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Review Paper

New Insights of Blending in Tea Industry and its Health Benefits: A Review

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ABSTRACT

Blending is a crucial practice in the tea industry, influencing the flavor, aroma, and overall quality of the final product. This review paper examines the various aspects of blending in the tea industry, including its historical significance, methodologies, factors influencing blending decisions, the impact of blending on tea quality, problems and limitations in blending, and the future outlook of blending. Through an analysis of existing literature and industry practices, this paper provides insights into the role of blending in meeting consumer preferences, ensuring consistency, and optimizing profitability for tea producers and marketers. Additionally, it discusses emerging trends and future directions in tea blending practices, considering sustainability, technological advancements, and evolving consumer demands.

Keywords: Green tea, black tea, blending, Herbal Tea

Tea is the most widely consumed beverage in the world and is served in a number of ways. The tea-producing plant, Camellia sinensis, wastes its young leaves and leaf buds to make a tea beverage. The small-leaved China plant (*Camellia sinensis varieties sinensis*) and the large-leaved Assam plant (*Camellia sinensis variation assamica*) are the two main types that are employed (Kaundun and Mutsumoto, 2002; Namita *et al.* 2012). Most people agree that tea, a non-alcoholic beverage, is the most consumed beverage worldwide, next to water. It is also one of the least expensive foods consumed worldwide by a large number of people pricey drinks (Henebery, 2006). Half of the world's population makes drinking tea a part of their daily routine. Since its origins in China, tea has traveled globally via trade channels over centuries, emerging as a major cash crop on a worldwide scale and supporting millions of smallholder farmers (FAO, 2022a). Tea is a stimulant that also provides many health benefits (Storozhuk, 2022) and is cultivated in more than 60 countries, primarily in Asia, Africa, South America, and parts of Eastern Europe. China produces 47% of the world's tea, followed by India, Kenya, and Sri Lanka (FAO, 2022a).

The value of the worldwide tea trade is estimated at USD 9.5 billion, with global tea production exceeding USD 17 billion annually. Important source of revenue from exports for developing and low-income countries (FAO, 2022a). The demand for tea has increased by 2.5% per capita over the past ten years, mostly in East Asia, Africa, Latin America the Caribbean, and the Near East, offsetting declining

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consumption in Europe, the United States, Canada, and the Russian Federation. Research estimates that global tea production will grow at a compound annual growth rate (CAGR) of 5.7% from 2021 to 2026 (Caro, 2020; Mordor Intelligence, 2023b). Due to its reputation as a beverage that strengthens the immune system, tea has been more popular worldwide since the COVID-19 pandemic (Fortune Business Insights, 2022). Fig.1 shows the green tea infusion in water.

Fig. 1: Green Tea infusion in water

The three most common varieties of tea are white, green, and black. New consumer forms, such as oolong and pu-erh tea (Li *et al.* 2013; wang *et al.* 2022) or various preparations like kombucha tea (Antolak *et al.* 2021), have been introduced in Europe in recent years. By reducing oxidative stress reactions and inflammation levels, which are known to play a critical part in the ethology of diseases like cardiovascular, metabolic, cancer, and neurological disorders, tea drinking has also been linked to protective benefits (Dinh *et al.* 2019; Wang *et al.* 2021). Tisanes, or herbal infusions, are another aromatic beverage with medicinal qualities that are becoming more and more well-liked and consumed on a daily basis. These drinks can be made using fruits, spices, or a combination of both (WHO Traditional Medicine Strategy, 2013).

These drinks can be made with fruits, spices, herbal (medical) plants, or a combination of the three. A variety of bioactive chemicals that can have a wide range of positive effects are possible to find in herbal infusions (Gupta *et al.* 2023).such as on cancer (Al-Zalabani *et al.* 2022; Wang *et al.* 2022), depression (Chen *et al.* 2022), reproductive health (Liu *et al.* 2022), and anti-inflammatory, anti-thrombotic, and antioxidant properties (Talib *et al.* 2022). (medical) plants and beverages. A variety of bioactive chemicals may be present in herbal infusions (Gupta *et al.* 2023).

A time-honoured traditional herbal beverage, herbal tea is made from a variety of native plant ingredients, such as leaves, stems, flowers, fruits, roots, and more. A single herb or a small combination. This tea is not Camellia; rather, it's prepared by steeping several kinds of plant species in hot water (Liu *et al.* 2013). It is consumed to support health and disease prevention after being properly prepared. It can be steeped in boiling water, infused with or without tea leaves, or gently decocted in water (Zhao *et al.* 2013; Wang *et al.* 2021). Plants classified as herbs can be either fresh or a combination of dried leaves, flowers, fruits, bark, seeds, grasses, nuts, and other botanical components (Peter *et al.* 2012; Peter, 2006; Ravikumar, 2014). People use plants for therapeutic purposes and to prepare refreshing drinks based on a variety of theoretical, cultural, and religious beliefs (Kamiloglu *et al.* 2012; Hicks, 2009; Bender *et al.* 2003; Kumar & Pandey 2013). Decoctions or infusions can be used to make herbal tea. Due to their health-promoting and sensory qualities, herbal teas have been widely drank (Kinki, 2021).

BLENDING

Today's tea business is aware that teas cultivated on different estates have varied qualities and personalities and that factors such as elevation, agroclimatic conditions, plant genetic makeup, and the chemical makeup of the green leaf as well as processing techniques all affect tea quality. Season to season, process to process, grade to grade, and even occasionally, the tea characters shift. In an attempt to discover a solution, the seller blends teas of varying grades from several estates to create a product mix that satisfies the buyer's acceptable perceptions of color, flavor, and scent.

Tea blending, a new marketing technique for tea, was born. Blending is an extremely sophisticated art form that is executed by a select few who genuinely understand it; it's not precisely scientific. Their trade. The desire and impression of the consumer cannot be satisfied by merely blending different types or grades of tea. More R&D support is needed for blending in order to maintain a certain tea mix and gain market share. In order to achieve desired product characteristics, blending is a key step in food processing that involves integrating several ingredients. It is essential to the processing of food. It makes it possible to mix various components. To produce an extensive variety of culinary items. Blending is a basic technique that impacts product quality and consumer satisfaction, whether achieving the ideal texture in a baked good, enhancing the flavor profile in beverages, or assuring consistency in sauces and dressings (Gogoi *et al.* 2014).

History of tea blending

The art of blending tea has been around for centuries, having originated in ancient China. Tea traders came up with the idea of blending different teas to generate distinctive flavors and scents during the Tang Dynasty (618-907 AD). The Song Dynasty (960–1279 AD) saw further development of this custom, with tea mixing becoming increasingly popular and advanced. To produce a final tea product with a harmonious balance of flavors, smells, and colors is the goal of tea blending (Banerjee & Chatterjee, 2014).

It is impossible to consider the development of the tea-blending process without considering the British contributions. In the past, tea was sold directly from the estates directly. These teas were designed to appeal to a particular type of client who enjoyed the consistency, flavor, and character of teas from the same estate. The customers discovered that the tea's taste varied throughout the year and that the tea's character changed with the seasons. This is precisely what happened to a tea trader in 1660. For his devoted clientele, he would typically stock teas from various estates in his shop. People in those days were unaware that the qualities and characteristics of tea changed with the seasons. Seasonal variations were observed in both sonal and quality. Due to the decreasing sales, the vendor was unable to sell his teas. Features of the teas as the growing season went on, and he blended the teas from every estate. He was ecstatic to discover that the blended teas produced a superb blend with better flavor and scent, and he was able to sell his tea quickly. The term "tea blending" therefore came into existence (gogoi *et al.* 2014).

The finest months for tea are June through June in Northeast India, after which the quality of the tea continues to deteriorate. Additionally, the quality varies depending on the cultivar, jats, clones, growing region, and country of origin of the tea. There is a clear preference for particular tea tastes in India. In contrast to tea drank in South or Eastern India, consumers in Western or Northern India would prefer a different variety of tea. In order to meet the needs of these localities, the tea traders have chosen blends that are distinctive to their locations. Teas from various places are combined for this reason to create a cup that has well-balanced qualities unique to the intended region. high-quality teas are mixed with low-quality teas to produce a consistent and acceptable blend. While doing so, the blenders take into account the compatibility factors i.e., mixing has to be done with matching teas. In doing so, the cost payable by the consumer is always kept in mind. A blending of tea in India is nearly 100 years old (Gogoi *et al.* 2014).

Purpose of the blending in tea industry

Blending plays a crucial role in the tea industry, as it allows for the creation of unique flavor profiles and ensures consistency in tea products. Blending involves the art of combining different types of tea leaves from various sources to achieve desired taste characteristics. This process requires an understanding of the chemical constituents of tea and the different manufacturing methods involved. Blending is essential to achieve the desired flavor, aroma, and color profiles in teas. Blending also helps tea producers cater to specific consumer preferences and expand their product offerings. Additionally, blending allows for the utilization of different teas from various regions or harvests, enabling the creation of complex and distinctive blends. Furthermore, blending in the tea industry also plays a role in maintaining consistent quality across different batches of tea. Blending helps to balance out variations in flavor and quality that can occur due to natural factors such as weather conditions or seasonal differences. Blending in the tea industry is not just a technical process; it is an art form that requires a deep understanding of the characteristics of different tea leaves and an appreciation for the cultural and historical influences on tea production. The nuanced skill of a tea blender lies in selecting the right combination of leaves to create a harmonious and balanced blend that appeals to the senses (Sanderson, 1972).

Health benefit of tea blends

Tea blends comprise two or more plant species blended to improve taste and multiply the health benefits. The health benefits ascribed to the consumption of teas may be related to the high content of bioactive ingredients such as polyphenols. Polyphenols have been reported to possess antioxidant, antiviral, and anti-inflammatory activities, modulate detoxification enzymes; stimulate immune function, and decrease platelet aggregation (Lampe 2003; Frankel and Finley 2008).

Three primary substances found in green tea leaves have an impact on human health: polyphenolic chemicals, essential oils, and xanthic bases like caffeine and theophylline. Mostly acting on the central nervous system, caffeine promotes alertness, eases the connection of ideas, and lessens feelings of exhaustion (Varnam *et al.* 1994). In addition to respiratory stimulation, theophylline relaxes the bronchial smooth muscle in a non-specific manner. It is not very handy to over brew because essential oils are highly volatile and evaporate from the beverage after a certain amount of time. The ability to aid in digestion is one of their qualities that has to be emphasized (Bruneton, 2001; Wu and Wei, 2002).

According to McKay and Blumberg (2003), it has been shown that consuming green tea and green tea extracts in capsule form on a regular basis for one to four weeks lowers oxidative status indicators. Furthermore, after ingesting about six cups of green tea per day for seven days, oxidative DNA damage, lipid peroxidation, and free radical generation were found to be reduced in a study by Klaunig et al.. (1999) including 40 male smokers in China and 27 men and women (smokers and nonsmokers) in the United States. Consequently, GTP might support the body's defenses against oxidative damage (Wu and Wei, 2002).

According to Rosengren (2003), green tea catechins inhibit the formation of breast cancer tumors in rodents as well as the proliferation of breast cancer cells in vitro. Moreover, in vitro research has shown that EGCG and tamoxifen work together to destroy breast cancer cells cytotoxically; these findings imply that the catechins offer a great deal of promise for the treatment of breast cancer. According to Mittal *et al.* (2004), EGCG administration reduced cell viability at various phases (about 80% inhibition) in human breast cancer MCF-7 cells, but showed no negative impact on the development of regular mammary cells. These writers discovered that this course of action reduced telomerase activity (40–55%); as telomerase is upregulated in about 90% of breast cancers, it has drawn a lot of interest as a target for breast research on cancer diagnosis and treatment. When compared to women who drank green tea infrequently (less than once a month), Wu *et al.* (2004) found that consumers had a considerably lower incidence of breast cancer.

According to Zhang *et al.* (2002), the risk of ovarian cancer decreased as green tea use increased in frequency and duration. Additionally, green tea works well as a chemopreventive against prostate cancer in humans. Yu *et al.* (2004) reported in the same line of research that EGCG caused apoptosis and prevented the proliferation of prostate cancer adenoma cells. According to Yamamoto *et al.* (2003), GTP can be used to increase the efficiency of chemotherapy and radiation treatment in order to promote the death of cancer cells while sparing healthy cells.

Green tea use does not appear to be inversely related to the risk of stomach and intestinal cancer, according to a systematic study by Borrelli *et al.* (2004). However, green tea did have a preventive effect against adenomatous polyps and chronic gastritis. Similarly, Hoshiyama *et al.* (2004) and Koizumi *et al.* (2003) discovered no correlation between the risk of stomach cancer and the consumption of green tea; these authors suggested that other factors, including age, smoking, socioeconomic status, Helicobacter pylori infection, history of pectic ulcer, and family history of stomach cancer, along with specific dietary components, may be more significant risk factors for stomach cancer than green tea consumption.

Negishi *et al.* (2004) found that in stroke-prone spontaneously hypertensive rats, the antioxidant qualities of both black and green tea polyphenols reduce blood pressure increases; however, the levels of polyphenols utilized in this experiment are roughly equivalent to those in one liter of tea. Recent epidemiological research suggests that drinking green tea lowers blood pressure a little.

According to Murakami and Ohsato (2003), eating green tea protects and enhances arterial adherence and the role of endothelium. Consumption of green tea has also been negatively correlated with the growth and development of atherosclerosis, which is in line with earlier findings.

Even in the presence of sweets in the diet, Linke and LeGeros (2003) found that regular use of green tea can considerably reduce the formation of caries. Certain pathogen-free rats infected with Streptococcus mutans and subsequently fed a cariogenic diet containing GTP have considerably reduced caries scores, according to in vivo animal research.

Decoctions of green tea inhibit the enzyme β-amylase in human saliva, hence lowering the cariogenic potential of starchy foods by 70% and reducing their release of maltose (Mckay and Blumberg, 2002). Similarly, green tea extracts have been shown to suppress human salivary amylase by Zhang and Kashket (1998). It may lessen the tendency for foods high in starch, like cakes and crackers, to act as slow-release sources of fermentable carbohydrates, thereby lowering their cariogenic potential.

Both green and black tea, besides from their polyphenol content, are a natural supply of fluoride and a useful way to get fluoride into the oral cavity. Simpson *et al.* (2004) report that following a tea rinse, about 34% of the fluoride remains in the mouth and exhibits a significant binding potential to interact with the surface integuments of the oral tissues. This fluoride content could prevent tooth loss and oral cancer, among other biological activities, and have a positive effect on caries (Okamoto *et al.* 2004; Lee *et al.* 2004).

By employing a green tea extract high in catechins and caffeine, Dulloo *et al.* (1999) found that green tea has thermogenic qualities and encourages fat oxidation beyond what can be explained by the caffeine itself; the green tea extract may be involved in the regulation of body composition through sympathetic activation of thermogenesis, fat oxidation, or both.

According to Kovacs *et al.* (2004), maintaining weight green tea treatment did not affect patients who were overweight or moderately obese after they lost 7.5% of their body weight, and that regular caffeine intake had an impact on the maintenance of weight during the green tea treatment. Some experts suggest that patients with a body mass index between 25 and 29.9 kg/m2 who are overweight may benefit from green tea extracts (which include 25% catechins) as long as they do not exhibit unique sensitivity to xanthic bases.

According to Anderson and Polansky (2002), the main active ingredient in green tea is EGCG, which raises insulin activity. These same authors also reported that adding lemon to the tea did not alter its insulin-potentiating properties, but adding 50 g of milk per cup reduced it by almost 90%.

Blending of Green Tea

Manikanta *et al.* (2023) observed that the nutritious composition and acceptability of the green tea improved with the addition of Tulsi and moringa leaf powder. Comparing the mixes to green tea alone, the nutrients were better distributed in the mixtures. When compared to green tea, the herbal tea brews were likewise quite good. Tulsi and moringa leaves were cleaned, dried using a tray dryer, and then blended in various proportions with green tea. The powdered herbal blend's moisture content, water activity, TSS, phenol content, and antioxidant content were assessed. Tea was brewed using these blends, and an organoleptic investigation was conducted. The herbal tea produced from drumstick, Tulsi, and green tea leaves has a unique flavor that is therapeutic and antioxidant-rich in addition to being nutrient-dense properties. Table 1 shows the green tea blend with the other tea.

Das *et al.* (2019) reported that by blending black and green tea with cloves, clove-based herbal infusions were developed. Phytochemical analysis was carried out to determine that when combined in very high

Table 1: Green tea blend with the other tea

Sl. No	Blend	Results	References
1.	Green Tea + Tulsi leaf Powder + Moringa Leaves Powder	Improved nutritious Composition and Acceptability	Manikanta *et al.* (2023)
2.	Black tea + Green Tea + Clove	Highest amounts of phenolic content mg/GAE (1007.25 1.75), flavonoid content mg/CE (158.17 2.14), free radical scavenging capacity in terms of % inhibition (96.81 0.16)	Das *et al.* (2019)
3.	Moringa Leaf + Tulsi + Lemon grass + Ginger	The positive organoleptic evaluation of an infusion observed. The total polyphenol content of the infusions varied from 685 to 1567 mg GAE/100 mL. The most frequent phenolic acid across all of the treatments was gallic acid	Kumar *et al.* (2019)
4.	Guava leaf powder + lemon grass + mint powder + moringa leaf powder + basil leaf powder +curry leaf powder	Phenol content (111.90 mg GAE g^{-1}), antioxidant activity (90.33%), and ascorbic acid content (121.37 mg 100 g^{-1}), The major flavonoid in guava leaf extract powder is quercetin, which is hydrolyzed in the body to produce glyconequercetine	Vyshali *et al.* (2022)
5.	Green tea + *Withania somnifera* stems + *Terminalia arjuna* bark + Cinnamon bark + *Tinospora cordifolia* stems	Increased sensory appeal and palatability of the blend with added health benefits of constituents of the blend.	Namdev and Gupta, (2015)
6.	Seedling leaves + Clonal leaves of tea plant.	Decrease in the polyphenol content of the produced tea when the ratio of seedling teas to clonal leaves increased to 3:1 or 1:1.	Selvan *et al.* (2009)
7.	Eucalyptus tea	The ideal combination of eucalyptus tea the ideal blended eucalyptus tea that satisfies consumer needs was 48.5% black tea and 29.8% cinnamon.. Because it lowers blood sugar and cholesterol.	Mu'tamar *et al.* (2021)
8.	Green Tea + Hibiscus Tea	Because the anthocyanin color and flavor, the blend of green tea and hibiscus tea was more acceptable to consumers. Hippophaerus tea had the highest anthocyanin concentration of all the infusions, but green tea had a much higher potential as an antioxidant, followed by infusions of green tea and hibiscus tea	Ramya *et al.* (2021)
9.	Spirulina + green tea	Formulation B (1 g each of Spirulina powder and green tea) displayed the highest protein and antioxidant levels out of the three with an IC50 value of 37.98 µL/ml\L, a greater protein level at 287.33 µg/100 µL. had 47.61 mg of ascorbic acid equivalent as total antioxidant. In addition, 80 mL of the total volume of Prot-Tea output included 229.86 mg of total protein.	Gopal *et al.* (2024)

concentration (1000 mg), the tea and clove herbal preparation had the highest amounts of phenolic content mg/GAE (1007.25 1.75), flavonoid content mg/CE (158.17 2.14), free radical scavenging capacity in terms of % inhibition (96.81 0.16) as well as improved antimicrobial property in comparison to the others. The total phenolic content, total flavonoid content, antioxidant potential, and antibacterial activity against Gram-positive bacteria *S. aureus* and Gram-negative bacteria *E. coli* were increased significantly with the incorporation of clove into the herbal infusion.

Kumar *et al.* (2019) observed the blending of moringa with a variety of herbs and flavors, such as Tulsi, ginger, and lemongrass. The total polyphenol content of the infusions varied from 685 to 1567 mg GAE/100 mL. The most frequent phenolic acid across all of the treatments was gallic acid. The organoleptic evaluation of an infusion, including Tulsi and moringa, was very positive.

Vyshali *et al.* (2022) concluded that Using a cabinet tray dryer, guava leaves, lemon grass, mint leaves, moringa leaves, Tulsi leaves, and curry leaves are dried. These dried powders are blended in various combinations with various ratios, with green tea serving as the control. The guava leaf-based herbal tea powder's physico-chemical properties was assessed. In terms of phenol content (111.90 mg GAE g-1), antioxidant activity (90.33%), and ascorbic acid content (121.37 mg 100 g^{-1}), the treatment combination (T9) 50% guava leaf powder + 10% lemon grass + 10% mint powder + 5% moringa leaf powder + 5% basil leaf powder + 20% curry leaf powder performed well. The major flavonoid in guava leaf extract powder is quercetin, which is hydrolyzed in the body to produce glyconequercetine, which is what provides the leaves with their spasmolytic properties. Additionally, it guards against intestinal motility and lowers belly capillary permeability.

Namdev and Gupta, (2015) observed that after blending green tea with *Withania somnifera* stems, *Terminalia arjuna* bark, Cinnamon bark, and *Tinospora cordifolia* stems. Although several health benefits are also credited to green tea, according to some unpublished reports, it has been observed that the sensory appeal of green tea is not very attractive due to the lack of distinct flavor properties. It may, therefore can, be a good idea to combine green tea with other herbs (*Withania somnifera)* stem, Cinnamon bark, *Tinospora cordifolia* stems, and *Terminalia arjuna* bark) for developing flavored green tea, which not only adds to its appeal but also palatability & thereby making it a wonder product in the context of human health. As sensory appeal matters the most to consumers more than health or nutritional benefits, so the above infusion will provide them with new alternatives to traditional flavored teas which can impart health benefits too.

Selvan *et al.* (2009) conducted studies on blending to enhance the quality of tea produced. Various ratios of seedling leaves were combined with a known amount of clonal leaves. There was a considerable decrease in the polyphenol content of the produced tea when the ratio of seedling teas to clonal leaves increased to 3:1 or 1:1. Conversely, there was a significant increase in polyphenol content when the proportion of clonal leaves increased. The biochemical components of clonal tea are highly valued for their nutritional and therapeutic properties. However, clonal tea is not widely available. The majority of seedlings are employed on tea plantations throughout southern India. Consequently, an attempt was made to blend in order to improve the quality of the tea made from seedlings, and the techniques that were available were used to quantify the biochemical components. The study's findings indicate that adding clonal leaves to seedling-produced food enhanced its quality.

Kim *et al.* (2018) conducted a study to identify the volatile ingredients in blended tea made from Korean fermented tea and a variety of herbs. This study examined 161 volatile components from 4 samples of BT (blended tea), FT (fermented tea), BT2, and BT3. The FT sample included the majority of the hydrocarbons, with 61 volatile chemicals in total. Three-methyldecane (10.48%), 2,2,4, 6,6-pentamethylheptane (10.00%), and 2,3,6-trimethyloctane (7.90%) were the main constituents. The BT1 sample, which included fermented tea, orange cosmos, lemon grass, chamomile, and peppermint, included a total of 75 volatile chemicals. The largest percentages of compounds were L-menthol (36.79%), menthone (24.92%), and iso menthone (8.70%). The BT2 sample, which included fermented tea, rose hip, lemongrass, lavender, and peppermint, included 76 different volatile chemicals. The most prevalent compounds were found to be alcohols, with the main constituents being linalool (26.32%), linalyl acetate (18.45%), and L-menthol (11.99%). In the BT3 sample, which included fermented tea, citrus peel, chamomile, hibiscus, and beet, 85 volatile chemicals were found. The most prevalent compounds were found to be sesquiterpenes, which include L-limonene (74.45%), -myrcene (3.06%), and δ-terpinene (7.47%).

Makanjuola *et al.* (2015) observed that Water was the most efficient extraction solvent to maximize peroxide scavenging and iron chelating activity under the examined extraction circumstances of ginger, tea, and their blends. The best solvent to maximize DPPH radical scavenging activity was ethanol, whereas the most effective solvent to maximize ABTS radical scavenging activity was aqueous ethanol. With R2 and Q2 of 0.93 and 0.83, respectively, a strong multivariate regression model explaining the connection between the extracts' total flavonoid concentration and antioxidant activity was found. Blended tea and ginger extracts shown combined benefits in their capacity to scavenge radicals DPPH and ABTS.

Mu'tamar *et al.* (2021) Conducted a study to create the ideal blended eucalyptus tea formula that satisfies consumer needs. Because it lowers blood sugar and cholesterol, eucalyptus tea is a useful herbal beverage. Nevertheless, eucalyptus tea's acceptability as a whole was poor; therefore, in order to enhance its sensory qualities, it must be combined with black tea and cinnamon. The response surface method (RSM) with central composite design (CCD) was employed in this investigation utilizing two factors: the proportion of cinnamon and black tea powder on eucalyptus leaf powder. In order to determine the ideal formula, the following factors were examined: moisture content, extract content, color, and sensory score, which takes into account color, flavor, scent, and overall preference, of mixed tea with eucalyptus. The findings indicated that the ideal combination of eucalyptus tea was 48.5% black tea and 29.8% cinnamon.

Ramya *et al.* (2021) conducted study to prepare hibiscus tea and evaluate its potential as an antioxidant when combined with different formulations of green tea. Seven remedies made out of shade-grown tea blends Green tea was produced along with dried red single cultivar hibiscus flowers, which were then preserved at various intervals. The tea infusions' overall anthocyanin content, potential as an antioxidant, and color value were evaluated. Hippophaerus tea had the highest anthocyanin concentration of all the infusions, but green tea had a much higher potential as an antioxidant, followed by infusions of green tea and hibiscus tea. Because of the anthocyanin color and flavor, the blend of green tea and hibiscus tea was more acceptable to consumers.

Spirulina, or *Arthrospira platensis*, is a type of blue-green algae that is known as a dietary single-cell protein because of its high protein concentration. Three separate formulations were used to brew the spirulina and green tea together: formulation A included 0.5 g of spirulina powder and 1.5 g of green tea; formulation B included 1 g of spirulina powder and green tea; and formulation C included 1.5 g of spirulina powder and five g of green tea. Every formulation was steeped for two minutes at 80°C in 100 milliliters of hot water. Subsequently, a quantitative protein estimation assay (Lowry method) and a 2,2-diphenylpicrylhydrazyl free radical scavenging assay were performed on each formulation. Formulation B displayed the highest protein and antioxidant levels out of the three. Formulation B exhibited a straight proportionality between its concentration and antioxidant activity, with an IC50 value of 37.98 μL/mL. In a similar vein, formulation B had a greater protein level at 287.33 μg/100 μL. Formulation B had 47.61 mg of ascorbic acid, equivalent to as total antioxidant. In addition, 80 mL of the total volume of Prot-Tea output included 229.86 mg of total protein (Gopal *et al.* 2024).

Herbal tea blends

Donghmo *et al.* (2024) Developed herbal tea blends using three different plant species, then evaluated which combination has the best antioxidant and antiobesogenic qualities. According to a study, the ideal tea mix sample contains (80% *Hibiscus sabdariffa*, 10% *Zingiber officinale* and 10% *Mentha spicata*) When compared to the control groups, it demonstrated strong antiobesogenic qualities with a significant decrease in food intake, body mass index, adipose tissue, blood triglycerides, total cholesterol, LDL-cholesterol, glucose, and atherogenic index, and an increase in the blood levels of HDL-cholesterol. The developed herbal blend exhibited promising results when used as a safer solution for managing and preventing obesity as well as other health problems linked to oxidative stress. Fig. 2. Shows the chemical structure of caffeine and theophylline.

Acar *et al.* (2022) conducted a study to determine whether food wastes may be used to make herbal tea and to identify the characteristics of these wastes, including their bioactive component content, physical characteristics, and sensory appeal. Three fresh blends made of walnut shell, banana, pomegranate, mandarin, eggplant, and red onion skins. 3, 4, and 5 minutes were given for the infusion of cherry stalk and corn tassel at varying temperatures (70 and 100 °C). Because of its bitter aftertaste, corn tea, with a high phenolic component level (677.7 mg GAE/L), was not as well regarded by tasters. The most preferred tea blend, then, was walnut shell tea with a moderate phenolic concentration. The color indices of teas were also shown to be significantly impacted by varying infusion periods and temperatures.

Malongane *et al.* 2022 studied that many herbal teas with anti-oxidant, anti-inflammatory, and anti-diabetic properties can be found in South Africa, including rooibos tea (*Aspalathus linearis* (Burm.f.) *R. Dahlgren*), honeybush tea (*Cyclopia intermedia E. Mey* and *C. subternata* Vogel), special tea (*Monsonia burkeana Planch*. ex Harv.), and bush tea (Athrixiaphylicoides DC.). The aim of this investigation was to evaluate the in vitro antioxidant capacity of specific tea blends through the utilization of 2,20-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) and 1,1-diphenyl-2-picrylhydrazyl (DPPH) assays. Additionally, the 15-lipoxygenase inhibitory assay was employed to evaluate the blends' anti-inflammatory characteristics. Moreover, the investigation assessed the utilization of glucose in C2C12 myotubes. The 3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide (MTT) assay was the last technique employed to evaluate the tea extracts' safety on Vero cells, a cell line derived from African green monkey kidneys. Both the special tea and the bush tea mix showed strong anti-inflammatory and antioxidant properties. Increased antioxidant activity was seen when varied ratios of bush tea and special tea were blended together. Special tea was somewhat cytotoxic to cells, however this toxicity was reduced in the blending process. When compared to insulin, the anti-diabetic effects of tea were not as strong in any of the samples. The use of blended herbal teas is

Fig. 2.: Chemical Structure of Caffeine and theophylline (Cabrera *et al.* 2006).

supported by the current study, and more research is necessary to fully understand the beneficial anti-inflammatory effects of special tea.

Builders *et al.* (2020) investigated that herbal teas are made from single herbs, occasionally many herbs, that have been shown to have numerous health advantages. They are frequently made as decoctions or infusions. *Herbiscus sapdariffa, Moringa oleifera*, *Citrus limon*, and *Zingiber officinale* were the ingredients of three different poly-herbal teas that were made and assessed for their stability and physicochemical characteristics. Both intrinsic and non-intrinsic physicochemical parameters were identified, including moisture content, granule flow and particle size, extractive matter, pH of brew solutions, and organoleptic dust leak from teabags. Additionally, an assessment was conducted on the impact of demanding storage conditions on specific physicochemical attributes. Significant variations were observed in the physicochemical parameters of the various tea blends. When kept in various storage environments, the items also shown variations in stability metrics such as appearance, brew pH, and antioxidant characteristics. Overall, the tea's physicochemical and stability qualities were good, which is indicative of a well-made herbal product

Şahin, (2013) determined and contrasted the phenolic content and antioxidant qualities of sixteen distinct fruit teas. Fruit teas' total phenol content and antioxidant characteristics were investigated using the Folin-Ciocalteu method and the ABTS (2,2-azinobis[3-ethylbenzothiazoline6-sulphonic acid]) method, respectively, based on the extraction condition (water temperature). Using the UV/Vis spectrophotometric technique, the total flavonoid and total anthocyanin contents of fruit teas were ascertained. Using photodiode array detection and high-performance liquid chromatography, the phenolic composition was ascertained and quantified (HPLC-PDA). Pomegranate (I) was shown to have the greatest total phenol content and antioxidant capacity. Peaches (III) and blackberries (I) had the greatest total flavonoid and total anthocyanin levels, respectively. Fruit teas were tested for chlorogenic acid, quercetin, myricetin, rutin, rosmarinic acid, and ferulic acid. The greatest extraction of total phenols, total flavonoids, total anthocyanins, and total antioxidant capacity from 16 distinct fruit teas was achieved at a water temperature of 100 °C. Also, determine using the HPLC method, ascertain the impact of water temperature on the extraction process, and quantify the different phenolic components present in fruit teas for use in extract production.

The Chemical Composition and the use of Herbal Tea

The Chemical Composition and the use of Herbal Tea has different chemical compositions: - phytochemical and antioxidant screening results showed the presence of tannins, steroids, terpenoids, saponins, cardiac glycosides, flavonoids, alkaloids, and phlobatannins (Samali *et al.* 2012; Altemimi *et al.* 2017). The chemical composition includes moistures, protein, carbohydrates, fiber, and ash content, minerals such as chromium (Cr), iron (Fe), manganese (Mn), Lead (Pb), and zinc (Zn) (Samali *et al.* 2012; Ahmad *et al.* 2012). Herbs have a long history of both culinary use and of providing health benefits, as well as acting as preservatives mainly in Ethiopia (Tapsell *et al.* 2006; Norris and Dahl (2013)). Many herb plants are widely used in cooking to enhance the flavor of foods, including meats, sauces, vegetables, and desserts (Tapsell *et al.* 2006, Opara and Chohan, 2014; Kozak *et al.* 2017). Beyond acting as a replacement for salt, the nutritional contribution of these dietary plants has in the past been deemed negligible probably because of the relatively small, although increasing amounts consumed (Nigus *et al.* 2016, Norris and Dahl (2013), Kozak *et al.* 2017). Herbal teas have health benefits due to specific active substances phytochemicals (Kozak *et al.* 2017-Saraf (2010)). Among the phytochemical substances, phenolic acids and flavonoids, are the major groups of natural components in plants that have received increasing interest over the last decades due to free radical scavenging properties. These phytochemicals are excellent to ensuring protection against harmful free radicals, which, through reactions with proteins, lipids, and saccharides, lead to their oxidation and consequently to the damaging of cellular structures, which contributes to the development of many diseases, have analgesic, anti-inflammatory, anti-bacterial, anti-viral and antiallergic. Drinking herbal teas have also the advantage of boosting energy levels and invigorating the body, quenching the body by preventing hydration of the body, it promoting night sleep due to caffeine-free and antimicrobial activity (Killedar *et al.* 2017; Kozak *et al.* 2017, Omogbai and Ikenebomeh, 2013). No adverse statements have been reported for the drinking of herbal tea, and herbal tea combinations can be used in minor complaints affecting (Bhat and Moskovitz, 2009; Mabey *et al.* 1998).

Polyphenols constitute the most interesting group of green tea leaf components, and in consequence, green tea can be considered an important dietary source of polyphenols, particularly flavonoids. Flavonoids are phenol derivatives synthesized in substantial amounts (0.5–1.5%) and variety (more than 4000 identified), and widely distributed among plants (Vison *et al.* 1995). The United States Department of Agriculture (USDA) has recently published a Database for the Flavonoid Content of Selected Foods [USDA: "USDA Database for the Flavonoid Contents of Selected Foods." Beltsville: US Department of Agriculture, 2003]. The main flavonoids present in green tea include catechins (flavan-3-ols). The four major catechins are (-)- epigallocatechin-3-gallate (EGCG), which represents approximately 59% of the total of catechins; (-)-epigallocatechin (EGC) (19% approximately); (-)-epicatechin-3-gallate (ECG) (13.6% approximately); and (-)-epicatechin (EC) (6.4% approximately) (McKay and Blumberg, 2002). Fig. 3 shows the chemical structure of gallic acid and the four catechins in green tea. GA, gallic acid; (-)-epigallocatechin-3-gallate; EGC, (-)- epigallocatechin; ECG,(-)- epicatechin-3-gallate; EC, (-)-epicatechin. Green tea also contains gallic acid (GA) and other phenolic acids such as chlorogenic acid and caffeic acid, and flavonols such as kaempferol, myricetin and quercetin [USDA: "USDA Database for the Flavonoid Contents of Selected Foods." Beltsville: US Department of Agriculture, 2003].

VARIOUS TEA BLENDS

Jin *et al.* (2019) conducted a study on the effects of green tea brewing conditions on the chemical profiles of metabolome and catechin components, as well as the antioxidant activity, at 60 ◦C and 95 ◦C for a duration of 5–300 min. The tea infusions' antioxidant capabilities were evaluated. Temperature had a greater influence on 2,2-diphenyl-1-picryl-hydrazyl hydrate (DPPH) radical scavenging activity than

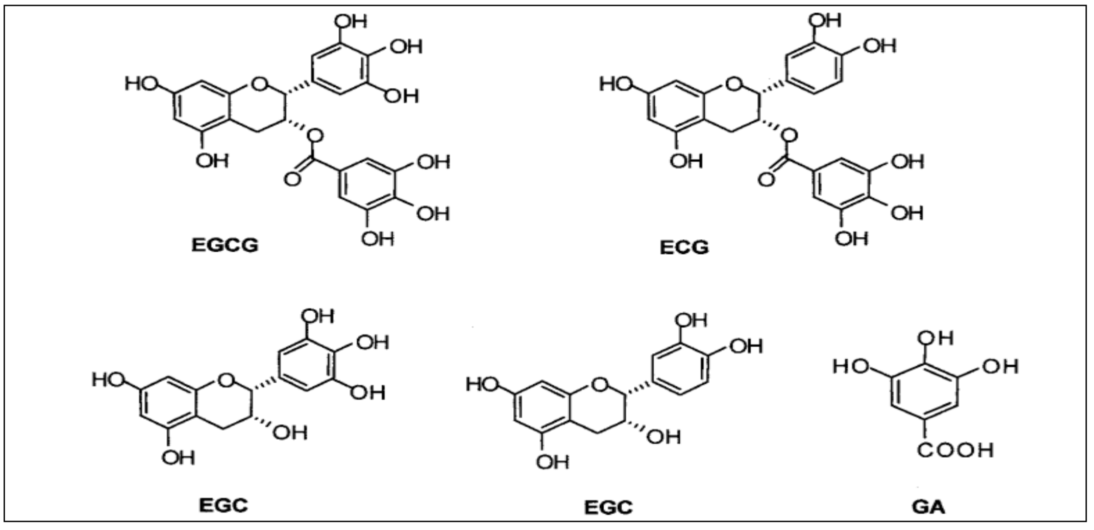

Fig. 3: Chemical structure of gallic acid and the four catechins in green tea. GA, gallic acid; (-)- epigallocatechin-3-gallate; EGC, (-)- epigallocatechin; ECG,(-)- epicatechin-3-gallate; EC, (-)-epicatechin (Cabrera *et al.* 2006)

did time. The results of a metabolomics study using ultra-high performance liquid chromatography-quadrupole-time-of-flight mass spectrometry (UHPLC-QTOF/MS) showed that temperature and time had a significant impact on the metabolic profiles, which included 33 differential metabolites. The effects of time were more pronounced at 95 °C starting after 30 minutes. In a hierarchical clustering study, infusions that were brewed at 95 °C for more than 30 minutes produced unique profiles. Eight catechins were quantified using UHPLC-QqQ/MS, and the results indicated that the overall catechin level peaked. The levels of four catechin epi-forms declined while those of four non-epi-forms increased after 10 minutes of brewing at 95 °C, suggesting the gradual epimerization of catechins. The results of this study indicate that, in research including the use of green tea extracts as aqueous infusions, great consideration should be given to the brewing parameters for green tea sample production. Table 2 shows the various tea blends. Table 3 summarizes the various factors affecting the quality of tea blends and infusion.

Green tea comprises both Chinese and Japanese steamed and parched (fired) teas, albeit with different blanching techniques. The study results presented conducted by Lin *et al.* (2014) includes data regarding the effect of various brewing temperatures (cold or hot water) on the quality of tea blends made from several types of green tea (parched or steamed) in varying dosages (2, 6 or 10%). The number of soluble solids, sugars, free amino acids, caffeine, and antioxidant components were comparable in tea infusions made from parched and steamed green tea, but they differed in pH, color, and sensory effects. Infusions of tea that were lighter, less colored, and had higher sensory ratings were produced by cold brewing with decreased extraction efficacy. Lower amounts of caffeine, epigallocatechin gallate, and epigallocatechin were found in cold-brewed tea infusions. Infusions made from cold-brewed tea have reduced levels of caffeine, gallate and epigallocatechin, as well as being less bitter and astringent. All things considered, the public would have an alternative in cold-brewed tea infusions made from parched green tea.

Yadav *et al.* (2018) studied the infusion patterns of four popular tea brands at temperatures ranging from 50 to 100°C. The results of the studies demonstrate a clear correlation between brewing temperature and various particle size fractions and infusion characteristics. When compared to other components under study, the HPLC analysis of the brew reveals that the epicatechin gallate (ECG) and catechin gallate (CG) dissolve rapidly. It has been determined what the principal catechin and methyl xanthine partition constants are between swollen tea granules and aqueous solution. All components have partition constants (K) ranging from 0.23 to 0.82 g/mL at 60-80°C. There is now an established connection between delivered polyphenol content (DPP), UV spectrophotometry, and HPLC—the three techniques most frequently employed in ordinary tea brew analysis.

Eleven varieties of tea were studied by Winiarska-Mieczan *et al.* (2024): hibiscus tea, yerba mate, raspberry tea bags, black tea, red tea, green leaf tea, white lychee plum tea, butterfly pea flower (*Clitoria ternatea*) tea, and white tea bags tea with flowers. Spectrophotometric assays were used to assess the level of total polyphenol (TPC), flavonoids, and anthocyanins, as well as the antioxidant and antiradical capacity utilizing the DPPH and ABTS radical cations. The ideal brewing time for green tea (leaf and bags), black tea (leaf and bags), butterfly pea flower tea, white tea, white lychee plum tea, raspberry tea, and yerba mate is 15 minutes because of the antioxidant activity of tea infusions. Ten minutes is the recommended brewing time for red tea and hibiscus it should be five minutes. The ideal brewing time for green tea (leaf and bags), black tea (bags), butterfly pea flower tea, white tea, white lychee plum tea, raspberry tea, and yerba mate is 15 minutes because of the antioxidant activity of tea infusions. It is ideal for steeping black tea (leaf) for 15 minutes. DPPH's ability to eliminate free radicals peaked after 10 minutes. The recommended brewing time for red tea is ten minutes, while hibiscus flower tea should

Table 2: Various tea blends used in Tea industry

Sl. No.	Tea name	Component of tea blend	Finding	References
1.	Instant Tea	Broken mixed fannings produced from tea leaves (two leaves and bud) plucked from three different tea estates, Pedro and Nuwara Eliya from the elevation category upcountry (UC) (>600 m MASL) and Halgolla estate from the low country (LC).	The aroma escape during the process affects the quality of instant tea used for application in the food and beverage industries. Capturing and adding back aroma to the instanttea is commercially important to overcome this drawback.	Dalpathadu *et al.* 2022
2.	Addition of milk to tea infusions	Two major species of tea, *Camellia sinensis* var. sinensis and *Camellia sinensis* var. assamica, are used and milk.	The negative effects of the addition of milk on the activity of tea antioxidant have been broadly reported, there is lack of information about the effect of milk addition on the activity or bioavailability of caffeine in tea infusions.	Rashidinejad *et al.* (2017)
3.	Herbal Teas and Bush Tea Blends	Tea samples selected for the study included 100% bush (B100), 100% fermented honeybush from species Cyclopia subternata (H100), 100% special (S100) and 100% fermented rooibos tea (R100) as well as nine blends of bush tea, namely 50% bush tea plus 50% honeybush tea (BH50:50), 50% bush tea plus 50% special tea (BS50:50), 50% bush tea plus 50% rooibos tea (BR50:50), 75% bush tea plus 25% honeybush tea (BH75:25), 75% bush tea plus 25% special tea (BS75:75%), 75% bush tea plus 25% rooibos tea (BR75:25), 25% bush tea plus 75% bush tea (BH25:75), 25% bush tea plus 75% special tea (BS25:75) and 25% bush tea plus 75% rooibos tea (BR25:75).	The study provides scientific evidence supporting the use of rooibos, honeybush tea, special, and bush tea as potential anti-inflammatory, anti-oxidant and anti-diabetic agents, respectively. This study highlighted the potential benefit of the two indigenous teas (bush tea and special tea). Moreover, blending bush tea with the other three selected herbal teas increased its anti-oxidant activities, thus suggesting that blending of bush tea and special provides the insight for further research of its nutraceuticals potential.	Malongane *et al.* (2022),
5	Fruit Tea	—	Total phenolic content, flavonoid content, anthocyanin and antioxidant capacity of fruit teas were higher by increasing the water temperature for the extraction and they reached maximum values at 100 °C.	Saliha 2013, Evaluation of Antioxidant Properties and Phenolic Composition of Fruit Tea Infusions, Antioxidants, 2, 206-215; doi:10.3390/antiox2040206

Table 3: Factors Influencing Quality of Tea blends and infusions

Sl. No.	Study	Influencing Factor	Tea blend	Results	References
1.	Effects of green tea brewing conditions on the chemical profiles of metabolome and catechin components, as well as the antioxidant activity	Temperature, Time	Green Tea	Temperature and time had a **significant impact** on the metabolic profiles, which included 33 differential metabolites. The effects of time were more pronounced at 95 °C starting after 30 minutes. In a hierarchical clustering study, infusions that were brewed at 95 °C for more than 30 minutes produced unique profiles.	Jin *et al.* (2019)
2.	Effect of various brewing temperatures (cold or hot water) on the quality of tea blends made from several types of green tea (parched or steamed) in varying dosages (2, 6 or 10%). The quantity of soluble solids.	Brewing Temperature	Chinese and Japanese steamed and parched (fired) teas	Infusions made from cold-brewed tea have reduced levels of caffeine, gallate and epigallocatechin, as well as being less bitter and astringent	Lin *et al.* (2014)
3.	The infusion patterns of four popular tea brands at temperatures ranging from 50 to 100°C.	Brewing Temperature	Four popular tea brands	Studies demonstrate the **clear correlation** between brewing temperature and various particle size fractions and infusion characteristics	Yadav *et al.* (2018)
4.	Ideal brewing time for different types of teas.	Brewing Time	Hibiscus tea, yerbamate, raspberry tea bags, black tea, red tea, green leaf tea, white lychee plum tea, butterfly pea flower (*Clitoria ternatea*) tea, and white tea bags tea with flowers.	The ideal brewing time for green tea (leaf and bags), black tea (leaf and bags), butterfly pea flower tea, white tea, white lychee plum tea, raspberry tea, and yerba mate is 15 minutes because of the antioxidant activity of tea infusions. The recommended brewing time for red tea is ten minutes, while hibiscus flower tea should only take five minutes	Winiarska-Mieczan *et al.* (2024)
5.	Selection of appropriate type of water to use to prepare ready-to-drink (RTD) beverages and green tea infusion	Water used for Infusion.	Green tea made using reverse osmosis (RO), packaged drinking (PD), or ultra-pure (UP) water	UP, PD, or RO satisfy all of the requirements (sensory qualities and the nutrients' extractability are essential for infusion), RO water is driven by economic factors.for the creation of RTD.	Murugesh *et al.* (2016)

Sl. No.	Study	Influencing Factor	Tea blend	Results	References
6.	Antioxidant properties of tea at different temperatures and times throughout the extraction process	Temperature, Time of brewing.	White, green, and black teas	Extended hot and cold extracts yielded the most activity for white tea, while short hot water infusion yielded the highest activity for black tea and prolonged cold steeping for green tea.	Hajiaghaalipour *et al.*. (2016)

only take five minutes. The results correspond to the temperature at which tea producers recommend brewing. Future research should consider different tea brewing temperatures for complete results, enabling people to reap the full benefits of consuming tea.

Murugesh *et al.* (2016) conducted the study with the goal of choosing the appropriate type of water to use to prepare ready-to-drink (RTD) beverages and green tea infusion. Both the sensory qualities and the nutrients' extractability are essential for infusion. For this reason, the preparation can be done using reverse osmosis (RO), packaged drinking (PD), or ultra-pure (UP) water. However, because RTD beverages are distributed and stored before being consumed, their aesthetic appeal and physical stability are also crucial factors in determining customer approval. Additionally, the findings showed that the stability of catechins should be taken into account when choosing a water source. Despite the fact that UP, PD, or RO satisfy all of these requirements, RO water is driven by economic factors, for the creation of RTD. The conclusions drawn from this scientific investigation are, therefore, useful in choosing the right water quality to use when making green tea beverages.

Six different kinds of tea leaves were studied for their antioxidant properties by Hajiaghaalipour *et al.* (2016) at different temperatures and times throughout the extraction process. Overall, the study's studied samples showed significant levels of both antioxidant activity and capacity. The findings show that steeping time and temperature have a major impact on antioxidant activity, with variation having the greatest influence. Under varying extraction conditions, the amounts of antioxidants in white, green, and black teas varied. Overall, extended hot and cold extracts yielded the most activity for white tea, while short hot water infusion yielded the highest activity for black tea and prolonged cold steeping for green tea. The results of the research proved that white and green teas have higher antioxidant capacities than black tea.

PROBLEMS IN BLENDING OF TEA

The problem with tea blending is to find the best tea blend recipes by taking into account the costs, properties, and availability of the raw ingredients. Every tea blend has a variety of qualities, including color, brightness, thickness, softness, coarseness, flavor, and so forth. A numerical scale is used to grade each of these qualities. As a result, every tea blend is "finger printed" for its various qualities; that is, every tea Blend receives a score in numbers. However, every raw material is also "finger printed" in opposition to the same qualities. The goal is to determine, given the raw material availability, the most economical combination of raw materials to create blends that meet the precise attributes score requirements. But given the raw components at hand, it is nearly never possible to precisely match the desired characteristic scores of the finished mixes. This leads the professionals in tea blending to frequently search for a solution that is the closest to the desired one. Generally speaking, certain blend attributes may be more important than others in obtaining the blend's quality (Fomeni, 2018).

In the case of the tea blending problem, the decision maker's goal is to produce tea blends that precisely meet the required qualities. Since it is nearly never possible to get such a precise match with the raw material available, the decision maker might be satisfied with the "closest match." 'Closest match' can theoretically be achieved via interactive multi-objective approaches like the satisficing trade-off method (Hwang *et al.* 1980; Oslon, 1993; Nakayama, 1992). The decision maker must, however, state their choice for each iteration of these procedures. Due to potential fatigue during the process, this could lead to the decision maker settling on a solution. In addition, the concept of the "closest match" is rather arbitrary because there are a lot of other feasible solutions that might work in this circumstance. Therefore, it's critical to provide a straightforward decision-support tool that can calculate all equally good or acceptable alternatives and give the decision-maker relevant analysis so they may select just one (Fomeni, 2018).

FUTURE OUTLOOK FOR TEA BLENDS AND HERBAL TEAS

Over the next several years, it is anticipated that the addition of new flavors to tea blends, such as fruits and flavor combinations, flowers and herbs (like mint, jasmine, and cardamom), and spices (like cinnamon, cardamom, etc.), will significantly grow the global tea market. Some of the major companies in the global tea market are Unilever, Tata Global Beverages, Twinings, McLeod Russel, James Finlay, Associated British Foods Plc., Bettys & Taylors Group Ltd., Nestle, and Barry's Tea. These companies are eager to add unique flavor profiles to tea sachets, like chocolate, pomegranate, acai, and turmeric. Through innovation and advertising, the market leaders are battling to maintain their share of the market and increase demand through innovation and advertising (Hicks, 2001).

Tea's many health benefits are contributing to its rising popularity. The market has recently seen an upward trend in demand for high-quality teas that have specific advantages for health and new flavors (World Tea News, 2017). This has established a market for value-added tea culture similar to instant coffee's widespread domination. The shift in consumer preferences towards healthier and more convenient beverages is largely responsible for the growth of the worldwide tea market. Due to convenience, bagged tea has essentially taken the place of loose tea in many varieties. It is projected that the industry will see profitable potential due to the increased demand from the younger generation who are concerned about their health. Furthermore, the growing popularity of ready-to-drink tea has had a substantial impact on the market for tea worldwide (Kumarihami & Song, 2018).

Tea extracts can be added to regular foods to make them healthier for consumers because of their inherent antioxidants. Therefore it is possible to investigate the large market potential for these foods. Tea extracts find application in breads and baked products, seasonings, confectionery, and frozen dairy desserts. Moreover, food coloring (black, green, orange, yellow, etc.) (United Nations Conference on Trade and Development Tea, 2016). Additional food items under development include tea-rice, tea-noodles, cake, biscuits, wine, candies, and ice cream (Hicks, 2001). The secret is diversification and goods like tea-flavored chewing gum might be created. All things considered, tea has a market share in the very competitive soft drink industry (Kumarihami & Song, 2018).

Different consumers in different countries have diverse preferences when it comes to tea styles and drinking patterns (Hicks, 2001). Additionally, a wide range of other herbal teas are becoming more and increased acceptance in addition to traditional teas in recent times. Herbal teas are utilized for their medicinal qualities and are created by steeping leaves of plants or other plant components, such as flowers. For instance, gymnema (*Gymnema sylvestre*), a plant that is mostly found in India and belongs to the Asclepiadaceae family of plants, is used to make a nutritious herbal tea that is said to have several therapeutic benefits (Hicks, 2001). Value addition and product diversity in the tea industry will therefore have a significant impact on the supply-demand chain's equilibrium (Kumarihami & Song, 2018).

Globally, the herbal tea market is expanding quickly, and companies are always searching for fresh flavors to appeal to consumers and satisfy market demands (Alibas *et al*. 2020 Liuetal. 2020) investigated the alterations in chemical makeup, flavor profile, and antioxidant capacity of fermented (FHT), sun-dried (SDHT), and pan-fried (PFHT) hawk tea. It was discovered that PFHT has the highest concentration of flavonoids and phenols. FHT had the largest concentration of volatile chemicals, which gave the consumer group the highest level of overall sensory approval. Compared to FHT, PFHT and SDHT had greater antioxidant activity. The maximum yield in water extract and the highest health value were found in PFHT. This demonstrates how the pharmacological properties and sensory appeal of traditional herbal tea can be exploited to cater to consumers with different needs (Kumarihami & Song, 2018).

Different processing techniques can change herbal tea, which can be used to meet the needs of various customers. This offers fresh concepts for the inventive industrialization of herbal tea that is customary. Vitas et al.. (2020) used kombucha broths to ferment six popular herbal plants. The new product exceeded the previous one in terms of total phenol and total flavonoid levels, as well as antioxidant, reducing, and angiotensin-converting enzyme inhibitory effects. (Kumarihami& Song 2018)

CONCLUSION

In conclusion, this review study has shed light on the complex science and art of blending in the tea industry. It is clear from an in-depth review of historical viewpoints, blending techniques, and modern methods that blending is crucial in determining the flavor, aroma, and general quality of tea products. Additionally, tea producers and marketers can use blending as a strategic tool to assure product consistency, cater to a wide range of consumer tastes, and boost market competitiveness.

This article has also shown the tea industry's dynamic character, which is defined by changing consumer preferences, technological advancements, and sustainability requirements. Consequently, the inference made highlights the need for tea growers and marketers to continue being flexible and adaptive in their blending procedures, involving adopting sustainable practices, staying up to date on emerging technologies, and constantly improving their comprehension of customer preferences.

In terms of the tea industry, blending has both opportunities and challenges ahead of it. For the tea business to be successful and sustainable in the long run, blending processes must be developed with an unwavering dedication to social responsibility and environmental stewardship. In an increasingly competitive global economy, tea farmers and marketers may position themselves for continuing growth and relevance by remaining aware of trends in the market, accepting innovation, and promoting collaboration across the value chain.

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