processes

MDPI

Editorial

Special Issue: Processing Foods: Process Optimization and Quality Assessment

Péter Sipos [1,*] and Milivoj Radojčin [2,*]

[1] Institute of Nutrition, Faculty of Agricultural and Food Sciences and Environmental Management, University of Debrecen, Egyetem tér 1, H-4032 Debrecen, Hungary
[2] Faculty of Agriculture, University of Novi Sad, Trg Dositeja Obradovića 8, 21000 Novi Sad, Serbia
* Correspondence: siposp@agr.unideb.hu (P.S.); milivoj.radojcin@polj.uns.ac.rs (M.R.)

For a long time, the basic as well as the only function of foods is to provide the nutrients and energy needed for human physiological processes. Over the past century, since the conditions of food security have been reduced, the expectations placed on food have constantly changed and new demands have been emerging. It is expected that foods should not only be safe, but they also have to be tastier and attractive; have a long shelf-life; contain as much of the physiologically beneficial components of the raw materials as possible; and have a positive impact on consumers' health. Industrial food production needs to meet these diverse demands in a way that is economically viable and environmentally friendly, while being flexible to the ever-changing needs. Fortunately, there is a wealth of research to help the food industry, and there is an increase in the amount of information available on the physiological effects of the nutrients of our foods, their health protecting role, and how different processing operations change their quantitative and compositional values. At the same time, changing consumer needs are influencing the expectations and tasks related to offline and online quality analysis and quality assurance. This Special Issue, entitled "Processing Foods: Process Optimization and Quality Assessment", provides a snapshot of new advances in unit operations of food production for healthy nutrition.

Fruits show relatively rapid spoilage due to their high-water content; however, their sensory and nutritional properties are the best when they are fresh. Several methods are under evaluation to provide gentle nutrient-saving conservation that preserves the properties of natural goods. Leneveu-Jenvrin et al. [1] compared the storability and sensory and chemical properties of refrigerated and gently heat-treated pineapple juice. Their results showed that mild heat treatment is the easiest way for prolonging pineapple juice's shelf life; however, a 60 °C heat treatment can provide microbiological safety for a month, while a decrease in sensory values limits the storability to one week. Abdullah and Chin [2] investigated the efficiency of thermosonication-assisted juice extraction of different tropical fruits and compared this method to the water bath incubation method. The authors found that this novel method not only improves yield, but it also improves ascorbic acid and water-soluble dry matter content. Additionally, the response surface methodology was found to be useful in the optimization of the process parameters. Advanced statistical methods can be used for the improvement of the sensory properties of beer. Kucharczyk et al. [3] used a multiple-response optimization procedure on the parametrization of the fermentation process based on the changes in esters and higher alcohols caused by the modifications to the pitching rate, fermentation temperature, level of aeration, and time of tank filling. The authors proved that this method is suitable for quality prediction and process control of aroma- and taste-driven beer production. Apart from the fact that processing parameters can be optimized for ideal sensory properties, Bi et al. [4] created a deep learning method to help select product features that can be associated with consumer preferences, thereby resulting in an improvement in product development, storage, marketing, and overall commercial performance. In a pilot study, the key characteristics of yoghurt were identified

check for updates

Citation: Sipos, P.; Radojčin, M. Special Issue: Processing Foods: Process Optimization and Quality Assessment. *Processes* **2023**, *11*, 851. https://doi.org/10.3390/pr11030851

Received: 25 February 2023
Accepted: 3 March 2023
Published: 13 March 2023

and used for hedonic contour mapping to associate these characteristics with Chinese consumers' acceptance. For evaluation, Benes et al. [5] applied the detrended fluctuation analysis on the results of a near-infrared spectral analysis of green and roasted coffee. This method successfully differentiated the samples based on the roasting levels, which was confirmed to be 100% accurate by the agglomerative hierarchical clustering. This method could be a useful tool for quality assurance of coffee production after an evaluation of its robustness.

To provide a longer shelf-life, drying is commonly used on fruits. However, the heat load results in nutritional and sensory damages. Radojčin et al. [6] made a comparison of traditional and recent, innovative methods and their possible combinations, helping in selection based not only on quality but also energy saving and environmental impacts. They underlined the efficiency of combining drying methods, hybrid drying, and advanced pre-treatments and emphasized the benefits of mathematical process modeling. Within this context, Pavkov et al. [7] investigated osmotic dehydration based on hot air drying of apricot and characterized the effects of the concentration and temperature of the osmotic solution on the increase in water loss, dry matter content, and shrinkage. The authors found the Peleg model to be effective in predicting these changes. During hot air drying, the osmotic dehydrating pre-treatment decreases the effective diffusivity of water and the shrinkage of the product.

Antioxidants, including polyphenols, flavonoids, and anthocyanins, have a significant role in healthy nutrition. Therefore, their evaluation is a trending research area. Šarić et al. [8] evaluated the composition of and changes in flavonoids in acacia and multifloral honey during a one-year-long storage period with different conditions and found that these foodstuffs are still a valuable source of antioxidants after a year of storage. The authors detected an increase in total flavonoid content in the first six months of storage, and further experiments are needed to clarify the background of this phenomenon. Nettle is another known source of polyphenols and pigments, and the study by Repajić et al. [9] increases our knowledge about their effective extraction. Accelerated ethanolic solvent extraction operated at different temperatures was evaluated, and the static times and cycle numbers were compared to ultrasound-assisted extraction. The authors found that the former method is better in terms of yield, resulting in 60% higher antioxidant recovery. Liquid milk concentrate can also be a source of antioxidants, as proven in the study by Nath et al. [10]. They applied cross-flow membrane filtration for concentration, and enzymatic modification of milk protein by trypsin was used in order to modify the biological activity. With this context, not only the antioxidant capacity, angiotensin-converting enzyme inhibitory activity, and antibacterial activity of the milk protein concentrate increase, but trypsin also reduces allergenic epitopes at more than 99.9%.

Several processes applied in the food industry are used to achieve specific results in the behavior as well as technological and/or nutritional properties of food components; for this reason, it is useful to summarize complex effects. In our Special Issue, Nagy et al. [11] reviewed the modifying effects of physical processing methods (such as size reduction, heat treatment, high pressure and its combination with heat treatment, extrusion, atmospheric and cold plasma, and radiation) on the starch and fiber content of foodstuffs. These methods are preferable in many situations because they are easy to apply, are toxicologically safer and more acceptable than chemical methods, are relatively inexpensive, and can be used to achieve a wide range of nutritional objectives. Miñano et al. [12] focused on different types of magnetic field applications and underlined their advantages: the use of a magnetic field is a non-invasive operation, which influences the properties of foods in different aspects, ranging from the physical-chemical to the microbiological level, and has shown promising preliminary results in material transformation and preservation.

There is increasing interest in food quality, especially the microbiological quality of bottled water due to the rapid increase in this market. Rygala et al. [13] revealed the critical points of water processing to help minimize the risk of food safety hazards. For monitoring, the plate count method and luminometry were used, and for identifying bacterial isolates,

polyphasic identification based on biochemical tests and molecular analysis using ribosomal RNA was applied. The most frequent microbial genera and the critical points of the system were identified, which could help improve the hygienic status of water processing lines.

A total of 13 papers are presented in this Special Issue. Initially, we focused on different areas of food processing, qualification, and quality assurance, and we had not expected to be able to present such interesting and forward-looking studies on such a wide range of research areas. The guest editors would like to thank the authors for their contribution.

Author Contributions: Conceptualization, P.S. and M.R.; writing—original draft preparation: P.S.; writing—review and editing: P.S. and M.R. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Leneveu-Jenvrin, C.; Quentin, B.; Assemat, S.; Remize, F. Maintaining Physicochemical, Microbiological, and Sensory Quality of Pineapple Juice (Ananas comosus, Var. 'Queen Victoria') through Mild Heat Treatment. *Processes* **2020**, *8*, 1186. [CrossRef]
2. Abdullah, N.; Chin, N.L. Optimising Tropical Fruit Juice Quality Using Thermosonication-Assisted Extraction via Blocked Face-Centered Composite Design. *Processes* **2021**, *9*, 3. [CrossRef]
3. Kucharczyk, K.; Żyła, K.; Tuszyński, T. Volatile Esters and Fusel Alcohol Concentrations in Beer Optimized by Modulation of Main Fermentation Parameters in an Industrial Plant. *Processes* **2020**, *8*, 769. [CrossRef]
4. Bi, K.; Qiu, T.; Huang, Y. A Deep Learning Method for Yogurt Preferences Prediction Using Sensory Attributes. *Processes* **2020**, *8*, 518. [CrossRef]
5. Benes, E.; Fodor, M.; Kovács, S.; Gere, A. Application of Detrended Fluctuation Analysis and Yield Stability Index to Evaluate Near Infrared Spectra of Green and Roasted Coffee Samples. *Processes* **2020**, *8*, 913. [CrossRef]
6. Radojčin, M.; Pavkov, I.; Bursać Kovačević, D.; Putnik, P.; Wiktor, A.; Stamenković, Z.; Kešelj, K.; Gere, A. Effect of Selected Drying Methods and Emerging Drying Intensification Technologies on the Quality of Dried Fruit: A Review. *Processes* **2021**, *9*, 132. [CrossRef]
7. Pavkov, I.; Radojčin, M.; Stamenković, Z.; Kešelj, K.; Tylewicz, U.; Sipos, P.; Ponjičan, O.; Sedlar, A. Effects of Osmotic Dehydration on the Hot Air Drying of Apricot Halves: Drying Kinetics, Mass Transfer, and Shrinkage. *Processes* **2021**, *9*, 202. [CrossRef]
8. Šarić, G.; Vahčić, N.; Bursać Kovačević, D.; Putnik, P. The Changes of Flavonoids in Honey during Storage. *Processes* **2020**, *8*, 943. [CrossRef]
9. Repajić, M.; Cegledi, E.; Kruk, V.; Pedisić, S.; Çınar, F.; Bursać Kovačević, D.; Žutić, I.; Dragović-Uzelac, V. Accelerated Solvent Extraction as a Green Tool for the Recovery of Polyphenols and Pigments from Wild Nettle Leaves. *Processes* **2020**, *8*, 803. [CrossRef]
10. Nath, A.; Eren, B.A.; Csighy, A.; Pásztorné-Huszár, K.; Kiskó, G.; Abrankó, L.; Tóth, A.; Szerdahelyi, E.; Kovács, Z.; Koris, A.; et al. Production of Liquid Milk Protein Concentrate with Antioxidant Capacity, Angiotensin Converting Enzyme Inhibitory Activity, Antibacterial Activity, and Hypoallergenic Property by Membrane Filtration and Enzymatic Modification of Proteins. *Processes* **2020**, *8*, 871. [CrossRef]
11. Nagy, R.; Máthé, E.; Csapó, J.; Sipos, P. Modifying Effects of Physical Processes on Starch and Dietary Fiber Content of Foodstuffs. *Processes* **2021**, *9*, 17. [CrossRef]
12. Miñano, H.L.A.; Silva, A.C.d.S.; Souto, S.; Costa, E.J.X. Magnetic Fields in Food Processing Perspectives, Applications and Action Models. *Processes* **2020**, *8*, 814. [CrossRef]
13. Rygala, A.; Berlowska, J.; Kregiel, D. Heterotrophic Plate Count for Bottled Water Safety Management. *Processes* **2020**, *8*, 739. [CrossRef]