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alpha-L-Fucosidases - a tool for the synthesis of prebiotics

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PURPOSE OF THE ABSTRACT

α-L-Fucosidases naturally catalyse the hydrolysis reaction of the glycosidic linkage. However, these enzymes are also capable of catalysing glycosidic bond synthesis reactions. This can be achieved by changing the reaction conditions, such as varying substrates, organic compounds, and salt concentrations. This capability of α-L-fucosidases could be used in fucosylated oligosaccharide synthesis since these compounds comprise the most significant part of oligosaccharides found in human milk and are highly beneficial components of infant milk formula and functional foods. Various studies show antiviral, antimicrobial, and immune response-modulating functions of fucosylated oligosaccharides [1]. However, there is still a lack of sustainable methods to synthesise these stereospecific compounds in high yields. Here, we introduce five bacterial α-L-fucosidases selected via metagenomic library screening. Through bioinformatics analysis, we investigate the characteristics of the sequences and structures of these enzymes. Finally, we evaluate the capability of the α-L-fucosidases to perform the trans-fucosylation reaction resulting in oligosaccharide compounds similar to those found in human milk. We also investigate the products of trans-fucosylation reactions using TLC, HPLC-ELSD, and HPLC-MS techniques. Our findings aim to offer valuable insights into utilising α-L-fucosidases for fucosylated oligosaccharides synthesis. Additionally, we aim to identify the structural properties that may affect the efficiency of the trans-fucosylation reaction.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

#fucosidases | #fucosylated | #oligosaccharidesynthesis | #humanmilkoligosaccharides

BIBLIOGRAPHY

[1] Walsh, C., Lane, J. A., van Sinderen, D., & Hickey, R. M. (2020). Human milk oligosaccharides: Shaping the infant gut microbiota and supporting health. Journal of Functional Foods, 72, 104074. https://doi.org/10.1016/j.jff.2020.104074