

Ayurvedic Herbs and Their Relevance in Modern Pharmacotherapy

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ABSTRACT

Ayurveda, the traditional medical system of India, has utilized medicinal plants for disease prevention and treatment for thousands of years. In recent years, growing scientific interest has focused on validating these herbal remedies through pharmacological and clinical research. Several ayurvedic herbs have demonstrated significant therapeutic potential, including anti-inflammatory, antidiabetic, immunomodulatory, antioxidant, and anticancer activities. The integration of traditional knowledge with modern drug discovery has contributed to the development of plantbased therapeutics and phytopharmaceuticals. This review discusses key ayurvedic herbs and evaluates their relevance and evidence-based applications in contemporary pharmacotherapy, highlighting both their therapeutic benefits and current challenges in standardization and clinical validation.

Key words: Ayurvedic medicine, Botanical therapeutics, Plant-derived compounds, Modern pharmacotherapy, Scientific validation, Phytopharmaceuticals, Integrative medicine

INTRODUCTION

Ayurveda, the traditional system of medicine that originated in India, represents one of the oldest holistic healthcare practices in the world. With a documented history spanning several millennia, Ayurveda is founded on the principle of maintaining balance among the three fundamental bodily energies, namely Vata, Pitta, and Kapha. The system emphasizes disease prevention, health promotion, and individualized therapy through the use of medicinal plants, dietary regulation, and lifestyle modifications. Among these, herbal drugs constitute the primary therapeutic modality and form the core of ayurvedic pharmacology.

In recent decades, there has been a resurgence of global interest in plant-based medicines due to increasing concerns regarding adverse effects, drug resistance, and the high cost associated with synthetic pharmaceuticals. This renewed attention has encouraged scientific exploration of traditional medicinal systems, particularly Ayurveda, with the aim of validating therapeutic claims through modern pharmacological and clinical research. Several medicinal plants described in classical ayurvedic texts are now being investigated using advanced analytical techniques to identify bioactive constituents and elucidate their mechanisms of action.

Modern pharmacotherapy is largely evidence-based and focuses on the use of chemically defined agents that act on specific molecular targets. Interestingly, many conventional drugs have originated from natural sources, including plants. This highlights the significant role of traditional knowledge in contemporary drug discovery. Ayurvedic herbs are known to contain diverse phytochemicals such as alkaloids, flavonoids, tannins, glycosides, terpenoids, and phenolic compounds, which exhibit a broad spectrum of pharmacological activities. These bioactive molecules have demonstrated anti-inflammatory, antioxidant, immunomodulatory, antimicrobial, antidiabetic, neuroprotective, and anticancer properties in various experimental and clinical studies.

Unlike single-target synthetic drugs, herbal medicines often exert multi-target and synergistic effects, which may be particularly beneficial in the management of chronic and complex diseases. Disorders such as diabetes mellitus, cardiovascular diseases, neurodegenerative conditions, autoimmune disorders, and cancer require long-term therapy, and ayurvedic herbs are increasingly being explored as complementary or integrative treatment options. The concept of “reverse pharmacology,” which begins with clinical observations from traditional use and proceeds toward laboratory validation, has further strengthened the scientific evaluation of ayurvedic medicines.

Despite the promising therapeutic potential, several challenges remain in integrating ayurvedic herbs into mainstream pharmacotherapy. Issues such as lack of standardization, variability in phytochemical composition, inadequate large-scale clinical trials, and possible herb–drug interactions must be systematically addressed. Ensuring quality control, safety evaluation, and regulatory compliance is essential for the wider acceptance of herbal formulations.

Therefore, a comprehensive understanding of ayurvedic herbs in the context of modern pharmacotherapy is essential. By bridging traditional wisdom with scientific evidence, it is possible to develop safer, effective, and affordable therapeutic agents. This review aims to examine the relevance of selected ayurvedic herbs in contemporary pharmacotherapy and to highlight their potential role in future drug development and integrative healthcare systems.

Principle:

The core principle of Ayurveda is centered on the concept of maintaining balance among the three vital energies of the body—Vata, Pitta, and Kapha—collectively referred to as the Tridosha. According to ayurvedic doctrine, a state of health is achieved when these doshas are in equilibrium, while any disturbance in their balance leads to the manifestation of disease. Ayurveda also emphasizes the interconnectedness of the body, mind, and environment in preserving overall well-being. The therapeutic use of herbs is determined by their intrinsic qualities, including taste (Rasa), properties (Guna), potency (Virya), postdigestive effect (Vipaka), and specific action (Prabhava), which influence their capacity to restore physiological harmony.

From a modern pharmacological perspective, this principle can be related to the maintenance of homeostasis and regulation of biochemical processes. Ayurvedic herbs contain diverse phytoconstituents that act on multiple molecular targets, thereby supporting holistic and preventive healthcare approaches.

Historical Use Of Medicinal Plants:

The use of medicinal plants has a very long history and is the basis of modern medicine. In ancient times, people discovered through observation and experience that certain plants could cure illnesses, reduce pain, and heal wounds. Civilizations such as Ancient Egypt, Ancient China, and Ancient India carefully recorded their herbal treatments.

In Egypt, the Ebers Papyrus listed many plant-based remedies around 1550 BCE. In China, medical knowledge was preserved in the Huangdi Neijing, which described the use of herbs to maintain balance in the body. In India, the traditional system of Ayurveda used plants like turmeric and neem for promoting health and treating diseases.

Greek scholars such as Hippocrates and Dioscorides further developed the study of medicinal plants and documented their uses. Over time, this knowledge spread to other parts of the world.

Even today, many modern medicines have their origins in plants. Therefore, medicinal plants have played an essential role in the growth and development of healthcare throughout history.

Diet For Mental Health And Illness In Ayurveda: Overview

According to Ayurveda, diet (Ahara) is a crucial determinant of mental well-being and plays an essential role in both the prevention and management of psychological disorders. Mental health is considered to be influenced by the equilibrium of the three doshas—Vata, Pitta, and Kapha—as well as the three mental attributes: Sattva,

Rajas, and Tamas. A Sattvic diet, which includes fresh fruits, vegetables, whole grains, milk, nuts, and moderately spiced foods, is believed to enhance mental clarity, emotional balance, and inner calmness. Conversely, frequent consumption of excessively spicy, oily, processed, or stale foods may disturb mental harmony by increasing Rajas and Tamas, potentially leading to anxiety, irritability, and mood disturbances.

Ayurveda further highlights the importance of proper digestion (Agni), regular meal patterns, and mindful eating habits in sustaining psychological health. Herbal formulations and specific dietary regimens are also recommended to strengthen cognitive function and support emotional stability, thereby complementing modern approaches to mental healthcare.

Evidence Based Application In Modern Medicine:

The incorporation of ayurvedic herbs into contemporary medical practice is increasingly grounded in scientific validation through experimental research, clinical investigations, and systematic evaluations. Modern studies aim to isolate bioactive compounds, clarify their molecular mechanisms, and assess their pharmacokinetic properties, safety, and therapeutic efficacy. Numerous herbal preparations have shown significant biological activities, including anti-inflammatory, antioxidant, antidiabetic, immunomodulatory, and neuroprotective effects in both preclinical and clinical settings.

Standardized herbal extracts are being utilized as supportive or adjunct treatments for chronic disorders such as diabetes mellitus, arthritis, cardiovascular diseases, and stress-related conditions. The concept of reverse pharmacology, which translates traditional clinical knowledge into laboratory-based evidence, has strengthened the credibility of ayurvedic medicine. Furthermore, improvements in quality assurance, standardization procedures, and regulatory frameworks facilitate their integration into mainstream healthcare. Nevertheless, comprehensive, large-scale randomized clinical trials remain essential to establish definitive safety and long-term therapeutic effectiveness in modern pharmacotherapy.

Challenges In Integration With Modern Pharmacotherapy:

The incorporation of ayurvedic therapies into mainstream pharmacotherapy presents several obstacles. A primary issue is the lack of uniform standardization of herbal products, as differences in plant sources, geographical conditions, cultivation practices, harvesting time, and processing methods can lead to variability in the concentration of active constituents. Concerns regarding quality assurance, including contamination, adulteration, and inconsistent labelling, also affect safety and reliability. Moreover, the scarcity of large-scale, well-controlled clinical trials limits the availability of robust evidence required for broader medical acceptance.

Potential herb–drug interactions represent another critical concern, particularly when patients combine herbal remedies with conventional medications. Regulatory discrepancies and limited pharmacovigilance mechanisms further complicate integration into established healthcare systems. In addition, unclear dosage standards and insufficient clinical guidelines may reduce confidence among healthcare professionals. Therefore, comprehensive research, stringent quality control measures, regulatory harmonization, and collaborative efforts between traditional and modern practitioners are essential to ensure safe and effective integration.

Future Directions In Herbal Drug Discovery:

The future of herbal drug discovery lies in combining traditional medicinal knowledge with advanced scientific approaches. Upcoming research is expected to emphasize the isolation, identification, and structural characterization of active phytochemicals using sophisticated analytical tools such as chromatography, spectroscopy, and computational modeling techniques. Emerging fields like genomics, proteomics, and metabolomics will further contribute to understanding the molecular targets and mechanisms underlying the therapeutic effects of herbal compounds.

Improving standardization, ensuring batch-to-batch consistency, and enhancing bioavailability through innovative drug delivery systems remain important priorities. The application of nanotechnology and the development of phytopharmaceuticals may improve efficacy and minimize adverse effects. Moreover,

conducting large-scale, well-structured clinical trials is essential to validate safety and therapeutic benefits. The continued use of reverse pharmacology will strengthen the scientific foundation of traditional remedies. Interdisciplinary collaboration among scientists, healthcare professionals, and regulatory bodies will be crucial for advancing herbal medicines into evidence-based global healthcare systems.

CONCLUSION

Ayurvedic herbs remain highly significant in contemporary pharmacotherapy owing to their extensive traditional usage and expanding scientific validation. Modern research has substantiated several classical therapeutic claims by isolating bioactive phytoconstituents and clarifying their pharmacological mechanisms at cellular and molecular levels. A wide range of ayurvedic plants have exhibited important biological activities, including antiinflammatory, antioxidant, antidiabetic, immunomodulatory, neuroprotective, and anticancer effects, supporting their potential role in managing both acute and chronic disorders.

The convergence of traditional ayurvedic wisdom with modern biomedical science provides a valuable platform for the discovery of safe, multitargeted, and economically feasible therapeutic agents. Approaches such as reverse pharmacology and evidence-based assessment have enhanced the scientific credibility and acceptance of herbal medicines. Furthermore, improvements in extraction techniques, analytical characterization, quality assurance, and novel drug delivery systems have contributed to greater consistency and therapeutic reliability of herbal formulations.

Despite these advancements, certain limitations persist, including variability in plant materials, limited large-scale clinical evidence, regulatory inconsistencies, and concerns regarding herb–drug interactions. Addressing these challenges through rigorous research methodologies, standardized production practices, and effective pharmacovigilance is essential.

Overall, ayurvedic herbs represent a promising and sustainable source for future drug development and integrative healthcare. Continued scientific exploration and collaborative efforts will facilitate their meaningful incorporation into modern pharmacotherapy, ultimately promoting holistic and patient-centered medical care.

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