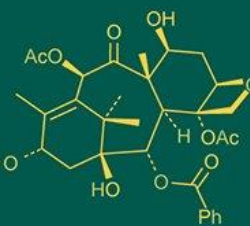
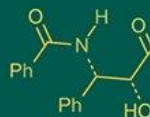
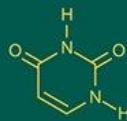
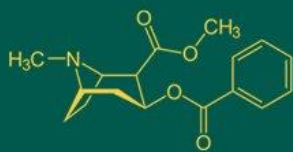


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(11): 868-875
www.biochemjournal.com
Received: 08-09-2025
Accepted: 12-10-2025

Saumya Aviral Mishra
Research Scholar, Institute of
Food Technology,
Bundelkhand University,
Jhansi, Uttar Pradesh, India

Shiv Kumar
Professor, Institute of Food
Technology, Bundelkhand
University, Jhansi, Uttar
Pradesh, India

Manish
Research Scholar, Institute of
Food Technology,
Bundelkhand University,
Jhansi, Uttar Pradesh, India

SK Chauhan
Ex-Director, Regional Food
Research and Analysis Centre,
Lucknow, Uttar Pradesh,
India

Exploring herbal remedies: Treating ailments and Unraveling supplement interactions

Saumya Aviral Mishra, Shiv Kumar, Manish and SK Chauhan

DOI: <https://www.doi.org/10.33545/26174693.2025.v9.i11Sk.6333>

Abstract

Throughout history, herbal plants have emerged as compelling therapeutic alternatives, functioning alongside conventional medical interventions to address diverse health challenges. Traditional Ayurvedic medical literature extensively documents botanical remedies employed for treating numerous health conditions. This comprehensive review examines the therapeutic efficacy of widely-utilized herbal supplements in disease management while simultaneously investigating the intricate interactions occurring between various supplement compounds. Our investigation specifically emphasizes four potent medicinal herbs---Amla, Mulethi, Giloy, and Brahmi---each demonstrating exceptional promise for developing innovative formulations and functional health supplements. Ayurvedic medicine continues experiencing remarkable international recognition and acceptance. India, recognised as the originator of this comprehensive healthcare system, has contributed significantly to global understanding of traditional medicine. The worldwide expansion of Ayurvedic popularity reflects documented evidence demonstrating its therapeutic effectiveness combined with its exceptional safety profile, characterized by minimal adverse effects when compared to synthetic pharmaceutical agents. The contemporary era has witnessed transformative changes in healthcare delivery and disease prevention approaches, fundamentally reshaping how societies conceptualize health and wellness maintenance.

Keywords: Nutraceuticals, dietary supplements, herbal medicines, Brahmi, Mulethi, Giloy

1. Introduction

Accumulating scientific evidence over recent decades has definitively established that dietary composition profoundly influences human health outcomes, thereby underscoring the necessity of maintaining nutritionally balanced dietary patterns. Contemporary societies increasingly recognize the direct relationship between eating patterns and susceptibility to serious health conditions including malignancies, metabolic disorders, and cardiovascular pathologies. This heightened awareness has motivated consumers to actively pursue specialized nutritional products specifically designed to address dietary insufficiencies and prevent disease development. The modern concept of dietary supplementation represents the practical application of the fundamental understanding that strategic dietary interventions---particularly the addition of missing essential nutrients---can effectively prevent numerous health complications (Srividya *et al.* 2010) ^[25].

1.1 Dietary Health Supplements

According to the United States Dietary Supplement Health and Education Act of 1994, dietary supplements are defined as any product (excluding tobacco products) containing one or more dietary components: plant-derived concentrates, botanical extracts, essential vitamins and minerals, medicinal herbs and their active constituents, amino acid compounds, or other natural substances intended to enhance and supplement overall nutritional intake. Regulatory frameworks classify nutritional supplements as a distinct food category, operating independently from conventional pharmaceutical regulations administered by the Food and Drug Administration (Baran *et al.* 2014) ^[2]. This distinction carries important legal ramifications, as dietary supplements cannot lawfully assert therapeutic disease claims---they are prohibited from purporting to diagnose, treat, alleviate, cure, or prevent pathological conditions. Nevertheless, extensive scientific investigation has consistently demonstrated that properly formulated supplements effectively support numerous physiological functions and

Corresponding Author:
Saumya Aviral Mishra
Research Scholar, Institute of
Food Technology,
Bundelkhand University,
Jhansi, Uttar Pradesh, India

address specific health requirements, accounting for their widespread adoption among health-conscious populations worldwide.

1.2 Nutraceuticals

Recent years have witnessed a discernible shift in nutritional science and consumer perspectives toward emphasizing functional foods and nutraceuticals as integral components of proactive health maintenance. These innovative products have demonstrated measurable positive effects on multiple physiological systems and overall health parameters. The foundational philosophy of nutraceuticals rests upon the principle that deliberate dietary selection and conscious nutritional practices form the cornerstone of sustained health. The term "nutraceuticals" represents an innovative linguistic creation coined by Stephen De Felice, strategically synthesizing the words "nutrients" and "pharmaceuticals." Nutraceuticals constitute bioactive organic compounds possessing therapeutic, preventive, or health-enhancing properties. These products transcend conventional nutrition by delivering food-based solutions enriched with bioactive compounds capable of producing physiological benefits or conferring protection against diverse disease processes. The nutraceutical category encompasses fortified food products, specialized dietary supplement formulations, herbal preparations, and functional food items. Contemporary consumer concerns regarding healthcare autonomy, informed medical decision-making, and personal health management have become increasingly paramount. Nutraceuticals include technologically processed foods such as fortified soups and cereals, specialized beverages, and genetically improved food products. Compelling evidence demonstrates that many of these substances surpass the health benefits derived from adequate nutrient consumption alone. These distinctive therapeutic effects correlate strongly with improved overall health status, enhanced physical vitality, and substantially diminished chronic disease risk (Srividya *et al.* 2010) ^[25].

1.3 Herbs and Botanicals

Botanical products, alternatively termed phytomedicines or herbal preparations, originate from natural plant sources and function to either treat existing health conditions or maintain optimal physiological wellness. Herbal supplements, defined as plant-based substances specifically formulated for internal administration, represent humanity's oldest and most extensively documented therapeutic interventions. Medicinal plants have sustained their therapeutic significance throughout recorded human civilization, valued for their remarkable healing and restorative properties. Conventional Ayurvedic medical philosophy maintains that properly selected medicinal plants possess inherent nutritional and therapeutic qualities, rendering them instrumental in addressing virtually any health condition or disease manifestation (Goyal *et al.* 2007) ^[9]. Since humanity's earliest periods, herbal remedies have successfully addressed both acute infectious conditions and chronic degenerative diseases. The accumulated wisdom derived from millennia of botanical investigation has provided contemporary practitioners with numerous scientifically-supported therapeutic options for maintaining and restoring optimal health (Srividya *et al.* 2010) ^[25]. This comprehensive review endeavors to consolidate evidence-based information regarding commonly-consumed

plants possessing substantial health-promoting properties, which can be safely and effectively incorporated into dietary supplementation protocols for disease prevention and health maintenance.

2. Herbal Renaissance

2.1 Herbal Medicine: A Time-Honored Tradition Evolving in Modern Healthcare

Herbal medicine practice maintains deep historical roots within traditional healthcare systems, representing a therapeutic approach refined and validated across countless generations. This exploration examines how herbal medicines continue to evolve and integrate successfully within contemporary medical frameworks.

The World Health Organization defines traditional medicine as "knowledge, skill, and practices based on the theories, principles, and experiences indigenous to diverse cultures, employed in diagnosing, treating, or managing diseases affecting the body and mind, as well as in preserving health." Traditional medical frameworks vary considerably across different civilizations, with each system's underlying philosophy and therapeutic methodology shaped by the environmental conditions, climatic patterns, and geographical characteristics of its region of origin (WHO, 2005). However, shared across these diverse traditions exists a common philosophical foundation emphasizing holistic approaches to human wellness, maintenance of equilibrium between environmental, psychological, and physical domains, and prioritization of health promotion over disease management.

2.2 Traditional Indian Medical Systems: Ayurveda, Siddha, and Unani

India has preserved and systematically developed several sophisticated traditional medical frameworks, most prominently Ayurveda, Siddha, and Unani systems. Ayurvedic medicine emerged during the historical period spanning 2500 to 500 BC. The term "Ayurveda" translates literally as "Science of Life," eloquently reflecting the system's fundamental emphasis on understanding individual constitutional variations and their critical relationship to health maintenance. Contemporary research has established that individuals maintaining optimally balanced metabolic function characteristically demonstrate superior health outcomes. Recognizing the comprehensive nature of this approach, Ayurveda has earned the distinguished designation "Science of Longevity," as it furnishes systematic methodologies for achieving physical regeneration through thoughtful nutritional planning and strategic dietary management (Pal *et al.* 2017) ^[3].

Throughout human prehistory and recorded history, civilizations have incorporated natural and plant-derived products---including herbaceous plants, animal products, microbial organisms, and aquatic substances---into sophisticated therapeutic formulations for managing and alleviating disease. Paleontological evidence indicates that humans have utilized plants for medicinal purposes for approximately 60,000 years (Shi *et al.*, 2010 Wachtel-Galor *et al.* 2011) ^[21, 29]. Ayurvedic pharmacological theory establishes its classification system around five fundamental characteristics: rasa (taste qualities), guna (inherent properties), vipaka (taste transformation following digestion), virya (potency level), and prabhava (specific therapeutic activity). This sophisticated framework

deliberately blurred traditional distinctions between medicine and nutrition, recognizing both as essential therapeutic elements. Ancient medical scholars including Charak, Sushruta, and Vagbhata meticulously documented and categorized approximately seven hundred distinct herbal medicines, describing their specific properties and therapeutic applications. Their comprehensive pharmacological framework identified more than fifty distinct therapeutic categories, including classifications such as appetite stimulants, digestive aids, laxative preparations, anti-inflammatory agents, fever-reducing substances, ulcer-protective compounds, vital energy tonics, and general health-enhancing formulations. The subsequent introduction of Western scientific medicine during the eighteenth century created considerable challenges for traditional Ayurvedic practice (Pal *et al.* 2017) ^[3].

2.3 Ethnomedicine in India: The Status of Traditional Medicines

The herbal medicine industry has experienced remarkable expansion during recent decades, progressively gaining acceptance not only in economically developed nations but equally in developing countries worldwide. This expanding market reflects growing consumer appreciation for the organic nature of herbal products and their substantially reduced side effect profiles compared to synthetic alternatives. Throughout historical periods and continuing today, communities have systematically utilized botanical extracts to address an extensive array of health challenges (Al Snafi *et al.* 2018) ^[1].

India stands recognized as one of twelve global megacenters of biological diversity, harboring approximately 45,000 distinct plant species. Historical Vedic texts reference approximately 1,500 plant species demonstrating documented medicinal utility, while currently approximately 800 plant species remain actively employed within traditional healing systems. This remarkable botanical wealth has provided the foundational basis for India's exceptional heritage in traditional medicine.

Indian scientific traditions, tracing from the ancient Vedic era, have systematically documented the therapeutic applications of traditional medicines for conditions including jaundice, frequently associated with viral hepatitis manifestations. This historical documentation underscores the lasting relevance and demonstrated effectiveness of these traditional healing practices. Contemporary research efforts have successfully identified approximately 170 plant-derived chemical components sourced from 110 distinct plant species spanning 55 plant families, all demonstrating well-documented hepatoprotective properties (Pal *et al.* 2017, Kumar *et al.* 2010) ^[3, 15].

Specific herbal preparations, notably *Asparagus racemosus*, *Ocimum sanctum*, and *Tinospora cordifolia*, have demonstrated substantial efficacy in counteracting stress and its associated physiological consequences. The distinctive antioxidant characteristics of amla, *Mangifera indica* L., *Curcuma longa* L., and *Withania somnifera* L. substantiate both their historical applications and current utilization within contemporary herbal medicine frameworks. Traditionally formulated preparations containing glycyrrhizin have demonstrated variable therapeutic success in managing hepatic disorders and peptic ulcer conditions. However, recent pharmaceutical innovation has isolated glycyrrhizin's more potent derivative---a novel compound

now forming the basis of an advanced Japanese therapeutic agent showing considerable promise in treating viral conditions associated with chronic hepatic disease. Despite this extensive historical foundation and sophisticated traditional understanding of herbal therapeutics, India currently exports comparatively limited quantities of traditional medicines to international markets (Pal *et al.* 2017, Kumar *et al.*, 2010) ^[3, 15].

3. Therapeutic Diversity

3.1 Exploring the Diversity of Traditional Indian Herbal Remedies for Multiple Disease States

Contemporary lifestyles, characterized by demanding professional commitments and limited temporal flexibility, frequently preclude individuals from maintaining optimal nutritional practices. Consequently, immune function and general health status often deteriorate noticeably. This recognition has prompted the development of convenient, time-efficient alternatives capable of addressing physical health requirements effectively. Such initiatives have stimulated increased utilization of familiar herbal medicines and catalyzed the creation of specialized dietary supplement products incorporating these valuable botanical ingredients. Herbs represent plants possessing distinctive flavoring properties, notable medicinal applications, and defensive protective mechanisms. Beyond culinary enhancement, these botanical substances provide prophylactic protection against pathological conditions affecting cardiovascular systems, hepatic function, vascular integrity, and neurological health (Jamshidi *et al.* 2012) ^[17].

Natural antioxidant compounds function through two complementary mechanisms: they directly sequester free radical species or operate indirectly through enhancement of enzymatic antioxidant systems via coordinated biochemical processes. Flavonoids, secondary plant metabolites abundant in plant-based nutritional products, and phenolic chemical compounds exemplify such protective substances. Furthermore, these compounds demonstrate extensive biological activity including oxidative stress protection, age-related pathology prevention, and mutagenic protection mechanisms (Chauhan *et al.* 2013) ^[3]. Specific herbal plants including amla, *Tinospora cordifolia*, *Bacopa monnieri*, and mulethi contain notable polyphenolic phytochemicals. The remarkable free radical scavenging capabilities of flavonoid and tannin compounds enable them to influence numerous disease processes and health conditions favorably. The following discussion examines select frequently-encountered herbs and their well-documented medicinal properties.

3.2 Amla (*Emblia officinalis* Gaertn. L.)

Amla, more commonly recognized as Indian gooseberry, represents a commercially significant fruit crop flourishing in tropical and subtropical regions including China, India, Indonesia, and the Malay Peninsula territories. This remarkable fruit demonstrates exceptionally high concentrations of plant tannins and essential vitamins. Traditional medical practitioners commonly designate amla as the "fruit that restores health," eloquently reflecting its esteemed position within historical medicine. Comparative nutritional analysis reveals that amla's edible tissue contains approximately threefold greater protein content and approximately 160 times more vitamin C when compared to equivalent apple tissue. The fruit's outstanding nutritional

profile and remarkable medicinal properties have generated considerable international scientific and commercial interest. Apart from Barbados cherry, amla represents the most abundant natural source of vitamin C, containing between 500 and 1,500 milligrams of ascorbic acid per 100-gram serving. The fruit's characteristically sharp and astringent taste and its limited acceptance as a fresh table fruit have historically necessitated its incorporation into alternative food preparations.

Plant components throughout the amla fruit possess distinct therapeutic applications. Traditional medical systems employ fresh or dried amla fruit for managing inflammatory conditions, diarrheal illnesses, and jaundice manifestations. Topical application of fruit pulp has demonstrated documented effectiveness in reducing vertigo and tension headaches. Aqueous extracts and processed fruits and leaves have been successfully utilized for fever reduction and inflammatory management (Devendra *et al.* 2018) [8].

Scientific investigation has confirmed amla's substantial concentrations of plant tannins and phenolic compounds, specifically gallic and ellagic acids, which function to prevent ascorbic acid oxidation and degradation. The gallic acid component contributes notable antioxidant capacity to the fruit. Within Ayurvedic and Unani therapeutic frameworks, amla fruits feature prominently in numerous health-promoting formulations including chawanprash, triphala, Rasyana, and Arishtha preparations, traditionally recommended for promoting longevity and comprehensive wellness. Because amla fruit exhibits diuretic, astringent, and mild laxative properties, practitioners have incorporated it into treatment protocols addressing bronchial inflammation, glucose dysregulation, jaundice, dyspepsia, persistent dysentery, cough, and numerous additional conditions. The fruit's naturally astringent flavor typically precludes consumption of uncooked fruit; consequently, it has traditionally been processed into diverse culinary products including sauces, pickled preparations, jams, confections, preserves, and multiple other applications (Chandra *et al.*, 2018, Devendra *et al.* 2018) [5, 8].

3.3 Brahmi (*Bacopa monnieri*)

Brahmi represents among the most venerable therapeutic agents within the Ayurvedic tradition, with documented utilization extending back approximately 3,000 years within Indian civilization. Recognized as a cognitive-enhancing nootropic compound, Brahmi has maintained continuous therapeutic application throughout Ayurvedic medical practice. The substance falls within the pharmacological category termed "Medhyarasayana," representing compounds specifically formulated to enhance intellectual capacity and cognitive function. The plant has sustained recognition for centuries as a cerebral tonic particularly valuable for individuals experiencing anxiety conditions or seizure disorders, while also demonstrating capacity to improve overall cognitive function, memory consolidation, and mental focus. Numerous scientific investigations have examined the detailed neurological and pharmacological properties of Brahmi extract preparations. Saponins and related bacosides represent key constituent compounds within brahmi, recognized for their capacity to facilitate neural signal transmission and enhance nervous system function. Brahmi demonstrates an impressive spectrum of therapeutic actions encompassing analgesic properties, ulcer-protective mechanisms, anti-inflammatory activity,

antibacterial effects, anticancer potential, cellular protective functions, antioxidant capacity, cholinesterase inhibition, and comprehensive neuroprotective mechanisms (J. Suresh Kumar *et al.* 2011) [18].

Bacopa has remained safely utilized within Ayurvedic therapeutic protocols for many centuries, and current evidence indicates that administration at recommended dosage levels produces no harmful physiological effects. Traditional dosage protocols have included five to ten grams of unstandardized powder administered three times daily, aqueous infusions at eight to sixteen milliliters administered thrice daily, and thirty-milliliter syrup doses administered at similar intervals. Current evidence-based recommendations suggest adult populations consume five to twelve milliliters daily of one-to-two ratio fluid extract preparations, while children aged six through twelve years should receive two-point-five to six milliliters daily. Contemporary utilization of herbal products has accelerated substantially within both developed nations and Western contexts. Among medicinal plants currently employed, Brahmi demonstrates exceptional promise, enjoying established therapeutic application throughout Eastern medical traditions while progressively acquiring recognition as a desirable and versatile functional food ingredient. Contemporary commercial markets now offer numerous food products incorporating Brahmi, demonstrating its widespread acceptance and multifaceted applications.

Notably, Brahmi appears as an active ingredient in commercially available products including "B-Natural Brahmi RTS fruit beverage, Baidyanath Junior Chyawanprash, Jain Memovit Flavoured Brahmi Granules, Assorted Nutrition Bar pack, Panchwati Health Prash, Ojasvita," and numerous comparable preparations. These commercial products encompass diverse categories including ready-to-serve beverages, medicinal syrups, specialized health drinks, fortified nutritional foods, confectionery preparations, and breakfast cereal formulations, collectively illustrating the remarkable multiplicity of methods by which Brahmi integrates into contemporary nutritional products (Devendra *et al.* 2018, J. Suresh Kumar *et al.* 2018) [8, 11].

The progressive incorporation of Brahmi into commercial food products reflects recognition of its perceived therapeutic advantages alongside its expanding application as a valued culinary component. As herbal products maintain significant momentum within consumer markets globally, Brahmi maintains prominence as a significant and remarkably versatile botanical ingredient possessing both well-established traditional applications and demonstrated contemporary relevance.

3.4 *Tinospora cordifolia* (Guduchi/Giloy): Unveiling the Immune-Boosting Ambrosia of Medicinal Excellence

Tinospora cordifolia, scientifically classified within the Menispermaceae plant family as a moonseed variety, bears the vernacular designations "Guduchi" or "Giloy." Steeped in ancient medical history, this historically significant botanical has demonstrated therapeutic efficacy across an extensive disease spectrum, ranging from metabolic disorders including diabetes and gout to cutaneous manifestations and hepatic conditions including jaundice. Sanskrit tradition bestows upon this plant the distinguished designation "amrita," signifying immortal nectar and encapsulating its recognized properties of immune

enhancement, systemic cleansing, comprehensive revitalization, and antirheumatic action. Modern scientific investigation has explored the detailed medicinal mechanisms of *Tinospora cordifolia*, revealing particular capacity for mitigating adverse effects associated with anticancer therapeutic interventions (Tiwari *et al.* 2018) [26]. This dual therapeutic role---simultaneously honoring traditional medicinal applications while addressing contemporary clinical requirements---illuminates the remarkable adaptability and continued relevance of Guduchi within evolving healthcare paradigms. Giloy functions as a cornerstone constituent within numerous Ayurvedic pharmaceutical formulations, establishing itself as a therapeutically versatile herbal agent recognized for effectiveness across an extensive disease range. From dyspeptic conditions and urinary tract dysfunction to fever manifestations and physical debility, Giloy maintains central importance within traditional medical frameworks, exemplifying integrated approaches to comprehensive health and overall wellness promotion. Ayurvedic pharmaceutical science has developed multiple sophisticated Giloy-containing formulations, demonstrating its remarkable adaptability for managing varied health concerns. Essential formulations incorporating Giloy include "Guduchi taila, Sanjivani vati, Kanta-kari Avaleha, Guduchyadi Churna, Chyawanprasha, Guduchu Ghrit, Giloy Satva, Amrita Guggulu," and numerous alternative preparations. The remarkably diverse applications of Giloy underscore its significant importance in promoting comprehensive physical and mental wellness.

Giloy's chemical composition includes amino acid compounds, polysaccharide structures, aromatic volatile oils, fatty acid components, substantial calcium content, and significant phosphorus concentrations, collectively demonstrating its considerable nutritional richness. The Giloy stem functions as both a diuretic agent and bitter digestive stimulant, while the plant's root system exhibits recognized antimalarial properties and notable stress-relieving capabilities. Giloy's multifaceted therapeutic advantages extend to jaundice management, enhancement of bile secretion, and meaningful improvement of hematological parameters. Research investigations examining Giloy constituents have documented the presence of alkaloid compounds, steroid molecules, glycosidic substances, and additional bioactive compounds, collectively establishing its potential utility as both an antioxidant and immunological enhancement agent. Significantly, research evidence consistently emphasizes Giloy as an exceptionally efficacious therapeutic agent, demonstrably devoid of unfavorable or deleterious side effects (Chauhan *et al.*, 2013, Tiwari *et al.* 2018) [3, 26].

3.5 Mulethi (*Glycyrrhiza glabra*): Unveiling the Sweet Herb with Rich Ayurvedic Legacy

Glycyrrhiza glabra Linn, commonly designated as Mulethi or Licorice, represents a traditional botanical agent profoundly embedded within early Ayurvedic medical history, where its extensive therapeutic application has permanently influenced medical philosophy and practice. Beyond its significant medicinal applications, the plant maintains prominent recognition as an important flavoring and culinary agent. The English term "glycyrrhiza" etymology illuminates its distinctive properties, deriving from classical Greek terminology: "glykos" signifying

sweetness and "rhiza" indicating root structure. Belonging to the Leguminosae plant family, *Glycyrrhiza glabra* carries multiple vernacular designations including "sweet wood," "mulethi," and "licorice." The ethnopharmacological advantages of Mulethi substantiate its longstanding application within global traditional medical systems. This remarkably adaptable botanical exhibits a comprehensive array of phytochemical constituents, incorporating notable compounds including glycyrrhizic acid, isoflavone derivatives, glabrin A and B isomers, and glycyrrhizin (Al Snafi *et al.* 2018, Damle *et al.* 2014) [1, 6]. These diverse bioactive compounds contribute substantially to its therapeutic profile, facilitating respiratory system soothing, digestive support, and pronounced anti-inflammatory activity. The presence of these complex bioactive elements further supports its traditional applications while emphasizing its potential relevance within contemporary herbal medicine frameworks.

Folk medical traditions have employed the herb as a laxative agent, milk production enhancer, antiviral therapeutic, and asthma management tool. The glycyrrhiza root's prominent expectorant and soothing demulcent properties render it particularly effective for cough management strategies. Additionally, the preparation effectively addresses gout manifestations, anemia, pharyngeal inflammation, tonsil infections, intestinal gas conditions, sexual dysfunction, fever episodes, and diverse dermatological conditions, alongside duodenal and gastric ulcer pathology. The herb demonstrates therapeutic efficacy against bronchial inflammation, hemorrhagic conditions, excessive vaginal discharge, jaundice manifestations, persistent hiccups, and various physiological imbalances associated with vata constitutional disturbances. Glycyrrhizin has demonstrated considerable therapeutic utility in managing cirrhotic liver degeneration and persistent hepatitis conditions. The compound functions effectively as an antioxidant substance, while additionally providing antidiuretic, antidiabetic, antibacterial, and antifungal therapeutic actions (Al Snafi *et al.* 2018, Damle *et al.* 2014) [1, 6]. Licorice root has been employed consistently for ulcer and gastritis management using dosages ranging from one to fifteen grams (containing approximately two percent glycyrrhizin). Administration of substantially elevated dosages sustained over prolonged periods may increase hyperkalemia risk. The scientifically-recommended daily glycyrrhizin intake has been established at 0.2 milligrams per kilogram body weight daily (Al Snafi *et al.* 2018) [1].

4. Benefits and Efficacy of Herbal Agents and Supplements

Authentic health transcends the mere absence of diagnosed pathological conditions, with herbal health supplements representing essential resources for establishing and maintaining robust physical wellness while fortifying physiological systems against emerging health threats. Through embracing comprehensive approaches to health that address physical, mental, and environmental factors, these botanical supplements provide extensive benefits via diverse and sophisticated pharmacological mechanisms, collectively contributing meaningfully to comprehensive vitality and health resilience. Scientific investigation has documented the plant's capacity to produce an impressive spectrum of pharmacological actions, encompassing lipid-reducing effects, cardiovascular benefits, immunological

enhancement, respiratory system support, analgesic capabilities, antimicrobial properties, antioxidant functions, anticancer potential, and neurological system benefits (J. Suresh Kumar *et al.*, 2018, Srividya *et al.* 2010) ^[11, 25].

4.1 Nutraceuticals Approach: A Developing Alternative Strategy for Health and Wellness

Adequate nutrition remains among humanity's most fundamental requirements for survival and optimal physiological function. Data compiled by the World Health Organization indicates that India currently maintains the highest prevalence of cardiovascular disease manifestations and diabetes among global populations. Consequently, strategic intervention emphasizing prevention of nutrition-related health disorders and active wellness promotion, rather than focusing primarily on disease treatment, has become scientifically and clinically imperative. Nutraceuticals embody an innovative conceptual approach, whereby specialized products supplement standard dietary intake with compounds exceeding conventional nutritional composition, simultaneously facilitating disease prevention and therapeutic management. These substances have been broadly characterized as products derived either from natural sources or manufactured utilizing synthetic chemical processes (Pal *et al.* 2017) ^[3].

4.2 Herbal Medicines in Contemporary Healthcare

Herbal medicines and their bioactive phytochemical constituents, alternatively designated as nutraceuticals, currently serve diverse therapeutic purposes within multiple national healthcare delivery systems, with utilization expanding rapidly across all global regions (WHO, 2004). Practitioners typically employ herbal medicines to treat existing ailments, provide symptomatic relief, and prevent disease onset, particularly conditions endemic to geographical regions where the herbs thrive naturally. The herbal medicine system relies fundamentally upon secondary plant metabolites for accomplishing its diverse therapeutic actions. Folk herbal medicine systems maintain expansive therapeutic applications comparable to traditional pharmaceutical approaches. Indications for herbal treatment extend across substantial disease spectra, ranging from minor acute conditions including common infections, pain syndromes, and superficial injuries to serious chronic conditions including glucose dysregulation, parasitic infections, hemoglobinopathy, mycobacterial disease, malignancy, and hypertensive conditions, among numerous others. Throughout numerous geographical regions, herbal medicine maintains central significance in primary healthcare delivery systems (Datta *et al.*, 2011, Kumar *et al.*, Pal *et al.*, 2017 Srividya *et al.* 2010) ^[7, 3, 25].

4.3 Advantages of Regular Herbal Supplement Use

From a functional perspective, health supplements are best defined as products that enhance health status by providing concentrated formulations of biologically active food components in non-food vehicle formats. Recognizing the documented association between dietary patterns and health outcomes, consumers appropriately recognize the importance of consuming increased quantities of plant-derived foods. However, realistic evaluation of daily consumption feasibility reveals that achieving adequate intake of compounds such as carotenoid pigments, polyphenolic substances, tocopherol derivatives, and

vitamin C proves challenging within contemporary lifestyle patterns. Consequently, specialized dietary and health supplement products provide practical alternative approaches (Devendra *et al.* 2018) ^[8].

Individuals demonstrating hypersensitivity responses to conventional pharmaceutical ingredients can safely and effectively utilize naturally-derived supplement preparations. Extensive temporal utilization studies have confirmed that herbal preparations improve comprehensive wellness parameters and produce substantially fewer adverse reactions than their synthetic counterparts. Herbal supplement utilization represents a notably safer and more effective strategy for enhancing immune responsiveness and attenuating symptom manifestations, particularly for managing allergic phenomena. A significant advantage distinguishing herbal supplements from conventional pharmaceutical products involves their economical accessibility. Herbal supplement formulations require no prescription authorization, remain readily accessible through commercial channels, and maintain affordability for diverse economic populations.

5. Herbal Supplements: Navigating Health Concerns in Contemporary Healthcare

Current healthcare environments witness increasing consumer concern regarding health management responsibilities, therapeutic administration protocols, and wellness cost considerations. Substantial dissatisfaction with expensive, technologically complex disease treatment approaches within contemporary biomedical practice has motivated progressive exploration of additional or alternative therapeutic pathways. The escalating worldwide interest directly manifests in progressively heightened consumer demand for herbal supplement products, nutraceutical formulations, and plant-derived therapeutic agents. Concurrent with emerging health awareness, populations increasingly scrutinize product formulations, particularly regarding ingredients incorporated into health and wellness preparations. The coronavirus pandemic has substantially illuminated the critical importance of maintaining strengthened immune responsiveness, consequently generating dramatic increases in consumer interest regarding plant-derived and natural remedy applications. Both the food production and pharmaceutical manufacturing sectors in India recognize herbal supplements and nutraceuticals as presenting substantial commercial and therapeutic opportunities.

Public health professionals acknowledge the significant role that nutraceutical substances play in disease prevention and therapeutic management, considering them instrumental tools against acute and chronic disease processes resulting from nutritional insufficiency. This professional recognition extends to encompassing nutraceuticals' capacity for extending human lifespan, promoting comprehensive health status improvement, and enhancing overall quality of life. Looking toward future developments, nutraceuticals maintain anticipated importance within therapeutic research and clinical practice, with successful implementation contingent upon maintaining rigorous standards governing purity, product safety, and therapeutic efficacy while simultaneously encouraging innovative development (J. Suresh Kumar *et al.*, 2018, Srividya *et al.* 2010, Kakkar *et al.* 2021) ^[11, 25, 13].

Within the contemporary environment, distinguished by chronic stress, environmental contamination, elevated hyperactivity, and interpersonal tension, nutraceutical-enriched food products may prove invaluable in disease prevention and management strategies. Nutraceutical products maintain anticipated central importance within evolving health sector frameworks. Plant-derived substances and products generated through organic agricultural methods have sustained utilization within food preparation and consumable formulations since antiquity. Food preparations enhanced through herbal extract incorporation or specialized herbal formulations demonstrate progressively increasing commercial appeal owing to their distinctive flavor profiles, comprehensive health advantages, and systemic cleansing properties. Expanding functional food product commercialization presents expanding opportunities for substantively improving and managing health conditions (Jamshidi *et al.*, 2017, Kakkar *et al.*, 2021, Srividya *et al.* 2010) ^[12, 13, 25].

6. Conclusions

The extensive health benefits associated with herbal botanical agents have stimulated substantial contemporary interest in these substances. Such enthusiasm extends throughout Western nations and industrialized societies globally. Successfully modifying consumer perceptions regarding herbal agents and herbal health supplements requires that food and pharmaceutical industries develop high-quality herbal product formulations while implementing comprehensive marketing strategies. The present comprehensive review endeavored to systematically consolidate medicinal and nutraceutical properties associated with multiple traditional botanical agents, specifically amla, brahmi, giloy, and mulethi. Flavor characteristics substantially influence consumer satisfaction and subsequent continued consumption patterns. Implementation of commercially viable methodologies becomes essential---methodologies that successfully eliminate astringent and bitter flavor components without incorporating prohibited additives, while simultaneously preserving intended flavor profiles and optimal nutritional value. Integrating herbal agents as functional food components possesses considerable potential for dramatically enhancing population health status, potentially catalyzing revolutionary transformation within functional food markets and herbal health supplement industries. The application of medicinal plant materials within food systems, whether through optimal incorporation into supplement formulations or other commercial products, has demonstrated capacity for providing substantial health advantages and effectively reducing prevalence of significant disease processes including diabetes mellitus and associated cardiovascular pathologies.

References

1. Al Snafi AE. *Glycyrrhiza glabra*: A phytochemical and pharmacological review. IOSR J Pharm. 2018;8(6):1-17.
2. Baran KP. Dietary supplements. In: Encyclopedia of Toxicology. 3rd ed. Academic Press; 2014. p. 128-133. doi:10.1016/B978-0-12-3864-3.00838-1.
3. Chauhan DK, Puranik V, Mishra V. Development of herbal functional RTS beverage. Int J Biotechnol Res. 2013;1(3):28-37.
4. Chauhan DK, Puranik V, Rai GK. Development of functional herbal RTS beverage. Sci Rep. 2005;1-12. doi:10.4172/scientificreports.541.
5. Chandra N, Sarkar S, Sinha R, Sharma B. Development and evaluation of ready to serve beverage (RTS) from blend of Awala, *Aloe vera* and Ginger. Int J Curr Microbiol App Sci. 2018;7:3467-3472.
6. Damle M. *Glycyrrhiza glabra* (Liquorice)-a potent medicinal herb. Int J Herbal Med. 2014;2(2):132-136.
7. Datta KA, Paul R. An updated overview on peppermint (*Mentha piperita* L.). Int Res J Pharm. 2011;2(8):1-10.
8. Devendra, Patel SS, Birwal P, Basu S, Deshmukh G, Datir R. Brahmi as a functional food ingredient in food processing industry. J Pharmacogn Phytochem. 2018;7(3):189-194.
9. Goyal RK, Kingsly ARP, Kumar P, Walia H. Physical and mechanical properties of aonla fruits. J Food Eng. 2007;82:595-597.
10. Hirdyani H. Development and quality evaluation of RTS beverages made from traditional Indian medicinal plants. J Nutr Food Sci. 2015;S13-004. doi:10.4172/2155-9600.S13-004.
11. Suresh Kumar J, Joseph J, Rajakumar SN, Nazar S. Preparation of herbal whey drink added with extracts of *Bacopa monnieri*. Asian J Dairy Food Res. 2018;37(2):132-137.
12. Jamshidi N, Cohen MM. The clinical efficacy and safety of *Tulsi* in humans: A systematic review. Hindawi. 2017;1-13. doi:10.1155/2017/9217567.
13. Kakkar S, Tandon R, Tandon N. Immunity boosting health drink mixes: A patent-based review. J Intellect Prop Rights. 2021;26:357-369.
14. Kanchan SS, Agarkar BS, Sawate AR. Studies on standardization of blended RTS based on apple and orange juice. Pharma Innov J. 2020;9(8):149-154.
15. Kumar SKP, Bhowmik D, Chiranjib, Biswajit. *Aloe vera*: A potential herb and its medicinal importance. J Chem Pharm Res. 2010;2(1):21-29.
16. Msomi NZ, Simelane MBC. Herbal medicine. In: IntechOpen. 2018. p. 215-227. doi:10.5772/intechopen.72816.
17. Pal SK, Shukla Y. Herbal medicine: Current status and the future. Asian Pac J Cancer Prev. 2003;4:281-288.
18. Pandey MM, Rastogi S, Rawat AKS. Indian traditional Ayurvedic system of medicine and nutritional supplementation. Evid Based Complement Alternat Med. 2013;2013:376327. doi:10.1155/2013/376327.
19. Pathak R, Thakur V, Gupta RK. Nutritional analysis of cereal bars formulated using *Morinda citrifolia* and *Bacopa monnieri*. J Pharmacogn Phytochem. 2018;7(4):1546-1549.
20. Sethi L, Bhadra P. A review on *Tulsi* plant (*Ocimum sanctum* L.). Indian J Nat Sci. 2020;10(60):20854-20860.
21. Shi QW, Li LG, Huo CH, Zhang ML, Wang YF. Study on natural medicinal chemistry and new drug development. Chin Tradit Herb Drugs. 2010;41:1583-1589.
22. Shagiwal M, Deen B. Studies on development of ready to serve (RTS) beverage from strawberry (*Zingiber officinale* Rosc?) and *Aloe vera* (*Aloe barbadensis* Miller). Pharma Innov J. 2022;11(7):2308-2317.

23. Maneesha SR, Deepika S, Preety L. Preparation and properties of herbal extracts blended pineapple RTS. J Agri Search. 2019;6(1):34-37.
24. Sharma A, Sabharwal P, Dada R. Herbal medicine: An introduction to its history. In: Herbal Medicine in Andrology. Elsevier BV; 2021. p. 1-8. doi:10.1016/B978-0-12-815565-3.00001.1.
25. Srividya AR, Nagaswamy V, Vishnuvarthan VJ. Review on nutraceuticals as medicine. Int J Adv Pharm Sci. 2010;1(2):132-145.
26. Tiwari P, Nayak P, Prusty SK, Sahu PK. Phytochemistry and pharmacology of *Tinospora cordifolia*: A review. Syst Rev Pharm. 2018;9(1):70-78.
27. Varzakas T, Zakynthinos G, Verpoort F. Plant food residues as a source of nutraceuticals and functional foods. MDPI. 2016;5(88):1-10.
28. World Health Organization. Traditional medicine. Available from: https://www.who.int/topics/traditional_medicine/en/.
29. Wachtel-Galor S, Benzie IFF. Herbal medicine: An introduction to its history, usage, regulations, current trends and research. In: Benzie I, Wachtel-Galor S, editors. Herbal Medicine: Biomolecules and Clinical Aspects. 2nd ed. Boca Raton: CRC Press; 2011. ISBN: 978-1-4398-0713-2.