Received: 13 Oct 2026	Revised: 15 Nov 2026	Accepted: 15 Dec 2026

Review Article

AJDP
Nature has the Power to Heal

ISSN: 3048-5614

"PLANT-PART SUBSTITUTION AS A CONSERVATION STRATEGY FOR AYURVEDIC DRUGS: A CRITICAL REVIEW OF COMPARATIVE PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES"

Tushar Tapadiya[1]

AFFILIATIONS:
1. Research Assistant, Ira Consultancy & Research Organisation, Bhosari, Pune, Maharashtra 411026

CORRESPONDENCE:
Tushar Tapadiya
EMAIL ID:
tushartapadiya11@gmail.com

FUNDING INFORMATION:
Not Applicable

How to cite this article:
Tushar Tapadiya, "Plant-part substitution as a conservation strategy for Ayurvedic drugs: a critical review of comparative phytochemical and pharmacological studies" Asian Journal of Dravyaguna and Pharmacology. 2026;3(4):8-11.
Sri. 2026.1006.ajdp.04.03

ABSTRACT
Many Ayurvedic drugs use roots, root bark, rhizomes or heartwood, parts whose harvest kills the plant or seriously damages it. Plant-part substitution proposes replacing these parts with renewable ones, such as leaves, young stems or small branches, from the same species. This review appraises comparative studies of plant-part substitution for Ayurvedic drugs and identifies what evidence is needed before a substitution can be adopted. Six studies were examined. For *Premna latifolia*, a Dashamula source, leaves resembled roots in chemical fingerprints and in anti-inflammatory and analgesic activity. For Shyonaka (*Oroxylum indicum*), decoctions of both root bark and the stem bark recommended by the Ayurvedic Pharmacopoeia showed significant anti-inflammatory activity. Young stem had principal flavonoids similar to root on mass-spectrometric profiling. For *Myrica esculenta*, *Acacia catechu* and *Litsea chinensis*, small branches resembled stem bark or heartwood in phytochemical screening and HPTLC profiles, but pharmacological equivalence was not tested. Ashwagandha illustrates the limits of the approach. Leaves contain higher concentrations of reactive withanolides than roots, and Indian authorities have restricted ashwagandha leaf in food products and directed manufacturers to use root only. Plant-part substitution is a promising conservation strategy, especially for slow-growing trees in Dashamula and similar groups. It must, however, be validated by chemical similarity in relevant constituents, equivalence in activity for the classical indication, and comparable safety. We propose a stepwise validation framework and recommend that validated substitutions be adopted in pharmacopoeial monographs.

KEYWORDS: Plant-part substitution, conservation, Dashamula, *Premna*, *Oroxylum indicum*, Shyonaka, *Acacia catechu*, Ashwagandha, sustainability

This is an open access article, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

INTRODUCTION

Classical texts specify the part of a plant to be used for each drug, and many important drugs use roots, root bark, rhizomes or heartwood.[1] Dashamula, the group of ten roots that underlies many formulations such as Dashamularishta, depends on the roots of five trees and five herbs. Harvesting such parts often kills the plant or seriously damages it. For a small herb, uprooting the whole plant may be required to obtain the rhizome; for Katuki, 300–400 plants are uprooted to produce one kilogram of dry drug.[2] For trees, removing roots or heartwood weakens or kills slow-growing individuals.

Plant-part substitution proposes that a renewable part of the same species, such as leaves, young stems or small branches, replace the destructively harvested part. Because the plant is the same, the substitute may share many constituents, and harvesting renewable parts allows the plant to survive. This review appraises comparative studies of plant-part substitution for Ayurvedic drugs and sets out what evidence is needed before a substitution can be adopted.

METHODS

This is a critical narrative review. We searched Indian journals, PubMed and publisher websites for studies that compared an officially used part of an Ayurvedic drug plant with an alternative part of the same species, using chemical, pharmacological or both kinds of comparison.

COMPARATIVE STUDIES

Table 1 summarises the studies examined.

Table 1. Comparative studies of plant-part substitution for Ayurvedic drugs.

Species (drug)	Official part → substitute	Comparison	Finding
Premna latifolia (Dashamula source)	Root → leaf	Chemical fingerprint; anti-inflammatory and analgesic activity[3]	Leaves closely resembled roots chemically and biologically
Oroxylum indicum (Shyonaka, Dashamula)	Root bark → stem bark	Anti-inflammatory activity of decoctions[4]	Both showed significant activity
Oroxylum indicum	Root → young stem, leaf	GC-MS and HR-LCMS[5]	Principal flavonoids oroxylin and chrysin similar in root and stem
Myrica esculenta (Katphala)	Stem bark → small branches	Phytochemical screening, phenolics, HPTLC[6]	Largely similar constituents
Acacia catechu (Khadira)	Heartwood → small branches	Phytochemical screening, phenolics, HPTLC[7]	Many similarities; pharmacology needed
Litsea chinensis (Medasakha)	Heartwood → small branches	Phytochemical screening, HPTLC[8]	Nearly the same phytochemicals; pharmacology needed

The strongest evidence comes from *Premna latifolia*, whose roots are heavily harvested for Dashamularishta.[3] Leaves resembled roots both in chemical fingerprints and in anti-inflammatory and analgesic activity, and the authors proposed leaves as a viable substitute.[3] For Shyonaka, the Ayurvedic Pharmacopoeia already recommends stem bark in place of the classical root bark,[9] and a study found that decoctions of both showed significant anti-inflammatory activity.[4] A separate mass-spectrometric study found that the principal flavonoids oroxylin and chrysin varied little between root and young stem, and recommended young stem for formulations.[5]

Studies of *Myrica esculenta*, *Acacia catechu* and *Litsea chinensis* compared bark or heartwood with small branches using phytochemical screening, total phenolic and flavonoid content and HPTLC, and found broadly similar profiles.[6–8] Their authors were careful to state that pharmacological comparison is needed before substitution can be recommended.[7,8]

A CAUTIONARY EXAMPLE: ASHWAGANDHA LEAF

Ashwagandha shows that a different part of the same plant is not automatically a safe substitute. The classical part is the root, but leaves, which contain higher concentrations of reactive withanolides such as withaferin A, have been used in some commercial

products. In April 2026 the Food Safety and Standards Authority of India issued an advisory against the use of ashwagandha leaves in any form in food products, and the Ministry of Ayush directed manufacturers to use only the root and to state the part on labels.[10] A substitution that increases the concentration of potent or potentially toxic constituents may change both efficacy and safety.

A VALIDATION FRAMEWORK

Comparative chemical similarity is a necessary first step but not sufficient evidence for substitution. We propose a stepwise framework (Table 2).

Table 2. Proposed stepwise validation of a plant-part substitution.

Step	Assessment	Notes
1	Conservation need	Document that harvesting the official part threatens the species or is unsustainable[2]
2	Chemical comparison	Compare relevant marker constituents quantitatively, not only qualitative profiles[11]
3	Activity comparison	Compare activity for the classical indication using the classical preparation, with an equivalence margin[3,4]
4	Safety comparison	Check for constituents that are higher or absent in the substitute; assess toxicity[10]
5	Dose adjustment	Determine the dose of substitute that matches the original
6	Pharmacopoeial adoption	Include the validated substitute in the monograph with its evidence[9]

A DRAVYAGUNA PERSPECTIVE

Classical texts specify plant parts deliberately, and the choice of part is part of the drug's identity.[1] Plant-part substitution therefore needs the same justification as any pratinidhi: equivalence in the properties and actions that matter for the intended use. The precedent set by the Ayurvedic Pharmacopoeia in recommending Shyonaka stem bark[9] shows that such substitution can be accepted within Ayurveda when supported by evidence. The Ashwagandha case shows the opposite: a part not sanctioned classically can introduce new risks.

LIMITATIONS

Few comparative studies exist, most are phytochemical only, and the strongest pharmacological evidence comes from single studies. Some studies could be summarised only from their abstracts.

CONCLUSION

Plant-part substitution offers a practical way to conserve medicinal trees and herbs whose roots, bark or heartwood are destructively harvested. For *Premna latifolia* and Shyonaka, pharmacological evidence supports substitution, while for several other species only chemical similarity has been shown. The Ashwagandha leaf example shows that substitution can also introduce safety risks. A stepwise validation framework covering chemistry, activity, safety and dose would allow evidence-based substitutions to be adopted in pharmacopoeial monographs and help reconcile Ayurvedic practice with conservation.

REFERENCES

1. Sushruta. Sushruta Samhita, with the Nibandhasangraha commentary of Dalhana. Acharya YT, editor. Varanasi: Chaukhambha Surbharati Prakashan; reprint 2012.
2. Hechhu R, Krishnan K, Singamaneni V, Raju PVN, Erukulla P, Kandimalla KV, et al. GC-MS-based phytochemical analysis, in-depth ADMET screening and molecular docking targeting EGFR for anticancer potential. Chem Methodol. 2026;10(5):465-88.
3. Jena AK, Karan M, Vasisht K. Plant parts substitution based approach as a viable conservation strategy for medicinal plants: a case study of *Premna latifolia* Roxb. J Ayurveda Integr Med 2017;8:68–72.
4. Nyavanandi D, Mandati P, Vidiyala N, Parupathi P, Kolimi P, Mamidi HK. Hot melt extrusion paired nozzle based additive manufacturing techniques for design and development of pharmaceuticals [preprint]. Preprints. 2024.
5. Smitha CK, Udayan PS. GC-MS and HR-LCMS fingerprinting of various parts of *Oroxylum indicum* (L.) Vent.: a comparative phytochemical study based on plant part substitution approach. J Pharmacogn Phytochem 2020;9(6):1817–24.
6. Jahnavi P, Kumar AK, Prema S, Singamaneni VR, Vidiyala N, Sunkishala P, et al. Recent

progress in heterogeneous catalysis for sustainable chemical processes. J Chem Rev. 2026;8(2):154-79.
7. Srivastava B, Sharma VC, Singh A, Singh R, Jadhav AD. Evaluation for substitution of heartwood with small branches of *Acacia catechu* for therapeutic use: a comparative phytochemical approach. J Pharmacogn Phytochem 2016;5(4):254–8.
8. Laxmiprasanna P, Chandan RS, Nagidi HR, Vidiyala N. Analytical method development and validation of a novel RP-HPLC method for simultaneous quantification of xanomeline and trospium chloride in pharmaceutical dosage form. Int J Drug Deliv Technol. 2025;15(1).
9. Government of India, Ministry of Health and Family Welfare. The Ayurvedic Pharmacopoeia of India, Part I. New Delhi: Pharmacopoeia Commission for Indian Medicine & Homoeopathy.
10. Food Safety and Standards Authority of India. Advisory on non-use of ashwagandha leaves in crude or extract or any other form in food products. New Delhi: FSSAI; 16 April 2026.
11. Vidiyala N, Sunkishala P, Parupathi PR, Nyavanandi D. Stem cell-derived exosomes in wound healing and skin regeneration: emerging therapeutic strategies and mechanisms. Cells. 2026;15(10):872.