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Valorisation of Food Industry waste via a Biotransformation Protocol for Application in Consumer Products

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In general, anthocyanins (ANCs) lack stability in many environmental conditions, but acylated ANCs are more stable than their non-esterified counterparts. Acylation is typically the final biosynthetic step and acylated ANCs are widely distributed in nature. Large amounts of ANCs remain unexploited as waste from several food industries. This research aims to modify ANCs derived from food waste using enzyme-catalysed biotransformation reactions to produce novel compounds for application in food and cosmetics. Enzymes possess regio- and enantio-selective catalytic properties, and can be recovered and recycled; hence, they are potentially eco-friendly and sustainable. Lipases can be used with fatty acids both for ester formation and hydrolysis, depending on the substrate structure and water availability. Candida antarctica lipase B immobilized on acrylic resin was employed on a model flavonoid system (the disaccharide rutin) and, after many trials under differentiated conditions where various factors were modified, an efficient and environmentally friendly acylation protocol was developed. Using Candida antarctica lipase B at 55 °C over 72 hours, with silicon dioxide as dehydrating agent, led to conversion ratios of up to 50%. This optimised protocol was then applied successfully on ANC-rich food waste, specifically blackcurrant skins left over after the berries had been pressed for juice, and transferred to pilot scale. The derivatives produced were isolated, characterized and evaluated for their lipophilicity and antioxidant activity. This procedure enabled further investigation of the valorisation of ANC-rich food waste, offering a viable process leading to compounds with improved characteristics that can be formulated in novel consumer products.