



# Recent Advancements in the Application of Metabolomics in Food Science and Future Trends

Insha Zahoor<sup>1</sup> · Tariq Ahmad Ganaie<sup>1</sup> · Farhana Mehraj Allai<sup>1</sup> · Tanveer Ahmad Mir<sup>1</sup> · Mehwish Bashir<sup>1</sup> · Faizah Farooq<sup>1</sup>

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## Abstract

**Purpose of Review** In systems biology, metabolomics is a relatively young field that focusses on the high-throughput characterisation of small molecular metabolites of biological systems. It is widely used in various scientific fields, particularly in the food sector. This study examines the most popular food metabolomics analytical technologies and emphasises their relevance for food sample analysis with the use of chemometric data visualisation, with a focus on novel approaches that have emerged recently. The food metabolite classes that are prioritised by the different metabolomics platforms are compared. Applications of metabolomics are discussed in relation to food traceability, food quality safety, and food composition analysis.

**Recent Findings** The introduction and widespread use of mass spectrophotometry imaging, together with other associated technologies and tools for analysis and detection, has made metabolomics applications at the industrial level easier in recent years. Metabolomics techniques allow for a thorough analysis of the volatile chemicals' composition and concentration, which optimises food product processing and production for a more palatable final product.

**Summary** Metabolomics is a relatively new discipline in systems biology that emphasizes on the high-throughput characterization of the small molecular metabolites found in biological systems. It is widely used in various scientific fields, particularly in the food sector. Food metabolomics is the application of metabolomics to human meals, food production, and food processing. Due to changing consumer behavior and the expansion of food firms globally, there is now a major increase in interest in food quality and safety. A range of technologies are needed for food processing, the food supply chain, and even plant breeding. This can be achieved by understanding the biology and composition of the metabolome of food. Moreover, food metabolomics can be used to watch the ripening process to improve crop shelf life and aesthetic appeal, find metabolites linked to pathways that cause postharvest illnesses, and see how different crop types differ and how they are similar. Metabolomics is a good fit for studying such a complicated matrix because of its enhanced detection and prediction capabilities.

**Keywords** Metabolomics · Food traceability · Food authenticity · Technologies

## Introduction

Concerns about food safety and integrity are crucial in the field of food science because of the effects and possible hazards to human health that come from food adulteration. As a result, consumers, food manufacturers, retailers, and regulatory bodies now all share the objective of guaranteeing

authenticity. Although regulatory bodies must constantly update analytical procedures and conditions to verify authenticity, a number of analytical techniques have developed as potential tools to achieve this goal, leading for the efficient enforcement of laws and regulations [1]. Finding a food product's complete chemical profile offers important information about its quality, provenance, and traceability. Changes in metabolite levels are brought on by numerous circumstances, such as production processes, origin of raw materials, and adulteration activities, which can cause variations in the chemical fingerprints [2]. In case of medicinal plants and herbs with relevant nutritional and health-promoting properties, it is crucial to understand the significance

✉ Insha Zahoor  
insha.zahor@gmail.com

<sup>1</sup> Department of Food Technology, Islamic University of Science and Technology, Awantipora, India 192122