

A review on current trend of next generation of teas

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Abstract

Several herbs are presently used in the food industry as functional additives, such as botanic extracts in healthy drinks. Rapid population growth uses healthy drinks for slimming, weight control, and various other beauty applications. In Asian countries, the custom of tea consumption is highly prevalent. Caffeine is the most commonly used behaviourally active ingredient in the world. Tea and coffee are the main product of daily caffeine intake. The review aimed to describe the word 'next-generation tea' and the implication of herbal tea/drinks which typically refers to healthy drinks produced using fresh or dried herbs, leaves, immature berries, seeds, and roots of the source material, such as infusion or boiling. Next-generation teas are rich in natural, bioactive compounds, including carotenoids, flavonoids, phenolic acids, alkaloids, coumarins, polyacetylene, terpenoids, and saponins. Traditional review methodology with practical and methodological screening was done to determine the appropriate reference sources. Various empirical research has demonstrated that bioactive compounds are responsible for multiple diversified biological functions, including anticarcinogenicity, antimutagenicity, and antiaging effects such as antibacterial, antioxidant, and antiviral. The next generation tea has more diverse bioactive compounds than *Camellia sinensis* L. based teas which make it potential as a healthy drink.

1. Introduction

The increasing number of degenerative diseases and more consumer awareness of food and health connections have increased the functional food demand. Tea is a boiling soft drink, macerating or infusion in the hot or cold water of plant materials, for example, fresh or dried leaves, flowers, roots, and stems (En and Willy, 2016). Tea is a significant source of polyphenols in human consumption due to the widespread application thereof. Tea is one of the cheapest beverages globally and is consumed by a wide range of age groups at any level of society. *Camellia sinensis* L. is the most popular tea plant, the evergreen shrub, and it is an essential industrial plant with a long history of fresh tea leaves and buds (Theppakorn *et al.*, 2014; Chen, Ding, Chen *et al.*, 2020). *Camellia sinensis* L. is an eastern and southeast Asian plant commonly grown and consumed in Japan, China, Sri Lanka, Taiwan, and India (Granato *et al.*, 2014). Every day there are more than 13 million consumers worldwide (Spizzirri *et al.*, 2019).

Tea is considered a part of the worldwide drinks market and is not seen as a commodity in isolation and the active ingredients are of concern to the demand for functional foods. Caffeine is the most widely consumed behaviorally active substance in tea. The amount of caffeine literature focuses on the level of use and its physiological consequences. However, youth can use caffeine beverages for social reasons or gain an energy boost in their activities (Tseng *et al.*, 2014).

Chemical ingredients of tea have been shown as tea polyphenols (TPP), amino acid, organic acid, tea polysaccharide (TPS), protein, lignin, lipid, pigment, and inorganic elements (Du *et al.*, 2016; Verloop *et al.*, 2016). These chemical ingredients include alkaloids (methylxanthines, e.g., caffeine, theophylline, theobromine), polyphenols (flavonoids and catechins), volatile oils, amino acids (γ -n-ethyl glutamine), non-protein amino acids (GABA and L-theanine), polysaccharides, lipids, inorganic elements (e.g., fluorine, manganese, and aluminium), vitamins (e.g.,

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vitamin C), and polyamines (e.g., spermidine and spermine) are found in tea leaves, and infusions (Nie and Xie, 2011; da Silva Pinto, 2013; Sahab *et al.*, 2020).

Flavonoids and polysaccharides are major components of tea. Tea is one of the most abundant sources of polyphenols, with a 30% antioxidant component, and is widely consumed (Drywień *et al.*, 2015). Recent research has shown the potential for one of the polyphenols, EGCG, and theaflavins contained in black tea as a potential antiviral for SARS-CoV-2 with an inhibitory mechanism of RdRp SARS-Cov-2 (Mhatre *et al.*, 2020). Furthermore, polysaccharides of tea serve as a structural feature of the tea cell wall, and the extraction process will depend on the cell wall composition (Nie and Xie, 2011). The quality of polysaccharides, physicochemical attributes, and bioactivity of tea polysaccharides (TPS) are closely connected to the source of tea (Chen *et al.*, 2009; Scoparo *et al.*, 2013). The potential of TPS to improve human health through several pharmacological and bioactivity such as hepatoprotective, antioxidant, immune-stimulating, antiviral, antidiabetic, antibacterial, and antitumour activities (Chen *et al.*, 2016).

According to many *in vivo* and *in vitro* studies, green tea is one of the most effective cancer preventives. Sueoka *et al.* (2001) focused on its inhibitory effect on the expression of TNF genes mediated by inhibition of NF- κ B and activation of AP-1. This study found that individuals who consumed more than 10 cups of green tea per day had a lower relative risk of coronary disease. These findings indicate that chronic inflammatory disorders and lifestyle-related diseases have protective effects on tea, such as cancer and cardiovascular disease.

While the famous green and black tea are made from *Camellia sinensis L.* leaves, tea can be made with water infusion of the roots, leaves, blossoms, flowers, immature berries, seeds, and other segment portions of an immensely different part of plant species. These teas contain an abundance of mixtures and could assume a critical part in conveying supplements and synthetic substances to increase low-quality diets (Poswal *et al.*, 2019). The term tea is less precise, as it does not contain any *Camellia sinensis L.* leaves. The typical tisane is the proper term for the herbal mix. Herbal Tisanes (teas) are made up of various flowers, spices, flavours, and dried organic items that are generally caffeine-free (Rabade *et al.*, 2016). Herbal tisane, a tea that is not made from *Camellia sinensis L.*, which is rich in natural bioactive compounds, has the potential to be the next-generation tea. This review aimed to define the term "next-generation tea" which often refer to healthy drinks made from fresh or dried plant material, such as infusion or

boiling.

2. Tea production

More than 200 types of most representative commercial tea products in China have been attempted to classify tea in various methods, including form, tenderness of tea leaves, production season, cultivation area, manufacturing method, and sensory profile (Feng *et al.*, 2019). Generally accepted concepts of tea classification are divided into six groups in China: unfermented (green tea), mildly (white tea, yellow tea), semi-fermented (oolong tea), and post-fermented (dark tea) (Ning *et al.*, 2017). Table 1 shows *Camellia sinensis L.* tea with various levels of fermentation. The fermentation levels are then described as dark or black tea - oolong - white or yellow tea - green tea (Teshome, 2019). Tea properties are dependent primarily on the quality of nitrogen, caffeine, amino acids, polyphenols, catechin (C), catechin gallate (CG), galliccatechin (GC), epigallocatechin (EGC), epicatechin gallate (ECG), complete catechin, epicatechin (EC), theaflavin-30-gallate (TF30G) and theaflavin (TF) and pigments (Liang *et al.*, 2003; Yan *et al.*, 2020; Musial *et al.*, 2020). The free amino acids in green tea are the main contributors to sweet taste. At the same time, catechin and its oxidation derivatives are mainly responsible for tea drinks' bitter tastes and astringents (Scharbert and Hofmann, 2005). The bitterness of pure caffeine is unpleasant to taste, but the bitterness is reduced by combining catechin and theaflavins (TFs).

Plucking takes in the fields between 0-1200 m and 1200-2000 m every ten days. Flush or fresh tea picked with two leaves and buds or more. Approximately 20-30 kg were picked, weighed, and delivered to the factory in baskets or gunny bags. Black tea is produced by withering, rolling, roll-breaking, green leaf sifting, fermenting, drying, sorting or grading, and packaging and labeling for shipping (Narukawa *et al.*, 2010).

Fermentation or oxidative processing refers to the oxidative enzymes process, for example, Polyphenol Oxidases (PPO), which cause enzyme browning reactions in tea leaf cells. The various varieties of tea vary fundamentally in the degree to which the oxidative processing contributes to the conversion of flavon-3-ols in green tea (minimally processed) into theaflavins (dimeric form) and thearubigin (oligomeric/polymeric structure) in oolong (partially oxidized) and black tea (complete oxidation) (da Silva Pinto, 2013). Major compound changes in fermentation are shown in Figure 1. This procedure, therefore, does not only affect the content of the primary tea polyphenols. It is the most critical process of developing tea pigments and unique flavours such as theaflavin and thearubigins (Zhang *et*

Table 1. *Camellia sinensis* L. tea with various levels of fermentation

Type	Process	Characteristic	Chemical compound	Sources
Green tea	Dried and heated to prevent enzymatic oxidation of catechin	Dominant features of acidic taste, astringent aftertaste, green flavor, dried taste, and dry scent.	Flavonoids, phenolic acids, and other more minor compounds.	Adawiyah <i>et al.</i> (2019); Granato <i>et al.</i> (2014)
Yellow tea	Similar to green tea with a different phase of chlorophyll hydrolysis. The mechanism of inactivation of the enzyme in yellow tea is slower so that through oxidizing enzymes, the fresh tea leaves can become yellow.	Similar characteristics as compared to green tea	Theanine, aspartic acid, glutamic, catechin, flavonoid, flavonoids, caffeine, soluble sugars, and free amino acids	Granato <i>et al.</i> (2014); Wei <i>et al.</i> (2021); Zhang <i>et al.</i> (2019)
White tea	White hairs on the tea surface will be withered after harvested fresh and immediately dried to prevent enzymatic oxidation of catechin.	A rich pubescence and tea infusion are more evident than black tea.	Chlorophyll is retained during the processing of white tea	Granato <i>et al.</i> (2014)
Oolong tea	Semi-fermented, the degree of enzymatic oxidation performed is lower than that of black tea.	Flavor and color between green and black tea.	Amino acids, Glycosides, flavonol, proanthocyanidin, flavonol, terpenoid aromas, and theaflavin	Chen, Liu, Zhao <i>et al.</i> (2020)
Black tea	Fresh tea leaf catechin is oxidized completely by polyphenol oxidases and peroxidases.	The enzymatic oxidation of polyphenols initiates the formation of the color chemical components, TFs and TRs.	Theaflavins, thearubigens, 14 flavon-3-ol, catechin, glycopyranoside,	Granato <i>et al.</i> (2014); Liang <i>et al.</i> (2003); Scharbert and Hofmann (2005)
Red Tea	Fully oxidized and fermented in a solution of dark-colored (reddish).	Red-brown infusion color.	Contain the lowest content of catechin, epicatechin, epigallocatechin, and chlorogenic acid.	Chen <i>et al.</i> (2016); Granato <i>et al.</i> (2014)
Dark Tea	Use aerobic or anaerobic microbial heat	Dark-brown infusion color.	Free amino acids, gallic acid, and six tea catechins	Chen <i>et al.</i> (2016); Gong <i>et al.</i> (2020)

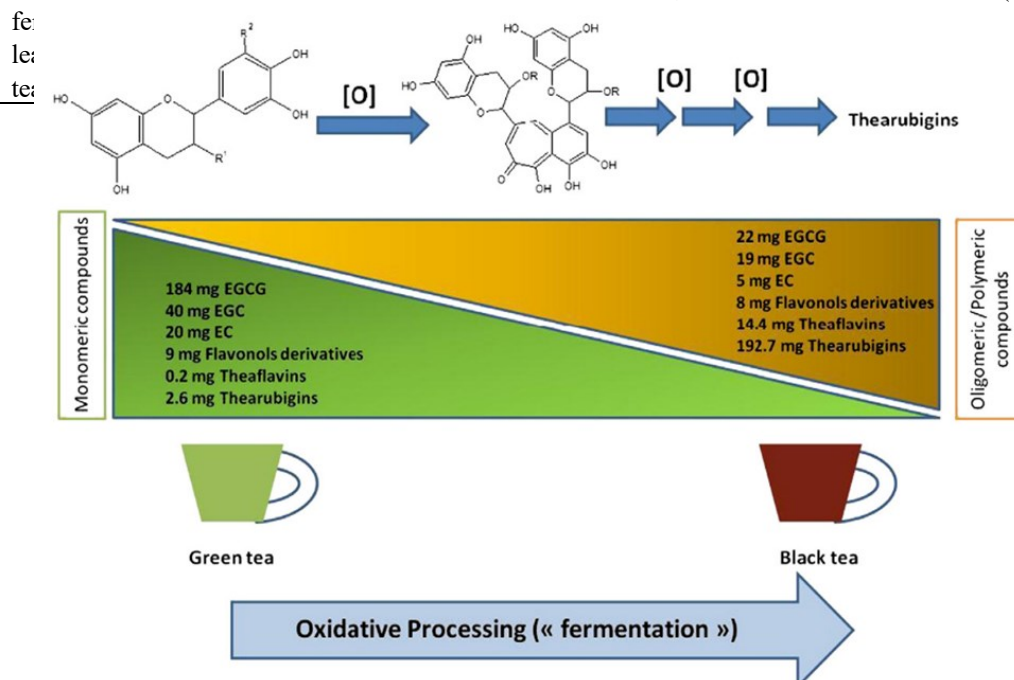


Figure 1. Major compounds change in green and black teas on fermentation (da Silva Pinto, 2013)

al., 2011).

Since oxidation starts at the rolling stage itself, the time between these stages is a critical factor as the degree of oxidation decides the consistency of the tea. The lower content of catechin gallate was closely associated with the low astringency and bitterness infusion of yellow tea, leading to umami and sweetness by aggregating soluble sugars and free amino acids (Narukawa *et al.*, 2010). The aggregation of soluble sugars and free amino acids improved the tea infusion's clarity and yellow colour, resulting in pre-drying leaves with lower water content (Wei *et al.*, 2020). Then the leaves are dried with hot air to avoid the oxidation process. In the end, the leaves are sorted into grades according to their sizes (whole leaf, split-leaf, fanning, and dust) (Adawiyah *et al.*, 2019).

The tea processing differentiates between tea and other types, such as the processing of dark tea and oolong tea. The primary step in processing dark tea is known to be microbial fermentation. The stacked rolling leaves should be kept for 24-40 hours in a room above 25°C during the microbial fermentation phase, the relative humidity (RH) of these leaves should be 85%, to initiate complex oxidation, condensation, and degradation of chemical tea components (Zheng *et al.*, 2015). Meanwhile, the oolong tea process commonly takes two days for traditional oolong tea processing, including leaf plucking, withering, zuoqing or bruising and withering, shaking or green-making, fixation or fixation de-greening (Granato *et al.*, 2014; Chen, Ding, Chen *et al.*, 2020). The variations in the related tea processing processes are described in Figure 2.



Figure 2. Various *Camellia sinensis* L. tea with different process (Zhu *et al.*, 2020).

The effect of various processes influences variations in the sensory characteristics of tea. During oolong tea fermentation, modifications of flavour-related metabolites associate with several stresses (Zeng *et al.*, 2020). Injury tension from YaoQing's step changes the flavanols mixture, proanthocyanidins, glycosides of flavanol, theaflavins, and amino acids. This compound enriches the distinctive flavour of oolong tea (Chen, Liu, Zhao *et al.*, 2020). Moreover, oolong tea induces unique aromas such as jasmine lactone α -farnesene, indole, (E)-nerolidol, phenyl ethyl alcohol, ocimene, and acetaldehyde benzene (Mei *et al.*, 2017). In addition, the

prolonged TanQing process is essential for aroma accumulation; apart from YaoQing, these findings will provide a valuable framework for improving processes for high-quality oolong tea production (Chen, Liu, Zhao *et al.*, 2020).

3. Diversity of next-generation tea

Next-generation tea has become popular in various regions such as Asia, Africa, America, and Europe. Herbal teas or tisane are next-generation tea and are well known as herbal beverages consumed globally for centuries (Poswal *et al.*, 2019). Herbal drinks, known as next-generation tea and popular drinks such as tea, coffee, and cocoa produced from plant ingredients, have penetrated an emerging niche market (Chandrasekara and Shahidi, 2018).

Nevertheless, next-generation tea refers to fruit infusions or other herbs that do not contain *Camellia sinensis* L. to prevent confusion with common teas; next-generation tea drinks are often called tisane, herbal or botanical infusion (Sivakumaran and Amarakoon, 2018). As shown in Table 2, various herbal drinks are consumed globally based on their regional origin. Some beverages have achieved more popularity than others. In the age of globalization, regional boundaries have progressively been eliminated, and such products have become widely accessible as foreign health products, although from different areas (Chandrasekara and Shahidi, 2018). Each region has its characteristics in producing a new generation of tea, following the commodities grown in the region, amount, and type of secondary metabolite in a plant depending on environmental factors (Carabajal *et al.*, 2017).

Varieties next generation tea as herbal infusion referred to as tisane, or herbal teas is produced from blends of dried or fresh herbs, bulbs, nuts, grasses, fruits, or other parts of plants that may provide unique flavour, taste, and health benefits (Theuma and Attard, 2020). Tea has a long medical and dietary history. Other plant infusions such as rosehip (*Rosa sp.*), rooibos (*Aspalathus linearis*), and chamomile (*Matricaria recutita* L.) have become very popular (Malongane *et al.*, 2017). Still, it is essential to emphasize that the words next-generation tea as herbal teas or tisanes are better applied to this collection of drinks (da Silva Pinto 2013).

4. Bioactive compound and functional effect of next generation tea

Next-generation tea as herbal infusions initiate an essential supplementation source; proteins, peptides, amino acids, enzymes, pectin, volatile compounds, vitamins, and minerals are other significant chemical

Table 2. Diversity of next-generation tea

Raw Material	Compound	Functional activity	Sources
Beli, bael, Bengal, quince, vilva tree (<i>Aegle mermelos</i>)- leaves, buds, flowers, immature, fruit, bark	Alkylated, terpenes, alkanes and alkenes, fatty acids and fatty alcohols, sterols, coumarins, and indazole derivatives.	Anticancer, antidiabetic, antihyperglycemic, anti-inflammatory, and anti-dyslipidaemia,	Chandrasekara and Shahidi (2018); Tiwari <i>et al.</i> (2020)
Borututu (<i>Cochlospermum angolensis</i>)-Roots	Gallic acid, Protocatechuic acid.	Anti-hepatocellular carcinoma, antioxidant	Chandrasekara and Shahidi (2018); Jain <i>et al.</i> (2020)
Chamomile (<i>Matricaria chamomilla</i> , <i>Chamomelum nobile</i>)-Flowers	Sesquiterpenes, flavonoids, coumarins, vitamins, phenolic acids and glucosides.	Antioxidant, hypocholesterolemic, anticancer, anti-inflammatory	Chandrasekara and Shahidi (2018); Žlabur <i>et al.</i> (2020)
Chamomile (<i>Matricaria recutita</i> L)	Volatile terpenoids (bisabolol oxide, α -bisabolol, β -trans-farnesene and chamazulene), phenolic compounds (coumarins, flavonoids, and phenolic acids), and sesquiterpene lactones.	Antiallergic, antibacterial, increased intestinal absorption of glucose against obesity, hyperglycemia and hyperlipidemia.	Jabri <i>et al.</i> (2017); Jamalian <i>et al.</i> (2012); Sharifi-Rad <i>et al.</i> (2018)
Dag cayl (<i>Sideritis montana</i> L. ssp.)-aerial part	Phenolic compound, flavonoid.	Antioxidant, antibacterial.	Chandrasekara and Shahidi (2018); Akbaba (2021)
Ginger (<i>Zingiber officinale</i>)-Rhizomae	Gingerol, shogaols, gingerdiol, and gingerdione. Phenolic acid and flavonoid.	Anti-inflammatory, hypoglycemic. antioxidants, antibacterial, anti-inflammatory, antiseptic, antiparasitic, and immunomodulatory properties	Chandrasekara and Shahidi (2018); Herve <i>et al.</i> (2019); Zahid <i>et al.</i> (2021)
Heart leave mooseed, Guduchi (<i>Tinospora cardifolia</i>)-Stem, roots	Phenolic and flavonoid compounds.	Antidiabetic, antioxidant, anti-inflammatory.	Chandrasekara and Shahidi (2018); Sahu <i>et al.</i> (2018); Reddi <i>et al.</i> (2019)
<i>Helichrysum italicum</i> (Roots, stems, leaves, and flowers)	Polyphenolic and several phenolics; (quinic acids and chlorogenic is the main compound, dicaffeoylquinic-acid isomers, and gnaphaliin-A), caffeoylquinic acids and pyrones.	High antioxidant, medium antidiabetic, anti-obesity.	Pereira <i>et al.</i> (2017); Kramberger <i>et al.</i> (2020); Kenig; <i>et al.</i> (2021)
Kemuning Leaves (<i>Murraya paniculate</i>)	B-cyclocitral, α -cubebene, methyl salicylate, cubenol, trans-nerolidol, β -isogermacrene and cubebene.	Antihypertensive	Cuong <i>et al.</i> (2014); Olawore <i>et al.</i> (2005); Primiani <i>et al.</i> (2018)
Mangosteen pericarp (<i>Garcinia mangostana</i> L.)	Isoprenylated xanthenes.	Antioxidant, neuroprotective, anticancer, hypolipidemic, antidiabetic, analgesic, anti-	Lalas <i>et al.</i> (2017); Ovalle-Magallanes <i>et al.</i> (2017); Primiani <i>et al.</i> (2018)
<i>Moringa oleifera</i>	Vitamins C and E, amino acids, minerals (natural iron and calcium), lipids, phenols and flavonols, fatty acids, ash, carbohydrates, dietary fiber and carotenoids.	Antioxidant.	Lalas <i>et al.</i> (2017); Manuwa <i>et al.</i> (2020); Primiani <i>et al.</i> (2018)
New Zealand kawakawa (<i>Piper excelsum</i>)	Phenylpropanoids, terpenoids, lignans, and amides.	Anti-inflammatory.	Butts <i>et al.</i> (2018)
Peppermint (<i>Mentha piperita</i>)-leaves	fatty acids (linoleic, linolenic, and palmitic acid, variety of volatile compounds, mainly menthol, menthone and isomenthone have also been identified along with b-carotene, chlorophyll, a- and c-tocopherols and ascorbic acid.	Antioxidant, antitumor.	Chandrasekara and Shahidi (2018); Frész <i>et al.</i> (2014)

Table 2 (Cont.). Diversity of next-generation tea

Raw Material	Compound	Functional activity	Sources
Pegaga, Indian pennywork, gotukola (<i>Centella asiatica</i>)	Hydroxycinnamic acids, flavonoids, and triterpenoids.	Anticancer, increase the activity of antioxidant enzymes.	Chandrasekara and Shahidi (2018); Ncube <i>et al.</i> (2017)
Polpala (<i>Aerva lanata</i>)	Canthin- 6-one (aervine, aervoside) and β -carboline alkaloids (aervolanine), flavonoids (kaempferol, quercetin), β -sitosterol, phenolic acids (syringic acid, vanillic acid), botulin.	Antihyperglycemic, anti-inflammatory, anti-urolithic, anticancer.	Chandrasekara and Shahidi (2018); Mandal <i>et al.</i> (2020); Rajesh, Chitra and Paarakh (2011); Rajesh <i>et al.</i> (2011)
Rooibos (<i>Aspalathus linearis</i>)	Essential oils, 50 volatile compounds.	Hepatoprotective, anti-inflammatory and antimycobacterial for therapy	Reid <i>et al.</i> (2020); Song <i>et al.</i> (2021)
Rosa hip (<i>Rosa sp.</i>)	Polyphenols (proanthocyanidins, triterpene acids, catechin), flavonoids (delphinidin, cyaniding and their glycosides, quercetin) and their glycosides, galactolipid, folate, vitamin A, C, and E, mineral, and essential fatty acids.	Antioxidant, anticancer, anti-inflammatory, cardioprotective, immunomodulation, antidiabetic, antimicrobial and neuroprotective.	Frész <i>et al.</i> (2014); Patel (2017)
Rosa rugosa tea	Polyphenols and flavonoids.	Antibacterial	Zhang <i>et al.</i> (2014)
Rosehips, dog rose (<i>Rosa canina L</i>)-Fruits	Trans tiliroside, flavonols (glycosides of quercetin and kaempferol), 3-O-caffeoylquinic and 5-O-caffeoylquinic acid, ellagic acid and hydrolysable tannins, gallotannins and ellagallotannins.	Anti-inflammatory, antioxidant.	Chandrasekara and Shahidi (2018); Ieri <i>et al.</i> (2015);
Roselle (<i>Hibiscus sabdariffa L.</i>)	Anthocyanins (such as delphinidin and cyanidin derivatives), polysaccharides, organic acids (hydroxycitric and hibiscus acids), phenolic acids and flavonoids (quercetin (Q), luteolin and their derivatives) .and 24 aroma-active compounds.	Antibacterial, antihypertensive, antidiabetic.	Andzi and Feuya (2016); Primiani <i>et al.</i> (2018); Sahebkar <i>et al.</i> (2015); Zannou <i>et al.</i> (2020); Herranz-Lopez <i>et al.</i> (2020)
Sage, adacayl, minchi (<i>Salvia officinalis</i>)	Volatile oil components (α -pinene, β -pinene, limonene, α -thujone, β -thujone, camphor, and 1,8-cineole in the oil),	Antioxidant, increase liver antioxidant status.	Chandrasekara and Shahidi (2018); Vosoughi <i>et al.</i> (2018)
Soursop Leaves (<i>Annona muricata L</i>)	Alkaloids anonaine, nornuciferine, asimilobine, lirioderine, corypalmine, xylopine, reticuline.	Antibacterial against Gram-positive and Gram-negative bacteria (<i>Staphylococcus aureus</i> , <i>Salmonella enterica</i> serovar Typhimurium and <i>Enterococcus faecalis</i>).	Pinto <i>et al.</i> (2017); Primiani <i>et al.</i> (2018)

Table 2 (Cont.). Diversity of next-generation tea

Raw Material	Compound	Functional activity	Sources
Tanner's Cassia, avartaki, ranawara (<i>Casia auriculata</i>)- Leaves, flowers.	Valine and norvaline mainly present in the leaf, and alanine, phenylalanine, beta-alanine, aspartic acid, asparagine, 5-oxoproline, proline, gamma aminobutyric acid (GABA), and tryptophan mainly detected in the flower. Sugar acids, sugar, sugar alcohols, nucleosides, fatty acids, phenolic compound, and miscellaneous composunds.	Antihyperglycemic, antidiabetic.	Chandrasekara and Shahidi (2018); Tietel <i>et al.</i> (2021)
Tea flower extract (TFE)	Phenolic compounds, carbohydrates, saponins, and crude proteins.	Improving the intestinal barrier, improve liver function, induced immunosuppression and hepatic injury.	Chen <i>et al.</i> (2020a)
Vine tea (<i>Ampelopsis grossedentata</i>)	Flavonoids.	Antioxidant.	Jia <i>et al.</i> (2021)
Yerba mate (<i>Ilex paraguariensis</i>)	Phenolic, alkaloids.	Hypocholesterolemic, hepatoprotective, cardiovascular system protective, antioxidant, antidiabetic, antirheumatic and anti-inflammatory and diuretic activities.	Chandrasekara and Shahidi (2018); Konieczynski <i>et al.</i> (2017)

materials available in herbs used for infusions (Theuma and Attard, 2020). For instance, polyphenolic antioxidant activity is primarily due to its redox properties, which enable it to act in the form of reducing agents, metal chelators, hydrogen donors, and single oxygen quenchers (Ivanova *et al.*, 2005).

Several ingredients of next-generation tea have shown their functional effects. *Moringa oleifera* tea has a strong antioxidant potential in solid to liquid ratio *M. oleifera* tea of 1:20 mg/mL, with a temperature of 97°C and a duration of 35 min which results in yields of 56.96, 34.66, and 3.53 mg/100 mL for total phenolic compounds (TP), total flavonoids (TF), total tannins (TT); respectively, and it helps reduce stress-related chronic diseases (En and Willy, 2016). *Hibiscus sabdariffa* L. beverage rich in anthocyanins, polyphenols, organic acids, volatile components, and polysaccharides beneficial to cardiovascular disease, revealed an essential role in minimizing both diastolic blood pressure (DBP) and systolic blood pressure (SBP) (Sahebkar *et al.*, 2015). A potent antioxidant and anticancer activity are shown by Mangosteen pericarp tea which was tested for skin cancer cells and mediated by the action pathways through apoptosis induction via intrinsic pathways and proliferation inhibition (Wang *et al.*, 2012). Meanwhile, the antimicrobial activity of *A. Muricata* tea has a wide range of actions, and the main targets of the bioactive compound's antimicrobial activity are outer bacterial membranes and plasma (Pinto

et al., 2017).

In the traditional medicine of several regions, fruit seeds and pericarps have a long tradition of being applied as drinks. Isoprenylated xanthones, a class of secondary metabolites with numerous records of biological effects such as antiproliferative, pro-apoptotic, antioxidant, ant nociceptive, neuroprotective, anti-inflammatory, antiobesity, and hypoglycemic, are the major phytochemicals found in the seeds and pericarps (Ovalle-Magallanes *et al.*, 2017). Almost any simple essential ingredient has a functional effect, with the tea production process providing an opportunity to increase its functional effect.

While the intake of next-generation tea, such as herbal teas, provides many health benefits, they can also pose a health risk because toxins and toxic metals are included. Concentrations of polyphenols are found in herbal infusions than in untreated herbal compounds and residual herbal extracts (Theuma and Attard, 2020). Heavy metals such Fe, Mn, and Zn were found at the largest concentrations in both the infusions and untreated medicinal compounds, with the least concentrated in these matrices were Cr, Cd, Cu, and Pb (Zhang *et al.*, 2018).

5. Conclusion

A wide variety of tea products is generated as more

expanding and increasingly dynamic market share. Through product and process value-added development, market shares become more sophisticated and highly competitive. The tea industry must face these challenges with confidence. Combining tea with a variety of other natural products that have health benefits is a required innovation. Many bioactive components of traditional herbal beverages remain undiscovered. Furthermore, the mixing of different herbal elements as a “blended tea” tea has the potential to create a new generation of tea with varied health benefits. Thus, further study of bioactive compounds and their roles is still needed.

It is vital to illustrate the ongoing need to classify and examine the circulating metabolites. The specific mechanisms or compounds that benefit health associated with the intake of tea and the amounts of metabolites used are much greater than the physiological aspect and should be more investigated. Bioavailability study is critical for bioactive substances since interactions may affect their metabolism with other nutritional components, cellular transporters, molecular transformations, solubility, metabolism, and the function of gut microbiota. More safety studies may be needed to examine the chronic and sub-chronic toxicity of the next generation of tea and the safety of daily intake of traditional tea over a longer exposure span. Next-generation tea is a mixture of possible bioactive compounds, a potential source of new and valuable herbal drinks. Thus, the next generation of teas could be used as a new functional drink trend to improve health function.

Conflict of interest

The authors declare no conflict of interest.

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