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Nutraceutical Prospective Performance of Functional Beverages in Current Scenario- As a Vector for Well Being: A Review

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ABSTRACT

The current era manifest mounting appreciation of the salient function of foods and beverages in disease anticipation and management. The consequence, invention and infliction of functional foods and beverages have secured a large amount of significance as they endow with healthiness ahead of the fundamental nutritional role for the well-being. At this time, beverages are far and wide the greatest dynamic functional food group for the reason that of expediency and opportunity to congregate consumer demands for effortlessness in the distribution and shelf life stability. Furthermore, they are an outstanding furnishing medium for nutritive and bioactive compounds counting plant extracts, omega-3 fatty acids, fiber, minerals, vitamins, prebiotics, antioxidants and probiotics. Nevertheless, the distinct concerns have been elevated to a higher position over their security where functional beverages characterize a significant prospect domestically and internationally. Progress of superior delineates and scientifically verified goods will facilitate to boost customer assurance in functional food categories. This present review delineates on the scientific proceedings towards the rising zone of commercialized functional drinks/beverages making a focus on prospective well-being associated to its utilization.

Key words: Beverages, Bioactive compounds, Functional, Plant extracts, Prebiotic, Probiotic.

I would like to draw attention towards the health benefits of commercial functional beverages developed from natural resources and their scope in benefiting the well being of the consumer with their expanding demand and its status In research.

Preface

Nutraceutical, a crossbreed denomination of two terms “Pharmaceutical” and “Nutrition” which is a food product that dispenses physical and therapeutic boon, counting deterrence and healing of unhealthiness. The contemporary developments in integral level of nutraceuticals are increasing along with medical practitioners and scientists/ researchers for assessing and assimilating information through experimental researches (Garg and Ahuja, 2015). Also, the flow of functional foods right through the marketplace has a vague the feature linking nutrition and pharma. Functional foods or nutraceuticals are the primary therapy regime for therapeutic and supervision of diverse lifestyle diseases such as heart diseases, obesity, diabetes, stroke and many other are acquiring indispensable situation in mounting health market of India as well in world by playing an important part in the 21st therapeutic scenario. Elements that hold up expansion of nutraceuticals in India are due to wide-ranging non communicable diseases as government is providing financial support in vitamin fortification (Gupta *et al*., 2010). Indian nutraceutical market of functional food and beverages has been on the increase at a CAGR of 18% for the last three years. In USD 1 billion marketplace contribute to 14% of functional beverages (Majaz *et al*., 2012). The nutraceuticals industry is a vivacious and budding industry that propounds remarkable occasion to join together scientific invention with budding consumer apprehension in health-amplifying food products. Nutraceuticals prolong have vast demand as they are expedient to contemporary standard of living. Furthermost confrontation is motionless in the public policy as well as authoritarian areas that influence research progression of goods that promotes public welfare and assurance (Ratnaparkhi *et al*., 2015).

Beverages are well thought-out to be an outstanding intermediate for the supplementation of nutraceutical components for fortification such herbal extract and soluble fiber. It is always added expedient to consume a beverage possessing health benefits rather than ingesting vitamins or pills for the same health perquisite. Functional beverages instigate primarily from fruits, herbs and vegetable sources; also incorporate those from plant source like tea, coffee, soybean, cocoa as well as animal products like milk and dairy-based and alcoholic drinks where, commercially accessible beverages are classified as: prebiotics/probiotics supplemented beverages, herbs infused fruits/vegetable beverages, sports and energy drinks (Corbo *et al*., 2014). The making of functional food product involves numerous

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explicit stages right from perception to flourishing market accomplishment by consumer approval and market archetype, which requires assessment for efficacy and safety in the course of animal and human testing. Thus, resultant in enhanced market diffusion of functional food entities, this in itself stimulates initiatives for conception of innovative products in the identical succession (Smith and Charter, 2010). In the present review, there is adequate data of current knowledge and comprehensive depiction of the contemporary achievements of nutraceutical/functional beverages with scientific advances and demand in the Indian market.

Evolution of wellness food

The evolution of food products as shown in Fig 1 are recognized from natural food products which were on the breadline from man-made products, additives, chemicals, or having instinctive health benefits. Presently, food products having inferior intensity of pernicious ingredients like condensed fats and sugars were marketed followed by fortified food products providing a distinct health benefit having nutritional and medicinal properties which are now called "Functional Food Products"(Suhag and Singh, 2017). The practice of fortifying table salt with iodine to avert goiter was a premature challenge at creating a functional food, since that instance several foods that we are proverbial with have turn out to be fortified, such as juices, breakfast cereals and milk and grain food. Functional food has been preferred for the reason that of their traits designed by nature to endorse health and put off disease ahead of their fundamental nutrient content (Kumar and Pal, 2015).

Nutraceutical concepts and other terminologies

Formerly, the pharmaceutical expansion concentrated on clinical tests outcome and animal studies for the assessment of its effects, except in the case of nutrition there were no such techniques for substantiation of foods in averting diseases. In latest time the food configuration has been scientifically proven to cause lifestyle associated diseases and has turn into a social concern (Majaz *et al*., 2012). There are extensive variety of terminologies which obscure the consumer in provisions of products that are proposed to avert diseases, terms like: "Functional foods", "Nutraceuticals", "Designer foods", "Dietary supplements", "Pharma foods", "Medical foods", "Phytochemicals" and so on. All these take part in a imperative role in overall wellbeing of a human being. The distinction between functional and nutraceuticals segregate the two concepts among food and medicine as shown in Fig 2. Developed functional end products dispense with requisite bundle of minerals, vitamins, proteins, carbohydrates and fats which are required for its healthy continued existence, these products are premeditated to permit consumers to consume enriched food in their natural state or close to it, to a certain extent by having dietary supplements. While, Nutraceuticals has represented as a conventional food not only to supplement the diet but also relieve in the anticipation of non-communicable diseases. "Medical foods" are a definite kind of curative agents which are projected for the nutritional management of a particular disease. Contemporary medical foods are designed to supervise pancreatic exocrine insufficiency, hyperhomocysteinemia, cancer cachexia, inflammatory conditions and furthermore health tribulations (Rajasekaran *et al*., 2008). "Pharmaceuticals" possibly will be considered as drugs used primarily to cure diseases, while "Nutraceuticals" are those that are anticipated to prevent diseases. "Dietary supplements" are products which carries "Dietary ingredient" proposed to supplement the diet which comprise herbs, metabolites, botanicals, minerals, amino acids, vitamins, enzymes and organ tissues. They may perhaps be found in abundant forms like soft gels, capsules, gel caps, tablets, liquids and powders which enclose antioxidants, dietary fiber, prebiotics and probiotics, omega 3 fatty acids *etc.* (Sharma and Singh, 2010). The existing awareness of advantageous effects of nutraceuticals shows the fastest emergent area of the present food commerce. The current accumulated information as regards nutraceuticals represents indisputably an immense challenge for food chemists, nutritionists, food technologists

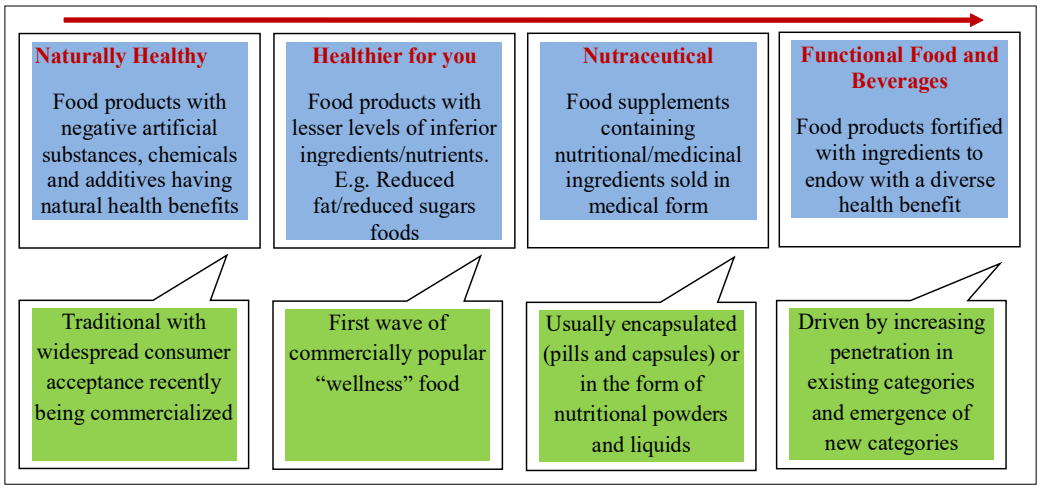
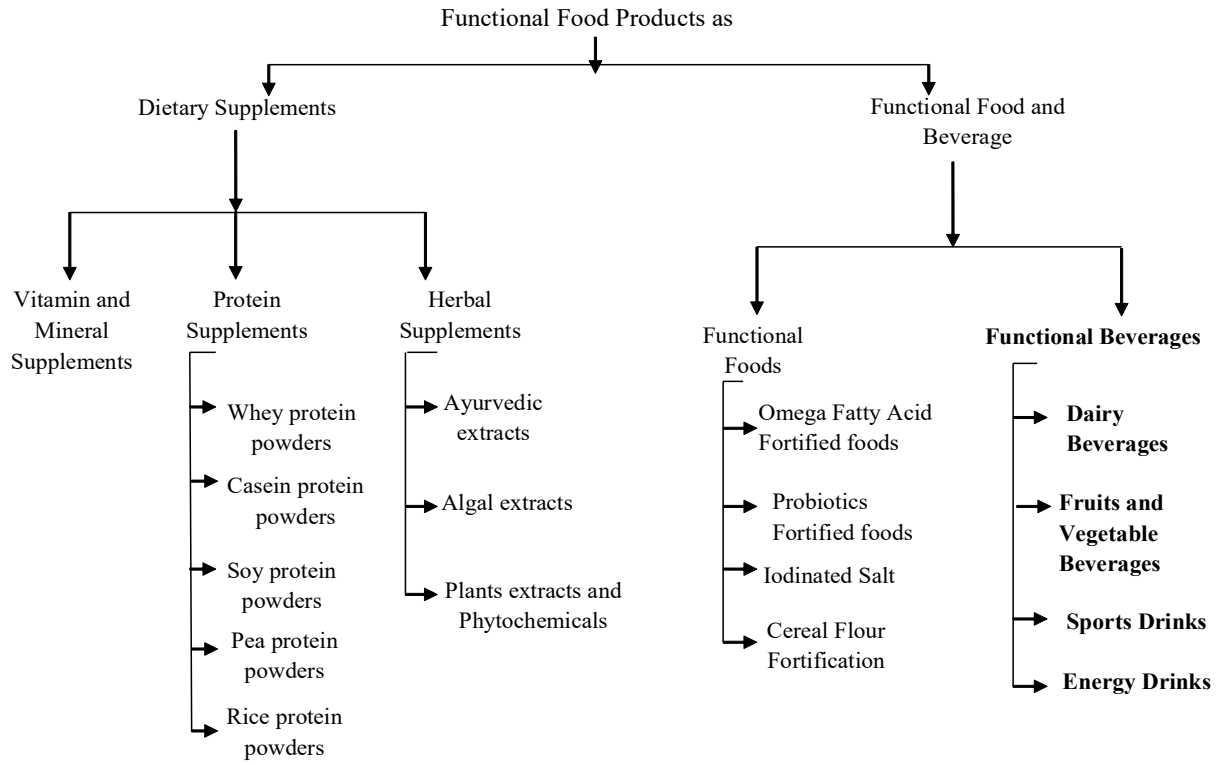


Fig 1: Evolution of functional food.

and physicians. It is predicted that the nutraceuticals industries and dictatorial agencies will work jointly to put off the critical cost of new drug expansion from fetching exorbitant. Public health system reflects on deterrence and healing with nutraceuticals as a prevailing mechanism in maintaining wellbeing and to perform adjacent to nutritionally prevailing diseases whether it is acute or chronic, in that way promoting the well-being, permanence and eminence. Nutraceuticals have expected extensive awareness in potential nutritional and therapeutic possessions along with their reputed safety (Srivastava and Maurya, 2019).

Market interest of functional food products

Marketplace significance specifies golden opportunities for commerce, uphold of communal health demands and acquaintance of dietary intake to notify curriculum and regulatory action. Customers are becoming smarter and captivated in knowing the ingredients and the procedure of developed food products. The functional beverage business is evident by rigorous competition and dilapidated demand for carbonated beverages. Major beverage firms in the business are behind positions because of the substitute option replacing "unhealthy beverages with healthy alternatives" which is potency of such agencies manufactured goods branding and marketing approaches (Nicole Fry, 2015). Research studies reveal changing in the position from carbonated beverages to healthy beverages and each solitary time this gap is expanding. The disparity among the traditional informed consumer and smart consumer is to facilitate the informed consumer who reads the nutritional value of the product and other contents for their knowledge and the smart purchaser learns all complications of incorporated constituents with its functions and usage of the market product (Buono, 2017). The raise of the promotion of functional beverages has connected to a stable increase in the initiation of its products (Sorenson and Bogue, 2009). Due to short of a globally acknowledged characterization of functional category, this makes extremely complex to gain knowledge about the universal functional product market. As a result, loads of researches related to worldwide trade of functional food products vary in statistics and the benchmark utilized for insertion of goods in the scrutiny. Regardless of the need of precision with reference to the statistical knowledge of worldwide trade of functional beverages have incontestably showed the trending segment in food commerce (Ozen, 2012). The promotion of functional beverages is the rapid-growing division, with a predictable yearly growth of 10% in comparison to food business for about 2% to 3% (Valls *et al*., 2013). The value of highest emergent segment of functional beverage market is $25 billion (Marete *et al*., 2011). Also, 14% of a yearly expansion in United States (Kranz *et al*., 2010). Out of whole functional food market functional beverage vending in United States presents around 59% (Sloan, 2012). The whole development of beverage commerce prolongs to increase although market is noticing deviations in the food subcategory of soft



Source: Corbo *et al.,* 2014 and Chanda *et al.,* 2019.

Fig 2: Functional food products as nutraceuticals.

beverages in comparison to functional beverages (Suhag and Singh, 2017). The comprehensive market for functional beverages was valued USD $43.27 billion approximately and continues to increase in size which create definite functional health profess (Surrey, 2014). It is anticipated to grow up by 25% in 2017 as shown in Fig 3, compared to the most recent available statistics (Bonar, 2014). These functional beverages are formed by adding up suitable quantity of substances may endow with benefits in physical condition ahead of those furnished by conventional essential nutrients. The universal functional beverage transaction are estimated to peak $130 billion by worldwide, the inclination concerning functional beverages are further assorted than standardized, budding at diverse rates both surrounded by and crossways country, due to sociocultural and sociodemographic distinction in purchaser perceptions and recognition of functional food products (Sloan, 2012).

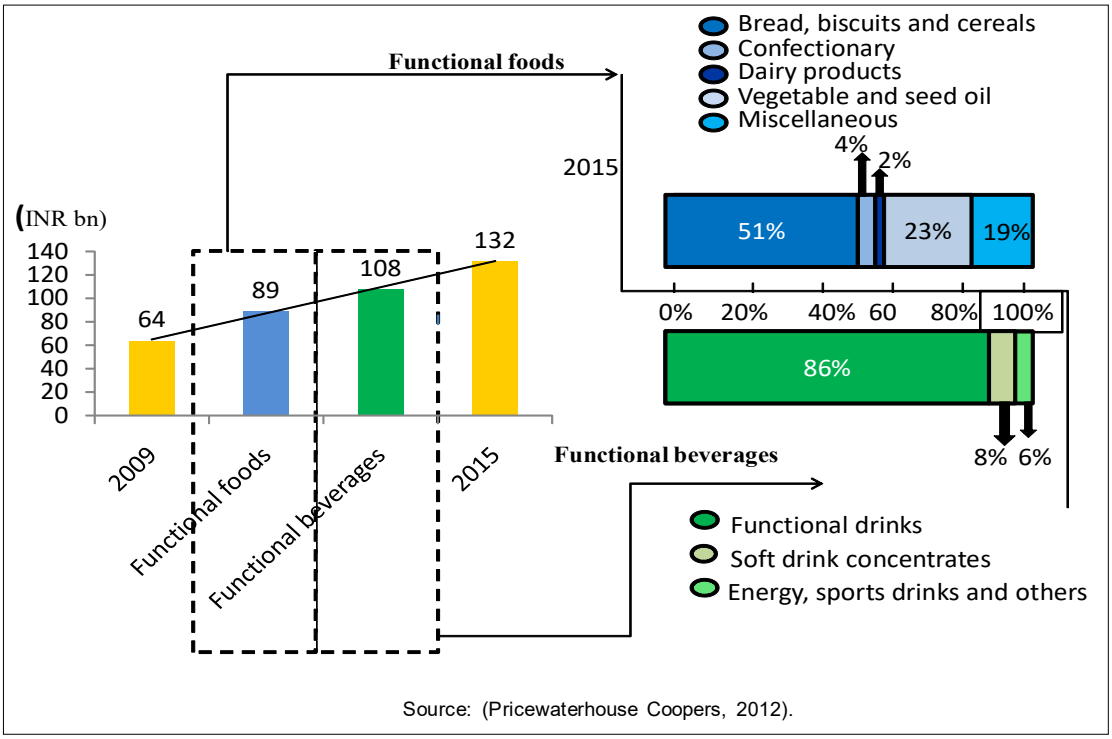
Commercial functional beverages in market

Dairy beverages

Yogurt drinks, fresh and fermented milk are the mainly widespread products among dairy based beverages and are well thought-out tremendous source for probiotics (Gurakan *et al*., 2010) (Table 1). The possessions of dairy beverages are associated to health like healing of viral fever and diarrhea due to intake of antibiotics, lactose-intolerance indications, atopic dermatitis symptoms in children, degradation of symptoms occurred due to Helicobacter pylori bacteria and preventing the risk of allergy in infancy, enhancing the immune reaction and changes in the symptoms of irritable bowel syndrome (Saarela, 2009). The most universally integrated probiotics bacteria comprise *L. rhamnosus*, *L. acidophilus* and *Lactobacillus casei* amongst lactobacilli and *Bifidobacterium bifidum* among bifido bacteria, other commercially available products are Yakult® (Yakult Honsha Co, Japan) with *L. casei Shirota*, Actimel® (Danone, France) with *L. casei Immunitas* and Chamytor® (Nestle, France) with *L. johnsonii* and *L. helveticus*. Food rich in proteins, mainly caseins rich milk and the biologically active peptides may possibly perform like a pioneer with dissimilar physiological effects (Bradford and Awad, 2010). To emerging verification, the phytosterols have shown prospective in eradicating breasts, ovaries, abdomen, lung and intestine cancers (Woyengo *et al*., 2009). Plant stanols efficiently diminish sterols absorption from the digestive tract, also lessening serum cholesterol levels when supplemented to beverage (Grattan, 2013). Besides nutraceuticals, vitamins, calcium, magnesium and iron are too incorporated to beverages which comprises dairy as a key ingredient to reimburse for vitamin and mineral losses for the duration of processing and because of their fundamental function in human beings (Ozer and Kirmaci, 2010).

Vegetable and fruit blend beverages

The extensively considered mere food “milk” possesses diverse indispensable substances for the absolute and complete human nutrition. Studies performed by research scientists lately focused on various constituents like saturated fatty acids, proteins, calcium, vitamin D, butyrate and contaminants like pesticides, estrogen and insulin-like



Source: (Pricewaterhouse Coopers, 2012).

Fig 3: The indian market for functional foods and beverages has doubled during last 6 years.

growth factors that are accountable between dairy products and cancers and a detrimental involvement (Davoodi *et al*., 2013). Furthermore, functional dairy products correlation among lactose intolerance and cholesterol content are foremost disadvantage (Prado *et al*., 2008). Newer products in the market with probiotics strains based drinks have been introduced, predominantly beverages with a blend of fruits and vegetables (Soccol *et al*., 2012). The ultimate medium for probiotic drinks are fruit based beverages as they contain essential nutrients along with hydration (Granato *et al*., 2010). Some fruits used in saleable provision comprise grapes, apple, cranberry, peach, blueberry, pomegranate, mango, cherries, blackcurrant, plums, kiwi *etc.* (Sun-Waterhouse, 2011). Also, sapodilla, watermelon and orange juices underwent experimentation and were reported as an appropriate transporter of lactobacilli for lactose intolerant consumers and to set up a health beverage for those who are allergic to milk and milk products (Gaanappriya *et al*., 2013). Few commercially accessible products are Rela®, Gefilus®, Bioprofit® and Biola®, beverage made of 95% fruit with no sweetner (Prado *et al*., 2008). For lactic acid bacteria cultures, aromatic herbs are utilized as an appropriate medium like a vegetable blended beverage Vita Biosa®, which is a blend of aromatic herbs and additional plants fermented by a combination of Lactic acid bacteria cultures (Soccol *et al*., 2012). Various commercially available fruit and vegetable based juices are Bolthouse Farms®, Tropicana®, Minute Maid®, Daily greens®, Welch's®, Langers®, Oasis Health Break® *etc*. all these are enriched with nutrients and minerals like calcium, vitamin D, vitamin A, vitamin C, manganese, iron, zinc and also omega-3 (Soccol *et al*., 2012).

Sports drinks

Sports drinks are intended for exercise and sports purpose to supply carbohydrates, avoid dehydration, provide electrolytes so as to maintain body salts and fluids like; calcium, potassium, sodium, magnesium, vitamins or other nutrients and caffeine free (Heckman *et al*., 2010; Larson *et al*., 2014) (Table 1). Sports drinks can undeniably most favorable tool that boasts advantage to water (Higgins *et al*., 2010). According to Khodaee, 2013, intervention on cyclists with normal plasma sodium levels was performed by providing sodium rich sports beverage for the period of a 3 hour ride in humid temperatures and had fewer urine productions compared to cyclists who drank only water. A variety of beverages specifically for sports has a blend of glucose, sucrose, fructose and maltodextrin polymers which depends upon the information that they contain less sugar that allows a sugarless carbohydrate concentration (Campbell, 2013). Though, the regular intake of sports drink which contains abundance of carbohydrate content enhances on the whole high calorie diet without mentioning notable supplementary nutritional amount (Schneider and Benjamin, 2011). Few exemplars of beverages available in the market with prominent taglines are Gatorade® "Mission Control" which was launched in 2009, represents an unusual extensive effort by a company to track social media, Powerade® "The Sports Drink for Young Athlete" developed a reduced calorie smaller sized variety for younger children and Accelerade® "A Protein Rich Sports Drink 37% More Effective than Water" (Schneider and Benjamin, 2011).

Energy drinks

Energy drinks is gaining tremendous popularity in the market amongst youngsters and individuals indulged in physical fitness (Dikici *et al*., 2014) (Table 1). Scientific studies recommend that most of the teenagers and young adults recurrently consume energy drinks while athletes consume such drinks to improve their workout level and improve their endurance (Duncan and Hankey, 2013). With such promotion, it was reported that the market range in the United states for energy drinks was virtually 12.5 billion dollars in 2012 and it is predictable to reach about 21.5 billion in 2017 (Sabban, 2016). Functional beverages are commercially labeled as energy drinks which refer to its main aim of improving sports performance, enhancing concentration in the field, offering sustenance and proving power to increase endurance (Gunja and Brown, 2012). Despite of numerous varieties of energy drinks in the market, several products allocate comparable compositions (Heckman *et al*., 2010). To form an energy blend the most ordinary component is caffeine which is frequently blended with glucuronolactone, taurine, guarana and B vitamins (Higgins *et al*., 2010). Few exemplars of communally accessible energy drinks are Full Throttle®, Red Bull® and Monster Energy®. In recent times, some chief components caffeine, guarana and ginseng severe concerns have come up specifically, caffeine shows enormous evidences regarding increase in aerobic reaction time by enhancing physical performance in adults, dilatoriness of fatigue and increasing endurance and enhancing strength. Nevertheless, effects have never observed in children and adolescents with such possessions which are exceedingly inconsistent and dependent on dosages (Schneider and Benjamin, 2011). However, guarana is a medicinal plant which holds notable quantity of caffeine (Heckman *et al*., 2010). Herb Ginseng which is utilized over decades mostly in Asia, as a medicine for diverse ailments and for the promotion of longevity, counting improved physical fitness, immune system stimulation, mental conditions, antioxidant, antidepressant, antiaging and anti-inflammatory features (Gunja and Brown, 2012).

The leading edge of functional beverages in research and its future growth

Functional beverages are fetching progressively more imperative to the ageing cohort as they inquire about food sources that possibly will advantage their healthiness in long period and avert the commencement of non-communicable ailments (Betoret *et al*., 2011). Researchers are meticulously running and aiming to acquire the remuneration from the raw resources, inventive techniques in the area of food biochemistry and technology and nutritional sciences as well as nutritional genomics are on condition that customers in

Table 1: Functional beverages-selected publications.

Products	Active compounds	References
Dairy beverages		
Functional beverage from soymilk, kefir, cow milk and sucrose	*Lactobacillus subspecie bulgaricus* and *Streptpcoccus thermophiles*	Silva *et al.,* 2018
Carbonated symbiotic milk-based beverage	Probiotics: *L.acidophilus* and Bifidobacterium Spp. Prebiotics:inulin	Walsh *et al.,* 2014
Fermented yogurt-like beverage	B-Glucans (oat flakes), Lactic acid bacteria: *L.Plantarum* PLO9	Nionelli *et al.,* 2014
Phenolic fortified fermented milk beverage	γ-amino butyric acid (*L. plantarum* C48); LAB: *L. paracasei* 15N Polyphenols (olive vegetable water)	Servili *et al.,* 2011
Fruits and vegetables beverages		
Red-fleshed Japanese plums *(Prunus salicina* Lindl.) functional beverage	Polyphenols, hydroxycinnamic acids, anthocyanins and flavonols	Naomi Steyn, 2011
Vegetable health-stimulating beverage	Phenolics, minerals, nitrogen-sulfur compounds and vitamins (Broccoli, *Brassica oleracea* L.) favonols and flavanols (green tea extract)	Dominguez-Perles *et al.,* 2011
Blended drink vitamins, Fibers and minerals	(cucumber, muskmelon, *Cucumis sativus* and *Cucumis melo*)	Kausar *et al.,* 2012
Blends of *Hibiscus sabdariffa* and mixed fruit juice	Hibiscus, pineapple, orange juices and carrot Antioxidants, total phenols, carotenoid and Vitamin C	Ogundele *et al.,* 2016
Sports drinks		
Gatorade®	Sodium and potassium	PepsiCo Inc., U.S.A
Powerade®	Iron and sodium	PepsiCo Inc., U.S.A
Accelerade®		PacificHealth Laboratories Inc., U.S.A
All sport body quencher®	Sodium, potassium and vitamin C	All Sport. Inc., U.S.A
Energy drinks		
Red Bull®	Caffeine, B-vitamins, Sodium, taurine, inositol and glucuronolactone	Red Bull GmbH, Austria
Java monster®	Sodium, caffeine, calcium, B-vitamins, potassium, vitamins A, C and D, taurine, guarana, inositol, ginseng, L-carnitine, glucuronolactone and phosphorus	Hansen Natural Corp., U.S.A
Full Throttle®	Sodium, caffeine and B-vitamins	Coca-Cola Co., U.S.A
Power Trip Original Blue®	Sodium, B-vitamins, caffeine, vitamin C, taurine, guarana, inositol and glucuronolactone	Power Trip Beverages Inc., U.S.A

the entrance to bright and frequently supplemented construct with identifiable health benefits. Consequently, it dispenses innovative alternatives for utilize of functional category (Sutar *et al*., 2010). In an endeavor to categorize novel constituents and its possessions, withdrawal from natural constituents and employ of corollary products boost the significance of definitive invention. Currently, numerous functional beverages are approaching in the marketplace by means of essential oils, essence and nectars alongside fibers and nutrients rich herbs, fruits and vegetables (Corbo, 2014). Studies are evidence for development of innovative biotechnological resources lactic acid bacteria and Xylanolytic enzymes to discover the properties of developed beverages from fermented cereals. As a result fermented non-alcoholic beverages are more acceptable by lactic acid bacteria in comparison to yeast fermented beverages because of its original as well as further advantageous invention (De Beer, 2012). Additional, the antimicrobial effect of cereal based non-alcoholic beverages including lactic acid bacteria for the construction in latest years has augmented the prospective to increase the security and present novel chances for functional beverages (Basinskiene *et al*., 2016). An immense arrangement of recent research is focusing attention on traditional herbal extracts that are associated with health augmentation and anticipation of diverse chronic diseases. The volatile stipulate growth for bioactive

ingredients for nutraceuticals and functional food category is being determined by recurrently cited health concerns such as: CNS disorders, Cancers, Immuno modulations, CVD, *etc*. (Prabhu *et al*., 2012). A lot of researchers reported that functional food category characterize solitary most remarkable field of research advancement in the food category as recommended by the mounting figure of scientific evidences related to this subject since last and few years (Bigliardi and Galati, 2013).

Functional beverages for rationale use

Apart from pervasive poverty, increase in high rates of underfeeding and non-communicable diseases in developing countries, the highest growing functional food and beverage category endow with new economic opportunity for progress in countries in public health sector as well as initiating progress in income and employment in the evolution of functional beverages and their supply chains. Functional beverages put on the market at elevated prices and enclose larger profit precincts than conventional beverages, which make the functional food and beverage segment attractive for the competitors and manufacturers in the market. The broadening area of functional food and beverage category not only constitute momentous well-being to the health but also propose opportunities for manufacturing and processing establishments. The growing demand for functional products provides key thrust to the manufacturers for constructing higher margin products and search for added-value. Functional beverages diversification can participate as a chief function in financially viable expansion for several developing countries that are capable of supporting traditional familiarity of the health possessions of certain aboriginal plant variety and attaining wealthy biodiversity. Besides the favorable diversified and high-value production, functional beverage industry could be profitable to primary producers, farmers and rural communities due to its agricultural produce for the functional category. Impoverished section of population can take an advantage from growing functional beverage markets through domestication of traditional plants and herbs which could enhance associations to the private sector, case in point, along contract farming; service or production opportunities from processing functional beverages. Regardless of the affluent resource of raw supplies for functional beverages because of their immense biodiversity and rate advantages in crop production, market for functional beverages in India has a range of curtailments. The value of introducing advanced invention to the marketplace can be momentous, particularly the upfront costs linked with high-value product, consumer and market research, food processing documentation, public relations and exporting along with conferencing regulatory demands. The expansion and promotion of functional beverages necessitate significant scientific evidence for claims as a functional food product. This take into account discover functional consolidations, assessing their physiological effect, bioavailability in humans, potential changes for the duration of processing, food research and clinical trials so one may attain authorization for health-amplifying merchandise claims and product effectiveness. This research stand in need of financing, time and skilled labor, mainly for products designed for export markets. A comprehensible dogmatic organization for construction, documentation, transaction and promotion of functional beverages, collectively with regular enforcement are significant determinant in building consumer conviction in functional food and beverages.

CONCLUSION

Substantially the population is changing its center of attention from medical science to a optimistic natural approach for preclusion of non-communicable diseases for their perfect well-being. In order to put a stop to diseases and bring up a healthy lifestyle innovative foodstuffs which have been confirmed by the human trials to be effectual to avert numerous ailments, should progressively break through globally. India is presently an emerging market for functional food category, without a tangible business sculpts in position. In the pharmaceutical world both multinational and local companies have tested market for food and beverages with a multiplicity of launches in recent years, with few accomplishments. Nevertheless, in requisites of ingredients, mainly in plant extracts, Indian organizations have well-established their position as suppliers, both domestically and internationally. Globalization of functional food industries and nutraceutical shows momentous competition among stakeholders, nevermore the authoritarian discrepancy among countries dynamic in the market.

Author contributions

Both authors have focused on this topic equally, performed a precise exploration of papers and wrote the significant section.

Conflict of interest: None.

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