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Editorial

Bioactive Compounds in Grain Fermentation

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As we conclude our exploration of the Special Issue, "Bioactive Compounds in Grain Fermentation", it is essential to revisit the origins of this initiative, providing a clear understanding of its objectives.

The world's dependence on cereal grains as a dietary cornerstone, coupled with the growing interest in their health-promoting bioactive compounds, spurred the conception of this Special Issue. With staples like rice, wheat, barley, rye, oats, maize, and sorghum being consumed globally, the nutritional value embedded in these grains has garnered significant attention from both the research and industrial communities.

The introduction of fermentation, a traditional, economical, and natural biological processing technique, further fueled the intrigue surrounding cereal grains. This process, widely applied to enhance their sensory properties, nutritional profiles, and economic value, has proven transformative [1,2]. The fermentation journey involves the interaction of microorganisms and digestive enzymes in the gut, giving rise to specific metabolites and biocatalysts. These compounds, such as γ-aminobutyric acid, exopolysaccharides, vitamins, bacteriocins, and β-glucan, contribute to the health-promoting properties of the fermented grains [2].

The call to investigate the fate of bioactive compounds during fermentation, both in vivo and in vitro, has emerged as a critical pursuit. Understanding the structural and biochemical modifications of these compounds in the gut during and after fermentation becomes the linchpin for future developments and the commercialization of grain-based food products with diverse health-promoting effects.

The goal of this Special Issue was to compile a comprehensive collection of review papers and original research articles that traverse multidisciplinary topics related to bioactive compounds in grain fermentation. In essence, this Issue has been a captivating exploration into the synergistic relationship between cereal grains and fermentation, offering a tapestry of insights that contribute to the broader canvas of knowledge in the field.

This Special Issue featured six publications, comprising four original research papers and two reviews, covering diverse topics. Each of these papers aligns seamlessly with our central theme, offering valuable perspectives on the role of bioactive compounds in grain fermentation. From enhancing nutritional profiles to unlocking the potential for bioactive compounds, each paper has carved a unique niche in our understanding.

Now, we provide a concise summary of these publications.

Yang, Duan, Lv, Xu, and Li (2022) explored the volatile components in Daqu, a crucial starter in baijiu production, using headspace solid-phase microextraction technology [3]. By analyzing variations in the volatile compounds during dissimilar production processes, the research provided insights into the changes affecting Daqu quality and laid the groundwork for mechanizing baijiu production.

Wang et al. (2023) explored the impact of solid-state fermentation with different edible mushroom mycelia on soybean meal. The fermented soybean meal exhibited improved nutritional value, with *Pleurotus ostreatus* standing out among the three species. The

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study emphasized the enhanced protein content, increased glutamate and aspartic acid concentrations, and significantly higher antioxidant activity after fermentation [4].

Investigating the fermentation of quinoa seeds using *Limosilactobacillus fermentum* PTCC 1638 and *Lacticaseibacillus rhamnosus* PTCC 1637, the study of Jafarpour and Hashemi (2023) showcased the collaborative effects of pure and co-cultures [5]. Fermentation led to increases in the bacterial population, total phenols, antioxidant activity, and enzyme inhibition. The co-culture exhibited the most significant changes in physicochemical properties and bioactive compounds.

Focusing on the solid-state fermentation of *Quercus liaotungensis* using *Bacillus subtilis*, the study by Li et al. (2023) identified the optimal conditions for enhanced nutritional value [6]. The process resulted in decreased crude fiber and ether extract content, increased crude protein and ash content, and reduced tannin content. The fermented *Quercus liaotungensis* demonstrated improved nutritional value, presenting potential applications for this natural resource.

Arabinoxylans (AXs), complex carbohydrates in cereal grains, significantly impact food processing and fermentation. Tse and Schendel (2023) conducted a comprehensive review delving into the intricate relationship between AXs and the production of grain-based fermented foods and beverages, such as bread, beer, and spirits [7]. By elucidating the impact of AXs on the processing efficiency and final product quality, the review underscores the need for a nuanced understanding of the structure–function relationships, providing a roadmap for future investigations into AXs in fermented cereal-based foods.

The review by Li, Zhang, Zhu, Chao, and Guo (2023) focused on high-amylose starch and its potential as a dietary fiber with unique fermentation properties in the gut [8]. By summarizing recent in vitro and in vivo studies, the paper compared the digestion and fermentation characteristics of high-amylose starches from different botanical sources. The review highlights the distinct fermentation products and nutritional properties resulting from both the modifications and food processing of high-amylose starches, providing valuable insights for future applications in modulating colonic fermentation for improved gut health.

In conclusion, this Special Issue has collectively delved into the potential of cereal grains and their fermented products. The included papers pave the way for future research, focusing on bioactive compounds during gut fermentation, multidisciplinary investigations into fermented foods, and analytical, social, and sustainability aspects in this evolving field.

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