Processing and Properties Analysis of Grain Foods

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Editorial

Processing and Properties Analysis of Grain Foods

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Foods from grains and grain-derived ingredients are among the most important energy and nutrient source for humans. Cereals (e.g., wheat, rice, corn) have been the conventional food materials, while interest is growing in utilizing pseudocereals (e.g., buckwheat, quinoa, amaranth), pulses (e.g., dry peas, chickpea, dry beans), oilseeds (soybean, peanut, hempseed), and other grains for the development of various foods and food ingredients. Grain and food processing converts raw grains to functional ingredients and produces palatable and nutritious end-products. Examples of grain-related processes include, but are not limited to, drying, milling, fractionation, hydration, fermentation, extrusion, cooking, baking, frying, steaming, freezing, etc. Various physical and chemical changes and interactions are expected during these processes, which further affect the nutritional, textural, sensory, and many other quality properties of the products. Methods, protocols, and equipment have been developed to process, monitor, and control the processing parameters to achieve the desired end-product quality or functionality. This Special Issue of *Processes* on "Processing and Property Analysis of Grain Foods", and the associated Special Issue reprint, published 15 research papers from lead scientists and researchers in the area and covered diverse topics related to grain-processing innovations and the effect of both conventional and innovative grain processes on the properties of grain-derived ingredients, intermediates, and end products. The Special Issue is available online at: https://www.mdpi.com/journal/processes/special_issues/Grain_Foods_Processing (accessed on 25 December 2022).

Sorghum (*Sorghum bicolor* (L.) Moench) ranks fifth in global cereal grain production. Starch is the primary constituent of sorghum grain, and its content and properties, especially the amount of amylose content in sorghum starch, influence the suitability of sorghum cultivars for specific end uses. Peiris et al. successfully developed partial least squares NIR (near infrared spectra) models to estimate starch and amylose contents in intact grain sorghum samples [1]. The newly developed calibrations can be used as a rapid screening tool for characterizing sorghum starch composition in segregating populations and to identify germplasms for developing new cultivars and hybrids for specific end uses.

Reducing the particle size of cereal grains is often the first step in the food and feed manufacturing process. Pulses are attracting an increasing interest due to their multiple agronomic and nutritional advantages. Siliveru and colleagues evaluated roller milling to produce chickpea, lentil, and yellow pea flours and characterized the particle and physicochemical properties of the produced flours [2,3]. The findings may assist millers to adapt pulse-milling technologies with minor modifications to their existing wheat milling facilities and provide guidance for more suitable uses of pulses.

Hammermills are among the most commonly used size-reduction equipment in the feed industry because of their high throughput and versatility in grinding different materials. Yellow dent #2 corn is a common grain type used for feed in the U.S. Paulk and colleagues investigated the effects of whole-corn moisture before grinding and hammermill screen size on subsequent ground corn moisture, particle size, and flowability [4]. They further evaluated the effects of hammermill tip speed, assistive airflow, and screen sizes on

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hammermill throughput and characteristics of ground corn [5]. The studies provide useful references for processes involving grinding operations.

Innovations in food extrusion technology are enabling its rapid expansion and applicability in diverse areas related to bioprocessing and value addition. McGuire et al. compared and characterized the flowability of some common powder ingredients (corn, wheat, and sucrose) in the extrusion process [6]. The study related raw material particulate rheology to the granular flow in a pilot-scale single=screw food extruder, and some findings were visualized using a transparent plexiglass window during extrusion.

Dough mixing is an important process that can affect the quality of end products. Elucidating the mechanisms underlying gluten formation and structure remains challenging. Iwaki et al. employed the front-face fluorescence method to assess changes in hydrophobic interactions among gluten proteins during dough formation by extracting proteins in different concentrations of 1-proponol solution [7].

Pulse flours are commonly added to food products to improve their functional properties, nutritional quality, and health benefits. Zhang et al. investigated the effects of the partial replacement (0–25%) of whole wheat flour with diversified whole pulse flours (yellow pea, green pea, red lentil, and chickpea) on dough properties and bread quality [8]. Among all the tested pulse flours, the composite flour containing yellow pea flour or chickpea flour showed overall better potential for bread-making with good dough-handling properties and product quality. Beans are also important pulse grains for food uses. Mariscal-Moreno et al. investigated the effects of the partial substitution of wheat flour by ayocote bean and black bean in bread production on the thermal properties of composite flours, the bread's proximal composition, in vitro protein digestibility (IPD), as well as color and sensorial parameters of the final products [9]. These studies on composite flours could lead to the development of more nutritious bread products by complementing cereal and pulse ingredients.

Noodles are a staple food in many Asian countries and are widely consumed throughout the world because of their convenience and palatability. Cheng et al. investigated the effects of gaseous chlorine dioxide treatment on the physicochemical properties of buckwheat-based composited flour (buckwheat–wheat–gluten) and shelf-life, textural qualities, and sensory properties of fresh buckwheat noodles [10]. The study reveals the effects of gaseous chlorine dioxide treatment on Tartary buckwheat flour properties and the shelf-life of the noodles. Park et al. explored the noodle-making performance of flour blends with different particle sizes and blending ratios of purple-colored wheat bran and their antioxidant properties [11]. Noodle quality and antioxidant activity were more significantly enhanced by small bran particles at higher blending ratios.

Last but not least, this Special Issue also published interesting papers addressing the physical characteristics of typical maize seeds in a cold area of North China based on principal component analysis [12], the spatiotemporal characteristics of heat resource effectiveness in the southern rice cropping area in China and relationships between heat resource effectiveness and rice potential yield, as well as grain yield reduction rate [13], the effect of different alternative sweeteners that contained sugar alcohols or bulking agents on the physiochemical properties of rolled "sugar" cookie [14], and the effects of different amylose contents of foxtail millet varieties on textural properties of Chinese steamed bread [15].

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