

Functional Food

Kalandadze T.¹, Dadiani K.², Jholidze N.²

Abstract

Background: Functional food represents a specialized category of food products aimed at maintaining health and preventing diseases through the enrichment of commonly consumed foods with beneficial components. The concept, rooted historically in ancient China, was scientifically established in Japan in 1989 through the introduction of Foods for Specified Health Uses (FOSHU), setting regulatory frameworks for functional ingredients and labeling.

Aim: The paper aims to highlight the global significance of functional food, based on a conceptual analysis of existing literature on the subject

Methods: A systematic analysis was carried out on scientific literature concerning functional food and the corresponding regulatory frameworks cited within it.

Results: The global functional food market has demonstrated significant growth, valued at 187.5 billion USD in 2021, and is projected to reach 280 billion USD by 2028. Region-specific trends highlight Japan's leadership in probiotic-rich products, the United States' focus on protein-based and low-calorie foods, and the European Union's emphasis on immune and cardiovascular health. In Georgia, functional foods are emerging, including vitamin D-fortified aromatic-functional water and research on fermented milk drinks based on probiotic bacteria. Functional foods are typically enriched with probiotics, prebiotics, omega-3 fatty acids, antioxidants, dietary fibers, bioactive peptides, and phytochemicals. Their consumption supports immune strengthening, cardiovascular disease prevention, cognitive function enhancement, digestive health, and diabetes management.

Conclusion. Given environmental challenges and the prevalence of civilization-related diseases, functional foods offer a strategic approach to health promotion and disease prevention. The reinforcement of regulatory standards and support for scientific research are crucial for advancing the functional food sector globally, ensuring benefits for both industry and consumers.

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Keywords: Functional Food, Health Promotion, Disease Prevention, Global Food Market, Japan, United States, European Union, Georgia.

Introduction

Functional food represents a category of food products used for maintaining human health and preventing various diseases. To achieve this type of food, commonly used products in the diet are enriched with food-grade, health-beneficial components [1].

Historically, the therapeutic properties of "functional food" were indicated as early as 2698 BC by the Chinese

emperor Shen-Nung, who advised the consumption of seaweed for patients suffering from goiter.

The first scientific concept of creating and using "functional food" in the human diet was developed in Japan in 1989, where it was recognized as "Foods for Specified Health Uses" (FOSHU). According to the Japanese Law on the Promotion of Healthy Lifestyles, FOSHU refers to food intended for special nutritional purposes, which must be certified as "Food for Special Dietary Uses" (FOSDU) and accompanied by the appropriate logo[2]

The labeling of such "functional food" in Japan is regulated by the "Food Labeling Act," adopted in 2013 (Act No. 70), which was amended in 2018 (Act No. 90), establishing standard food labeling requirements, such as indicating allergens, shelf life, and functional properties.

From the ¹Ministry of Agriculture, Georgia; ²Ivane Javakhishvili Tbilisi State University, Georgia; ³League of Supporters for the Development and Implementation of Applied Science

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Address requests to: Kalandadze Tengiz

E-mail: Tengiz.Kalandadze@mepa.gov.ge

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Thus, according to Japanese regulation, FOSHU represents food containing ingredients related to health functions, whose physiological action must be officially confirmed. FOSHU is intended for the maintenance and improvement of health or for special medical purposes. For market placement, the safety and effectiveness of health-related functions must be evaluated.

Methods

A systematic analysis was carried out on scientific literature concerning functional food and the corresponding regulatory frameworks cited within it.

Results and discussion

According to the "Food Labeling Act," information about Food with Functional Claims (FFC) allows companies to place information about specific functional properties of food on the label. FFC includes not only processed food but also fresh fruits and vegetables. Improvement of regulatory issues has facilitated the creation and production of scientifically substantiated, health-beneficial food, its application for the prevention of various diseases, and its inclusion in the diets of special categories of consumers such as children, the elderly, pregnant and breastfeeding women [2].

Today, the necessity of functional food production is conditioned by the existing ecological situation, the disruption of the correlation between the abiotic environment and natural bio-geo-cenosis due to anthropogenic activities. Consequently, the accumulation of harmful substances in the human body has led to the development of so-called "civilization-related diseases."

Since reducing the harmful effects caused by negative environmental changes is a lengthy process, at the modern stage, the wide use of new technologies has been adopted to produce food that, in addition to nutritional value, contains functional ingredients. Its consumption supports health maintenance, disease prevention, and the reduction of risk factors [3,4].

As global market dynamics show, in 2021 the global market for functional food reached 187.5 billion USD. It is forecasted that by 2028 this figure will reach 280 billion USD (CAGR - Compound Annual Growth Rate - 6.8%)⁵. Consumer attention is focused on probiotics, prebiotics, omega-3 fatty acids, vitamins, and minerals. Notably, there is a trend towards creating targeted functional food using natural ingredients, such as ultra-attractive foods for children or food products with low sugar content [6].

Functional food use particularly supports the strengthening of immunity, prevention of cardiovascular diseases, improvement of brain function, regulation of digestion, and prevention of diabetes [3,4,7]

Production and Use of Functional Food by Region

●**Japan:** Considered the leader of the functional food market. In 1991, the country introduced the FOSHU system, legally defining the category of food used to improve health. The Japanese market is particularly popular for probiotic-enriched foods aimed at gut health and tea products rich in antioxidants. In 2020, the FOSHU food market reached 9 billion USD[8].

●**United States:** The most demanded categories include

protein-rich products, low-calorie foods, and drinks that enhance energy or satiety. In 2021, the US functional food market reached 70 billion USD. Plant-based proteins and "superfoods" like quinoa and chia seeds are especially popular [5].

●**European Union:** Functional food is strictly regulated. Most products focus on strengthening immunity, improving digestive system function, and preventing cardiovascular diseases. By 2021, the EU functional food market reached 40 billion USD, with probiotics and vitamin-enriched beverages being the fastest-growing segments⁶.

Studies in 2020 showed that 65% of consumers prefer functional food for health improvement. Globally, the probiotics market is growing by 7.3% annually, and omega-3 fatty acid sales reached 2.2 billion USD in 2021 [7].

Situation in Georgia

Today, in Georgia, the market already features water labeled with voluntary information such as "aromatic-functional" water, supplemented with vitamin D. This information falls under "health-related claims," regulated by the Government of Georgia's Resolution No. 510 of November 17, 2016, "On Approving the Rule for Placing Nutritional and Health Claims on Food," which establishes special conditions for placing health-related claims.

It is also important that in 2025, at the Georgian Technical University, a doctoral dissertation was defended on "Biotechnology for Producing Fermented Functional Milk Drink Based on Lactic Acid and Propionic Acid Bacteria," with planned production by a manufacturing company.

Main Ingredients Used in Functional Food Production

●**Probiotics:** Strains from genera *Bifidobacterium*, *Lactobacillus*, *Lactococcus*, and *Propionibacterium*³.

●**Prebiotics:** Soluble dietary fibers found in raw materials or produced during technological processing (fructo- and galactooligosaccharides, inulin, polyfructosans, polydextrose, lactulose) [9].

●**Omega-3 Fatty Acids:** Important for cardiovascular health and reducing inflammatory processes, found in fish oil, flaxseed, and krill oil [4].

●**Antioxidants:** Substances that protect cells from damage caused by free radicals, such as vitamins C and E, carotenoids (e.g., beta-carotene), polyphenols, and flavonoids[10].

●**Dietary Fibers:** Plant components that aid digestion, lower blood cholesterol, and balance gut microbiota, mainly found in fruits, vegetables, and whole grains [11].

●**Bioactive Peptides:** Molecules produced by protein hydrolysis that help control blood pressure, boost immunity, and exhibit antioxidant activity, found in dairy products, fish, and eggs[12].

●**Phytochemicals:** Plant-derived substances that promote health and prevent diseases, such as isoflavones (in soy), resveratrol (in grape skin extract), and lycopene (in tomatoes) [13].

Benefits of Functional Food

●Functional food consumption promotes:

●**Strengthening Immunity:** Probiotic-rich foods like yogurt and kefir support the balance of intestinal microbiota, directly positively affecting immunity. Vitamin- and mineral-enriched products, like vitamin C-rich juices, reduce the risk of infectious diseases[14].

●**Prevention of Cardiovascular Diseases:** Products

rich in omega-3 fatty acids, such as fish oil and krill oil, lower cholesterol levels and reduce the risk of stroke¹⁵. Fiber-rich foods, like oatmeal, help regulate blood sugar and cholesterol levels.

•Improvement of Brain Metabolism and Cognitive

Activity: Antioxidant-rich foods like blueberries and dark chocolate improve memory and protect neurons from damage. Phospholipid-enriched products enhance neuronal conductivity and strengthen brain function¹⁶.

•Improvement of Digestive System Function:

Prebiotic- and probiotic-enriched foods, such as kombucha and yogurt, promote the development of healthy microbiota [9].

•Prevention of Diabetes and Other Metabolic Dis-

eases: Low-calorie products containing natural sweeteners, such as stevia (effective for diabetes prevention), and low glycemic index products like quinoa and oats, contribute to stabilizing blood sugar levels [17,18,19].

Conclusion

Thus, functional food represents the food of the future, simultaneously satisfying human nutritional needs, supporting disease prevention, and reducing health-related risks. Strengthened regulations and the support of scientific research worldwide create new opportunities that will benefit both the industry and consumers [20].

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