Review of: "Meta-Omics Analyses of Organic and Conventional Fermented Vegetables Reveal Differences in Health-Boosting Potential"

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Potential competing interests: No potential competing interests to declare.

The study entitled "Meta-Omics Analyses of Organic and Conventional Fermented Vegetables Reveal Differences in Health-Boosting Potential", which is currently under review, addresses the microbiome and metabolome profiles of three naturally fermented vegetables—carrots, peppers, and radishes—grown under either conventional or regenerative organic systems, offering insight into how farming practices affect the health-promoting properties of these foods. Through the use of advanced sequencing techniques (16S rRNA for bacteria, ITS2 for fungi) and untargeted metabolomics (LC-MS), the research reveals that both the microbiome and metabolome of the vegetables differ significantly based on the growing method. These distinctions are reflected in key metabolites, such as amino acids and potentially probiotic microbes.

There is room for improvement in this nice story in food science. The fields of health and food science are rapidly evolving, necessitating the increasing use of new methods and analytical techniques for effective monitoring and problem-solving. Employing NMR and Mass Spectrometry in metabolomics analyses is among the most effective of these approaches. To enhance this paper, the authors should consider the following references:

There is significant potential in this research area, especially within metabolomics, given the recent advances in analytical and spectroscopic methods used for identifying both natural compounds and potential pollutants in various biological tissues (see Molecules, 2020 Oct 9; 25(20):4597. doi: 10.3390/molecules25204597). Recent advancements in NMR spectroscopy have deepened our understanding of potentially active or toxic compounds on a molecular level, allowing for both targeted and untargeted analyses (refer to Metabolites, 2019 Jun 27; 9(7):123. doi: 10.3390/metabo9070123). These studies provide complementary data crucial for identifying useful biomarkers. Additionally, noteworthy improvements in the sensitivity and resolution of NMR-based metabolomics (see RSC Adv. 2021 Feb 25; 11(15):8694-8700. doi: 10.1039/d1ra01103k and Mol Omics. 2021 Oct 11; 17(5):719-724. doi: 10.1039/d1mo00118c) open new avenues for a more comprehensive approach to addressing key issues in food science and medicine.
Moreover, there remains scope for further refinement of this commendable work on the active and biochemically significant compounds in our food and their sources. To further enhance this study, the authors should incorporate findings from recent research across different food types. The publication listed below provides a thorough review of recent advancements in food metabolomics and would be beneficial if succinctly summarized in the paper:

Foods 2021, 10(6), 1249; https://doi.org/10.3390/foods10061249 - This detailed review on food metabolomics, which encompasses the latest developments in the field, should be concisely integrated into a brief paragraph within the study.

https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2022.805782/full - Fluxomics is a cutting-edge field within -omics research that focuses on measuring the rates of intracellular metabolic fluxes, providing a comprehensive view of central metabolism in biological systems. By integrating data from various -omics disciplines, fluxomics offers a holistic picture of molecular interactions. In recent years, it has emerged as a critical approach for studying metabolic phenotypes. A key method involves tracking metabolic fluxes using ^{13}C-labeled molecules, which allows real-time monitoring of metabolic pathways and their associated gene-RNA and protein-metabolite networks. This approach enables a deeper understanding of the dynamics of complex metabolic processes and has found increasing applications in both biotechnology and pharmacology. In this review, we outline the primary fluxomics techniques, experimental platforms, and summarize recent advances in fluxomics research across different biological systems. This methodology should also be referred to as a way of connecting the state of human health and the quality of food people consume.

https://www.sciencedirect.com/science/article/abs/pii/S0956713524003967 - a recently published very successful attempt at food fraud detection (concerning different types of vegetable oils) by the currently available -omics approaches. It should also be referred to.

Implementing the mentioned changes will undoubtedly make this work more appealing to a wider audience.