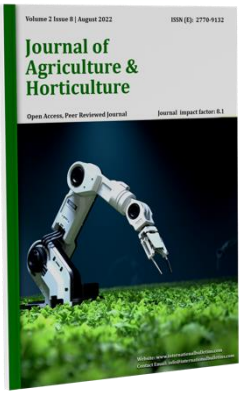

SOCIAL SIGNIFICANCE OF FUNCTIONAL BEVERAGES

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Abstract: Today, consumers are more interested in maintaining and improving their health than in eating. The interest in purchasing products rich in nutrients and with additional health benefits has led to the development of the food industry, as well as new opportunities for scientists and technologists. The role of essential nutrients in supporting human health and protecting against diseases caused by pathogenic organisms is invaluable. Therefore, it is of great importance to optimize food processing technology and ensure the preservation and effective delivery of nutrients after consumption. This article aims to provide a general understanding of functional drinks and assess their social significance and therapeutic efficacy.

Keywords: Nutrients, Beverage, Nutrients, Antioxidants, Isoflavones.

The global demand for functional foods containing beneficial nutritional components is increasing at a rapid pace. In particular, functional beverages have gained significant importance due to their beneficial properties, such as reducing cholesterol levels, maintaining blood sugar levels, providing high fiber content, strengthening the immune system, and improving digestive processes. This is largely attributed to their relatively low cost and broad therapeutic potential. For instance, the global market for fermented milk and yogurt is valued at approximately 46 billion euros, with Europe, North America, and Asia accounting for 77% of the market share. Additionally, due to constraints such as lactose intolerance and allergies to milk proteins, consumers increasingly prefer incorporating probiotic supplements into non-dairy beverages, such as fruit, grain, and vegetable juices. Concurrently, manufacturers are expanding the range of non-dairy beverages by integrating probiotic cultures into food matrices. Globally, a significant proportion of morbidity and mortality is attributed to chronic diseases, including cancer and cardiovascular diseases. Research indicates that alterations in oxygen metabolism and the excessive production of reactive oxygen species (ROS) contribute to many chronic conditions. Consequently, protection against oxidative stress is partially dependent on the presence of antioxidants in the diet [1].

Research indicates that phytochemicals derived from fruits and vegetables enhance the body's defense system against free radicals. Fruit and vegetable juices are recognized as rich sources of bioactive antioxidants, which are a primary factor contributing to their health benefits. Antioxidant-rich food products are typically derived from plant sources and contain

numerous beneficial components. This makes them a favorable choice for inclusion in the diet as a supplement to the body's antioxidant defense system. Concurrently, the food industry faces the challenge of inspiring healthy eating habits by developing innovative, relevant, and convenient food products. Beverages are commonly used to deliver functional ingredients, such as those found in sports and performance-supporting drinks, ready-to-drink teas, vitamin-enriched water, soy-based beverages, and energy drinks with highly concentrated components. This is attributed to their ease of consumption and alignment with the human body's natural need for hydration. Beverages serve not only as a convenient medium for delivering functional components but also as a popular and practical method of consumption [2].

The concept of functional foods was first introduced in Japan in the mid-1980s. These foods were designed to contain components beneficial to health, with the aim of improving human well-being. In Japan, such products were termed "Foods for Specified Health Use" (FOSHU). FOSHU products are required to carry an official label certifying their specific health benefits for consumers. This definition paved the way for the global development of functional foods aimed at health maintenance, encouraging other countries to adopt similar approaches. The concept has created new opportunities for the food industry and has contributed to a heightened focus on healthy foods in various countries [3].

On the other hand, the concept of foods designed to enhance health has its own historical roots. Approximately 2,400 years ago, Hippocrates famously stated, “Let food be your medicine, and let medicine be your food.” This renowned phrase underscores the enduring recognition of the strong connection between diet and health since antiquity. This philosophy served as a foundational principle for medical practices of that era and has paved the way for the development of modern functional foods and health-promoting dietary strategies. Notably, the therapeutic properties of food were widely utilized in ancient Asian societies through plants and natural products. This historical perspective has contributed to the global significance of the functional food concept in contemporary times [4].

Asian societies have long been renowned for their understanding of the functional properties of food products, particularly plants. These societies developed traditional health practices based on the therapeutic properties of plants. For instance, in traditional Chinese medicine, herbal-based remedies and food products have been widely used to enhance human health. This approach highlights the ancient roots of utilizing food as a tool for health promotion, forming the foundation of the modern functional food concept. The experience of Asian societies in this regard is now recognized in contemporary international food technology and scientific research [5].

In the United States, functional foods are defined as “foods or food components that provide health benefits beyond basic nutrition.” According to this definition, functional foods are expected not only to meet the body’s nutritional needs but also to improve health or prevent certain diseases. This approach has driven the growth of the health-oriented food market and increased consumer demand for products that support a healthy lifestyle. In the U.S., this concept has spurred innovations in the development of healthy foods, significantly contributing to scientific research and technological advancements [6].

The European Commission defines functional foods as follows: “A food product is considered functional only if, in addition to its basic nutritional impact, it exerts a beneficial effect on one or more functions of the human body. As a result, overall health and physical

well-being are improved, and/or the risk of disease development is reduced." According to this definition, functional foods not only fulfill nutritional requirements but are also designed to promote health and prevent diseases. This approach serves as a key criterion for promoting healthy foods, providing clear guidance for the food industry and scientific research. Furthermore, this concept supports innovation in the development of food products and contributes to the rapid expansion of the market for health-oriented foods [7].

In Canada, functional foods are defined as "foods that may resemble conventional foods or be consumed as part of a regular diet, but which have been scientifically proven to provide physiological benefits beyond basic nutritional functions and/or reduce the risk of chronic diseases." According to this definition, functional foods offer broader opportunities for health maintenance and can be easily integrated into routine dietary practices. The Canadian government requires rigorous scientific evidence to substantiate the physiological benefits of these foods, ensuring their reliability and widespread acceptance among consumers. Canada's approach plays a significant role in the global development of functional foods, promoting their recognition as innovative products aimed at improving health [8].

In the Chinese interpretation, functional foods are considered "foods with specific health-promoting properties or those capable of delivering vitamins or minerals." These products are designed for consumption by specific population groups and serve to regulate bodily functions. However, they are not intended for therapeutic purposes and are deemed safe for use in acute, subacute, or chronic conditions without causing harm. According to this definition, functional foods in China are viewed as products that support health improvement, but their role as therapeutic agents is strictly limited. This approach ensures the safety of functional foods and encourages their widespread use. Additionally, these foods play a significant role in meeting daily nutritional needs and supporting a healthy lifestyle [9].

According to the definitions in the literature, functional foods can take the following forms:

Unmodified natural foods;

Foods with enhanced composition through specific cultivation conditions, selective breeding, or biotechnological methods;

Foods fortified with beneficial components;

Foods from which non-beneficial or harmful components have been removed using technological or biotechnological methods;

Foods in which a component has been replaced with an alternative ingredient possessing beneficial properties;

Foods with modified composition through enzymatic, chemical, or technological processes;

Foods containing components with enhanced bioactivity or products created through a combination of the above approaches.

The advancement of global scientific research confirms that foods not only meet nutritional needs but also play a significant role in preventing and treating certain diseases. This approach fosters innovation in the healthcare sector and supports the rapid growth of the functional food market.

Such foods include bioactive compounds, such as beta-carotene (found in carrots), lycopene (found in tomatoes), omega-3 fatty acids (found in fish oil), or probiotics (found in

yogurt). These substances play a crucial role in improving health and preventing diseases [10,11].

Bioactive compounds are secondary nutritional components typically present in foods in small quantities. These compounds not only meet the body's nutritional requirements but also play a significant role in improving health and preventing certain diseases. Below are examples of some bioactive compounds:

Beta-carotene (from carrots): A potent antioxidant that strengthens the immune system and enhances vision.

Lycopene (from tomatoes): Reduces the risk of cardiovascular diseases and provides protection against certain types of cancer.

Beta-glucan (from oats): Lowers blood cholesterol levels and boosts immunity.

Omega-3 fatty acids (from salmon oil): Possess anti-inflammatory properties and support cardiovascular health.

Conjugated linoleic acid (from cheese): Improves fat metabolism and aids in weight management.

Lactobacilli (from yogurt): Enhances gut microbiota and supports the digestive system.

Isoflavones (from soybeans): Help maintain hormonal balance and reduce the risk of osteoporosis.

As natural components that deliver significant health benefits, bioactive compounds are integral not only to healthy nutrition but also to pharmaceutical and nutraceutical products. Their presence in the daily diet plays a crucial role in protecting the body from various diseases.

According to prevailing views on the consumption of antioxidant-rich products, foods high in antioxidant compounds, such as fruits and vegetables, may contribute to improved health outcomes related to various diseases. One effective strategy to increase overall consumption is to promote the intake of fruit and vegetable juices [12]. Beverages can be modified to overcome sensory barriers associated with fruit and vegetable consumption, enhance the bioavailability of bioactive compounds, and provide a convenient method of intake. Fruit and vegetable juices have been recognized as rich sources of easily digestible antioxidants. The North American market for functional beverages is experiencing rapid growth, with an annual increase of 14% since 2002. Key drivers of this growth include heightened focus on health maintenance, concerns about obesity, lifestyle choices, and an aging population. These factors serve as primary forces propelling the functional food market.

When purchasing functional beverages, approximately 60% of U.S. consumers prefer products rich in antioxidants, reflecting growing awareness of their health benefits. Antioxidant-based beverages are among the most sought-after products in the functional food segment, valued for their role in health improvement and disease prevention. In the U.S., fruit-based functional beverages constitute the largest segment, accounting for 58% of the total functional beverage market. Their prominence is attributed to the natural abundance of bioactive compounds, vitamins, and minerals in fruits, aligning with consumers' demands for a healthy lifestyle. These beverages are typically fortified with antioxidants, probiotics, and other functional components, distinguished by their positive impact on health.

A recent market analysis conducted in Nova Scotia, Canada, revealed that consumers prefer obtaining nutritional and functional benefits through food products rather than pharmaceutical forms of dietary supplements. This preference stems from the belief that

nutrients derived from natural food sources are more beneficial and convenient for health. Moreover, functional foods often provide multiple nutrients simultaneously, making them appealing to a broader population. These findings contribute to the rising demand for functional foods and beverages, as they are considered effective in promoting health and preventing diseases.

Currently, the commercial market features a range of ready-to-drink beverages that claim high levels of polyphenolic antioxidants. These beverages are promoted for their potential health benefits due to their high antioxidant capacity. Containing antioxidants such as flavonoids, phenolic acids, and other polyphenols, they may help mitigate oxidative stress by neutralizing free radicals in the body. Such beverages, often offering a convenient consumption method, are in high demand for their role in promoting health. Examples include berry-based juices, green tea-based beverages, and cocktails made from so-called superfoods. These products are gaining popularity as the focus on supporting a healthy lifestyle and preventing diseases continues to grow [13].

Conclusion

The increasing demand for functional foods and the need to concentrate bioactive compounds in functional beverages continue to drive the search for effective concentration methods. Emerging technologies, particularly those aimed at enhancing the concentration of bioactive compounds in functional beverages, are being developed. In recent years, various membrane-based technologies, such as those applied to fruit juices, have been explored for concentrating bioactive compounds. Among these membrane processes are microfiltration (MF), ultrafiltration (UF), nanofiltration, reverse osmosis, and integrated systems, with their applications documented in the literature. MF, UF, and nanofiltration are molecular separation processes primarily used in the food industry for clarifying fruit juices. Reverse osmosis is considered highly promising for concentrating various fruits, as it facilitates partial dehydration, leading to an increase in total soluble solids (TSS), including phenolic and carotenoid bioactive compounds. Additionally, novel technologies such as centrifugation techniques, freeze concentration, high-pressure processing (HPP), and ultrasound-assisted processing can be utilized for concentrating bioactive compounds. Research confirms that the range of technologies reviewed in this section can be applied to enhance the concentration and functionality of bioactive compounds in functional beverages.

References:

1. Kaliora A.C., Dedoussis G.V.Z., Schmidt H. Dietary antioxidants in preventing atherogenesis—a review J. Atheroscler., 187 (2006), pp. 1-17
2. Wootton-Beard P.C., Ryan L. Improving public health?: The role of antioxidant-rich fruit and vegetable beverages Food Res. Int., 44 (10) (2011), pp. 3135-3148
3. Lau T.-C., Chan M.-W., Tan H.-P., Kwek C.-L. Functional food: A growing trend among the health conscious Asian Soc. Sci., 9 (2013), pp. 198-208
4. Otles S., Cagindi O. Safety considerations of nutraceuticals and functional foods McElhatton A., Sobral P.J.A. (Eds.), Novel Technologies in Food Science, Springer, New York (2012), pp. 121-136.
5. Valls, J., Pasamontes, N., Pantale'on, A., Vinaixa, S., Vaqu'e, M., Soler, A., Mill'an, S., G'omez, X., 2013. Prospects of functional foods/nutraceuticals and markets. In:

Ramawat, K.G., M'erillon, J.M. (Eds.), Natural Products. Springer-Verlag, Berlin, pp. 491–525.
6. Serafini, M., Stanzione, A., Foddai, S., 2012. Functional foods: Traditional use and European legislation. Int. J. Food Sci. Nutr. 63, 7–9.
7. Ozen, A.E., Pons, A., Tur, J.A., 2012. Worldwide consumption of functional foods: A systematic review. Nutr. Rev. 70, 472–481.
8. Lau, T.-C., Chan, M.-W., Tan, H.-P., Kwek, C.-L., 2013. Functional food: A growing trend among the health conscious. Asian Soc. Sci. 9, 198–208.
9. Yang, Y., 2008. Scientific substantiation of functional food health claims in China. J. Nutr. 138, 1199p–1205p.
10. Pravst, I., 2012. Functional foods in Europe: a focus on health claims. In: Valdez, B. (Ed.), Scientific, Health and Social Aspects of the Food Industry. Rijeka, Croatia, InTech, pp. 165–208.
11. Corbo, M.R., Bevilacqua, A., Petruzzi, L., Casanova, F.P., Sinigaglia, M., 2014. Functional beverages: the emerging side of functional foods. Compr. Rev. Food Sci. Food Saf.13 (6), 1192–1206.
12. Bates, B., Lennox, A., Swan, G., 2010. National Diet and Nutrition Survey: Headline Results From Year 1 of the Rolling Programme (2008/2009). Food Standards Agency, London.
13. Mintel, 2007. Functional Beverages – US August. Market Research Report of Mintel International Group Ltd, US.
14. Eshonturaev A., Sodiqova S. Analysis of raw material sources for a plant-based milk alternative from almonds //E3S Web of Conferences. – EDP Sciences, 2024. – T. 486. – C. 02013.
15. Eshonto'rayev A. A., Sagdullayeva D. S., Salihanova D. S. BODOM MAG 'IZIDAN O 'SIMLIK SUTI OLISHDA GOMOGENIZATSIYA USULLARINING REJIMLARINI O 'RGANISH //Educational Research in Universal Sciences. – 2024. – T. 3. – №. 9. – C. 92-101.
16. Eshonturaev A. A., Sagdullaeva D. Reymov Effect of heat treatment of raw materials on milk quality in plant-based milk production technology //Science and Education in Karakalpakstan. – T. 4. – №. 3. – C. 123-126.
17. Eshonturaev A., Sagdullaeva D., Salikhanova D. Study of physical and chemical properties of almond milk //Int J Innov Sci Res Technol. – 2023. – T. 4. – C. 1004-1007.
18. Eshonto'rayev A. A., Sagdullayeva D. S., Salihanova D. S. BODOM MAG 'IZIDAN O 'SIMLIK SUTI OLISHDA GOMOGENIZATSIYA USULLARINING REJIMLARINI O 'RGANISH //Educational Research in Universal Sciences. – 2024. – T. 3. – №. 9. – C. 92-101.