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From Waste to Wellness: Exploring Bioactive Carbohydrates in Plant Byproducts for Improved Health

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Abstract: The rise in plant-based consumption and the resulting accumulation of byproducts have created a strong demand for sustainable valorization strategies. To address this need, the food industry must adopt advanced analytical technologies that optimize extraction methods to preserve the bioactive compounds and their health benefits of plant-based materials. In this context, plant-based byproducts should be rigorously evaluated for their content of bioactive compounds, particularly prebiotic glycans such as oligosaccharides and polysaccharides. Recent advances in mass spectrometry have enabled molecular-level insights into carbohydrate structures. This presentation features two case studies examining carbohydrate composition and abundance in Chardonnay and pomegranate byproducts, using integrated “omics” approaches with a focus on mass spectrometry. It also discusses the strengths and limitations of current extraction and derivatization methods used prior to analysis. Chardonnay and pomegranate pomace contain a fascinating diversity of carbohydrates, including monosaccharides, oligosaccharides, and polysaccharides, accounting for around 20-40% of total weight. A total of 178 and 80 oligosaccharides (including isomers) built from 14 monosaccharide units were characterized in Chardonnay and pomegranate pomace. The discovery of these carbohydrates' presence in side streams can promote their valorization as natural sweeteners, prebiotics, and ingredients for functional food/beverage/skincare products.

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