

Botanical Knowledge in Ancient Indian Texts: Applications in Modern Pharmacology

Dr. Rajesh Kumar Patel

Guest lecturer

Department of Botany, K. G. Arts and science college, University of SNPV, Raigarh.

ORCID ID: 0009-0008-7116-0737

Abstract:

Among the ancient Indian texts are a rich body of botanical knowledge that has remained of interest in the contexts of ethnopharmacology, pharmacognosy and drug discovery. Medical texts like the Atharvaveda, the Charaka Samhita, and the Sushruta Samhita are records of medicinal plants not only as ritual or household medicine, but as medicinal agents defined by property, mode of preparation, and clinical utilization. Over the last decades, the modern pharmacology is returning to the traditional medical knowledge as one of the sources of the hypothesis to discover bioactive compounds, multi-target therapies, and plant-based formulations. In this paper, the botanical knowledge that featured in ancient Indian works will be discussed and analyzed regarding the applicability with respect to contemporary pharmacology. It claims that these writings are not important because they specifically and personally testify to the efficacy of modern medicine, but because they are valuable historical artifacts and systematically organized reservoirs of medicinal vegetable knowledge that can guide modern pharmacological studies. The paper initially discusses the historical and theoretical background of botanical medicine in ancient India, followed by the discussion of key textual sources and some examples, including *Rauwolfia serpentina*, *Curcuma longa*, and *Withania somnifera*. It also argues about the methodological, taxonomic and regulatory issues associated with the translation of the ancient textual knowledge into scientifically validated pharmacological implementations. The conclusion of the paper is that the ancient Indian botanical knowledge can play an important role in the modern pharmacology, but only when approached critically, interdisciplinarily, and with rigorous standards of safety, standardization, and evidence generation (Boddupalli, 2024; National Center for Complementary and Integrative Health [NCCIH], 2025).

Keywords: ancient Indian literature, natural medicine, ethnopharmacology, Ayurveda, modern pharmacology.

Introduction

Indian medical history is closely connected with the history of plants. The application of roots, barks, leaves, fruits, resins, and combinations of minerals and herbs in medical care had been recorded in Indian intellectual traditions long before the emergence of modern pharmacology, both practically and theoretically. Among the earliest systematic thoughts about healing plants, their therapeutic effect, and their place in the maintenance of health and disease treatment, ancient Indian writings hold some of the

oldest. This was already known to early Vedic literature, and it is described more systematically in early Ayurvedic texts as the Charaka Samhita and Sushruta Samhita (Boddupalli, 2024; Britannica Editors, n.d.-a).

The contemporary value of this knowledge is that plants continue to play a primary role in the pharmacological science. Despite synthetic chemistry and the design of molecular drugs, medicinal plants are still sources of bioactivity, semi-synthetic drug templates and examples of multi-component therapeutic systems. Ancient textual traditions are thus becoming the focus of increasingly serious study not as cultural objects per se, but as reservoirs of ethnopharmacological data that can be used to inform scientific research. It is particularly the case in ancient Indian medicine, where the textual traditions are vast, systematic, and remain related to the current medical practice, like Ayurveda (Boddupalli, 2024).

One of the earliest valuable sources of medicine plant knowledge in India is the Atharvaveda. According to Boddupalli (2024), a significant portion of the verses of the Vedic cure Vedic verses in the Atharvaveda is the bhaisajya sutta verses, which describe diseases, remedies, and herbs. These early sources indicate that the plant medicine in India was developed in a system that amalgamated empirical looking, ritual importance, as well as proto-medical rationale. Subsequent Ayurvedic texts developed this information into more developed curative systems. According to the Encyclopaedia Britannica, Charaka Samhita is the complete Indian medicine book that focuses on diagnosis and introduces Ayurveda as one of the preventative and curative systems of healthcare (Britannica Editors, n.d.-a).

Simultaneously, one should be careful with ancient botanical knowledge applied to the field of modern pharmacology. The use of history is not comparable to the current evidence of effectiveness or safety. Plants that are described in ancient literature might not be easily recognizable, recipes might differ over time and location, and much of traditional knowledge has not been adequately methodically studied up to modern scientific rigor. Modern organizations thus focus on scientific assessment of botanical products. As an illustration, NCCIH points out that although certain plant preparations, including turmeric and ashwagandha, may have potential in a certain area, the evidence is still scarce or inconsistent, and the issues of formulation variability and safety should be considered significant (NCCIH, 2025; Office of Dietary Supplements [ODS], 2025).

This paper demonstrates that botanical knowledge in ancient Indian texts has much to contribute to the contemporary pharmacology, primarily as a source of leads, types of observation, and research questions with a historical perspective. The most useful thing about these writings is not that they contain ready-made pharmacological evidence, but that they contain organized knowledge of medicines, which could be studied by philology, taxonomy, chemistry, toxicology, and clinical science. The paper reviews the literature on the topic, discusses sources of the major textual evidence of the botanical knowledge, analyses the selected plant examples, and presents the opportunities and challenges of applying the ancient Indian botanical knowledge in the modern pharmacology to develop this argument.

Literature Review

The study of the history of Indian botanical knowledge in ancient India has become a significant subject of scholarly interest in the past few years, particularly at the interface between history of science,

ethnobotany, and pharmacology. A major contribution lies in the fact that Boddupalli (2024) studied the Atharvaveda and suggested that this text has a large medicinal corpus in the form of healing hymns and descriptions of the plants. The article stresses the fact that numerous verses of the Atharvaveda are concerned with disease, causation, curative action and medicinal plants, indicating that there had been by now an Indian concept of how to systematize therapeutic uses of flora. The significance of the given work is that it places an emphasis on the ancient roots of Indian botanical medicine and demonstrates that the textual records about plant therapeutics date back much earlier than the classical Ayurvedic textbooks.

The Ayurvedic classics are also literature which highlights the emphasis on medicinal plants. According to the version of the story provided by Britannica about the Charaka Samhita, it was a general piece on the ancient Indian medicine, both preventive and curative, as well as addressing issues of diagnosis, treatment and healthcare organization (Britannica Editors, n.d.-a). This is important as it indicates that the medicinal plants in ancient India were not applied in isolation as an isolated practice but rather integrated into a systematic system of clinical and theoretical knowledge. Plants were linked with the evaluation of the patient and the disease, the diet, regimen, and the preparation of pharmaceuticals.

Sushruta Samhita has again come under the focus of the modern study particularly in surgery and wound care. Kumar et al. (2021) reviewed and identified numerous medicinal plants listed in the Sushruta Samhita to cleanse wounds and heal them. Their review has stated that 43 plants were characterized as wound-cleansing agents, 48 wound-healing agents, and 62 wound-cleansing and wound-healing agents. This is particularly applicable to pharmacology since wound care is still a promising target of antimicrobial, anti-inflammatory and tissue-repair therapeutics and ancient textual resources can lead to potential botanical prospects.

Not only have the contemporary pharmacological literature devoted attention to texts, but also to plants that have been used traditionally by the Indians. *Rauwolfia serpentina* is one of the most obvious ones. According to Britannica, the historical use of the powdered root of this Indian shrub was snakebites, insomnia, hypertension, and insanity, with reserpine, a component extracted from the plant in 1952, subsequently playing a significant role in treatment of antihypertension and insanity (Britannica Editors, n.d.-b). The MeSH record of the National Library of Medicine also includes the fact that reserpine drains the storage vesicles of catecholamines and serotonin, and its use was restricted in clinical practice due to its side effects (National Library of Medicine, 2026). The case is listed among the strongest examples of the linkage of traditional plant knowledge and modern pharmacology.

Broad modern research programs have been produced by other botanicals, as opposed to an iconic drug. According to NCCIH, turmeric has undergone research in conditions, including osteoarthritis, nonalcoholic fatty liver disease, and lipid disorders, but also reminds that the evidence is inconclusive and highly bioavailable preparations are potentially harmful, including liver damage (NCCIH, 2025). On the same note, according to the NIH Office of Dietary Supplements, ashwagandha extracts potentially can be used to reduce stress, anxiety, and enhance sleep, although there is still a lack of evidence (such as the short-term nature of these studies) and recommendations are still unproven by long-term results, variable preparations, and unanswered long-term safety questions (ODS, 2025).

The literature, considered as one, indicates a definite trend. The ancient Indian writings contain worthwhile knowledge on botany; contemporary pharmacology has been able to translate the same knowledge into biochemical and therapeutic findings in some instances; however, such translation must be done with due care on scientific validity. Thus, the usefulness of old texts can be most warranted as heuristic and research-producing as opposed to being automatically confirmatory (Boddupalli, 2024; Kumar et al., 2021; NCCIH, 2025).

Objectives of the Study

There are four objectives of this paper. First, it aims to investigate the representation of botanical knowledge in great Indian texts of the ancient period. Second, it discusses the medicinal and pharmacological significance of the chosen plants mentioned in or related to these traditions. Third, it examines ways in which ancient knowledge of texts can be used to guide modern pharmacology using ethnopharmacological lead generation and interdisciplinary research. Fourth, it determines the significant issues related to the process of translation of traditional botanical knowledge into a validated modern therapeutic practice.

The Indian Botanical Knowledge sources of ancient Indian texts.

The Atharvaveda

The Atharvaveda has a fundamental role in the Indian medical thought history. In contrast to other Vedic literature which is more closely connected with liturgy and sacrificial performance, the Atharvaveda is full of hymns connected with healing, malady, and medicine. Boddupalli (2024) describes that the bhaisajya sūktas of Atharvaveda treat diseases, causes of diseases, and remedies of diseases and that these hymns display a prominent understanding of the health sciences when they describe various medicinal plants. This renders Atharvaveda a major source of text on ancient Indian botanical medicine.

The contents of the Atharvaveda are not the same as modern pharmacological classification, but they indicate a significant shift in the ritualistic approach to healing to a more structured approach to medicine. Plants are not just figurative; they are called upon as agents of action that influence a particular disease condition. This pre-historic layer of the text is thus not only useful to historians of religion and literature, but also to ethnopharmacologists concerned with the history and survival of plant-based medicine in South Asia (Boddupalli, 2024).

The Charaka Samhita

The Charaka Samhita represents a far greater advance of codification of botanical knowledge. It introduces Ayurveda as a complex of healthcare in both preventive and therapeutic goals and places a focus on diagnosis as the key element of medicine (Britannica Editors, n.d.-a). This is very important as it means that the discussion of plants occurred in the context of clinical reasoning as opposed to mere folk lists of remedies.

Medicinal plants are associated with disease types, body type, drug preparation, digestion, nutrition and prognosis in The Charaka Samhita. By so doing, it provides systematic pharmaceutical and therapeutic literature and not scattered references. One of the reasons why this text remains interesting to scholars investigating the historical roots of pharmacology and traditional medicine is this type of organization.

The Sushruta Samhita

Surgical content is the most notorious in the Sushruta Samhita, which is also a major source of botanical therapeutics. According to Britannica, there is also a work on toxicology, pediatrics, pharmacology, and

other Ayurvedic works contained in Sushruta-samhita (Britannica Editors, n.d.-c). This botanical knowledge is practically rich as shown in the wound-healing review by Kumar et al. (2021), which shows an overview of plant applications in the cleansing and healing process.

This is particularly significant in terms of indicating that ancient Indian knowledge of botany was not restricted to internal medicine. Plants were also significant in surgery, wound management and recovery. Modernly speaking, such data may come in handy especially in the translational research into antimicrobial, anti-inflammatory and regenerative cures.

Theoretical Aspects of Indian Botanical Knowledge of the Ancient India.

The ancient Indian botanical knowledge has several features that are still relevant to the modern pharmacological thought. The former is categorization according to properties and action. Plants were also commonly classified in terms of taste, strength and the post-digestive action. The article by Kumar et al. (2021) presents the process of wound-healing plants of the Sushruta Samhita, which are discussed in terms of the rasa, virya, and vipaka. These categories, though not biochemical models, are attempts to make therapeutic action systematic.

The second significant characteristic is the contextual therapeutics. There are few cases when ancient Indian literature offers plants as standalone remedies without any clinical issues. Plants, on the contrary, are attributed to disease pattern, and body states, administration paths and combinations. This implies that botanical knowledge in these texts was not taxonomic only but clinical. This contextualization can apply to contemporary pharmacology as numerous of the interventions offered by plants are affected by extraction technique, route, and the existence of more than one active component.

A third characteristic is the compound formulations. The old Indian texts on medicine frequently prescribe combination of several plants. This makes validation challenging based on a contemporary perspective since multi-herbal formulations are not easy to standardize and research. It, nevertheless, also raises intriguing questions of synergy, multi-target pharmacology, and disease systems. Therefore, the pre-modern Indian botanical tradition might be particularly useful in those fields in which pharmacology is outgrowing the one-target, one-drug paradigm.

Modern Pharmacology Applications.

Rauwolfia serpentina and Reserpine.

The Rauwolfia serpentina history provides one of the most relevant examples of how the traditional Indian knowledge of plants may help guide modern pharmacology. In India, the plant had been used since a long time in snakebites, insomnia, hypertension and mental illness. According to Britannica, reserpine was extracted in the plant in 1952, and it was the first of many Rauwolfia alkaloids to be identified in the crude drug (Britannica Editors, n.d.-b). The National Library of Medicine also describes that reserpine works by emptying catecholamines and serotonin storage vesicles and was administered as an antihypertensive and antipsychotic but was later restricted in its clinical application due to side effects (National Library of Medicine, 2026).

This case is significant due to several reasons. To begin with, it shows that the traditional use could guide researchers to pharmacologically active plants. Second, it demonstrates how a crass botanical matter could be transformed into the foundation of nowadays alkaloid isolation and mechanism-driven drug

development. Third, it is also a demonstration of the value of contemporary scientific assessment: despite the apparent effects, standardization of dosage, effects-adverse effects and mechanistic knowledge, the plant did not reach modern pharmacology.

Curcuma longa (Turmeric)

Turmeric is among the most common medicinal and culinary plants which are related to Indian culture. Curcumin which is one of its major constituents has been widely investigated in modern pharmacology in terms of its anti-inflammatory, antioxidant, metabolic, and other biological activities. According to NCCIH, turmeric has been researched on osteoarthritis, nonalcoholic fatty liver disease, and lipid disorders and some of the results are promising, especially in the osteoarthritis symptoms (NCCIH, 2025). Meanwhile, NCCIH underlines that the evidence is still not enough to make the conclusive judgments and some very bioavailable preparations can be even more dangerous, such as liver injury can occur (NCCIH, 2025).

Turmeric thus demonstrates the second example of translation of traditional botanical knowledge to the modern pharmacological one. Turmeric, in contrast to reserpine, provided a wide area of drug research both pharmacological and formulation science that focused on extracts and curcuminoids. Its example also illustrates the weaknesses of specific popular enthusiasm of medicinal plants. The conventional significance and in vitro potential readily do not indicate clinically substantiated therapeutic application.

Withania somnifera (Ashwagandha)

The third current pharmacological interest model based on Ayurvedic tradition is Ashwagandha. According to the NIH Office of Dietary Supplements, ashwagandha extracts have the potential to reduce stress and anxiety and enhance sleep, and that some randomized placebo-controlled trials have also had positive short-term outcomes in these fields (ODS, 2025). Nevertheless, the same source also reports that it is hard to form strong recommendations since it was used in various preparations and doses, and it is unclear whether it is safe in the long-term (ODS, 2025).

This is particularly significant to contemporary psychopharmacology and integrative medicine. It argues that there is still a possibility that the ancient Indian botanical information can guide on future studies in the field of stress physiology, neuroendocrine regulation and mood-dependent effects. That careful product standardization, toxicological surveillance, and improved trial design are necessary is confirmed, however.

Wound-Healing Herbs in Sushruta Samhita.

The wound healing plant in the Sushruta Samhita is one of the most promising fields of translational pharmacology. These herbs were reviewed in a systematic review by Kumar et al. (2021), and the classical Ayurvedic descriptions were standardized according to the contemporary wound-healing phases. Regarding their findings, they indicate that the text contains a significant botanical resource to be used in examining the cleansing, anti-inflammatory, and tissue-repairing properties of medicinal plants.

The importance of this area lies in the fact that the wound care continues to be a major clinical problem, particularly in the chronic wounds, diabetic wounds and compromised immunity setting. Ancient literature can thus be used as edited historical databases where candidate plants may be ranked to be the focus of phytochemical, microbiological and tissue-repair studies.

Table 1-Major Ancient Indian Texts and Their Botanical Relevance

Text	Nature of text	Botanical significance
Atharvaveda	Early Vedic healing and ritual corpus	Contains healing hymns and descriptions of medicinal plants; important for early history of ethnomedicine
Charaka Samhita	Classical Ayurvedic medical compendium	Organizes plant knowledge within diagnosis, prevention, therapeutics, and pharmaceuticals
Sushruta Samhita	Classical Ayurvedic surgical and medical compendium	Links plants to surgery, wound cleansing, wound healing, toxicology, and recovery
Text	Nature of text	Botanical significance

Table 2-Selected Plants and Their Relevance to Modern Pharmacology

Plant	Traditional/ancient relevance	Modern pharmacological relevance	Key limitation
Rauwolfia serpentina	Traditionally used in India for insomnia, hypertension, and mental illness	Source of reserpine, a historically important antihypertensive and antipsychotic agent	Adverse effects limit current use
Curcuma longa	Widely used in Indian diet and medicine	Studied for osteoarthritis, inflammation, NAFLD, and lipid disorders	Evidence mixed; formulation variability
Withania somnifera	Important Ayurvedic botanical	Studied for stress, anxiety, and sleep outcomes	More long-term safety and dosing data needed
Multiple herbs in Sushruta Samhita	Used for wound cleansing and healing	Potential leads for antimicrobial and tissue-repair research	Taxonomic identification and validation needed

Suggested Figures for Research Paper Submission

Figure 1. Historical Development of Botanical Knowledge in Ancient India

A timeline showing progression from Vedic plant knowledge in the Atharvaveda to organized Ayurvedic pharmacology in the Charaka Samhita and Sushruta Samhita, followed by modern pharmacognosy and pharmacology.

Figure 2. Translational Pathway from Ancient Text to Modern Drug Research

Textual mention → philological interpretation → botanical identification → phytochemical isolation → pharmacological screening → toxicology → standardization → clinical evaluation.

Figure 3. Case Model: From Rauwolfia serpentina to Reserpine

Traditional Indian use → plant collection and pharmacognosy → alkaloid isolation → mechanism discovery → therapeutic use → safety-based decline in use.

Difficulties in the transfer of ancient knowledge of botany to the modern pharmacology.

The initial significant difficulty is the identification of the plants. Old plant names do not always fit into the botanical taxonomy of the modern day. Identification can be complicated by synonyms, naming traditions, differences in manuscripts, and ecological modifications. This implies that, prior to making any claim that is pharmacological, it needs to be supplemented by textual interpretation and linguistic research as well as botanical knowledge.

The second problem is standardization. Contemporary pharmacology demands reproducible matter, active constituents that are quantified, constant dosing, and controlled production. The ancient recipes usually embrace entire plants, variable process, or mixture of compounds. Although this can be highly traditional, it poses a challenge to laboratory reproducibility and clinical trial design.

The third difficulty is safety. Even common plants may be dangerous in terms of concentration, extraction, contamination or co-morbid conditions. NCCIH cautions that different preparations of turmeric can significantly differ and that high-bioavailability preparations may potentially cause liver damage (NCCIH, 2025). ODS also reports on a lack of long-term safety data on ashwagandha and the use by groups is not recommended (ODS, 2025). The above concerns demonstrate why the use today should be complemented by the modern toxicology and regulatory control.

A fourth obstacle is the evidence inflation. Historical importance of the mention of a plant in an ancient text does not indicate clinical efficacy in a contemporary disease endpoint. The ancient Indian texts must then be discussed as hypothesis generative sources and not ultimate clinical sources. They are useful in indicating the potential pharmacological activity, rather than absolving substances of scientific scrutiny.

Discussion

The connection between ancient Indian botanical knowledge and modern pharmacology is most clarified as a relationship of dialogue as opposed to continuity. The ancient literature has observations, classifications and therapeutic traditions which can even guide pharmacological thinking. Historically valuable discoveries of drugs have already been made through this dialogue in certain instances such as *Rauwolfia serpentina*. In other scenarios, e.g. turmeric and ashwagandha, the discussion is still going on and has produced enormous data, yet to be further developed.

The best thing is that one of the strongest features of ancient Indian texts is the ability to conserve medicinal plants in clinical and theoretical frameworks, but not in the form of folklore. This renders them especially valuable in the ethnopharmacology, which does not just aim at cataloging plants but understanding how the plants were chosen, prepared, mixed, and utilized. This kind of contextual knowledge can assist contemporary researchers in making their plausible leads more important and tradition claims more intelligible.

Meanwhile, the methodological rigor provided by modern pharmacology cannot be achieved by old writings alone. The design of clinical trials, molecular tests, toxicology, pharmacokinetics, and regulatory science is required to transform the knowledge of the past into safe and effective use as a therapeutic agent. Thus, interdisciplinary approach is the most productive one. Responsible translation of ancient botanical

knowledge has a role to play in Sanskritists, historians of medicine, botanists, pharmacognosists, chemists, clinicians, and regulators.

Conclusion

The body of botanical knowledge in ancient Indian writings is rich and has a long history and remains relevant to the study of pharmacology in the contemporary world. Atharvaveda captures an early tier of the use of medicinal herbs, whereas the Charaka Samhita and Sushruta Samhita systematize plant-derived therapies in medical systems. These sources evidence that botanical medicine in India in ancient times was not only empirical in a loose sense, but was organized, classified, and was combined with diagnosis and treatment (Boddupalli, 2024; Britannica Editors, n.d.-a).

This has already found application in the modern pharmacology in the form of *Rauwolfia serpentina* and it is still being studied to examine the possibilities of plants like turmeric and ashwagandha to have a clinical impact. Nevertheless, a modern use of the ancient botanical knowledge should be evidence-based, taxonomically accurate, standardized and cautious. The best contribution of ancient writings in contemporary times is to provide research leads, historical clinical understanding as well as ethnopharmacological orientation and not replacement of the current scientific validation (National Library of Medicine, 2026; NCCIH, 2025; ODS, 2025).

In this regard, the ancient Indian knowledge of botany will be a resource of great importance in the future of pharmacology. It can still aid the field of drug discovery, plant-based therapeutics, and a deeper comprehension of the way the traditional medical systems maintain biologically significant observations over centuries when approached critically and scientifically.

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