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REVIEW ARTICLE

A comprehensive review of herbal tea varieties and health benefits

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Abstract

Herbal beverages, made by steeping medicinal plants and herbs in hot water, have a rich historical background in traditional medicine across the globe, particularly in Indian, Chinese and indigenous practices. In recent years, these infusions have gained popularity due to their potential health benefits and therapeutic properties, such as promoting relaxation, supporting heart health, aiding digestion, boosting immunity, providing antioxidants and reducing stress. Herbal teas have been studied for their biological activities, including antioxidant, anti-inflammatory and antimicrobial properties, with research suggesting they may possess synergistic antioxidant effects. Indian herbal teas are uniquely positioned due to their rich history and use in traditional Indian medicine. This review aims to analyse the current scientific literature on herbal teas and their potential health benefits, highlighting the global phenomenon of their consumption and integration into the everyday lives of various cultures.

Keywords

herbal tea; medicine; therapeutic properties; biological activities

Introduction

Tea, an infusion derived from the desiccated leaves of the *Camellia sinensis*, is the most prevalent herbal beverage, consumed more often than coffee, chocolate and fruit drinks. Its popularity in global beverage culture has evolved, adapting to different locations, historical periods and cultural practices. In addition to its unique flavors, tea is a more versatile ingredient than store-bought coffee. This versatility reflects consumers' preference for herbal remedies for long-term health conditions such as diabetes, high blood pressure and metabolic syndrome. Furthermore, these remedies have been shown to have anti-obesity properties (1) alleviate allergic rhinitis syndromes (2) and delay cognitive decline, which promotes accelerated aging. Herbal teas, made from medicinal herbs and known for their numerous biological properties, including antioxidant, anti-inflammatory and antibacterial effects, are extensively researched and have been embraced by cultures around the world (3).

As a traditional beverage, herbal tea is used to enhance general health and alleviate specific ailments. Unlike tea made from *Camellia sinensis*, herbal tea is produced through the aqueous extraction of various plant parts, including leaves, stems, flowers, fruits, seeds, roots and bark or a combination of these components. The term "herbal tea" distinguishes this botanical drink from true tea, which is prepared through infusion, decoction or a combination of these methods (4). Herbal teas are highly regarded by both consumers and scientists for their therapeutic effects and pleasant sensory qualities, as they contain a variety of phytochemicals with diverse bioactivities (5).

Differences in species, agronomic conditions, production characteristics and home brewing techniques (such as boiling or infusion) can significantly affect the phytochemical composition of herbal tea. Herbal tea is a potential dietary supplement or health tonic that may contribute to healthy aging (6, 7). Additionally, the form of herbal mixtures (whether coarse, fine powder or granules) and the processing techniques used can influence the antioxidant properties of an infusion. Reports emphasizes the importance of evaluating herbal teas by identifying the bioactive components that affect their antioxidant or oxidative capacity (8). This evaluation should include comparisons of these values across relevant studies and ensure sufficient sample sizes. Furthermore, there is a growing popularity of Indian herbal teas, attributed to their potential medicinal effects and their relaxing, refreshing qualities (9).

Vertical Structure of *Camellia sinensis*

Members of the Theaceae family, specifically *Camellia sinensis*, are evergreen trees or shrubs that can reach heights of 10 to 15 m in their natural habitat. However, their cultivated height is generally lower, ranging from 0.6 to 1.5 m. The lanceolate, alternately arranged leaves of *C. sinensis* are light green, short-stemmed and leathery, featuring a wavy edge. These leaves typically measure between 5 to 30 cm in length and about 4 cm in width. When fresh, they exhibit a pubescent texture and a soft, leathery feel, complemented by a bright green hue. *C. sinensis* produces fragrant white flowers that measure 2.5 to 4 cm in diameter, which may appear singly or in clusters of 2-4. After flowering, these blossoms give way to brownish-red capsules, characterized by an abundance of filaments with yellow anthers (10). The plant also produces fruits that resemble smooth, spherical, flattened trigonal capsules with 3 compartments. Each compartment contains a single seed, roughly the size of a small nut (11).

Basic requirements for growing tea

The Yunnan and Guizhou plateaus, located in southwest China, represent the tropics and subtropics and are known as the birthplace of tea. This region's temperate climate is characterized by abundant rainfall, high humidity and diffused light. These environmental conditions have enabled tea plants to develop unique characteristics that allow them to thrive in hot and humid areas, low-light conditions and acidic soils (12, 13). Significant fluctuations in temperature, precipitation, relative humidity, rainy days and annual hours of sunshine directly influence both the quantity and quality of tea produced. Moreover, several other factors are essential for tea cultivation, including the natural ecosystems surrounding tea plantations, soil pH, water content, organic matter and nutrient availability. Additional important aspects include pest and disease management, along with the procedures involved in tea processing. Fig. 1 outlines the environmental conditions necessary for the growth and flowering of tea (14).

Current State of World Tea

Worldwide Tea Production

In 2018, the total amount of tea produced worldwide was 5966.19 million kg. This figure rose to 6161.15 million kg in 2019 and further increased to 6279.50 million kg in 2020. By 2021, production reached 6455.19 million kg, continuing the upward trend. However, in 2022, production experienced a slight decline, falling to 6422.66 million kg. China remained the world's largest tea producer, with its production increasing from 2610.39 million kg in 2018 to 3090.00 million kg in 2022. India, the second-largest producer, saw a modest increase in production from 1338.63 million kg in 2018 to 1365.23 million kg in 2022. Other important tea producers include Indonesia, Vietnam, Kenya, Turkey and Sri Lanka. In 2022, Kenya produced 530.00 million kg of tea, exhibiting some fluctuations in output. Meanwhile, Turkish tea production remained relatively stable at 280.00 million kg between 2018 and 2022. Sri Lanka's production, however, declined from 304.01 million kg in 2018 to 251.50 million kg in 2022.Vietnam and Indonesia also experienced a decrease in production during this period. In total, the combined production of several countries in 2022 was 606.83 million kg, down from 624.16 million kg in 2018. In

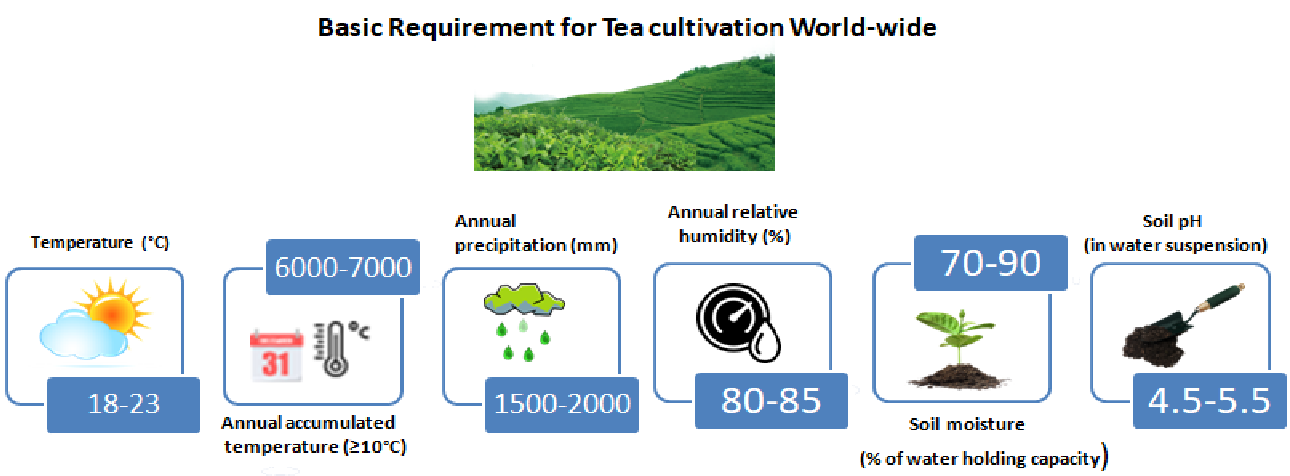

Fig. 1. Basic requirement for tea cultivation worldwide.

Table 1. Classification of *Camellia sinensis.*

Genus	*C. L- Camellia*
Family	Theaceae
Order	Theales
Subclass	Dilleniidae
Class	Magnoliopsida- Dicotyledons
Division	Magnoliophyta- Flowering plants
Super division	Spermatophyta- Seed plants

(**Source:** Mabberley's Plant-Book)

summary, there was a slight decline in global tea production in 2022 following an overall increase from 2018 to 2021. Table 2 shows the worldwide tea production rates (15).

Tea production in India has shown a fluctuating yet overall increasing trend from the financial year (FY) 2018 to FY 2023, with total output measured in million kg. In FY 2018, production was recorded at 1325.05 million kg, rising modestly to 1350.04 million kg in FY 2019. This growth continued into FY 2020, when production reached 1360.81 million kg. However, a notable decline occurred in FY 2021, with production dropping to 1283.03 million kg, likely due to significant disruptions caused by the COVID-19 pandemic. Despite this setback, tea production rebounded in FY 2022, increasing to 1365.34 million kg and continued to grow to 1374.97 million kg in FY 2023. This overall trend indicates a resilient recovery and sustained expansion in India's tea industry, underscoring its importance to both the agricultural and economic sectors (16).

Global Demand and Supply of Tea

According to the tea board of India (15), global tea production and consumption fluctuated between 2017 and 2022. In 2017, worldwide tea output totaled 5,718 million kilograms, exceeding apparent global consumption by 231 million kilograms. This trend of increasing production and consumption continued in the following years. In 2018, global tea production rose to 5966 million kg, resulting in an apparent surplus of 285 million kg. In 2019, production increased further to 6161 million kg, accompanied by a positive margin of 266 million kg in apparent global consumption. In 2020, global tea consumption reached 5,949 million kilograms, leading to a surplus of 338 million kilograms, while global tea output rose to 6,287 million kilograms. In 2021, both production and consumption estimates continued to rise, with apparent global consumption reaching 6173 million kg and global production totaling 6455 million kg, resulting in a surplus of 282 million kg. However, in 2022, the global tea market experienced a slight decrease in production to 6423 million kg. Despite this reduction, a surplus of 325 million kg was recorded due to relatively high apparent world consumption of 6098 million kg. Table 3 presents the world production and apparent global consumption of tea. Throughout this period, the global tea market consistently demonstrated a production surplus over consumption, indicating a stable supply to meet global demand, albeit with minor fluctuations in the surplus margin.

Table 2. World production of tea (Qty.inM.kg).

Country	2018	2019	2020	2021	2022
China	2610.39	2799.38	2986.02	3063.15	3090.00
India	1338.63	1390.08	1257.53	1343.06	1365.23
Kenya	493.00	458.85	569.54	537.83	530.00
Turkey	280.00	267.80	280.00	282.03	280.00
Sri Lanka	304.01	300.13	278.49	299.34	251.50
Vietnam	185.00	190.00	186.00	180.00	174.00
Indonesia	131.00	128.80	126.00	127.00	125.10
Others	624.16	626.11	595.92	622.78	606.83
Total	5966.19	6161.15	6279.SO	6455.19	6422.66

Classification of Herbal Teas

In addition to promoting increased tea consumption, herbal teas play a significant role in health care and maintenance, making them an integral part of tea culture. Most teas produced during the green tea production process are classified as unfermented teas. Some teas, such as oolong tea, undergo semi-fermentation, while others, like black tea are fully fermented (17). To preserve the color and natural components, unfermented tea plant materials are compressed, dried, mechanically packaged and immediately heated after harvest (18).

Semi-fermented tea is primarily produced through a process that includes rolling, picking, drying, sieving and boiling (19). Catechins constitute the principal biological component of fermented tea, making up approximately 20 % of its dried mass. The conversion of catechins into flavonoids and other polyphenolsduring fermentation relies on the action of polyphenol oxidase. (20, 21). The degree of fermentation significantly influences the unique taste and color of the tea, with flavonoids contributing to its characteristic orange-red hue (22). The 2 main phases of herbal tea production are illustrated in Fig. 2.

Unfermented Tea

It is important to note that most herbal teas are not fermented. Instead, they are made through a series of steps, including picking, withering, blanching, rolling and drying. In southwest China, the dried and delicate buds of *Castanopsis lamontii*, a plant known for its medicinal properties are used to prepare herbal tea. This plant is traditionally valued for relieving respiratory issues and reducingoral irritation (23).

Table 3. World production and global consumption.

Year	World production	Apparent global consumption
2017	5718	5487
2018	5966	5681
2019	6161	5895
2020	6287	5949
2021	6455	6173
2022	6423	6098

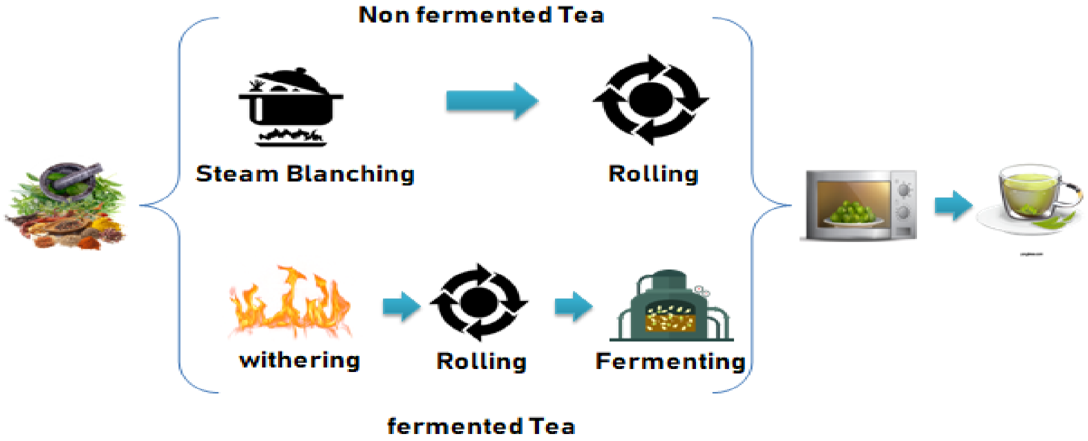

Fig. 2. Two primary herbal tea production methods.

Combretum micranthum G. Don, commonly used in traditional West African medicine, is often referred to as a "medicinal plant" or "long-lasting herbal tea." Traditional healers particularly value itfor treating kidney ailments (24). *Jasonia glutinosa* DC, known as "stone tea," is another well-known medicinal plant in the Mediterranean. Its flower stalks are used to prepare herbal drinks that aid in digestion (25). The dried flower heads of plants like *Matricaria recutita* L. and *M. chamomilla* are used to make chamomile tea, a popular herbal infusion known for its anti-inflammatory properties and long-standing use in traditional medicine (26). Additionally, *Yacon* (*Smalanthus sonchifolius*), native to the Andes, is traditionally grown and used to treat digestive issues, kidney problems and diabetes (27).

Fermented Tea

Fermented tea is produced through a specialized process involving picking, withering, rolling, fermenting and drying. This type of tea constitutes only a minimal portion of the overall production of infusions. As shown in Fig. 3, microbiologically fermented tea can be categorized into 4 distinct types based on the organisms used for fermentation: tea fermented by molds, bacteria, yeasts and fungi, each contributing to unique flavors and potential health benefits.

Fig. 3. Fermented tea types.

Fermentation increases the phenolic compounds in tea, enhancing its antibacterial and antioxidant properties. The process also reduces caffeine content, leading to a broader range of flavor components and a fresher aroma, while improving the tea's overall taste. Changes in the tea's pigments during fermentation give the tea a distinctive, transparent hue. According to a study, microbial metabolism during fermentation promotes the synthesis of many active ingredients, thereby significantly enhancing the quality of the tea (28).

Kombucha and black tea are both produced through essential fermentation processes. According to one report, black tea can be classified into 2 types: microbially fermented tea and naturally oxidized tea (29). The fermentation process is essentially an oxidation process facilitated by enzymes occurring naturallyin tea leaves.

Microbial teas have gained increasing popularity in the West in recent years, likely due to stronger economic ties between the People's Republic of China and Western nations as well as the health claims associated with these teas. Studies demonstrated that extracts from these teas contain natural antibacterial compounds that inhibit various food-borne pathogens and spoilage-causing microorganisms (30, 31). Puer tea, a unique type of microbially fermented tea from China, is produced using microorganisms and local fermentation processes. Unlike traditional black tea, Puer tea does not undergo natural oxidation. It was highlighted that *Aspergillus niger* plays a key role in the solid fermentation process involved in Puer tea production (29, 31).

It was reported that pressed tea exhibits antibacterial and antimutagenic properties, lowers the atherogenic index and increases the HDL/total cholesterol ratio (32). Kombucha, a tart tea drink, is produced by fermenting sweetened tea with a mixture of yeast and acetic acid bacteria following boiling. Originally from Manchuria in northeast China, kombucha has gained global popularity. It was reported that, despite often being referred to as "tea mushroom" in the literature, mushrooms are not involved in the fermentation process (33, 34).

It had been discovered that kombucha retains antibacterial activity against various microorganisms even after being heat-denatured (35). Compounds such as pyrogallol, γ-aminobutyric acid (GABA) and D-amino acids enhance the lactate fermentation process, primarily catalyzed by *Lactiplantibacillus plantarum* and *L. pentosus* in post-fermented tea. According to one study, lactic acid bacteria, particularly those in the *L. plantarum* group, play a crucial role in the biological functions of post-fermented tea (36).

Reports are also on the antibacterial activity of teas treated with normal fermentation decreases over time (37). This suggests that the antimicrobial effects of the original catechins or polyphenols are diminished during the enzymatic oxidation process. Different levels of tea fermentation result in varying antibacterial properties: unfermented green tea exhibits the most potent antibacterial effects, followed by partially fermented teas such as oolong, long jing, tieh-kuan-ying and paochung. Fully fermented teas, like black tea, show the least antibacterial activity. As fermentation progresses, the oxidation or degradation of catechins and flavonoids generally reduces their presence, thus decreasing antimicrobial activity. Unfermented tea differs from microbially fermented tea in maintainingstronger antibacterial and antioxidant properties after fermentation. Research suggests that microbially fermented tea offers additional benefits, such as anti-inflammatory and weight-loss properties. Long-term consumption of microbially fermented tea is associated with positive health and medical outcomes. It also has improved sensory characteristics compared to unfermented tea, with less bitterness and astringency, a stronger aroma and a more vibrant tea infusion.

Recent advances in fermentation technology have facilitated the microbial fermentation of tea, resulting in the production of beneficial compounds (28). *Aspalathus linearis*, a plant native to South Africa, is used to make the well-known herbal tea, Rooibos. The phenolic components of fermented herbal teas contribute to their high levels of polyphenols, which are associated with various health benefits (38, 39). Fermented *grossedentata*, produced similarly to black tea, has a slightly sour and sweet taste and has been used as both herbal tea and traditional medicine in southern China for generations (40). Table 4 explains microbial fermentation and its effects.

Table 4. Microbial fermentation and their effects.

Tea type	Microorganisms	Effects	Reference
Kombucha	Acetic acid bacteria and yeast	Vitamin C and glucuronic acid increase Changing the proportions of acid and sugar results in a taste alteration for the tea.	(41)
Green tea and Black Tea	lactic acid bacteria	LAB to enhance the antioxidant capacity and bioavailability of TFLs in cell model.	(42)
Pu-erh tea	*Streptomyces bacillaris* and *Streptomyces cinereus*	Total polyphenol content and α,α-diphenyl-β-picrylhydrazyl (DPPH) radical scavenging efficiency were both improved Increased the content of γ-aminobutyric acid (GABA), enhances the color and content of statin and polyphenols	(43)
Green tea and Black Tea	*Aspergillus niger* van Tieghem	Increase of the theobromine, caffeine content, lactic acid, acetic acid and citric acid and rich in nonester catechins Enhanced tea quality by facilitating an interaction b/w aroma and taste	(44, 45)
Raw Dark Tea	*Eurotium cristatum*	Theabrownin, free amino acids and total flavonoids all had their concentrations raised. 12 new aromatic components appeared after the fermentation and most of them are esters and alcohols.	(46)
Black Tea	*Dabaryomyces hansenii*	Less caffeine and tannins, with enhanced nutritional and medicinal benefits Accumulation of important vitamins, such as A, B1, B2, B12 and C in adequate quantities to fulfill the recommended dietary requirements (RDA).	(47)
Green Tea	*Wolfiporia cocos*	W. Cocos preserves 80 % of antioxidant capacity changed the typical green odor to a lovely floral, jasmine-like and slightly citrus-like flavor	(48)
Jinxuan oolong tea	*Grifola frondosa* and Tianzhi (new variants of *Ganoderma lucidum*)	Polysaccharide, free amino acid and protein were enhanced Tea polyphenols, caffeine and water extract in the fermented products were lowered which decreased the turbidity of tea juice, reduced the bitterness and gave it delicate taste and fragrance	(49)
Pu-erh tea	*Aspergillus pallidofulvus* PT-3 and *Aspergillus sesamicola* PT-4	APaPT and AsePT contributed to production of gallic acid and various flavonoids, such as kaempferol, quercetin and myricetin in the metabolism of phenolic substances.	(50)
Kombucha and Black Tea	*Starmerella davenportii*	It has a cholesterol-lowering capability of 45 % ± 2 %, grew at temperature of 37 °C and is resistant to pH 1.5, 2 % bile and 40 % sucrose solution. It has high total phenolics and flavonoids content and demonstrated strong antioxidant and antibacterial activity.	(51)
Kombucha	*Candida* sp. and *Lachancea* sp. (Komagateibacter was identified)	Radical scavenging ability, D-saccharic acid-1,4-lactone content and caffeine degradation property were increased	(52)
Loose tea	*Eurotium cristatum*	Antioxidant ability and gallic acid content were increased	(53)
Black Tea	*Lactobacillus acidophilus*	The intracellular phenolic compounds of the black tea extract inhibited *E. coli* growth by increasing endogenous oxidative stress	(54)

Phytochemicals and Their Impact on Human Health

Locals often consume traditional herbal drinks due to their perceived medicinal benefits. In recent years, the potential of infusions as therapeutic and preventive measures against metabolic diseases has garnered increasing attention. The biological benefits of herbal tea are well-documented, including its anti-inflammatory, antibacterial, antioxidant, anti-diabetic and anti-cancer effects. Herbal teas, derived mainly from the leaves, buds, flowers, and fruits of medicinal plants, maintain significant demand due to their extensive health advantages. Phytochemicals, naturally occurring compounds in plants, are widely recognized for their potential to promote human health and prevent chronic diseases. Herbal teas, as a prominent source of phytochemicals, are entrenched in traditional practices and are currently receiving worldwide recognition. It had been emphasized that Chinese herbal tea, a cultural heritage and essential component of traditional Chinese medicine, contains bioactive compounds such as flavonoids, alkaloids, polysaccharides and glycosides, which contribute to its health-promoting properties, including antioxidant, anti-inflammatory, antiviral, antibacterial and hepatoprotective effects (55). Herbal teas are becoming increasingly popular in China and regions like Japan, the United States and Europe, underscoring their growing global relevance. Further study is on elaborated on the health benefits of herbal teas, noting their significant amounts of phenolic compounds and flavonoids, known for their antioxidant properties (56). These compounds help mitigate oxidative stress, is crucial role in reducing the risk of chronic diseases such as cardiovascular disorders and cancer. Additionally, Kong's bibliometric analysis highlighted the importance of continued research on herbal teas, particularly regarding their safety and potential applications as functional foods.

Again, reports are on the broader category of nutraceuticals, focusing on *Camellia sinensis*, which produces popular teas such as black, green and oolong (57). These teas are rich in bioactive compounds, particularly polyphenols, which provide benefits such as managing diabetes, reducing inflammation and inhibiting cancer cell growth. Despite these health advantages, emphasized the need for further research into the molecular interactions of these compounds to fully understand their therapeutic potential (58).

The classification and health benefits of herbal teas are increasingly becoming a topic of interest. Review is on the nutritional and biological activities of various herbal teas, emphasizing the need for more systematic research to explore their full potential (58). Although herbal teas have been utilized for centuries, their action and quality control mechanisms still require further investigationstill require further investigation. Contribution is also on this discourse by highlighting the phytochemical content of herbal drinks, including flavonoids and terpenoids, which enhance their pharmacological properties (59). These beverages are increasingly regarded as potential commercial products with various health benefits. The global popularity of green tea, which has gained attention due to its high concentration of catechins and other bioactive constituents (60). While green tea is widely consumed for its antihypertensive, anticancer and antibacterial effects, excessive consumption may lead to adverse effects such as gastrointestinal disturbances and hepatotoxicity. This dual aspect of green tea-its benefits and potential risks-further illustrates the complexity and importance of ongoing research into phytochemicals and their role in health. The therapeutic features and some suitable herbal options are illustrated in Fig. 4 and Table 5 explains the phytoconstituents and health benefits of various herbal teas.

Fig. 4. Therapeutic features and some suitable herbals.

Future Thrust in Herbal Tea Products

Indian herbal teas have a bright future, offering numerous opportunities for research and advancement. Recent advancements have broadened the spectrum of accessible items, many of which are based on conventional medical methods (80). The evaluation of the modulatory effects of herbal teas focuses on their interactions with the intestinal environment and the bioavailability of key ingredients. Research on Indian herbal teas indicates that they possess various medicinal properties, including antibacterial, anti-inflammatory and antioxidant effects (3). While oolong, black and green teas remain widely consumed, fruit and herbal teas are gaining popularity due to their diverse flavors, fruity characteristics and associated health benefits (81). Herbal teas abundant in antioxidants, especially those that address age-related ailments, are rising in demand within the functional food sector(39). Specifically, studies suggest that adding vitamins to these infusions helps maintain optimal levels of antioxidants (8). Herbal teas offer numerous health benefits and are generally considered safe. However, the lack of global regulations for medicinal herbs raises concerns about potential combinations and adverse reactions (82). Additionally, the risk of contamination by mycotoxins and fungi during harvesting, transportation and storage and the presence of microbes in medicinal plants used for tea production, presents further challenges (83). Minerals and metallic substances found in herbal teas include arsenic (As), barium (Ba), cadmium (Cd), cobalt (Co), copper (Cu), chromium (Cr), nickel (Ni), lead (Pb), selenium (Se), vanadium (V) and zinc (Zn). These components can be absorbed by plants growing in unfavorable conditions (84,85). *Platostoma*

Table 5. Phytoconstituent and health benefits on various herbal tea.

Herbals	Important Phytoconstituent Compounds	Results of the Study	Reference
Ashwagandha tea	Withanolides, saponins and alkaloids	Ashwagandha tea was found to reduce anxiety symptoms and improve sleep quality in adults.	(61)
Fennel tea	Anethole, fenchone and estragole	Fennel tea was found to relieve indigestion and other digestive problems, such as bloating, gas and constipation.	(62)
Cornflower tea	Apigenin,7-O-glucoside, methyl-apigenin and methyl-vitexin, arginine, caffeic, chlorogenic, neochlorogenic acids and umbeliferone	Anti-bacterial, anti-inflammatory, anti-serotonin, anti-oxidant and gastroprotective effect	(63)
Lemon Verbena tea	Naringenin, 5,6,4′Trihydroxy-7,3′-Dimethoxyflavone, hispidulin and eupatilin	Tumor growth control	(64)
Marigold flower tea	Sitosteorols, lupeol, quercetin, escultin, limonene and neoxanthin	Cholesterol control, anti-hypertensive and used as hypoglycemic drugs	(65)
Rosemary tea	Rosmarinic acid, carnosic acid, rosmanol, carnosol, ursolic acid	Cure intercostel neuralgia, migraine, insomnia and depression	(66)
Hyssopus tea	Elemol, β-phellandrene, durenol, germacrene, limonene, linalool and myrtenol	Miorelaxation activity, anti-bacterial, anti-oxidant activity, mosquito larvicidal activity and tumor growth control	(67)
Passionflower tea	Chrysin, apigenin, vicenin	Anxiety, insomnia, muscle spasms	(68)
sYerba mate tea	Caffeine, mateine, theobromine, chlorogenic acid	Fatigue, depression and weight loss	(69)
Stinging nettle tea	Caffeine, tannins, vitamins A, C and K	Improve blood circulation, gastrointestinal health, boost immune system, reduce inflammation, prevent kidney stones, helps in detoxification, reduce the risk of prostate cancer and treat respiratory problems	(70)
Linden tea	Tiliaponin A and B, quercetin, kaempferol	Anticonvulsant activity of Tilia reinforcing its utility for central nervous system diseases	(71)
Cranberry tea	Proanthocyanidins, vitamin C, quinic acid and anthocyanins	Lower LDL cholesterol and total cholesterol, increase HDL, improve endothelial function, lower glycemic response and evaluate plasma antioxidant capacity.	(72)
Cats clow tea	Spiroxindole alkaloids, Quinovic acid glycosides Proanthocyanidins and Polyhydroxylated triterpenes	Potential therapeutic effects against COVID-19, Arthritis and cancer.	(73)
Feverfew tea	Parthenolide, luteolin, flavonoids and apigenin	Prevention of migraine headaches and menstrual cramps.	(74)
Hawthorn tea	Flavonoids, tannins, proanthocyanidins	cure heart disease, high blood pressure and congestive heart failure	(75)
Red clover tea	Isoflavones, genistein, daidzein, chalcones and coumarins	Reduce Menopause symptoms, cure osteoporosis and breast cancer	(76)
Thyme tea	Carvacrol, thymol and linalool	Decreased oxidative damage, improved sperm quality, lowering lipid peroxidation, increasing antioxidant enzyme activity and cure Respiratory infections, sore throat, cough.	(77)
Tarragon tea	Estragole, ekemicin, methyl eugenol and sabinene	Treatment of gastrointestinal diseases, inflammation, fever, helminthiasis and as an anesthetic, hypnotic and anti-epileptic agent.	(78)
Sorrel tea	alkaloids, flavonoids, phenolics and biterpenoids	Treatment of hypertension, liver diseases and fever.	(79)

malabaricum, commonly known as Chinese mint, is a significant ingredient in herbal tea production in Southeast Asia. Potential plant diseases associated with herbal teas have been identified through DNA sequencing, underscoring the importance of quality management throughout the manufacturing process (86). As the global demand for herbal teas continues to rise, companies must to experiment with new flavors to satisfy customer preferences and meet market expectations (87).

In a study conducted, researchers investigated the chemical composition, sensory properties and antioxidant potential of fermented (FHT), sun-dried (SDHT) and fried (PFHT) falcon tea (88). The medicinal properties and sensory appeal of traditional herbal tea were significantly influenced by the processing methods used, providing valuable insights into its innovative industrialization. Furthermore, a product had been developed that surpassed its predecessor in antioxidant and inhibitory properties by fermenting 6 common medicinal plants with kombucha broth, thereby creating economic opportunities to enhance product offerings (89).

The herbal tea market is experiencing significant growth, driven by increasing consumer awareness of health benefits and a growing preference for natural products. Recent trends indicate a surge in demand for functional herbal teas that address specific health concerns, such as stress relief, immune support and digestive health (4). Additionally, there is a rising interest in novel flavor combinations and the incorporation of superfoods into herbal tea blends, catering to health-conscious consumers seeking taste and nutritional benefits (90). These trends create opportunities for researchers and manufacturers to explore new herb combinations, investigate their bioactive compounds and develop innovative herbal tea formulations that align with consumer preferences while potentially offering enhanced health benefits.

Conclusion

People have been drinking herbal teas for thousands of years, claiming they offer numerous health benefits, although the exact phytochemical composition of these beverages was previously unknown. To support or refute these historical claims, scientific studies in recent years have focused on identifying, classifying and isolating the various secondary metabolites found in herbal teas. Concurrently, researchers have discovered compounds that could potentially negatively affectthese plant-based beverages. The antioxidant properties of certain phenolic compounds, known for their ability to prevent and treat metabolic issues, contribute to the appeal of herbal teas. Public demand for health-oriented foods has significantly increased, as the physiologically active components naturally present in herbal teas pave the way for innovative product development. In response, the industry has raised its quality requirements for these products. To provide interested companies with a solid theoretical and scientific foundation for the production and marketing of infusions, thorough investigations are essential. This research requires precise knowledge of the mechanisms of action and potential toxicity of the infusions. The findings conclude that herbal teas may have therapeutic benefits, based on a careful examination of scientific evidence. Studying the various aspects of herbal teas not only validates historical claims but also creates opportunities for future innovation and advancement within the herbal tea industry.

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Authors' contributions

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