

Chapter 50

Green Pharmacy: Botanical Remedies for Animal and Human Well-being

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ABSTRACT

Over 5000 years, herbs have been used for healing spans with over 85,000 plant species identified for their medicinal properties. Traditional systems such as Ayurveda and Traditional Chinese Medicine (TCM) have long used botanical remedies for holistic health management. Currently, approximately 75% of the global population is utilizing herbal remedies. Despite challenges in regulatory frameworks and standardization due to integrating botanical drugs into modern healthcare, their potential benefits in managing chronic conditions, and the rising demand for sustainable practices. However, traditional medicine contains essential botanical remedies but faces ecological threats from overexploitation. Ayurveda and TCM systems share common philosophical approaches to health which focus on balance within the body. Comparative studies show both common and unique ways by using plants, emphasizing the need to preserve ethno botanical knowledge. This preservation is crucial for maintaining cultural heritage and biodiversity. Plants have been essential in drug discovery and are serving as sources of bioactive compounds. The increasing herbal medicines demand is driven by their affordability and potential sustainability. However, research on plants such as ginseng emphasizes the need for rigorous quality control to ensure the efficacy and safety of herbal products. Herbs are also used in animal health practices to address concerns over synthetic drug residues and resistance. Worldwide acceptance of plant-based medicine remains to propagate as well as is supported by scientific validation of effective treatments. Developing countries are rich in medicinal plant species that are crucial in meeting global pharmaceutical needs. Ongoing research and regulatory efforts aim to ensure the efficacy, safety and sustainability of herbal remedies used in the healthcare of both humans and animals.

KEYWORDS

Botanical remedies, Animal and human wellbeing, Ayurveda, Traditional medicine

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INTRODUCTION

Humans have been utilizing herbs for healing purposes for many centuries and the historical records indicate that the medicinal use of natural products dates back at least 5000 years (Jamshidi et al., 2017). However, western medicine contains a shorter history duration a few hundred years. Currently, the medicinal properties of more than 85,000 plant species worldwide have been identified. The WHO predicted certain herbal remedies and nearly 75% all over the world population consumes for medicinal purposes (WHO, 2019). Herbal medicines are defined through the Food and Drug Administration (FDA) and encompass substances extracting out from garden-fresh as well as from dried out floras and plant fragments and extracted out as collective chemical constituents of plant foundation, macroscopic fungi, algae also their amalgamations (Khan and Abourashed, 2011). These drugs are formulated as solutions, powders, tablets, capsules, topicals, injectables, etc (Dahab, 2020). Consequently, this drug category can exhibit numerous characteristics including

composite mixes as well as absence of well-defined bio-active components (La Mesa et al., 2020)

Historically, natural products have played integral roles in various native medicinal methods like, (TCM) Traditional Chinese Medicine and also Indian herbal medicines (Ayurveda) (Patwardhan et al., 2005). The empirically-dependent treatments stay used to inhibit or treat holistically particular ailments and their signs which offer complementary alternatives to modern medicine (Lee et al., 2018). However, a significant portion of scientific examination dependent on herbal medicines is underscored by current medical research happening during twenty first era that focuses on rejuvenation as well as global validation of their efficacy and safety (RH, 2015). Furthermore, standardized biomass and manufacturing processes are continuously being developed through innovative methodologies (Van dam et al., 2008). Humans have relied on nature for sustenance, shelter, and healing throughout recorded history and one of the oldest and most enduring forms of treatment is herbal medicine which highlights our deep-seated connection with the natural world (Lewis, 1996). Due to the increase in the population, individuals seek alternative and holistic approaches to health and wellness which is a noticeable resurgence of interest in herbal medicines in recent years (Salmon, 2022). Herbal medicine utilizes plants and plant extracts to treat various illnesses and promote overall well-being known as botanical medicine (Jamal, 2023).

With the rise of pharmaceutical drugs and advances in Western medicine, the popularity of herbal remedies gradually waned (Andrew, 2014). The numerous reasons driving the growing popularity of herbal medicine (Pan et al., 2013). The demand for sustainable and environmentally friendly practices is rising and has also contributed to the popularity of herbal medicines (Dubey et al., 2004). Despite pharmaceutical drugs being involved in complex chemical processes and producing waste herbal medicines rely on sustainable resources and have a minimal environmental footprint (Espro et al., 2021). In recent years, contemporary healthcare systems have accepted the herbal medicine (Mosihuzzaman, 2012). Furthermore, integrative medicine combines conventional medical practices with complementary therapies such as herbal medicine become increasingly prevalent in hospitals and clinics worldwide (Debas et al., 2011). The potential benefits of incorporating herbal treatments into comprehensive treatment plans are widely recognized by medical professionals for chronic conditions that may benefit from a holistic approach (Jamal, 2023).

The interest in herbal medicine resurgence does not signify a rejection of modern medicine but rather an acknowledgment of the evidence-based approaches to healthcare and the valuable contributions of both conventional (Cant, 2020). People are rediscovering their connection to the natural world and are exploring ancient remedies that have withstood the test of time by appreciating nature's therapeutic power (Jamal, 2023). Herbal medicine contains a fascinating history that examines the reasons behind its effectiveness and explores the diverse range of medicinal plants used across cultures (Li and Weng, 2017). Additionally, the incorporation of plant-based medication interested in up-to-dated healthcare live outs as well as considerations regarding potential interactions with prescription pharmaceuticals, and safety issues (Rivera et al., 2013). Whether well-being or a healthcare professional exploring enhanced alternative therapies by joining understanding and embracing the therapeutic potential of herbal medicine (Andrew, 2014). Herbal products are gaining widespread acceptance as valuable agents with various therapeutic properties and treatments for numerous conditions (Pan et al., 2013).

Natural herbs have been extensively used in treating and preventing various ailments and the accumulated knowledge has contributed to the development of new herbal remedies that offer health benefits with minimal or no side effects (Sofowora et al., 2013). This rich tradition spans different systems of medicine including traditional Indian, European, Japanese Kampo, traditional Chinese, and traditional Arabic (Ansari, 2021). These systems encompass not only herbal treatments but also pharmaceuticals derived from minerals and metals and substances derived from animals (Kapoor, 2010). Botanicals comprise plants and plant products containing active ingredients sourced from various plant parts or other plant materials that are formulated for medicinal use to treat diverse ailments (Tiwari, 2008). Since prehistoric times plants have been utilized as medicinal remedies due to their healing properties documented over millennia and are dating back over 5000 years to the era of ancient Sumerians who recorded their knowledge on clay tablets (Halberstein, 2005).

Botanical medicine plays a crucial role in outmoded as well as current therapeutic methods along with treatments like (TCM), flower essence therapy, naturopathy, aromatherapy, homeopathy as well as Indian herbal medicine system (Bone and Mills, 2013). Within numerous emerging nations, botanics fulfill essential healthcare needs are fulfilled by botanicals and with significant usage observed in Africa and Asia (Mudau et al., 2022). However, several drugs have been derived from botanical sources in modern medicinal practices such as *Artemisia* represents artemisinin, for malaria treatment they used annua, foxglove is used for cardiac glycosides for cardiac arrest and *Galega officinalis* is used for Isoamylene guanidine, that leads towards synthesis of metformin for diabetes treatment (Koul et al., 2017). In contrast, the combination underscores a growing recognition within the medical community of the efficacy and importance of botanical medicine (Talalay, 2001). Moreover, herbal or botanical sources offer natural products among the most popular supplements used due to their efficacy in treating various conditions that remain debated due to a lack of controlled studies (Khan and Ahmad, 2019). This chapter provides a review of the literature on the significance of botanicals by highlighting current challenges in this field and exploring opportunities for the advancement of botanical drugs with a particular focus on market dynamics, regulatory frameworks, and modernization efforts.

Botanical Remedies in Traditional Medicine

Herbal medications are vital to treat various ailments such as millennia which are playing a crucial role in promoting health and well-being (Sen and Samanta, 2015). However, a significant increase in global demand for plant resources and

resulted in the endangerment of various plant's germplasm resources because of ecological destruction and degradation (Ogwu et al., 2014). This can lead to a gradual decline in agronomic yield as well as source of various species and studies are focusing on therapeutic herbs to recognize species by same phytochemical constituents or else active ingredient contented by facilitating qualitative and quantitative substitution (Moyo et al., 2015). Moreover, these global efforts are essential for the sustainable utilization and protection of medicinal plant resources that face extensive exploitation driven by high commercial demand (Chen et al., 2018).

World Health Organization defined the outmoded medication as encompassing awareness, and abilities based on indigenous notions, opinions along with capabilities from various values (Ogwu et al., 2014). However, this knowledge is utilized for maintenance of well-being as well as inhibit, identify, recover, give bodily as well as cerebral ailments (George, 2024). Moreover, many scholars have extensively reviewed and compared Ayurveda and TCM and are noting their distinct but lengthy traditions in utilizing medicinal plants for therapeutic purposes (Koul et al., 2017). These systems share many botanical drugs that are employed for similar or different therapeutic applications using varied processing methods (Chen et al., 2016).

Ayurveda and TCM shared a similar philosophical approach to treat diseased conditions which are considered humanoid body's components and the fundamentals of the world (Gasseholm, 2012). The humanoid body consists of basic around which world's penta components (water, metal, earth, wood, and fire) operate in balanced yang and yin state (Chopra and Doiphode, 2002). In Ayurveda, the humanoid body stays supposed that it consists of 3 powers (tridoshas) — vatta, pitta, and kapha — each governed by two elements from the pancha mahabhutas (Patwardhan et al., 2005). Furthermore, physiological balance and various processes are regulated within the body by these triodes' maintenance (Patwardhan et al., 2005; Kim et al., 2011). Several aspects can provide deeper intuitions into earliest medical texts as well as their underlying principles through detailed comparative studies (Sox et al., 2024). Plants with similar therapeutic activities but belonging to different species within the same genus can serve as substitutes for each other and such investigations are valuable (Stefano, 2020). For instance, various species of *Aconitum* various species found in India and China share similar medicinal usages then species such as *Aconitum carmichaeli* Debx (Kakkar et al., 2023). Cultivated widely in China could substitute for endangered species (Rawat et al., 2016). The given example demonstrates how knowledge about medicinal flora from different traditional systems can mutually advantage every system (Sarivastava and Vikash, 2010).

Traditional Chinese Medicine (TCM) and Ayurveda contain distinct diagnostic principles and guides for the use of different herbs for similar therapeutic purposes. Moreover, TCM and Ayurveda used various species but for varying therapeutic effects (Patwardhan et al., 2005). Such as, rhizome of *Curcuma longa* L. is known as Jianghuang in Chinese and is used in TCM to promote blood circulation, stimulate menstruation, and alleviate pain (Jaiswal and Liang, 2016). However, *Curcuma longa* L. (Haldi, and Haridra in Sanskrit) is valued in Ayurveda for treating respiratory issues, rheumatism, inflammation, menstrual problems, colds, coughs, and skin (Patwardhan et al., 2005). The leaves of Haridra are traditionally used to aid digestion, reduce bloating and gas, and as a culinary flavoring agent and are noted for their antimicrobial properties (Arutselvi et al., 2012). Similarly, Asparagus roots of different species are employed in both TCM and Ayurveda for diverse therapeutic purposes (Jaiswal et al., 2016).

Herbal medicines hold enduring efficacy and yet their widespread adoption for disease management remains limited despite their potential (Bone, 2013). Ethnic and rural communities play a crucial role in preserving ancient medicinal knowledge associated with plants and preventing it from fading into obscurity (Block et al., 2015). Revitalizing herbal medicine requires its integration into mainstream modern healthcare by ensuring adherence to rigorous safety and efficacy standards contains significant challenges (Yin et al., 2013). Additionally, the natural products are continued to serve as inspiration for drug discovery with nearly 80% of drug molecules having origins in natural sources or being natural product derivatives (Payyappallimana, 2010). However, approximately 50% of newly approved drugs have been based on natural compounds since 1994 and are underscoring the pharmaceutical importance of plant-derived substances (Gielecinska et al., 2023). Herbal products also serve as popular nutritional supplements and offer essential nutrients like vitamins, minerals, micronutrients, and antioxidants that are deficient in the diet (Bennett and Sturmberg, 2018).

Scientific Research on Botanical Remedies

Plants are fundamental in pharmacotherapy and have served as a rich source of bioactive compounds essential for drug discovery since the 19th century (Suntar, 2020). However, the pharmaceutical industries have shifted towards synthetic and combinatorial chemistry-based libraries for high-throughput screening and a significant proportion of new drug objects approved between 1981 and 2010 were derived from or inspired by natural products (Sarivastava and Vikash, 2010). In addition, plants form the basis of herbal medicines known as phytopharmaceuticals or botanicals due to their role in drug discovery as shown in Table 1 (Suntar, 2020). Herbal preparations are vital for traditional medical systems worldwide and in regions where conventional medicine is inaccessible to 70% of the population and are making herbal remedies their primary healthcare option (Anand et al., 2019). Traditional systems like Ayurvedic medicine in India, Kampo in Japan, Traditional Chinese Medicine (TCM), and Unani in the Middle East and South Asia are widely relied upon (Bennett and Sturmberg, 2018). The herbal treatments' affordability, local availability, and potential sustainability make them increasingly relevant amidst rising healthcare costs and all are explained in Table 2 (Bhusnure et al., 2019)

In the contemporary herbal historical period there has been a steady global increase in demand for traditional herbal

medicines and botanicals over the past two decades, even in industrialized nations (Suntar, 2020). Due to their complex composition, herbal extracts and mixtures are believed to interact synergistically, enhancing solubility, and bioavailability, and potentially influencing multiple disease pathways, which is advantageous in chronic, multifactorial diseases (Balunas et al., 2005). Although proving these effects experimentally is challenging, the popularity of herbal medicines continues to rise. Many traditional medical systems aspire to integrate into mainstream healthcare by necessitating evidence of safety, efficacy, and quality that meets public health insurance standards (Ogwu et al., 2014). However, many challenges are posed by regulatory variations globally for herbal medicinal products. Herbal products are also marketed across countries as dietary supplements, functional foods, cosmetics, or medical devices, and each category is subject to different regulatory frameworks (Thakkar et al., 2020). For instance, dietary supplements are regulated under the Dietary Supplement Health and Education Act (DSHEA) in the USA which allows marketing without premarket approval based on efficacy and safety data required for medicinal products. Despite drugs being dietary supplements cannot make health claims but can use structure-function claims and are often ambiguous (Hernandez et al., 2004).

Table 1: Immune mechanisms of herb-induced Immunostimulation (Suntar, 2020)

Herb	Mechanism of immune stimulation
<i>Spirulina</i>	<ul style="list-style-type: none"> Increases NK cell activity. Activates Toll-like receptors and increases NK-mediated IFN secretion via elevated IL-12 and IL-18 Increases gene expression of cytokines IL-8, MCP-1, MIP-1α, MIP-1β, IP-10, TNF-α, IL-1β, and the enzyme COX-2. Acts on Th1 cells and increases production of Th1 cytokines, such as IL-2 and IFN-γ.
<i>Aphanizomenon flos-aquae</i>	<ul style="list-style-type: none"> Activates NK Cells. Activates NF-kappa B and increases TNF-α and IL-1β expression
<i>Chlorella</i>	<ul style="list-style-type: none"> Increases TNF-α and IL-1β expression. Augments Th1 cells response. Increases NK cell activity and production of IFN-γ and IL-12.
<i>Echinacea</i>	<ul style="list-style-type: none"> Increases extracellular cytotoxic effects of macrophages to similar levels compared to IFN-γ. Increases production of various interleukins, including IL-1, IL-10 and TNF-α. Stimulates NK cell activity and increases antibody-dependent cell cytotoxicity.
Alfalfa	<ul style="list-style-type: none"> Novel epitopes created by L-canavine-laden aberrant proteins trigger autoantibody production or cytotoxicity.

Table 2: Reports of activation of autoimmune skin disease following ingestion of herbal supplements (Bhusnure et al., 2019)

Herbal supplement	Autoimmune skin disease
Food supplement containing <i>Spirulina platensis</i> , <i>Ginkgo biloba</i> , and ginseng	Pemphigus vulgaris
supplement containing <i>Spirulina platensis</i> , <i>Alphanizomenon flos-aquae</i> , organic cayenne pepper, and methylsulfonylmethane	Dermatomyositis
<i>Spirulina</i>	Mixed immunoblistering disorder with features of bullous pemphigoid and pemphigus foliaceus confirmed via histopathology and direct/indirect immunofluorescence
<i>Spirulina</i>	Dermatomyositis
<i>Echinacea</i>	Erythema nodosum
<i>Echinacea</i>	Pemphigus vulgaris
Alfalfa	Systemic lupus erythematosus
Isalean (contains alfalfa and a proprietary enzyme blend of <i>Aspergillus oryzae</i> , <i>Rhizopus oryzae</i> , <i>Trichoderma longibrachiatum</i> , <i>Saccharomyces cerevisiae</i> , <i>Bacillus subtilis</i> , <i>Ananas comosus</i> , <i>Aspergillus niger</i>)	Dermatomyositis

Notably, efforts are ongoing to harmonize global regulations within the European Union and worldwide. Moreover, herbal medicinal products present unique challenges throughout their production by ensuring quality, safety, and efficacy from cultivation and processing to manufacturing and are demanding tailored quality control measures at each stage (Fan et al., 2012). China, Korea, and Japan have been using the root of *Panax ginseng* Meyer for centuries to treat conditions like tiredness, exhaustion, and weakness, and to aid recovery during convalescence. Over the past half-century, understanding of ginseng's pharmacology enhanced due to extensive research focusing on its active components including ginsenosides which were first identified in 1963 (Patwardhan et al., 2005). Ginsenosides are categorized into 20(S)-protopanaxadiol and 20(S)-protopanaxatriol groups based on their chemical structures. Moreover, the quality and composition variability of these components depends on factors such as plant species, cultivation methods, and plant part used (Fan et al., 2012). The pharmacokinetics of ginsenosides are

unrevealed by the continued research efforts and are supporting their observed efficacy in clinical studies (Bagchi, 2014). Upon oral administration, intestinal microflora metabolizes ginsenosides into compound K believed to be the principal active constituent. Ginsenosides undergo enterohepatic recirculation and are primarily excreted via feces after liver metabolism (Ghosh et al., 2019). Numerous *in vivo* and *in vitro* studies have explored ginseng's effects like antioxidative properties, neuroprotection, immune modulation, anticancer activities, and benefits for cardiovascular health and metabolic functions (Al-Harrasi, 2022).

Applications of Botanical Remedies in Animal Well-being

Plants have been utilized for health and medicinal purposes for millennia and pinpointing the exact origin of their medicinal use is challenging (Gulati et al., 2019). However, plants are consistently served as the primary source of drugs and treatment strategies across various traditional medicinal systems (Sahoo et al., 2010). India is renowned for its rich biodiversity and boasts numerous medicinal plant species utilized in systems like Ayurveda, Siddha, and Unani to combat a wide array of diseases (Nazir et al., 2019). Nature has provided medicines not only for humans but also for animals and birds since the dawn of life (Buhner, 2020). The animals have this innate ability to self-medicate with herbs called Zoo pharmacognosy which reflects an ancient practice that persists today (Huffman, 2022). Traditional and folk medicine worldwide relies heavily on plant-based therapeutic entities by encompassing approximately 75% of all remedies used. However, the use of plants surges in animal health practices driven by concerns over synthetic drug residues, high costs, and drug resistance (Robson and Baek, 2009). The organic livestock production systems particularly marked this trend. Now, plant-based medicines and products are employed widely to enhance health and serve as curative agents either alone or in combination with other treatments (Dawkins and Yan, 2010).

Herbal plants are utilized not only as health enhancers but also in the treatment of various infections, surgical interventions, gynecological issues, and animal ailments like bovine mastitis. These plants encompass the bioactive compounds that are vital for enhancing livestock productivity and reducing environmental pollutants (Hernandez et al., 2004). Moreover, the importance of traditional medicine is recognized by the World Health Organization (WHO) which advocates for further exploration and integration of these practices into veterinary care, particularly in developing countries. The potential benefits in modern healthcare are underscored through the resurgence of interest in medicinal plants for treating diseases and improving animal productivity (Al-Harrasi, 2022).

In animal diets or extracts, the practical use of herbal supplements depends on various factors like animal species, age, and intended production purpose. Each herb contains distinct biological substances through varied mechanisms that exert different effects (Kuralkar et al., 2021). Additionally, the phytogetic feed additives are a key mechanism that involves beneficially influencing the gut microflora ecosystem by controlling potential pathogens (Dawkins and Yan, 2010). This microbial eubiosis stabilization in the gastrointestinal tract indirectly enhances digestive capacity in the small intestine. Consequently, phytoGENICS alleviate immune stress in animals during critical periods and increasing the availability of essential nutrients for absorption and supporting optimal growth within their genetic potential (Hernandez, 2019).

In recent years, herbal plant feed additives have garnered increased attention as alternative feeding strategies to replace antibiotic growth promoters. Studies have shown that extracts from herbs such as sage (*Salvia officinalis*), thyme (*Thymus vulgaris*), and rosemary (*Rosmarinus officinalis*), along with blends containing carvacrol, cinnamaldehyde, and capsaicin, improve feed digestibility in poultry (Hernandez et al., 2004). These improvements are attributed to properties like appetite stimulation, digestion enhancement, and antimicrobial effects, suggesting that herbal extracts can serve multiple functions in animal health management. For instance, the growth responses of birds to essential oil supplementation remain debated and some studies are reporting enhanced growth parameters while others show no significant effects. Essential oils are used to stimulate digestive enzymes and impact lipid metabolism and fat digestibility (Kuralkar et al., 2021). In contrast, the use of herbal plants and phytogetic compounds in animal nutrition is gaining importance due to their perceived safety, efficacy, and natural origins. However, the mechanisms of action, optimizing dosage and application methods and ensuring safety and compatibility can be understood thoroughly by further research along with animal diets before widespread adoption in animal feed practices (Hashemi and Davoodi, 2011).

Applications of Botanical Remedies in Human Well-being

Humanity has relied heavily on plants not only for sustenance but also for healing purposes throughout history. Natural products have played a crucial role in advancing modern medicine by dating back to the eighteenth century when digitalis glycosides were first used to treat cardiovascular disorders and willow bark was popular for managing pain and fever (Hernandez et al., 2004). The search for new therapeutic agents from natural sources has led to significant discoveries such as antibiotics, anticancer agents, anti-inflammatory compounds, and pain relievers. Terrestrial plants provide a renewable resource for discovering novel biomolecules with therapeutic properties due to the diverse structures and biological activities of their constituents (Kuralkar et al., 2021).

The safety concerns related to herbal ingredients are understood by acknowledging their origins, the regulatory frameworks guiding their production, and the criteria available for making informed decisions about their authenticity, efficacy, and safety in their intended use (Hashemi and Davoodi, 2011). However, current practices are insufficient to ensure consumer confidence and protection because the global interest in herbal medicine grows and reports of

adverse effects increase. Therefore, to address these issues both international and national policies are being developed and implemented (Bhatt, 2015). Traditional pharmacopeias have evolved based on empirical testing over time, and many people worldwide rely on herbal remedies for their primary healthcare needs. The popularity of herbalism is expanding globally, with the industry projected to grow significantly in this century (Pandey and Saxena, 2019). Increasingly, these remedies are being clinically evaluated to establish their effectiveness. Some herbs have been found to contain specific biologically active compounds that validate their therapeutic value and have even led to new drug discoveries (Singh, 2020).

Consequently, there's a growing trend towards "designer foods" that incorporate medicinal herbs and other additives to enhance perceived health benefits in the health food industry. However, the composition and potential effects of these products are inadequately informed by consumers. For instance, certain additives such as psyllium in soy powder products can affect nutrient absorption and interact with medications by underscoring the importance of clearer labeling and consumer education. Moreover, herbal ingredients require comprehensive regulatory frameworks, improved consumer education, and transparent labeling practices associated with understanding safety concerns to ensure informed choices and safe use (Jana et al., 2018).

The raw medicinal plant materials quality depends significantly on agricultural and field practices that oversight policies in the country of origin, and the manufacturer's ability to detect potential issues. The final product value is influenced by factors like cultivation techniques, harvesting, post-harvest processing, transport, and storage (Bhatt, 2015). The cultural practices differences can affect how herbal remedies are diagnosed and evaluated for efficacy potentially leading to regional variations even when using the same plant species (Pandey and Saxena, 2019). The origins of medicinal systems, plant availability, and external influences on formulation and application are influencing the practices (Hashemi and Davoodi, 2011).

Future Directions and Challenges

Herbal medicine is widely used extending beyond developing countries with 70% of doctors in France and Germany regularly prescribing herbal remedies (Wang et al., 2024). The US FDA's guidelines for herbal supplements sales have fueled a booming market. Natural products or their derivatives accounts for 60-80% of newly approved antibacterial and anticancer drugs (Ahmadifar, 2021). Examples include penicillin from plant mold and belladonna in ophthalmology treatments. Rauwolfia serpentine known as Indian snake root, contributed to modern tranquilizers and hypertension medications (Talebi et al., 2022). Approximately 25% of modern pharmaceuticals trace their origins to traditional medicine (Caipang, 2020). The efficacy of herbal treatments require quality standards and evidence evaluation (Ogunkalu, 2019). Countries like China and India rich in medicinal plants are crucial in meeting global pharmaceuticals needs (Serra, 2021). Research on tribal medicines and efforts to document their use highlight the global demand for plant derived products enhancing public awareness and improving health outcomes (Basit et al., 2020).

Conclusion

In conclusion, the chapter emphasizes the profound historical and current significance of botanical remedies in both human and animal healthcare. For centuries, plants have served as a primary source of therapeutic agents, and their medicinal use dates back at least 5000 years. Despite the dominance of pharmaceutical drugs, there is a noticeable resurgence in the interest and use of herbal medicines due to their sustainable, holistic, and often synergistic properties. Traditional systems like Ayurveda and Traditional Chinese Medicine (TCM) provides the valuable insights. Moreover, the use of botanical remedies promotes productivity and reduces synthetic drug dependence in animal health. Globally, the interest in herbal remedies grows, and evidence-based approaches become paramount to fully harnessing their potential for well-being across all species.

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