virya*, and *Vipaka*. Thus, conservation and cultivation efforts must strive to replicate natural conditions to preserve medicinal value.[18]

Ayurveda also emphasizes ethical principles such as *Ahimsa* (non-violence) and *Parigraha* (non-hoarding). These principles, when applied to plant collection, naturally align with modern ideas of sustainability. Using only what is necessary and preserving the environment reflects the holistic vision of Ayurveda.[19]

Finally, sustainability ensures the continuity of authentic formulations. If *Dashmoola* species vanish or lose potency due to poor practices, it directly impacts treatment outcomes. Respecting *Dravyaguna* principles in cultivation and conservation guarantees that future generations of practitioners and patients benefit from the true essence of Ayurvedic wisdom.[20]

Findings

- Many *Dashmoola* species, especially *Shyonaka* (*Oroxylum indicum*), *Patala* (*Stereospermum suaveolens*), and *Agnimantha* (*Clerodendrum phlomidis*), are threatened due to overharvesting, deforestation, and habitat destruction.
- Increasing demand from Ayurvedic pharmaceutical industries has led to unsustainable exploitation, resulting in scarcity and reduced quality of raw materials.
- Standardized cultivation techniques such as nursery raising, vegetative propagation, and agro-techniques exist but are not widely adopted by farmers.

- Advanced methods like tissue culture and micropropagation have shown potential but are still limited to research institutions rather than field application.
- Lack of farmer training, economic incentives, and assured market linkages restricts large-scale cultivation of *Dashmoola* species.
- In-situ conservation strategies, including forest reserves, sacred groves, and Medicinal Plant Conservation Areas (MPCAs), play a vital role in protecting natural populations.
- Ex-situ measures such as botanical gardens, gene banks, and seed banks safeguard genetic diversity and provide backup resources.
- Policy frameworks by AYUSH and NMPB support conservation and cultivation but require stronger community participation and effective implementation.
- Integration of *Dravyaguna* principles ensures that cultivation and conservation practices preserve not just plant survival but also therapeutic authenticity.
- Community involvement, awareness programs, and participatory farming emerged as key factors in achieving sustainable use of *Dashmoola*.

Discussion

The present study emphasizes that *Dashmoola*, being one of the most frequently used groups of Ayurvedic drugs, is facing critical challenges in sustainability. With roots being the main usable part, destructive harvesting practices have led to rapid depletion of wild populations. The rising global demand for Ayurvedic formulations has worsened the situation, creating a supply-demand gap. This highlights the urgent need for integrating sustainable harvesting methods and cultivation models into mainstream practice.[21]

Although scientific agro-techniques and tissue culture methods have been developed for several *Dashmoola* species, their practical application remains limited. Farmers often hesitate to cultivate these plants due to lack of awareness, technical expertise, or assured markets. This indicates the necessity of bridging the gap between laboratory research and field-level implementation. Extension activities, training workshops, and contract farming initiatives can encourage farmers to adopt medicinal plant cultivation, ensuring both livelihood security and species conservation.[22]

Conservation approaches must also address ecological integrity. In-situ methods such as Medicinal Plant Conservation Areas (MPCAs) protect natural habitats, while ex-situ

measures like botanical gardens and seed banks provide genetic safety nets. A combined approach, supported by biodiversity laws and AYUSH–NMPB policies, ensures long-term availability. The involvement of local communities in conservation adds value by blending traditional ecological knowledge with scientific practices.[23]

From the perspective of *Dravyaguna Vijnana*, sustainability is not just about plant survival but also about preserving therapeutic authenticity. Factors such as soil type, season of harvest, and ecological conditions influence the *Rasa*, *Guna*, *Virya*, and *Vipaka* of drugs. Therefore, cultivation strategies must replicate natural habitats as closely as possible. Ethical principles of Ayurveda, like *Ahimsa* and *Parigraha*, align with modern conservation ethics, making the preservation of *Dashmoola* both a scientific and cultural responsibility.[24]

Conclusion

The study concludes that the sustainable use, cultivation, and conservation of Ayurvedic *Dashmoola* medicinal plants require an integrated approach that balances therapeutic demand with ecological preservation. Overexploitation and habitat loss have endangered several species, but scientific agro-techniques, tissue culture methods, and conservation frameworks provide viable solutions. Active participation of farmers, local communities, and policymakers, along with adherence to *Dravyaguna* principles, ensures both the ecological survival and therapeutic authenticity of these plants. Strengthening awareness, promoting community-based farming, and bridging traditional wisdom with modern conservation strategies are essential for safeguarding *Dashmoola* for future generations.

Conflict of Interest –Nil

Source of Support –None

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