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Editorial: Post-pandemic foods: development, processing, acceptance and quality

Wan Abd Al Qadr Imad Wan-Mohtar[1]*, Zul Ilham[2]*, Wahyudi David[3], Nurul Aqilah Mohd Zaini[4] and Sarina Abdul Halim-Lim[5]*

[1]Functional Omics and Bioprocess Development Laboratory, Faculty of Science, Institute of Biological Sciences, Universiti Malaya, Kuala Lumpur, Malaysia, [2]Faculty of Science, Bioresources and Bioprocessing Research Group, Institute of Biological Sciences, Universiti Malaya, Kuala Lumpur, Malaysia, [3]Department of Food Science and Technology, Universitas Bakrie, Jakarta, Indonesia, [4]Department of Food Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, Bangi, Malaysia, [5]Department of Food Technology, Operational and Quality Management Unit, Faculty of Food Science and Technology, University Putra Malaysia, Seri kembangan, Selangor Darul Ehsan, Malaysia

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EDITED AND REVIEWED BY
Rosane Freitas Schwan,
Universidade Federal de Lavras, Brazil

*CORRESPONDENCE
Wan Abd Al Qadr Imad Wan-Mohtar,
✉ qadyr@um.edu.my
Zul Ilham,
✉ ilham@um.edu.my
Sarina Abdul Halim-Lim,
✉ sarinalim@upm.edu.my

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Editorial on the Research Topic
Post-pandemic foods: development, processing, acceptance and quality

Post-pandemic foods: development, processing, acceptance and quality

Since the start of the COVID-19 pandemic, we have witnessed significant changes in eating behaviors as individuals have reassessed their attitudes toward health, diet, and wellbeing while experiencing severe lifestyle disruption. As such, the demand for functional foods–foods with improved nutritional qualities that deliver health benefits like reduced fatigue and greater immunity–is growing such as fermented foods like *Kimchi*, *Kicap*, *Douchi*, *Cheonggukjang* and *Tempe* (Wan-Mohtar et al.). These foods come from organic and urban agriculture, both of which are pioneers in new and innovative food systems. As an instance, Besides the indulgence factor, *Yarrowia lipolytica* synthesises a wide range of functional and bioactive compounds that can act as active ingredients in functional beverages, adding to its potential in producing novel beverages (Sorensen et al.).

Given the increase in food insecurity caused by COVID-19 and the global decline in accessible cropland per person, it is critical that researchers examine the ways in which we can produce more bioprotein in less time and with less land (Rahman et al., 2021). Food insecurity increased globally during the pandemic year of 2020, particularly among families with children. Moreover, there is a scarcity of information on how post-pandemic foods can be used from now onwards. Though the pandemic has created an imbalance and disrupted the economy in the food industry, it has had a positive impact on speeding the acceptance of the industry towards digital innovations (Halim-lim et al.). Therefore, in this Research Topic we look to highlight the most recent scientific and technological advances in the development of novel food systems. Both the methods and the novel-food products are renewable, environmentally benign, and circular (reusable, recyclable, or degradable). Furthermore, such innovation has the ability to replace pre-COVID-19 foods while also delivering new and enhanced outcomes such as resource use, food efficiency, and supply efficiency.

Functional food for better health and immunity

Fermented foods are poised to revolutionize the culinary landscape, offering enticing alternatives to traditional meals. Their remarkable versatility lies in their scalability, reliability, affordability, environmental friendliness, and consistent high quality. Moreover, fermented foods align seamlessly with the United Nations' Sustainable Development Goals (SDGs), particularly those pertaining to Zero Hunger (SDG 2) and Good Health and Wellbeing (SDG 3). Their ability to double agricultural productivity (SDG 2.3) and ensure sustainable food production systems (SDG 2.4) further underscores their significance. This trend holds true even for fermented foods that have gained prominence as "superfoods" in recent times.

Digitalizing food operation in post-pandemic era

The review highlighted several food safety and sustainability implications for further investigation in the post-pandemic era. Industry practitioners can glean three key insights from the findings. The COVID-19 pandemic may directly introduce hazards to the food chain, but the rapid adoption of digital technologies (DI) during the pandemic can enhance food safety measures and have mixed impacts on supply chain sustainability and quality (Wan-Mohtar et al., 2019). The study proposes DI technology clusters for safer food and links appropriate technologies to specific sustainability opportunities.

This approach effectively implements DI to address food safety and sustainability, two critical aspects of a resilient food system. The discussion on how DI can support a food system's resilience has gained momentum post-pandemic. Blockchain's application in food safety has grown primarily due to its data security capabilities for traceability, monitoring, and inspection, as well as its contributions to sustainability. IoT-based solutions are emerging as promising technologies, with studies showing their potential to improve food safety monitoring. Integrating IoT and blockchain technologies could revolutionize food system traceability. The study demonstrates how DI can support a sustainable food system. However, small firms, which produce over 70% of the world's food, may struggle to adopt advanced DI. Data fairness issues (Findability, Accessibility, Interoperability, and Reusability; FAIR), data quality concerns, and a lack of standardization hinder DI adoption in the food system. Despite the well-developed FSC risk management frameworks prior to the COVID-19 disruption, the integration of DI with the Food Safety Management system (FSMS) presents intriguing research opportunities.

Food oil from natural biomass

The efficient and economical production of EFAs from microbial biomass faces several challenges. Microbial lipid synthesis involves expenses for carbon and nutrient sources, fermentation process operation, and post-processing lipid separation. Carbon and nitrogen source costs significantly impact overall microbial lipid production costs. Replacing glucose as the carbon source while maintaining high biomass and lipid yields is crucial. Utilizing readily available feedstocks like industrial food waste or high-sugar wastewater can lower processing costs. Starch wastewater, sweet sorghum bagasse, and corncob hydrolysate are promising alternative carbon sources with financial advantages. However, these waste substrates often require pretreatment, increasing overall production costs. Therefore, current efforts focus on reducing downstream processing costs associated with oil extraction, cell wall disruption, and refining (Sohedein et al.).

Maximizing fatty acid synthesis in microbial biomass largely depends on metabolic engineering. Enhancing triacylglycerol and fatty acid synthesis pathways in lipid-producing microorganisms is possible through metabolic engineering. Overexpressing key enzymes that provide cofactors can also improve production efficiency. Alternative strategies like response surface methodology (RSM) for process design optimization using multifactorial research design can help overcome some of these challenges and enhance the economic viability of microbial lipid production by reducing substrate requirements. Additionally, exploring the production of valuable byproducts alongside EFAs, such as enzymes, bioactive compounds, and cell wall polysaccharides like β-glucan, can further reduce costs and improve production viability. There is also a need to look into alternative food production using the landless bioreactor concept such as currently being explored using fungal species such as *Ganoderma lucidum* and *Lignosus rhinoceros* (Sohedein et al.).

Conclusion

Amidst rising food insecurity and declining arable land, scientists must explore innovative food production methods that maximize output while minimizing land and time requirements. The COVID-19 pandemic exacerbated food insecurity, particularly among families with children. Moreover, knowledge of the long-term implications of pandemic-induced dietary shifts remains limited. This Research Topic aims to highlight the latest scientific and technological advancements in developing novel food systems. These novel food items and their production processes adhere to circularity (reusable, recyclable, or biodegradable), renewability, and environmental sustainability. This innovation has the potential to replace pre-pandemic products and deliver enhanced outcomes in terms of supply chain efficiency, food utilization, and resource management. This Research Topic showcases the dynamic use of biomass, both natural and synthetic, to produce post-pandemic foods, addressing critical food security and bioeconomy needs.

Author contributions

WW-M: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing–original draft, Writing–review and editing. ZI: Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Writing–review and editing. WD:

Formal Analysis, Investigation, Methodology, Validation, Visualization, Writing–review and editing. NM: Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing–review and editing. SH-L: Data curation, Formal Analysis, Investigation, Methodology, Project administration, Supervision, Writing–original draft, Writing–review and editing.

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Conflict of interest

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