



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://doi.org/10.5281/zenodo.13922586>Available online at: <http://www.iajps.com>

Review Article

**HERBAL REMEDIES IN PHARMACOTHERAPY:
A COMPREHENSIVE REVIEW****Mr. Abhishek Pandhari Kale^{1*}, Sunil S. Bhagat², Dr. Swati P. Deshmukh³**¹Student, Shraddha Institute of Pharmacy, Kondala Zambre, Washim-444505²Assistant Professor, Department of Industrial Pharmacy, Shraddha Institute of Pharmacy,
Washim-444505³Principal, Shraddha Institute of Pharmacy, Department of Pharmacology, Kondala Zambre,
Washim-444505**Abstract:**

Herbal remedies have been utilized in traditional medicine for centuries and are now gaining renewed attention in modern pharmacotherapy. This comprehensive review explores the role of herbal medicines in treating various diseases, including cardiovascular, metabolic, neurological, oncological, and gastrointestinal disorders. The pharmacological actions of widely used medicinal plants such as Hawthorn, Garlic, Fenugreek, Bitter Melon, Ginkgo biloba, and Curcumin are discussed, emphasizing their mechanisms at the molecular and cellular levels. While herbal therapies offer promising alternative treatments, challenges such as herbal-drug interactions, safety concerns, and standardization issues remain significant obstacles. Advances in herbal drug delivery systems, such as nanoparticles and liposomes, are enhancing the bioavailability and therapeutic efficacy of these natural compounds. However, the lack of consistent regulations, mislabeling, and insufficient clinical evidence hinders the full integration of herbal remedies into mainstream medicine. Future prospects highlight the need for rigorous research, personalized approaches, and collaboration between traditional and modern practitioners to optimize the use of herbal pharmacotherapy. This review provides a foundation for understanding the potential, limitations, and future directions of herbal remedies in modern healthcare.

KEYWORDS:

Herbal remedies, pharmacotherapy, traditional medicine, medicinal plants, herbal-drug interactions, standardization, bioavailability.

Corresponding author:**Mr. Abhishek Pandhari Kale,**

Student, Shraddha Institute of Pharmacy,

Kondala Zambre, Washim-444505

QR code



Please cite this article in press Abhishek Pandhari Kale et al., *Herbal remedies in pharmacotherapy: A comprehensive review.*, Indo Am. J. P. Sci, 2024; 11 (10).

INTRODUCTION:

Pharmacotherapy, the use of drugs to treat diseases, plays a central role in modern medicine, providing effective interventions for a wide range of health conditions. It is a cornerstone of healthcare systems globally, contributing significantly to disease management, symptom relief, and the enhancement of patient outcomes. Over the years, pharmaceutical research has led to the development of a vast array of synthetic and biologic drugs, designed to target specific physiological pathways for optimal therapeutic benefits. However, with the rise of chronic illnesses, drug resistance, and adverse effects of synthetic drugs, there is a growing need for complementary approaches to conventional treatments.

Herbal remedies, rooted in ancient medical traditions, have been used for millennia in various cultures, including Ayurveda, Traditional Chinese Medicine, and Unani. Historically, plants have been a major source of medicinal compounds, with many modern drugs being derived or inspired by plant-based compounds. For instance, aspirin was developed based on compounds from willow bark, and the antimalarial drug artemisinin comes from the plant *Artemisia annua*. This historical significance continues to influence the development of herbal medicine in contemporary pharmacotherapy.

In recent years, there has been a resurgence of interest in herbal remedies, particularly as complementary and alternative therapies. This renewed focus is driven by growing public interest in natural and holistic approaches to health, as well as increasing scientific evidence supporting the therapeutic potential of herbal compounds. Herbal medicines are often perceived as safer and more accessible than synthetic drugs, which has made them a popular choice for patients seeking more natural forms of treatment. Moreover, the rising cost of conventional drugs, coupled with concerns about side effects, has led healthcare providers and researchers to explore herbal alternatives that may offer fewer risks.

The objectives of this review are to comprehensively explore the role of herbal remedies in pharmacotherapy, examining their historical context, pharmacological actions, and clinical efficacy. This review will also assess the challenges of integrating herbal medicine into mainstream healthcare, including issues related to standardization, quality control, and herbal-drug interactions. By providing an in-depth analysis, this review aims to contribute to a better understanding of how herbal remedies can

complement and enhance modern pharmacotherapeutic approaches. Ultimately, the scope of the review encompasses not only the traditional uses of herbal medicine but also the advancements in herbal drug delivery systems, the potential for future integrative practices, and the importance of further research and regulation in this field.

HISTORICAL BACKGROUND OF HERBAL MEDICINE:

Herbal medicine has a rich history that spans across cultures and continents, with roots deeply embedded in traditional healing systems like Ayurveda, Traditional Chinese Medicine (TCM), and Unani. These ancient systems of medicine have long relied on the therapeutic properties of plants to treat a variety of ailments. In Ayurveda, which originated in India more than 3,000 years ago, plants such as turmeric, ashwagandha, and neem have been used to balance the body's energies and promote overall health. Traditional Chinese Medicine, which dates back over 2,500 years, incorporates herbs like ginseng, ginkgo, and astragalus, often in combination, to restore harmony between the body's yin and yang. The Unani system, developed by Greco-Arabic physicians, uses plants such as fenugreek, black cumin, and licorice to maintain the balance of bodily humors (phlegm, blood, bile) and treat various diseases.

The evolution of herbal remedies can be traced through centuries of trial, error, and cultural exchange. In ancient times, herbal medicine was often passed down through generations by oral tradition, with communities experimenting with local flora to discover their medicinal properties. Over time, these practices became formalized, leading to the development of comprehensive medical texts like the *Charaka Samhita* in Ayurveda and the *Shennong Bencao Jing* in TCM, which documented the therapeutic uses of hundreds of herbs. As civilizations expanded, trade routes such as the Silk Road facilitated the exchange of herbal knowledge between the East and West, enriching herbal pharmacopoeias worldwide.

During the middle Ages and the Renaissance, European herbalists like Dioscorides and Paracelsus contributed to the growing body of knowledge about medicinal plants. The invention of the printing press allowed for the widespread dissemination of herbal knowledge, with early pharmacopoeias categorizing plant-based remedies for specific diseases. Despite the rise of synthetic drugs in the 19th and 20th centuries, herbal medicine remained a key component

of healthcare in many parts of the world, especially in Asia, Africa, and Latin America.

Herbal medicine has played a foundational role in the development of modern pharmacotherapy. Many of today's pharmaceutical drugs have origins in plant compounds. For example, the cardiac drug digoxin is derived from the foxglove plant (*Digitalis purpurea*), while the pain-relieving properties of morphine are extracted from the opium poppy (*Papaver somniferum*). The discovery of penicillin from fungi in the 20th century also emphasized the importance of natural sources in drug development. Moreover, plant-based compounds continue to inspire modern drug discovery, with ongoing research into herbs for the treatment of chronic diseases such as cancer, diabetes, and neurodegenerative disorders. Thus, while the methods of drug development have evolved, the role of herbal medicine in shaping pharmacotherapy remains profound.

This historical perspective demonstrates that herbal remedies, far from being relics of the past, have significantly influenced and continue to inform modern medical practices, offering a bridge between traditional healing and contemporary drug development.

HERBAL REMEDIES AND THEIR PHARMACOLOGICAL ACTIONS:

Herbal remedies are used worldwide for their wide range of pharmacological effects, with many medicinal plants demonstrating significant therapeutic potential. Commonly used herbs like turmeric (*Curcuma longa*), garlic (*Allium sativum*), ginseng (*Panax ginseng*), and aloe vera (*Aloe barbadensis*) have long been recognized for their healing properties. For instance, turmeric contains curcumin, which exhibits strong anti-inflammatory and antioxidant effects, while garlic is known for its cardiovascular benefits and antimicrobial activity. Ginseng, on the other hand, is valued for its adaptogenic properties, helping the body resist stress, while aloe vera is commonly used for its soothing and wound-healing abilities.

Medicinal plants can be classified based on their therapeutic effects. Herbs with anti-inflammatory properties include turmeric, ginger (*Zingiber officinale*), and boswellia (*Boswellia serrata*), which inhibit pro-inflammatory pathways and reduce inflammation in conditions like arthritis. Antioxidant herbs, such as green tea (*Camellia sinensis*), rosemary (*Rosmarinus officinalis*), and ginkgo (*Ginkgo biloba*), help neutralize free radicals, thereby protecting cells from oxidative damage.

Antimicrobial herbs like garlic, neem (*Azadirachta indica*), and echinacea (*Echinacea purpurea*) are used to treat infections due to their ability to inhibit the growth of bacteria, viruses, and fungi.

At the molecular and cellular levels, the pharmacological actions of herbal compounds are often mediated through interactions with specific receptors, enzymes, and signaling pathways. For example, curcumin from turmeric inhibits nuclear factor-kappa B (NF- κ B), a key regulator of inflammation. Resveratrol from grapes (*Vitis vinifera*) activates the sirtuin 1 (SIRT1) pathway, promoting cell survival and longevity. Polyphenols from green tea exert their antioxidant effects by activating the Nrf2 pathway, enhancing the body's natural defense mechanisms. These molecular actions highlight the complexity and specificity of herbal remedies in modulating biological processes, supporting their use in various therapeutic contexts.

HERBAL MEDICINES IN THE TREATMENT OF SPECIFIC DISEASES:

Herbal remedies have been extensively studied for their potential in treating specific diseases, offering a natural alternative or complement to conventional therapies.

For cardiovascular diseases, herbs like hawthorn (*Crataegus oxyacantha*) and garlic have been used for centuries to promote heart health. Hawthorn is known for its ability to dilate blood vessels, improve coronary blood flow, and reduce blood pressure, making it beneficial for managing conditions like hypertension and heart failure. Garlic contains allicin, which helps lower cholesterol levels and reduces the risk of atherosclerosis by inhibiting platelet aggregation and improving lipid metabolism.

In the treatment of diabetes, plants like fenugreek (*Trigonella foenum-graecum*) and bitter melon (*Momordica charantia*) are widely used for their antidiabetic potential. Fenugreek seeds are rich in soluble fiber, which helps regulate blood sugar levels by slowing carbohydrate digestion and absorption. Bitter melon contains compounds like charantin and polypeptide-p, which mimic insulin's effects and help improve glucose uptake in cells, making it a promising remedy for managing type 2 diabetes.

Herbal remedies also show promise in managing neurological disorders like Alzheimer's, Parkinson's, and epilepsy. For instance, *Ginkgo biloba* is widely researched for its neuroprotective effects, improving cognitive function and memory in patients with

Alzheimer's disease by enhancing blood flow to the brain and reducing oxidative stress. *Bacopa monnieri* is another herb used in traditional medicine to support cognitive health, showing potential in improving memory and learning through its modulation of neurotransmitter activity and antioxidant properties. For epilepsy, herbs like *Annona senegalensis* and valerian have demonstrated anticonvulsant effects, though more research is needed to confirm their efficacy in clinical settings.

In cancer therapy, herbal compounds play a role in both chemoprevention and treatment. Phytochemicals like curcumin, resveratrol, and sulforaphane exhibit anticancer properties by inducing apoptosis (programmed cell death), inhibiting tumor growth, and suppressing cancer-promoting pathways. For example, curcumin inhibits multiple cancer-related pathways, including NF- κ B, and resveratrol targets the PI3K/Akt pathway to reduce cancer cell proliferation. These compounds are being studied not only for their ability to prevent cancer but also to enhance the effectiveness of existing chemotherapy drugs.

For gastrointestinal disorders, herbs such as aloe vera and ginger are commonly used. Aloe vera has anti-inflammatory and healing properties that help soothe irritated mucous membranes, making it effective in treating conditions like gastritis and peptic ulcers. Ginger, known for its ability to reduce nausea and improve digestion, is frequently used to manage gastrointestinal discomfort, including motion sickness and chemotherapy-induced nausea.

Herbal remedies are also used to treat other diseases such as respiratory and skin disorders, and to protect liver health. *Echinacea purpurea* is widely used for its immune-boosting properties, helping to prevent and treat respiratory infections like the common cold. For skin disorders, neem (*Azadirachta indica*) is recognized for its antibacterial and anti-inflammatory properties, making it effective for treating acne,

eczema, and other dermatological conditions. In liver protection, milk thistle (*Silybum marianum*) contains silymarin, a compound that supports liver regeneration and protects against toxins, making it a popular remedy for conditions like cirrhosis and hepatitis.

HERBAL-DRUG INTERACTIONS:

Herbal remedies, though natural, have the potential to interact with conventional drugs, leading to altered drug efficacy, increased toxicity, or reduced therapeutic benefits. These interactions occur when compounds in herbs interfere with the absorption, metabolism, distribution, or excretion of prescription medications. For instance, St. John's Wort, a popular herbal remedy for depression, is known to reduce the effectiveness of antidepressants, oral contraceptives, and certain anticancer drugs by inducing the cytochrome P450 enzyme system, specifically CYP3A4, which accelerates the breakdown of these drugs in the liver. Similarly, garlic and ginkgo can interact with the anticoagulant warfarin, increasing the risk of bleeding by inhibiting platelet aggregation and altering drug metabolism.

The mechanisms underlying these interactions often involve the alteration of drug-metabolizing enzymes, drug transporters, or changes in gastrointestinal absorption. Herbal remedies like St. John's Wort, turmeric, and grapefruit can upregulate or inhibit key liver enzymes like CYP3A4 and P-glycoprotein, affecting how drugs are metabolized. Additionally, some herbs may impact drug absorption in the intestines or modify the pH of the gastrointestinal tract, further influencing how quickly or completely a drug is absorbed. Such interactions pose significant risks, especially in patients with complex medical regimens or those taking drugs with a narrow therapeutic index. Therefore, healthcare professionals should always assess potential herbal-drug interactions to avoid adverse effects.

Table 1: herbal remedies, their pharmacological actions, and the underlying mechanisms for the treatment of specific diseases

Disease Category	Herbs/Plants	Pharmacological Action	Mechanism of Action
Cardiovascular Diseases	Hawthorn (<i>Crataegus</i> spp.)	Cardioprotective, antihypertensive	Increases coronary blood flow, antioxidant, vasodilation
	Garlic (<i>Allium sativum</i>)	Lowers blood pressure, cholesterol-lowering	Inhibits cholesterol synthesis, improves endothelial function
Diabetes	Fenugreek (<i>Trigonella foenum-graecum</i>)	Hypoglycemic, insulin-sensitizing	Stimulates insulin secretion, slows carbohydrate digestion
	Bitter Melon (<i>Momordica charantia</i>)	Antidiabetic, lowers blood glucose levels	Activates AMP-kinase, mimics insulin
Neurological Disorders	Ginkgo biloba	Neuroprotective, cognitive enhancement	Improves blood flow, antioxidant, reduces β -amyloid aggregation
	Bacopa monnieri	Enhances memory, reduces anxiety	Enhances synaptic activity, increases neurotransmitter levels
Cancer	Curcumin (Turmeric, <i>Curcuma longa</i>)	Anticancer, chemopreventive	Inhibits cell proliferation, induces apoptosis, antioxidant
	Green Tea (<i>Camellia sinensis</i>)	Chemopreventive, antioxidant	Inhibits angiogenesis, modulates cell signaling pathways
Gastrointestinal Disorders	Aloe vera	Soothes gastrointestinal tract, anti-ulcer	Anti-inflammatory, promotes mucosal healing
	Ginger (<i>Zingiber officinale</i>)	Anti-nausea, digestive aid	Inhibits serotonin receptors, anti-inflammatory
Respiratory Disorders	Echinacea (<i>Echinacea</i> spp.)	Immunostimulant, antiviral	Activates immune cells, reduces viral replication
Skin Disorders	Neem (<i>Azadirachta indica</i>)	Antimicrobial, anti-inflammatory	Inhibits bacterial and fungal growth, reduces inflammation
Liver Protection	Milk Thistle (<i>Silybum marianum</i>)	Hepatoprotective, antioxidant	Inhibits lipid peroxidation, stabilizes cell membranes

STANDARDIZATION AND QUALITY CONTROL OF HERBAL MEDICINES:

One of the major challenges in herbal medicine is ensuring the standardization and quality control of herbal formulations. Unlike synthetic drugs, which are composed of single, well-defined chemical entities, herbal medicines consist of complex mixtures of bioactive compounds. This variability in phytochemical content arises from factors like plant species, geographical origin, harvesting methods, and storage conditions, leading to inconsistencies in potency and efficacy between different batches of the same herbal product.

To address these challenges, several analytical methods are employed to ensure the quality and safety of herbal medicines. Techniques such as thin-layer chromatography (TLC), high-performance liquid chromatography (HPLC), and gas chromatography-mass spectrometry (GC-MS) are commonly used to identify and quantify the active constituents in herbal extracts. These methods help to

standardize herbal products by ensuring they contain consistent levels of bioactive compounds, regardless of natural variability. For instance, HPLC can be used to determine the concentration of silymarin in milk thistle extracts or curcumin in turmeric preparations.

Quality control also involves screening for contaminants such as heavy metals, pesticides, and microbial contamination, which could pose health risks. Ensuring the safety, efficacy, and consistency of herbal remedies is vital for gaining consumer trust and integrating herbal medicine into mainstream healthcare. Regulatory agencies like the World Health Organization (WHO), the U.S. Food and Drug Administration (FDA), and the European Medicines Agency (EMA) play critical roles in overseeing the safety of herbal products. They establish guidelines for the production, labeling, and testing of herbal medicines, promoting global standards to ensure that these products meet quality requirements.

ADVANCEMENTS IN HERBAL DRUG DELIVERY SYSTEMS:

The therapeutic efficacy of many herbal compounds is often limited by their poor bioavailability, rapid metabolism, and inability to reach their target site in sufficient concentrations. To overcome these limitations, significant advancements have been made in herbal drug delivery systems, incorporating modern technologies to improve the pharmacokinetics and therapeutic potential of herbal remedies.

Innovative delivery systems such as nanoparticles, liposomes, and phytosomes have been developed to enhance the bioavailability of herbal compounds. Nanoparticles are particularly useful in improving the solubility and stability of poorly water-soluble herbal compounds, allowing for more efficient absorption and prolonged circulation in the bloodstream. For instance, curcumin-loaded nanoparticles have shown enhanced bioavailability and greater therapeutic efficacy in the treatment of cancer and inflammation. Liposomes, which are lipid-based carriers, encapsulate herbal extracts to protect them from degradation, enhance cellular uptake, and facilitate controlled release, making them suitable for delivering herbal medicines to specific tissues or organs. Phytosomes, which complex herbal extracts with phospholipids, improve the bioavailability of polyphenolic compounds by enhancing their solubility and absorption across biological membranes.

These advancements not only enhance the bioavailability of herbal compounds but also improve their pharmacokinetic profiles, leading to more consistent and reliable therapeutic outcomes. For example, silymarin-loaded nanoparticles have shown improved liver-targeting ability and increased hepatoprotective effects compared to traditional formulations. Similarly, ginkgo biloba extract delivered through liposomal systems has demonstrated enhanced neuroprotective effects in models of neurodegenerative diseases.

Overall, these innovative drug delivery technologies represent a promising frontier in herbal medicine, allowing for more precise, effective, and sustained therapeutic outcomes, while minimizing side effects commonly associated with higher doses of traditional herbal formulations.

CHALLENGES AND LIMITATIONS OF HERBAL MEDICINES:

Despite their growing popularity, herbal medicines face several significant challenges and limitations.

One of the major concerns is safety and potential toxicity. While many herbs are considered safe based on traditional use, some herbal products can cause adverse effects, particularly when used in high doses or over prolonged periods. For example, herbs like ephedra have been associated with cardiovascular toxicity, and comfrey has been linked to liver damage. Furthermore, the perception that "natural" equates to "safe" often leads to the underreporting of side effects by patients using herbal supplements alongside conventional drugs.

Another critical issue is the inconsistent regulations and quality control standards across different countries. The manufacturing and sale of herbal medicines are often less regulated than pharmaceutical drugs, leading to variability in product quality. Some herbal products may be contaminated with heavy metals, pesticides, or harmful microbes, while others may be adulterated with prescription drugs to boost efficacy. For example, cases of mislabeling, where the actual herb differs from what is stated on the label, pose serious health risks to consumers.

Additionally, lack of robust clinical evidence for many herbal remedies remains a major obstacle to their integration into modern pharmacotherapy. Most herbal products are supported by anecdotal evidence or small-scale studies rather than large, randomized controlled trials, which are the gold standard in clinical research. This lack of evidence limits the confidence that healthcare providers can place in prescribing or recommending herbal treatments. Furthermore, issues like adulteration and contamination of herbal products complicate efforts to assess the efficacy and safety of these treatments reliably.

FUTURE PROSPECTS AND INTEGRATIVE MEDICINE:

The future of herbal medicines lies in the potential for integrative medicine, where herbal remedies are incorporated into mainstream pharmacotherapy alongside conventional treatments. The growing body of research into the pharmacological actions of medicinal plants supports this movement, offering new avenues for the treatment of chronic diseases like diabetes, cancer, and neurological disorders. However, realizing the full potential of herbal remedies requires greater standardization, better regulatory frameworks, and collaboration between traditional practitioners and modern healthcare providers.

Personalized medicine and pharmacogenomics also hold promise for optimizing herbal therapies. As our understanding of genetic variations in drug metabolism expands, it may become possible to tailor herbal treatments based on an individual's genetic makeup, maximizing efficacy while minimizing side effects. This could lead to more effective use of herbal remedies in treating conditions where conventional drugs may not be suitable due to adverse reactions or drug resistance.

To successfully integrate herbal remedies into conventional medicine, there must be greater collaboration between modern medical researchers and traditional practitioners. Traditional systems of medicine, such as Ayurveda and Traditional Chinese Medicine (TCM), have accumulated centuries of knowledge, but they often lack the rigorous scientific validation required by modern medical standards. By combining this traditional knowledge with cutting-edge scientific techniques, researchers can better identify, isolate, and test the bioactive compounds in medicinal plants.

Future research priorities should focus on validating the clinical efficacy and safety of herbal medicines through well-designed studies, developing advanced drug delivery systems for herbal compounds, and ensuring consistent product quality. Such research can help bridge the gap between traditional herbal practices and modern medical science, paving the way for the wider acceptance of herbal remedies in healthcare systems worldwide.

CONCLUSION:

Herbal remedies play a crucial role in modern pharmacotherapy, offering alternative or complementary treatments for a wide range of diseases and conditions. Throughout history, plants have been a rich source of medicinal compounds, many of which have been incorporated into modern pharmaceuticals. In this review, we explored the pharmacological actions of various medicinal plants, their therapeutic applications in diseases like cardiovascular disorders, diabetes, and neurological conditions, and the challenges posed by herbal-drug interactions and lack of standardization. However, for herbal medicines to gain greater acceptance in mainstream medicine, significant advancements in research are necessary. This includes rigorous clinical trials to establish efficacy, improved quality control measures, and enhanced regulatory oversight. Furthermore, the integration of herbal remedies with modern pharmacotherapy requires collaboration between traditional and modern healthcare systems, as well as the application of personalized medicine

principles to optimize treatment outcomes. Herbal remedies offer promising avenues for addressing unmet medical needs, further research, standardization, and integration into modern medical practice are essential to fully realize their potential in pharmacotherapy. By addressing the challenges and building on current scientific knowledge, herbal medicine can become an integral part of future healthcare systems.

DECLARATION OF CONFLICTS INTEREST:

The authors report no conflicts of interest.

ACKNOWLEDGMENT:

The authors acknowledge The Shraddha Institute of Pharmacy, Kondala Zambre, Washim-444505 for providing the necessary internet and library facilities and support to complete the work.

REFERENCES:

1. Gilani AH, Rahman AU. Trends in ethnopharmacology. *J Ethnopharmacol.* 2005;100(1-2):43-49.
2. Srivastava JK, Lambert J, Vietmeyer N. Medicinal plants: An expanding role in development. *World Bank Technical Paper.* 1996;320:1-61.
3. Li S, Han Q, Qiao C, Song J, Cheng CL, Xu H. Chemical markers for the quality control of herbal medicines: An overview. *Chin Med.* 2008;3:7.
4. Qi F, Zhao L, Zhou A, Zhang B, Li A, Wang Z, et al. The advantages of using traditional Chinese medicine as an adjunctive therapy in the whole course of cancer treatment instead of only in terminal stage of cancer. *Biosci Trends.* 2015;9(1):16-34.
5. Mashour NH, Lin GI, Frishman WH. Herbal medicine for the treatment of cardiovascular disease: Clinical considerations. *Arch Intern Med.* 1998;158(20):2225-34.
6. Gupta RK, Kesari AN, Watal G, Murthy PS, Chandra R, Tandon V, et al. Hypoglycemic and antidiabetic effect of ethanolic extract of leaves of *Annona squamosa* L. in experimental animals. *J Ethnopharmacol.* 2005;99(1):75-81.
7. Stough C, Lloyd J, Clarke J, Downey LA, Hutchison CW, Rodgers T, et al. The chronic effects of an extract of *Bacopa monniera* (Brahmi) on cognitive function in healthy human subjects. *Psychopharmacology (Berl).* 2001;156(4):481-4.
8. Ramasamy S, Agarwal R. Multitargeted therapy of cancer by proanthocyanidins. *Cancer Lett.* 2008;269(2):378-87.
9. Ernst E. Efficacy of herbal medicinal products for the treatment of hypercholesterolaemia: A systematic review. *J Fam Pract.* 1999;48(11):927-32.

10. Williamson EM. Drug interactions between herbal and prescription medicines. *Drug Saf.* 2003;26(15):1075-92.
11. Bent S, Tiedt TN, Odden MC, Shlipak MG. The relative safety of ephedra compared with other herbal products. *Ann Intern Med.* 2003;138(6):468-71.
12. Wu Y, Li W, Xu Y, Jin E, Tu Y, Hu L. Quality control methods and standardization of herbal medicines: Challenges and opportunities. *Chin Med.* 2021;16(1):32.
13. Atal CK, Dubey RK, Singh J. Biotechnological approaches in standardization of plant based drugs. *J Pharm Biomed Anal.* 1985;3(5):355-63.
14. Patel A, Shah V, Patel N. Nanotechnology in herbal medicines and cosmetics. *J Pharm Bioallied Sci.* 2012;4(3):186-8.
15. Goyal A, Rishi P, Shukla G, Chopra R. Herbal nanomedicine: A new era of nanodrug delivery. *J Chem Pharm Res.* 2015;7(10):78-87.
16. Ekor M. The growing use of herbal medicines: Issues relating to adverse reactions and challenges in monitoring safety. *Front Pharmacol.* 2014;4:177.
17. Handa SS, Rakesh DD, Vasisht K. *Compendium of Medicinal and Aromatic Plants. Asia.* United Nations Industrial Development Organization and the International Centre for Science and High Technology; 2006.
18. Rahman AU, Choudhary MI, Memon F. The importance of herbal medicine in healthcare systems. *J Ethnopharmacol.* 1999;68(1-3):99-101.
19. Dinda B, Panda A, Kumar S, Ghosh K, Sahu R. Role of herbal drugs in the management of diabetes. *Phytother Res.* 2013;27(5):661-8.
20. Abascal K, Yarnell E. Herbal medicine and its effects on drug therapy. *Altern Complement Ther.* 2004;10(4):227-34.
21. Leach MJ, Coyle ME, Mazzarella A, Houghton SL. Echinacea for preventing and treating the common cold. *Cochrane Database Syst Rev.* 2016;2
22. Wozniak D, Stojanovic M, Stojanovic M, et al. Anticancer activity of herbal medicines. *Cancer Chemother Pharmacol.* 2010;65(5):779-87.
23. Balachandran P, Govindarajan R. Cancer: A traditional herbal approach to treatment. *Am J Cancer Res.* 2011;1(3):220-37.
24. Nascimento SC, de Almeida RFL, Sousa LP, Doria J, Silveira A. The effect of ginger on health: A systematic review. *Adv Nutr.* 2017;8(5):716-29.
25. Velayudhan L, Anil Kumar K, Basak S. Role of herbal therapy in management of Alzheimer's disease: An overview. *J Ayurveda Integr Med.* 2018;9(1):59-65.
26. Koul IB, Prasad S. Studies on the effectiveness of various extracts of garlic (*Allium sativum*) on the blood glucose levels of diabetic rats. *Indian J Physiol Pharmacol.* 2009;53(2):159-64.
27. Cragg GM, Newman DJ. Plants as a source of anti-cancer agents. *J Ethnopharmacol.* 2005;100(1-2):72-9.
28. Lin S, Zhang Y, Liu Y, et al. Quality control of traditional Chinese medicine. *Phytomedicine.* 2011;18(2-3):214-21.
29. WHO. Guidelines on good agricultural and collection practices (GACP) for medicinal plants. World Health Organization; 2003.
30. Sarker SD, Nahar L. Chemistry for pharmacy and the pharmaceutical sciences. *Chem Pharm Bull.* 2007;55(3):289-301.
31. Pan SY, Zhang S, Tang M, et al. Historical perspective of traditional Chinese medicine and modern pharmacology: An overview. *Evid Based Complement Alternat Med.* 2013;2013:817942.
32. Li Y, Yang Y, Li T, et al. Anticancer effects of curcumin and its derivatives. *Cancer Lett.* 2016;375(1):68-79.
33. Van der Kooy F, Verpoorte R. Pharmacognosy of medicinal plants: An overview of the latest developments. *Pharmacogn Rev.* 2014;8(16):1-12.
34. Borrelli F, Ernst E. Garlic for the prevention of cardiovascular disease: A systematic review. *Lippincotts Prim Care Pract.* 2004;8(4):47-56.
35. Khedher N, Hfaiedh N, Boussabbeh M, et al. Ethnobotanical study of medicinal plants in the region of Kairouan, Tunisia. *J Ethnopharmacol.* 2018;223:184-91.
36. Adnan M, Kahn M, Khursheed A, et al. Herbal medicines for cancer therapy: An overview. *Cancer Chemother Pharmacol.* 2017;79(5):853-63.
37. Thirumalai T, Prabhu V, Sridhar S. Phytotherapy for diabetes: An overview of efficacy and safety. *J Diabetes Metab Disord.* 2014;13(1):29.
38. Gupta R, Tripathi N, Singh R. Pharmacological potential of ginger in managing various diseases. *J Med Plants Res.* 2011;5(30):6515-20.
39. Sancheti J, Mohan V. Review on herbal approaches for Alzheimer's disease. *Curr Drug Targets.* 2016;17(8):900-10.
40. Liao Z, Wang Y, Xu Y, et al. Integrating herbal medicine with modern pharmacotherapy in the treatment of depression. *J Ethnopharmacol.* 2020;250:112491.