

Assessment of the Quality and Safety of Fermented Foods

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Since ancient times, fermentation has been used to increase the shelf life and improve the safety of food raw materials. With the active development of science, other benefits resulting from the actions of microorganisms and enzymes on food raw materials have also been noted, such as changes in the texture of the product, improvements in its sensory characteristics, and increases in the amount of useful substances. With the development of scientific knowledge, it has been discovered that the use of fermented foods has a positive effect on human health. This is due to biochemical changes in food components and an increase in their nutritional and biological values, as well as the targeted addition of viable probiotic microorganisms. The controlled growth of microorganisms in the food substrate allows fermentation to be carried out in the correct manner so as to vary and improve aspects of the foods and achieve the required indicators of quality and food safety. The vast variety of microorganisms used in the food industry has resulted in thousands of different types of food and drink specific to different cultures around the world.

This Special Issue of *Fermentation*, “Assessment of the Quality and Safety of Fermented Foods”, presents research conducted by scientists from China, Russia, Egypt, Saudi Arabia, and Nigeria, aimed to study the quality and safety indicators of fermented products of plant and animal origin, as well as food ingredients obtained through the fermentation of food raw materials.

In the case of the Chinese scientists, the object of study was the traditional Chinese sour soup, Hongsuantang. The production of Hongsuantang by natural fermentation is difficult to control and may cause problems associated with its safety. To solve these problems, the scientists investigated the possibility of using starter cultures for the directed fermentation of Chinese soup in order to obtain a product with predictable quality and safety indicators [1].

Interesting research results with clear social significance were obtained by the scientists from Nigeria. They evaluated the solid-state fermentation of fonio and soybeans using *Rhizopus oligosporus* (2710) and orange-fleshed sweet potato using *Lactobacillus plantarum* (B-41621). This research shows that nutrient-rich complementary foods of an acceptable quality can be produced from blends of plant-based raw materials using solid phase fermentation for optimal infant growth and development [2].

Scientists have noted that product quality assessment is important in the selection of enriching additives and biologically active substances, as they can have negative impacts on the technological process and the quality of the finished product. Thus, a group of scientists evaluated the effects of dihydroquercetin on the enzymatic processes that occur during the maturation of dough and the antioxidant properties of the finished bread. Based on the results obtained, the authors concluded that it is expedient to add dihydroquercetin to bread in order to increase its antioxidant properties [3].

The problem of safety is also relevant to dairy products. Thus, studying 60 random samples of various types of commercial cheeses in Egypt, these scientists identified the presence of biogenic amines, which adversely affect human health, in many of the samples. Additionally, the samples of cheeses that were not favorable in terms of their microbiological indicators were identified. Based on this research, the scientists concluded that directed



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fermentation using starter cultures helps to reduce biogenic amines in cheeses. In particular, the authors demonstrated a decrease in the biogenic amines in hard cheese with the addition of *B. polymyxa* D05-1 [4].

The Special Issue also presents the results of assessments of the quality indicators of food ingredients obtained by the fermentation of food raw materials. Research in this area is important due to the fact that food ingredients introduced into a food system have direct impacts on the quality and safety of the product. Research was carried out to examine the effects of a combination of germination with sonication and fermentation, which was applied to grain crops for complex sourdough, on the antioxidant activity and the content of γ -aminobutyric acid in food ingredients, with the possibility of using them in the matrix of the food product. The research results showed that the processes of germination and fermentation of grain raw materials led to a decrease in the content of phytic acid and increases in the content of flavonoids, γ -aminobutyric acid, and the general antioxidant activity and digestibility, thus rendering it possible to obtain food products with pronounced preventive effects [5].

One of the promising ingredients in the food industry is protein hydrolysates obtained by the fermentation of raw materials. It has been established that protein hydrolysates with improved technological properties are formed in the process of microbial fermentation of chicken gizzards with propionic acid bacteria and bifidobacterial found in whey. In addition, they effectively inhibit the growth of *Escherichia coli* and *Staphylococcus aureus* [6]. The unique properties of protein hydrolysates make it possible to use in food systems to increase their nutritional and biological values and to ensure their safety and storage capacity.

Modern research on the development of new fermented products aims to modify the chemical compositions of food products, increasing the bioavailability of the raw material components and using bacterial cultures that increase the healing properties of the food products. Food products obtained by fermentation, due to the presence of organic acids, ethanol, and bacteriocins, have a lower risk of microbiological contamination.

We express our thanks to all the researchers and professors who participated in the creation of this Special Issue through their current, promising works.

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References

1. Li, C.; Zhang, Q.; Wang, C.; He, L.; Tao, H.; Zeng, X.; Dai, Y. Effect of Starters on Quality Characteristics of Hongsuantang, a Chinese Traditional Sour Soup. *Fermentation* **2022**, *8*, 589. [\[CrossRef\]](#)
2. Okoronkwo, N.C.; Okoyeuzu, C.F.; Eze, C.R.; Mbaeyi-Nwaoha, I.E.; Agbata, C.P. Quality Evaluation of Complementary Food Produced by Solid-State Fermentation of Fonio, Soybean and Orange-Fleshed Sweet Potato Blends. *Fermentation* **2023**, *9*, 250. [\[CrossRef\]](#)
3. Kalinina, I.; Fatkullin, R.; Naumenko, N.; Popova, N.; Stepanova, D. The Influence of Flavonoid Dihydroquercetin on the Enzymatic Processes of Dough Ripening and the Antioxidant Properties of Bread. *Fermentation* **2023**, *9*, 263. [\[CrossRef\]](#)
4. Saad, M.A.; Abd-Rabou, H.S.; Elkhtab, E.; Rayan, A.M.; Abdeen, A.; Abdelkader, A.; Ibrahim, S.F.; Hussien, H. Occurrence of Toxic Biogenic Amines in Various Types of Soft and Hard Cheeses and Their Control by *Bacillus polymyxa* D05-1. *Fermentation* **2022**, *8*, 327. [\[CrossRef\]](#)
5. Naumenko, N.; Fatkullin, R.; Popova, N.; Ruskina, A.; Kalinina, I.; Morozov, R.; Avdin, V.V.; Antonova, A.; Vasileva, E. Effect of a Combination of Ultrasonic Germination and Fermentation Processes on the Antioxidant Activity and γ -Aminobutyric Acid Content of Food Ingredients. *Fermentation* **2023**, *9*, 246. [\[CrossRef\]](#)
6. Zinina, O.; Merenkova, S.; Rebezov, M.; Galimov, D.; Khayrullin, M.; Burkov, P. Physicochemical, Functional, and Technological Properties of Protein Hydrolysates Obtained by Microbial Fermentation of Broiler Chicken Gizzards. *Fermentation* **2022**, *8*, 317. [\[CrossRef\]](#)

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