

Technical Brief

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One-pot process production of the prebiotic substance, 4'-galactosyl-kojibiose

Technology Summary

A one-pot method for the utilization of raw and by-products of cane and dairy industries such as molasses, jaggery, table sugar, and whey as feedstocks to synthesize prebiotic and functional molecules such as Kojibiose.

Background

Prebiotic biomolecules are selectively metabolized by beneficial bacteria in the colon, exerting several health advantages beneficial to human health, due to which there has been a rapid increase in the consumer demand for prebiotic food additives. 4-galactosyl-kojibiose (4GK) is a promising prebiotic that also provides a well-balanced sweetness profile. Its α -(1 \rightarrow 2) linkages are highly resistant to in vitro and in vivo gastrointestinal digestion. However, the large scale and sustainable production of Kojibiose has been a challenge.

Technology Description

Biocatalytic production of the trisacchride 4-galactosyl-kojibiose (4GK) and disacchride kojibiose was achieved by a two-step enzymatic cascade reaction from low-cost feedstock such as table sugar and whey lactose, by employing dextransucrase and β -galactosidase. Purified dextransucrase enzyme was obtained from a strain of *Leuconostoc mesenteroides*. The biosynthesis of 4GK was achieved by mixing the various feedstocks with the purified dextransucrase at 30 °C for 2 h. After completion of incubation, the enzymatic reactions were stopped by boiling. Kojibiose biosynthesis was achieved by lowering the pH of the above heat-inactivated samples, followed by incubation with purified β -galactosidase at 37 °C for 4 h. The samples containing 4GK or kojibiose were subjected to a digestibility test mediated by stimulated gastric juice. The extent of their digestibility was measured by HPLC analysis. Microbial bio-processing of the feedstock was achieved by inoculating with a culture of native *L. mesenteroides*. Trisaccharide synthesis in the supernatant was examined by analytical techniques.

References

<https://www.marketsandmarkets.com/Market-Reports/paint-coating-market-156661838.html>
<https://www.marketsandmarkets.com/Market-Reports/plastic-additives-market-722.html>

Value Proposition

- One pot and cost effective process for conversion of low-cost starting feedstock (Table sugar+ whey lactose) to a high value biomolecule 4-galactosyl-kojibiose and kojibiose
- Low cost of final product
- 40% conversion of Sucrose+Lactose to 4-galactosyl-kojibiose
- Minimal byproducts
- 100% pure 4-galactosyl-kojibiose

Market Potential

The global probiotics market is estimated to be valued at USD 61.1 billion in 2021 and is projected to reach USD 91.1 billion by 2026, at a CAGR of 8.3% during the forecast period. The demand for probiotics in fortified foods is projected to remain high due to the increasing awareness about their benefits, and willingness of consumers to purchase premium products incorporated with probiotics.

Applications

These functional biomolecules, generated from the bioprocessing of low-cost feedstocks, have immense potential applications in food, nutraceutical, and pharmaceutical industries.

Technology Status

- Demonstrated at lab scale using a 5 L fermenter
- Patent protected
- Seeking interested industry partners

