

Metabolomics and Flavoromics as Tools for Authentication and Quality Assessment of Tropical Fruits and Traditional Fermented Products

Kriskamol NA JOM

Department of Food Science and Technology, Faculty of Agro-Industry, Kasetsart University, 50 Ngamwongwan Rd., Lad-Yao, Chatuchak, Bangkok, 10900 THAILAND

Correspondence e-mail: kriskamol.n@ku.th

ABSTRACT:

Authentication and quality assessment of tropical fruits and their fermented products represent significant challenges due to variations in cultivar identity, ripening stages, and fermentation conditions. Metabolomics and flavoromics provide comprehensive omics-based platforms to characterize metabolites and volatile compounds, thereby enabling robust differentiation and authentication. In the present study, integrated metabolic and flavor profiling was applied to mango (*Mangifera indica* L. cv. Nam Dok Mai), including cultivars 'Si Thong' and 'No. 4', as well as to fermentation-based products such as mango wine, Khao-Mak (a traditional Thai fermented glutinous rice dessert), and coconut cider. For mango, key biomarkers including palmitic, linoleic, and linolenic acids, β -sitosterol, citric and malic acids, sucrose, glycine, leucine, and ethyl esters (ethyl octanoate and ethyl decanoate) were identified, enabling clear discrimination between cultivars and ripening stages. In mango wine, principal component analysis of 56 metabolites and 33 volatiles highlighted acids, esters, and higher alcohols as markers distinguishing fermentation stages and final product authentication. In the case of Khao-Mak, although derived from glutinous rice rather than fruit, metabolomic and flavoromic profiling revealed lactic acid, acetic acid, and short-chain alcohols as characteristic biomarkers, indicating optimal fermentation time and product differentiation. For coconut cider, acetate and ethyl esters contributed significantly to fruity aroma and correlated with sugar metabolism, serving as reliable indicators of fermentation quality. Collectively, these findings demonstrate the utility of metabolomics-flavoromics as versatile tools not only for authentication of tropical fruits but also for evaluating quality and process control in traditional fermented products. This approach provides a strong scientific basis for quality assurance, value addition, and consumer confidence in fruit- and rice-based food industries.

KEYWORDS:

Metabolomics, Flavoromics, Authentication, Tropical fruits, Fermentation