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Editorial

Recent Advances in Cereals, Legumes and Oilseeds Grain Products Rheology and Quality

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Grains and the products obtained from them have a central importance in human nutrition, representing the main source of food for humans. The term grain encompasses multiple crop products such as cereals, legumes, oilseeds, pseudocereals and others. From these grains, cereals are the most used in the food industry in order to obtain different products such as bakery ones, beer, ethanol, starch, gluten, dextrose, e.g., In this Special Issue, the use of maize and sorghum, some of the most important cereal grains in the world as raw materials in the brewing process, whether as simple adjuvants or via the brewing of beers made from 100% sorghum or maize malt, are reviewed by Dabija et al. [1] who discussed the advantages and disadvantages of using them in brewing. In addition to the use of sorghum as raw material in brewing, it may also be used as a valuable ingredient in bakery industry, as was discussed in this Special Issue in the article by Apostol et al. [2], who demonstrated that the addition of sorghum seed flour in various percentages to wheat flour improves the nutritional value of bread by increasing its mineral, fiber and fat (monounsaturated fatty acids + polyunsaturated fatty acids) content. Moreover, from the technological point of view, the rheological behavior of composite dough obtained from sorghum and wheat flour was adequate for bakery products, which presented good quality characteristics. However, the use of a starter culture such as *L. plantarum* in bread made with different sorghum seed flour addition, further improves the bread quality especially from the nutritional and sensory point of view, compared to the bread samples in which only sorghum flour was added to wheat flour. Among maize and sorghum, the wheat and barley are also two of the most cultivated cereal grains in the world. Barley is the most used cereal for brewing [1], whereas wheat is the most used one for bakery products due to its unique viscoelastic properties we underlined in their article by Jańczak-Pieniążek et al. [3]. According to them, the wheat variety influences in a significant way the bread quality from the technological and quality point of view. Grains of different hybrid wheat cultivars grown in various climatic and agronomic conditions may be also used for the production of bread of a good quality, which leads to the conclusion that it can be considered an alternative in agricultural production for population cultivars.

Many research groups have focused on improving the bread quality especially from the nutritional point of view, by adding different ingredients of a high nutritional value or using different processing techniques, such as germination and fermentation. Bread reflects the nutritional value of the flour from which it is obtained, the ingredients used and of the technology applied to obtain it. It is an important source of proteins, B vitamins and mineral salts. However, through wheat refining, the nutritional value of bread decreased. Bread is the main source of vegetable protein, covering about 1/5–1/3 of the total protein requirement for the human body, but is deficient in essential amino acids, especially lysine, but also tryptophan and threonine. In order to correct this deficit, different ingredients may be used, such as legume protein concentrate as Belc et al. [4] have reported in this Special Issue. Through refined wheat flour substitution with pea and soy protein concentrate up to 15% addition, the bread nutritional quality was improved. Comparatively, bread obtained with soy protein concentrate presented higher quality characteristics from the

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technological point of view (higher volume, softer crumb, stronger dough structure, higher sensory characteristics) than the bread obtained with pea protein concentrate. The protein digestibility does not dependent only on the protein source, but also on the food processing technique. The review written by Atudorei and Codină [5] underlined the impact of germination on the nutritional quality and sensory characteristics of different legume types such as bean, lentil, chickpea, lupine, soy and the effect of their addition in a germinated form in bread making. Germination induces changes in protein and starch digestibility (amino acid content, available sugars), an increase in the mineral bioavailability (calcium, copper, manganese, zinc), vitamin concentrations (riboflavin, niacin and ascorbic acid), polyphenols content and antioxidant activity and activates some hydrolytic enzymes such as amylases, proteases, lipases which may improve bread quality not only from the nutritional point of view but also from the technological point of view. The effect of germination combined with a fermentation process on dough rheological properties from different wheat and triticale varieties has also been reported in this Special Issue by Banu et al. [6]. According to them, flour obtained from germinated grains presented lower dough stability, higher protein weakening and a significant improvement of dough pasting properties when sourdough was added in wheat flour. Also, a narrower viscoelastic domain was recorded for samples subjected to the fermentation and germination process. The nutritional aspects related to the sprouts of soybean resulted from germination process and treated with different levels of chitooligosaccharide with various molecular weights have been approached in this Special Issue by Tang et al. [7]. According to them, the use of chitooligosaccharide during the germination process led to a significant increase in the bioactive compounds and antioxidant activity of the soybean sprouts. The use of a buckwheat sprout flour in a bakery product, namely a wheat bun, in combination with buckwheat, has been reported by Sturza et al. [8]. According to them, by adding the buckwheat and buckwheat sprout flours in wheat flour, the nutritional quality of buns has been improved in terms of starch digestibility, phenolic content, total flavonoid content and antioxidant activity. The use of ingredients such as pseudocereals in bread making has also become a concern in the bakery industry. One of the reasons for their use in bread is their nutritional value—these grains being richer in fibers, lipids, minerals and vitamins, compared to the wheat flour. Also, these grains present a high protein quality, thus completing the wheat proteins deficient in lysine, threonine and methionine. However, their use in bread making may be difficult, since these cereals do not contain gluten, fact that may affect bread quality. An extensive study related to the effect of the quinoa seed flour addition in wheat flour on dough rheology has been reported in this Special Issue by Coțovanu et al. [9]. According to them, the substitution of wheat flour with different milling fractions of quinoa seeds flour may affect in a different way the dough rheological properties and therefore the bread quality. The Falling Number values, water absorption, protein weakening decreased with the increasing particle size of quinoa seeds, whereas the Mixolab starch gelatinization rate and starch retrogradation speed increased. These authors predicted that the optimum bread may be obtained according to the rheological data for a medium quinoa particle size addition of 8.98% in wheat flour.

Nowadays, the bakery producers are trying to diversify the assortment range of bakery products in order to satisfy the consumer demands. Some of the consumers want special bakery products, healthier ones to meet their needs. For example, some of the consumers want bakery products to be gluten-free, others without sodium or with a low sodium content, others want a clean label, etc. These aspects were approached in this Special Issue by some research groups. Almost 1% of the world's population is affected by celiac disease and therefore they demand gluten-free bakery products. Prolamines are gluten components that are responsible for the immediate immune response. Celiac disease is not the only disease associated with gluten ingestion. In fact, gluten also causes other pathologies grouped under the term "gluten-related disorders". The only therapy to counteract gluten-related disorders, which are on the rise nowadays, is a gluten-free diet. This requires the production of bakery products from gluten-free raw materials, in which wheat flour is replaced by gluten-free flours, as Culetu et al. [10] reported in this Special Issue. In their article, they presented an overall view of different gluten-free flours: rice, brown rice, millet, maize, amaranth, teff, buckwheat, chickpea, quinoa, gram, plantain, tiger nut, e.g., which they compared from the functional properties and nutritional point of view. These may be valid alternatives to wheat flour in order to obtain gluten-free bakery products. However, there are challenges to producing gluten-free bakery products, due to the fact that gluten presents unique viscoelastic properties which lead to the good development of bakery products. A development of gluten-free bakery products is discussed in the article by Chiș et al. [11] published in this Special Issue. In their study they used quinoa flour as gluten-free flour which fermented with Lactobacillus plantarum ATCC 8014 (Lp) in order to obtain gluten-free muffins. Another challenge to obtain special bakery products for consumers who demand a low sodium diet was discussed in the article written by Voinea et al. [12], in which potassium chloride was proposed to partial substitute the sodium chloride from bread recipe. This was an interesting approach, since sodium chloride has a huge impact on dough rheology, yeast activity, bread quality especially from the sensory point of view. The article focuses only on the technological influence that sodium chloride substitution with potassium chloride may present on dough rheology. According to this study, the optimum replacement of sodium chloride with potassium chloride is of 22% in order to obtain the best dough rheological properties.

The quality of various bakery types have been reported in different ways in this Special Issue through baking loss, bread yield, bread volume, dallmann porosity, index of crumb, crumb moisture content [3], compositional analysis, loaf volume, crumb porosity, elasticity, colour parameters, texture properties, sensory ones through nose system, descriptive method [4], preferential method [2], free sugar content, total flavonoid content, total phenolic content, radical scavenging activity [8], carbohydrates, organic acids, folic acid, minerals [11], e.g., These methods are common ones used in the international literature to analyze bakery products quality from the nutritional and technological point of view. An innovative approach by using multivariate analysis as a statistical tool to evaluate bread quality in order to classified as a specific type of food product according to a standard database was reported in this Special Issue by Popescu et al. [13]. According to them, Karl Fischer titration can be a rapid and useful tool for a simple differentiation between various types of breads.

Last but not least, different research groups have focused in this Special Issue on the capitalization of by-products from the food industry in order to minimize losses resulting from the processing of agro-food raw materials. The review written by Chetrariu and Dabija [14] discussed the possibility of using brewer's spent grains, which were globally produced in 38.8 million tons in 2018 in food, as substrate for the cultivation of microorganisms and the production of enzymes, in different fermentation processes, for obtaining building materials, as adsorbent, as source of phenolic compounds, for biogas production, for food/composite packaging, for proteins, protein hydrolysates, bioactive peptides, as source of fiber, polymers, e.g., The review written by Petraru and Amariei [15] discussed the possibility of using the by-products obtained from the oil industry for extraction of bioactive compounds (protein isolate, concentrate and hydrolysate, antioxidants, dietary fiber), as substrate for functional ingredient production (enzymes, mushrooms, antibiotics, biosurfactants), animal feedstuff, in food products (bread, biscuits, snacks, desserts, dairy products), biopolymer packaging, e.g., The article written by Ursache and Gutt [16] presented the possibility to obtain bioethanol from wheat straw through different technological methods.

The works published in this Special Issue presented recent advances in cereals, legumes and oilseeds grain products rheology and quality in different directions of research, such as obtaining special food products such as gluten-free ones [10,11], with a lower sodium content [12], novel ones by partial replacement of wheat flour with other flour types [2,8,9], or by combining different ingredients [1,10] which are high nutritional quality by improving the quality of raw materials to be used [3,7] or of the bakery products, by using ingredients with a high nutritional value [4,5,9] and using different technological methods [6], etc. In addition, novel methods to evaluate bread quality [13] and by-products valorization through circular economy approaches [14–16] have been developed in an extensive way in this Special Issue.

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