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Investigating the Potential of Phenolic Compounds as Acceptor Substrates for Levansucrase-catalysed Transfructosylation Reactions

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PURPOSE OF THE ABSTRACT

Due to the promising physiological effects of levan and levan-type fructooligosaccharides, levansucrase (EC 2.4.1.10) has garnered much interest in the pharmaceutical and food industry. Levansucrase is a fructosyl-transferase that can catalyze the synthesis of complex oligosaccharides, by acquiring a fructosyl residue from a donor molecule and performing a non-Lenoir transfer to an acceptor molecule. The mechanism of action of levansucrase toward various carbohydrates has been well documented. However, in-depth studies are still needed to investigate and modulate the ability of phenolic compounds to act as acceptor substrates for levansucrase-catalyzed transfructosylation reactions. The enzymatic glycosylation of phenolic compounds is indeed seen as an attractive means to change their aqueous solubility, stability, and bioavailability. It is an interesting alternative to chemical glycosylation that requires multistep synthetic routes and results in low overall yields. This study characterized the acceptor specificity of levansucrases from Gluconobacter oxydans, Vibrio natriegens, Novosphingobium aromaticivorans and Burkholderia graminis towards various phenolic compounds using sucrose as a fructosyl donor. Their ability to catalyze the synthesis of fructosylated phenolic compounds were investigated via LCMS. The results showed that overall, levansucrase from V. natriegens had the highest catalytic efficiency and activity for the transfructosylation of phenolic compounds, while levansucrase from G. oxydans favored polymerization, oligomerization, or hydrolysis. LCMS analysis further confirmed that more than one fructosyl unit could be attached to the glycosylated phenolic compounds. The transfructosylation of Epicatechin by levansucrase from B. graminis had the most diversified products, with up to five fructosyl units transferred. This study suggests the high potential for application of levansucrase in the glycosylation of phenolic compounds.

FIGURES

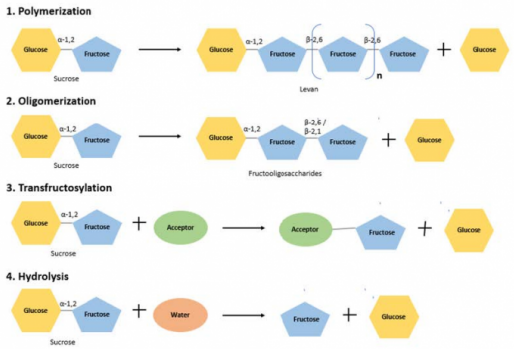

FIGURE 1

Reactions Catalyzed by Levansucrase

no legend

FIGURE 2

KEYWORDS

Levansucrase | Transfructosylation | Phenolic Compounds | Acceptor Specificity

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