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Metabolomic analysis reveals structural diversity of pectic polysaccharides from Prunus persica (L.) Batsch and their relationship with purees characteristics

Abstract:

Pectin metabolism and remodeling are closely associated with its concentration and structural characteristics, which play a critical role in determining the quality attributes of mature peach fruit. Nevertheless, our understanding of the underlying mechanisms governing pectin, from its biosynthesis to its conversion into processed products, remains limited. This research focuses on analyzing the structural features of different pectin fractions (sequentially extracted by water, chelate, and sodium carbonate, namely water-soluble pectin (WSP), chelate-soluble pectin (CSP), and sodium carbonate-soluble pectin (SSP), respectively), alongside the physicochemical and rheological properties of purees, as well as metabolomics, among 20 peach varieties with distinct viscosity, turbidity, and color features. Multivariate statistical analysis was applied to elucidate significant differences between these varieties based on the structure of pectin fractions from the perspective of the metabolome. The results show that the varieties are divided into four groups according to 12 key structural features of pectin. The metabolome analysis identified 12 core metabolites. Notably, the elevated levels of homogalacturonan (HG) and galacturonic acid (GalA) in CSP may largely account for the distinct accumulation of homocitrate, inositol, D-galactose, and D-mannose. Correlation analysis showed a significant positive relationship between the backbone and side chain of CSP and the rheological properties of purees. Meanwhile, higher expression of taxifolin and phlorizin chalcone was probably associated with the accumulation of pigments responsible for the various colors of the purees. This study provides theoretical support for improving puree quality and breeding nutrition-enhanced varieties of peach fruit.

Biography

Meng Liu is currently a joint Ph.D. candidate in the Gembloux Agro-Bio Tech, university of Liège, and Institute of Food Science and Technology, Chinese Academy of Agricultural Sciences, majoring in Agro-products processing and utilization. Her research interests focus on structural characterization and functional activity of natural polysaccharide.