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Functional beverages: A modern gateway to healthy lifestyle

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Abstract
The increased global interest in functional foods containing ingredients that have the potential to provide favourable health impacts is driving up consumer demand. Functional drinks are the fastest-growing segment of the non-alcoholic beverage and functional food industries. According to the data, this growth in recent years is due to the maturation of the soft drink sector and a large number of multinational corporations (MNCs) investing globally in the functional beverage sector; as a result, per capita consumption has increased, while carbonated beverage consumption has increased. Because of the availability of so many additives on the market, such as nutraceuticals, zero-calorie sweeteners, tastes, colours, stabilizers, amino acids, vitamins, and minerals, the last decade has seen the introduction of novel beverage products. The light of this review paper focuses on various functional beverages and the bioactive components present in them. Studying their bioactive components and reactions altogether would help in understanding the method of production of quality assured beverage as well as their future perspectives in association with the application of nanotechnology techniques.

Keywords: Functional beverages, non-alcoholic beverages, nutraceuticals, bioactive components

1. Introduction
Nowadays liquids have come to be afamous intake international as dietary. consumption in view that they're an exquisite technique of conveying dietary elements and bioactive compounds in a herbal way (John Wiley and Sons *et al*; 2010) [37]. They have become a "cross and grab" product that has fuelled their call for withinside the phase of useful meals (Olejnik *et al*; 2005) [42]. Their recognition as an RTS product has been elevated amongst purchasers because of severa benefits consisting of handy form and size, smooth transportation and storage, and the opportunity to include positive vitamins and bioactive compounds which are polyphenols, flavonoids, carotenoids, and bioactive peptides (BPs) that are essential for the law of the human body. Functional liquids as described via way of means of European Commission are the ones non- alcoholic liquids which have a few useful results collectively with the fundamental dietary effect like improving the overall bodily situations or/and reducing the danger of the evolution of the disease. (Grumezescu Alina and Maria Holban, 2019).
The call for sparkling and herbal eco-sustainable merchandise with attractive sensory traits and the excessive dietary fee is exponentially developing withinside the beverage market. This has formed the priority for degradation withinside the best of useful liquids withinside the market. The lack of bioactive chemical substances all through processing (blanching and pasteurization), in addition to diverse nonthermal remedies along with a pulsed electric powered field (PEF), excessive- strain processing, UV radiation, and so on, is the maximum crucial determinant in beverage functioning. This paper will offer a complete review of useful drinks, consisting of their dietary fee and coaching methods.

1.1 Functional food and beverages
Functional liquids describe liquids as any liquid that are in shape for human intake and offer vitamins and freshness, in conjunction with attractive taste, and flavor. They might have or might not have a stimulating impact on us (Playne *et al*., 2003) [1]. In today's world, purchasers are greater awareness of their fitness and that they need to boom right fitness thru the inclusion of useful meals withinside the weight loss program in preference to spending cash on medicines (Mudgil, 2017). The useful liquids market, worth US$25bn in 2005, has certainly come to symbolize a crucial strategic and operational orientation for meals and beverage, biotechnology, and pharmaceutical companies (Datamonitor, 2006).

In order to differentiate between prescribed drugs and useful meals and liquids, it's miles crucial to focus that useful meals and beverages need to be meals or liquids and their useful results have to be acquired via way of means of ingesting ordinary quantities of meals or liquids inside the "ordinary" weight loss program (Lopez-Varela, S.; Gonzalez-Gross ,2002) [8]. There is debate over the character of useful meals and liquids, consisting of Whether capsules, Whether or now no longer capsules and powders have to be included, whether or not or now no longer a separate magnificence for those items has to be established, and boundaries at the sort of fitness claims that may be made. Despite those disagreements, consistent with Cong, Bremer, and Miranda, 2020, useful meals or beverages may be:

1. Any herbal meals or beverage
2. Any meals or beverage to which a thing has been introduced
3. Foods or beverage from which thing has been removed
4. Meals or beverages with one or greater additives changed
5. Food or beverage containing an energetic substance whose bioavailability has been altered
6. Any mixture of the aforementioned Some of the famous useful liquids commercially to be had are :

Table 1: Functional beverages and functions claimed

Functional beverages	Functions claimed	References
1. Probiotics	Digestion, blood pressure, brain function, Irritable bowel movements, prevents infection	Turkmen *et al*; 2019 [7] Nazhand *et al*; 2020 [40]
2. Energy drink	Increase in energy, hydration, improves aerobic endurance and anaerobic performance	Higgins *et al*; 2010
3. Herbal drinks	A large number of plants are known they have antibiotic properties, which is why they have been and are widely used in traditional medicine around the world for proper digestion, freshness even for revolutionary delaying aging	Zion Market Research, 2017
4. Mineral enriched beverages	More hydrating, High Ph value,claim to reduce acidity, increase alertness boosts metabolism	
5. Sports drinks	Improves rehydration, helps to fuel muscle, Increases endurance by 29%, decreases muscle damage by 83%	Leong lim *et al*; 2011

Depending on preferences Asian nations prefer dairy-based beverages, whereas the United States and Europe choose juices, and Mexico and South America prefer sports drinks and energy drinks. The types of functional beverages available worldwide are discussed below.

2. Types of functional beverages

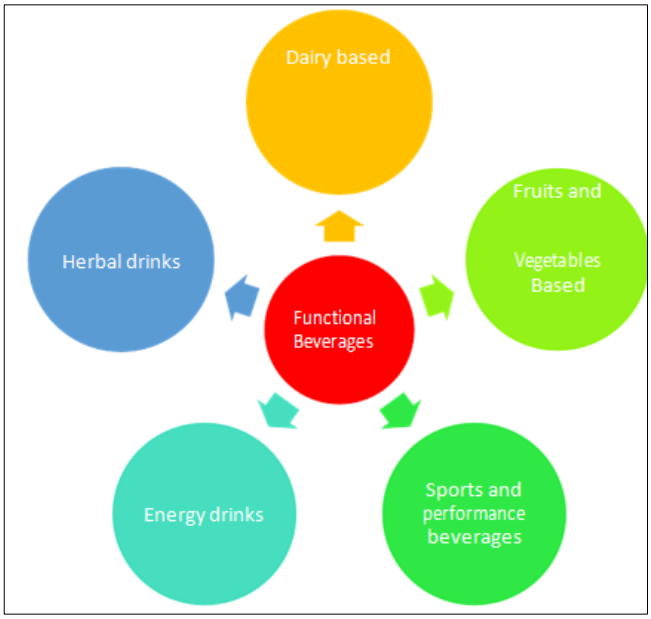

Fig 1: Classification of Functional beverages

2.1 Dairy-based functional beverages

For centuries, milk has been taken as a primary source of many critical nutrients (Erzen *et al*., 2014). Milk is a part of the daily diet in many countries and is even considered as a complete food since it provides a major portion of RDA of nutrients such as protein, fat, vitamins, and minerals. The main constituent of milk- based beverages is generally in form of liquid milk, milk powders, or by-products derived therefrom. The addition of several components to the basic milk components such as peptides, oligosaccharides, enzymes, vitamins, and minerals was found to increase the nutraceutical properties whey easily understandable (Onwulata & Tomasula, 2004) [4]. Functional dairy beverages based on probiotics, prebiotics, and synbiotics were the first to be launched and continue to dominate the market. The FAO/WHO defined probiotics as "live microorganisms that confer health benefits on the body when administered in inadequate quantities" in 2002. Commercial strains used for making probiotic drinkable yogurts/ fermented milk are of Lactobacillus spp. (i.e., Lb. acidophilus strain La-5, Lb. rhamnosus strain, Lb. casei strain Shirota, Lb. casei strain Danone, Lb. casei strain) and Bifidobacterium spp. (i.e. B. bifidum strain BB536, B. animalis subsp. lactis strain Bb-12 etc (Nazli Turkmen *et al*., 2019) [7] along with certain health benefits (Ozer and Kirmaci, 2010) [8].

Many dairy products are being used for making beverages and fermented beverages are a major sector of dairy-based functional beverages (Nazli Turkmen *et al*., 2019) [7].

Even traditional dairy beverages like Kefir and Koumiss are used as dairy-based functional beverages in many parts of the world to cure illnesses like tuberculosis, disorders of stomach and colon, and hepatitis (Özer and Kirmaci (2007) [8] and (Otles & Cagindi, 2003)) [9]. Kefir is popularly consumed in Central Asia, Eastern and Central Europe, and North America (Otles & Cagindi, 2003) [9]. Whey a by-product of cheese-making technology is being used for making functional beverages for a long time. Many whey products fermented or nonfermented beverages, whey-fruit or vegetable juice mixture, probiotic/ prebiotic/symbiotic whey beverages, enriched or supplemented whey beverages are eventually dominating the dairy-based beverage market because technological advancement has made the nutritional capacity and bio functionality of Yakult, the first commercially available probiotic milk beverage launched in 1935 was introduced to the global market by Dr. Minoru Shirota-a

Japanese microbiologist using Lactobacillus casei strain (www.yakult.co.uk).

2.2 Cereal-based functional beverages: Cereals have been used across the globe, especially in Asia, Africa, South America, and parts of Central America as a staple food since ancient times. Along with the major cereals consumed by humans namely rice, rye, maize barley, millets sorghum, and wheat, pseudocereals such as buckwheat, quinoa, and amaranth also contribute significantly to the diet by providing a surplus amount of macro and micronutrients, phytochemicals as well as antioxidants (Mckevith, 2004) [10]. There are many epidemiological shreds of evidence that consumption of whole-grain cereals protects the body against various types of chronic diseases such as diabetes, cardiovascular diseases, and cancers (Fardet, Rock, and Remesy 2008) [12]. Mridula and Sharma (2014) [13] made a non- dairy probiotic drink using sprouted cereals, legumes and soymilk by grinding the dried sprouted powder and fermenting the powder obtained using Lactobacillus acidophilus. Amaro *et al*. (2015) [14] studied the effect of different types of maize varieties on the nutritional quality of tejate; a traditional drink of Mexico prepared using maize and cocoa.

Cereal-based milk as non-dairy milk is becoming increasingly popular as a functional and specialty beverage across the world as, there has been an increasing trend for vegan diets. They can also be used as a substitute for cow's milk during a time when lactose intolerance, cow milk allergies, calorie concerns, and hypercholesterolemia are common. They are also cost-effective alternatives for cow's milk when it is unavailable or inadequate (Valencia-Flores, *et al*., 2013) [15]. Oat milk has become the most popular and marketed cereal milk in the world, with brands such as Oatly (Sweden), Pureharvest (Australia), and Vitasoy (China). Milling, mixing with water, enzymatic hydrolysis, filtering, and fortification are the most common preparation methods for producing oat milk; homogenization and thermal treatments are often employed to increase product stability and shelf life (Deswal, Deora, and Mishra 2014).

Limited research in corn milk creates a hurdle in the production of corn milk. As of now, corn milk has only been marketed in China. Yang and Zhang 2011 in their work have claimed that corn milk help in preventing cardiovascular diseases, obesity, and diabetes due to presence of rich bioactive components.

2.3 Fruits and vegetables-based functional beverages

Fruit and vegetable juice-based beverages are gaining popularity because they are a simple and practical method to consume fruits, which are rich in health-promoting chemicals (Rodriguez-Roque *et al*., 2015) [36]. As a result, there has been a lot of progress in the fruit and vegetable sector in terms of trying to come up with innovative and appealing goods. These products provide consumers with year-round access to fruits and vegetables, regardless of the season (Nowicka *et al*., 2016) [17]. Fruits and vegetables are high in antioxidants, in addition to their nutritional qualities. These bioactive substances improve blood lipid profiles, reduce oxidative stress, protect LDL cholesterol from atherogenic alteration and improve HDL concentration (Guthrie and Kurowska, 2001) [18]. A daily intake of 400g of fruit and vegetables (excluding potatoes and starchy tubers) was suggested by the WHO as early as 2003 for the prevention of chronic illnesses and micronutrient deficiencies (WHO, 2003) (Storey and Anderson, 2017).

Table 2: Fruits and their health benefits

Fruits	Health Benefits	References
Apple	antioxidants are present, chlorogenic acids protect against breast cancer and colon cancer, also prevent kidney stones	Manzano and Williamson, 2010
Avocado	Oleic acid, a healthy monounsaturated fat present, it balances cholesterol, protects against breast cancer. It is high in the pigment lutein (source of vitamin E), which reduces the development of prostate cancer.	Mezzomo and Ferreira 2016
Cranberry	A half cup of fresh cranberries includes 2 grammes of fibre (mainly insoluble) and 9 percent of the daily vitamin C recommendation. useful for urinary infections.	Harich *et al*., 2017 And Mathison *et al*., 2014
Kiwi fruit	Contains antioxidants and phytochemicals that protect the DNA. Helpful in regulating blood glucose levels and maintenance of heart and colon.	Wang *et al*., 2014 [26]
Orange	It is high in vitamin C, fibre, calcium, and vitamin D. Juices are proven to contain more β-cryptoxanthin than fresh oranges.	Aschoff *et al*., 2015a Aschoff *et al*., 2015b
Mango	It gives a naturally cool effect to the body. Vitamins A and C, as well a beta-carotene, have been shown to help prevent cancer and maintain skin health	Bunea *et al*., 2008

Natural Fruits and Vegetables are delicious, nutritious, and high in vitamins, minerals, and phytonutrients, or natural bioactive chemicals that interact well with dietary fibers and other components. In the modern world, the workaholic people find the process of making it consumable tedious hence mostly prefer readymade food. Fruits and vegetables-infused functional beverages would therefore be a witty and easy option for intake of nutrients. Some fruits and vegetables can be made into beverages individually. But mostly a blend of fruits and vegetables is superior in taste and provides a variety of nutrients in a single go.

A.A. Atallah 2015 [19], had tried to formulate a new functional beverage using fruit pulp and milk permeates. *Lactobacillus delbrueckii* subsp *bulgaricus* an exopolysaccharide (EPS) strain of *Streptococcus thermophil*us and a probiotic *Bifidobacterium longum* was fermented and used with mango and carrot pulp.

Atallah Mabrouk 2015 [19], formulated a functional beverage using LAB, papaya pulp, and sugarcane. He concluded that mixing fermented milk permeate with food pulp (1:1) with 5% sucrose can be prepared functional beverages.

2.4 Sports drinks

Sports drinks are flavored beverages that are specifically created to assist consumers or athletes in replenishing water, electrolytes, and energy after activity. Hydration, athletic performance, and the prevention or treatment of certain health disorders all benefit from functional sports beverages. Their

formulations can be tailored to boost energy, enhance mental concentration, and/or avoid bone and joint discomfort (Hoffman *et al*., 2017) [32]. Electrolytes such as sodium, potassium, chloride, calcium, phosphate, and magnesium, which are lost via perspiration during training and/or competition, are used to make sports beverages. B vitamins are utilized to promote metabolism and create energy, while amino acids are used to reduce weariness and improve muscular performance (Evans *et al*., 2017) [33].

2.5 Herbal drinks

Herbal teas, are commonly used functional herbal drinks that are in use since time immemorial and generally are prepared from the leaves, flowers, seeds, fruits, stems, and roots of plant species (other than the leaves of the conventional tea plant (clonorchis sinensis)) that are known to have, and have been utilized for their nutritional and medicinal advantages for thousands of years. (Aoshima *et al*., 2007; Chan *et al*., 2010; Deetae *et al*., 2012; Desideri *et al*., 2011; Dalar and Konczak, 2013; Zhao *et al*., 2013) [21-26]. Herbal teas and drinks are becoming a highly popular area in the functional food industry since they are a great way to get nutrients, prebiotics, probiotics, fibre, and bioactive components into your body (De Beer *et al*., 2012; Gironés-Vilaplana *et al*., 2012; Filannino *et al*., 2013) [27, 28].

Adedayo O. Ademiluyi *et al*.; 2012 [62], studied on properties of hibiscus, the goal of which was to see if aqueous extracts of two types (red and white) of Hibiscus sabdariffa (Roselle) calyces might block carbohydrate hydrolyzing enzymes (a-amylase and a- glucosidase), and if so, what mechanism could be responsible for their anti-diabetes activities.

Many papers have highlighted the potential of the banana flower as a medicinal herb since it is rich in phenolic compounds. In a paper, Sara Ramırez-Bolanos *et al*, 2021 [49] evaluated the potential of DBF (Dried banana flower) and found positive results. The banana blossom (Musa paradisiaca) has galactopoietic properties and can boost maternal milk production (WHO, 2020). It is also a traditional medicinal food for postpartum mothers in many Asian progesterone levels in the body, which helps to prevent bleeding hence is used during menstruation (Kalwar *et al*., 2021) [30].

Lutein, a carotenoid, is well-known for its ability to improve eye and skin health while also lowering the risk of age-related macular degeneration (AMD), cataracts, cancer, and cardiovascular disease. The pigments like lutein and zeaxanthin are present in the yellow spot of the human retina and have been proved to serve a variety of roles, including shielding the macula from blue light damage, enhancing visual acuity, and scavenging dangerous reactive oxygen species.

3. Papers have also cited the development of effective herbal beverages blending desired herbs

Khiewnavawonsga *et al*. 2018 [38] have developed a potential herbal blended beverage with dried mint and basil leaves , licorice root and fennel leaves. With a score ranging from 7.5 to 8.0, he decided that the herbal blended beverage with 40% dried mint, 10% dried basil, 30% dried licorice root, and 20% dried fennel seed was the most acceptable for all attributes: appearance, colour, odour, flavour, aftertaste, and overall. Similarly, Blanca D. Vázquez-Cabral *et al*., evaluated a beverage a herbal beverage composed of oak leaves and kombucha consortium (A popular beverage originally developed in Northeast China and has spread worldwide)

4. Development of functional beverages

Since different types of functional beverages can be prepared by using different functional ingredients, different methods are employed for their processing and preservation. Functional beverages introduced should be, based on customer demand, innovation potential, and the aforementioned health advantages. For designing the second generation of fortified functional drinks required bioactive component should be selected. Steps include:

1. The discovery and measurement of prospective bioactive compounds 2)Bioactive chemicals discovered must be standardized.
2. The selection of bioactive compound- producing starters
3. The use of natural bio preservatives to improve the functional beverage's image of
4. Naturalness.
5. The creation and validation of standard
6. Procedures for enhancing and ensuring the levels of specified phytochemicals and other physiologically active substances in raw and processed foods,
7. The creation of appropriate dose and delivery mechanisms,
8. The study of functional compounds' bioavailability and metabolism
9. The study of safety aspects related to functional beverage consumption,
10. The formulation of value-added products based on traditional dietary supplements.
11. 10) the investigation of regulatory difficulties,
12. The study of the effects of processing on functional compounds,
13. Product stability,
14. The functional ingredients' potential
15. Interactions with prescription and nonprescription drugs, as well as other classes of substances

5. Conservation processes

Processing procedures have been developed to bring a wide variety of safe and stable food products to the marketplace, including increasing the availability of perishable food commodities to populations with limited access, thanks to modern technological breakthroughs. As a result, contemporary food processing techniques have improved the accessibility of certain foods and expanded the availability of nonseasonal food goods all year. However, when it comes to processing items, maintaining nutritional quality is crucial (Tadapaneni *et al*., 2014) [43].

5.1 Thermal processes

Thermal procedures are the industry norm, and they entail exposing foods/beverages to high temperatures for brief periods of time in order to prevent pathogenic microbes, spoilage-causing yeasts, and molds from growing and ensuring food safety over extended shelf life. More individuals now have access to a wider range of safe foods and beverages thanks to the successful application of thermal processing. Thermal processing can inactivate harmful microbial intruders in meals and beverages, but it can also ruin the functioning and flavor of many foods and beverages. Heat-labile minerals including vitamins and bioactive phytochemicals can be dramatically destroyed by increased processing temperatures (Tadapaneni *et al*., 2014) [43].

Thermal processing can inactivate harmful microbial intruders in meals and beverages, but it can also ruin the functioning and flavor of many foods and beverages. Heat- labile substances like vitamins and bioactive phytochemicals can be severely destroyed by higher processing temperatures (Tadapaneni *et al*., 2014) [43]. When strawberries are processed into a puree, Aaby *et al*. (2007) [44] found that exposure to relatively higher temperatures (75–80°C) lowers the anthocyanin and total ascorbic acid concentration. Furthermore, heat processing might result in the production of unwanted new compounds that may have negative health consequences or leave the original molecules inert (Van Boekel *et al*., 2010) [45]. Thermally processed fruit juice concentrates, such as strawberry concentrate held at room temperature, can also be affected in terms of flavor and color.

5.2 Non thermal processes

To address these consumer needs, non- thermal food processing technologies have emerged as viable alternatives to traditional thermal processing procedures. Nonthermal technologies include high-pressure processing (HPP), light technologies (UV/pulsed UV), pulsed electric field
(PEF) treatment, and cold plasma. They are normally sprayed at (or below) room temperature and have a minor impact on food quality and freshness, as well as maintaining nutrients and other health- promoting components (Barba *et al*., 2012, 2013). The loss in total anthocyanins and hydrophilic antioxidant activity in strawberry beverages (nectar and juice) can be avoided, according to Klopotek *et al*. (2005) [46], if milder processing procedures are utilized instead of standard thermal processing.

5.3 High-pressure processing

The HHP is a modern processing technology that is gaining traction as a safe way to reduce quality losses during processing, such as the loss of polyphenols and other physiologically important plant components. Foods are subjected to high pressures using a hydraulic system in a pressure-sustainable cylinder, often in the range of 400–800MPa, with a shorter holding period and a lower temperature than heat treatment. These high pressures kill harmful germs without affecting flavor or nutrition, preserving the nutrients and freshness of fresh fruits and vegetables better than standard thermal treatments. Furthermore, HPP may improve the bioaccessibility of plant components, allowing the processed product to provide more benefit (Tadapaneni *et al*., 2014) [43]

6. Packaging system

Essentially, these technologies are intended to regulate the number of integrated constituents and deliver them to a specific location at a specific time. The main goal of protecting-delivery systems is to protect the active ingredient's core from harmful environmental elements (such as light, oxygen, or pH), contribute to controlled encapsulate liberation, determine the rates of the carried bioactive compounds, and, finally, determine how much the body can metabolize (the compounds' overall efficacy).
The techniques can be used to limit reactivity with the environment, reduce active ingredient degradation, allow for few changes in the characteristic for easier handling, mask unpleasant flavors or odors, dilute the active ingredient when only a small amount is needed, or create a barrier between sensitive bioactive materials (Champagne and Fustier, 2007) [47].

7. The global market of functional foods and beverages

Due to the absence of a globally defined definition of FF, research on global FF markets is problematic (Emine, 2015) [65]. The inclusion criteria for products in the research analysis have led in considerable variances in the worldwide market size of FF presented data. The worldwide market for functional foods and drinks was worth US$19.4 billion in 2007 and US$24.2 billion in 2011, according to definition (Emine, 2015) [65]. Euromonitor International projected the worldwide market for FF to be worth US$168 billion in 2010, which was 2.5 times greater than the market for vitamins and other dietary supplements (Roozbeh et al, 2003) [31]. The leading trend in FFs has been undeniably reported. Despite the lack of clarity in worldwide sales statistics, FFs have been firmly cited as the leading trend in the food sector. From 2009 to 2013, the global market value of FFs climbed by 26.7 percent (Research, 2014). The worldwide market value is expected to hit $305.4 billion by 2020, with an annual growth rate of 8.5 percent (Bigliardi & Galati, 2013). Globally, the leading FF markets are the United States and Japan, followed by European markets (Arc, 2014). With a
$43.9 billion sale in 2012, the United States led the FF market (an increase of 6.9 percent from 2011). By 2020, the worldwide compound annual growth rate (CAGR) for the FF market in the United States is estimated to be 8.7% (Bagchi & Nair, 2016) [39].
Europe contributes for 20.2 percent of the global market value of FFs, with France, the United Kingdom (U.K.), and Germany as important contributors (Bagchi & Nair, 2016) [39]. The Chinese FF market was valued at $24.6 billion in 2012, and it is likely to continue to rise (Bagchi & Nair, 2016) [39]. The Brazilian FF market was valued at US$ 8.7 billion in 2014, and it is expected to grow by 12% by 2019 (Bagchi & Nair, 2016) [39]. The functional beverage market, valued at $25 billion in 2005 (Marete, Jacquier, & O'Riordan, 2011), is the fastest-growing sector of the global food market, and the functional beverage market is the fastest- growing component within the FF sector. Functional drinks accounted for around 59 percent of the overall FF market in the United States in 2012. (Sloan & Adams Hutt, 2012). The fastest-growing FF market is functional beverages, with a CAGR of 9%. Functional drinks are predicted to account for 40% of overall consumer demand by 2025. (Bagchi & Nair, 2016) [39]. Functional beverage market trends are diverse, developing and evolving at varying rates across and within nations, which is thought to be attributable to sociocultural and sociodemographic variances in consumer adoption of FF products. For example, the United States has had rapid development in probiotic dairy beverages in recent years, although the industry is still undeveloped in terms of value and volume when compared to the United Kingdom, Germany, France, and Spain. In Japan and the United States, on the other hand, the focus has been on energy and fortified beverages.

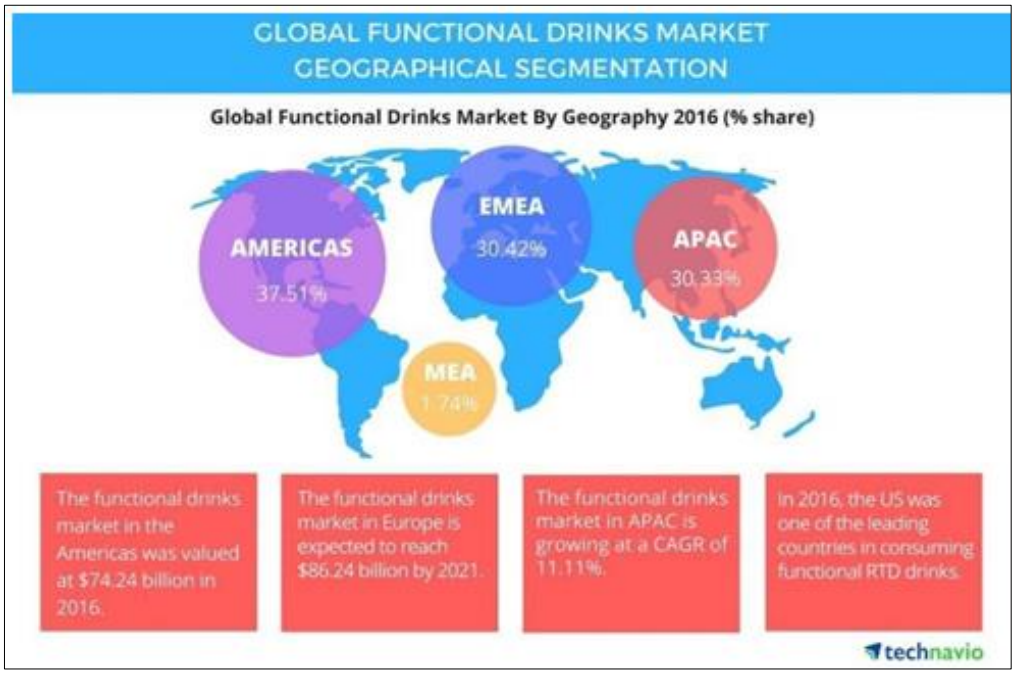

Fig 2: Apt via Global functional drink market geographical segmentation from 2017-2021 published by Technavio (Graphic business wire)

8. Insight into market dynamics and new product development trends

Consumer needs in the sector of food production have shifted dramatically. Consumers increasingly assume that food has a direct impact on their health (Mollet & Rowland, 2002) [66]. Foods are now designed to not only fulfil human appetite and offer essential nutrients, but also to prevent nutrition-related illnesses and promote physical and mental well-being.

Five general trends have influenced food and beverage innovations since 1985: convenience, pleasure, ethnic fusion, tradition, and importantly, health and wellness which strongly influence beverage market (Basu 2007; Longo, 2007; Foote, 2002) [69]. The continued decline in traditional carbonated soft drink sales in the maturing EU and US markets has been offset by consumers increasingly seeking beverage alternatives perceived as natural or healthy, such as flavored and near-water drinks, premium chilled juices, and non-carbonated fruit juice drinks, ready-to-drink ice tea, soy drinks, and functional beverages (Reynolds, 2010; Miglietta et al. 2017) [68].

The functional beverages market, valued at US$25bn in 2005, has indeed come to represent an important strategic and operational orientation for food and beverage, biotechnology and pharmaceutical companies (Datamonitor, 2006a). Overall, the market dynamics and NPD activities across functional beverage categories, such as sports and energy drinks, probiotic and nutraceutical beverages, are either influenced or driven by five key factor groupings: increased concentration in the global beverages market; diverging functional beverage trends worldwide; flavor innovations; product differentiation; and cross-category innovations.

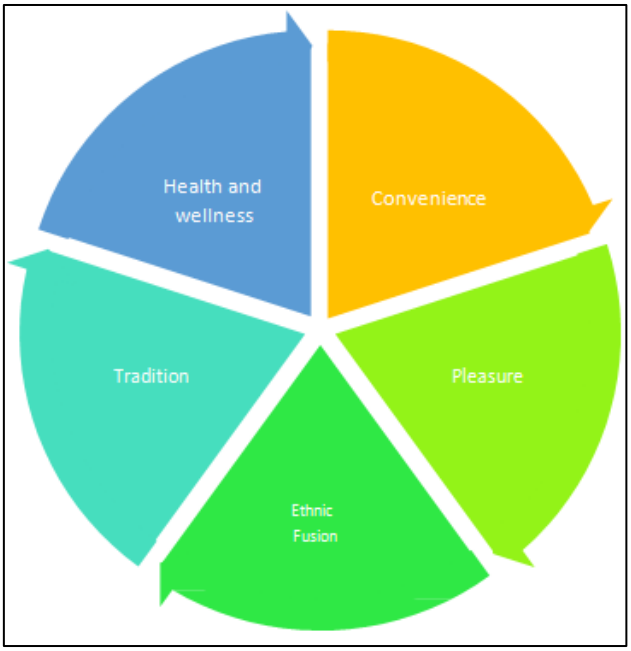

Fig 2: Trends that have influenced beverage innovation since 1985

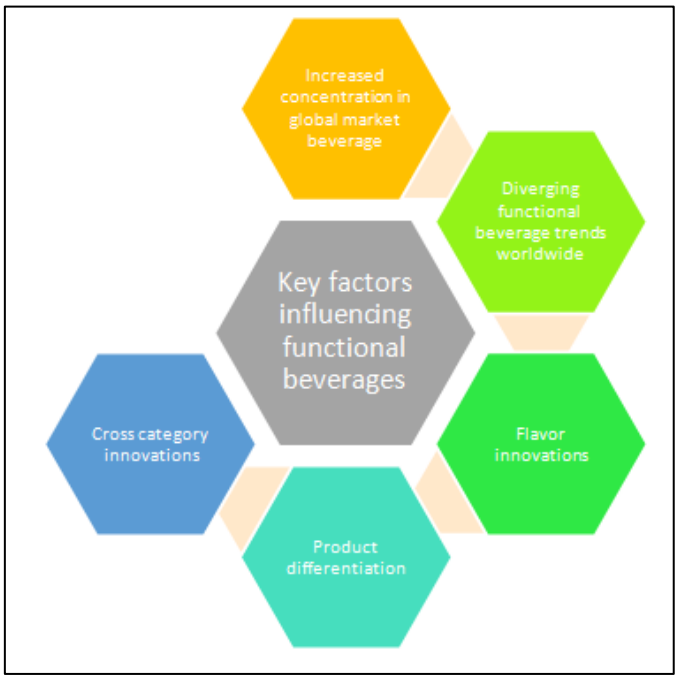

Fig 3: 5 key factors influencing functional beverages in this generation

9. Conclusion

In recent years, the food and health paradigm has shifted dramatically. The desire for people to live longer and better lives has been a key motivating reason behind this shift. The attempts to make functional foods intensified when we realized that foods and food additives may have a more favorable influence on our health than we think. Commercially available functional beverages are prepared in a unique way to address people according to their health requirements. Due to the inclusion of diverse bioactive components, such as phenols, flavonoids, carotenoids, peptides, vitamins, and minerals, functional drinks have a variety of health consequences when consumed. Because these components have low bioavailability and are poorly absorbed by the body, a convenient way of consumption is ensured for their proper absorbance. In terms of bioactive component absorbance, it may be improved by establishing processing processes that allow for maximal retention. Another issue that might degrade the usefulness of functional drinks is the loss of these chemicals during processing. These have been shown to be susceptible to thermal processing and to be deteriorated or be destroyed throughout the procedure. Keeping these considerations in mind, it is necessary to adopt beverage processing technologies that focus on minimizing the loss of these components so that consumers may get the most out of functional beverages. Nonthermal treatments such as pulsed electric field, ultrasonication, and ozone treatment, which have been proven for microbiological safety as well as beverage shelf stability, might be a preferable answer to these problems.

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