



## A novel Levansucrase enzyme for efficient production of Fructo-oligosaccharide and Levan from Plant biomass derived feedstocks

TECHNOLOGY AVAILABLE FOR TRANSFER

### UNMET NEED AND OPPORTUNITY

The prebiotic effect of both Fructo-oligosaccharide (FOS) and Levan have found that they are suitable to be added as sweetener in food products or supplements. Intake of FOS to human body occurs through the consumption of fruits, vegetables like artichoke, cereals, honey and Andean Yacon Root. The growing use of Fructo-oligosaccharide or Fructan in food & beverages, infant formula, dietary supplements, animal feed, and pharmaceuticals owing to the low calorific benefit is driving the market growth [1]. It offers a long list of health advantages, including relief from constipation, traveler's diarrhoea, and high cholesterol [2]. The valuation for the Fructo-oligosaccharides market was USD 2.37 Billion in 2020 and it is anticipated to grow USD 5.22 Billion in 2028 with a CAGR of 10.4% during the forecast period [1]. The advancements in novel manufacturing techniques that use **recombinant enzymes**, efficient purification systems, enzyme engineering, and new substrates helps in reducing the manufacturing cost and overall pricing of FOC which would increase the growth of its market. Europe, North America, and Asia Pacific are the main markets of FOS products, Asia Pacific is projected to witness the fastest CAGR of 10.9% during the forecast period, which is expected to hold 24.0% of the market by 2028. In view of the above, efficient method/technology for production of Fructo-oligosaccharides and Levan is important.

### TECHNOLOGY

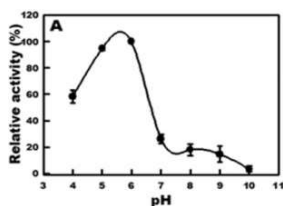
The present technology relates to a route of bioconversion of *in-situ* sucrose present in plant biomass or partially or fully processed products or by-products or residues into prebiotic biomolecules Fructo-oligosaccharides and Levan employing Levansucrase enzyme derived from *Leuconostoc mesenteroids*.

### UNIQUE SELLING PROPOSITIONS

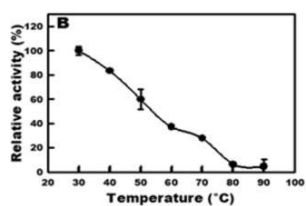
- Recombinant enzyme Levansucrase is able to exhibit substantial catalytic activity in the pH range of 4-6, and a wide range of temperature 25-50°C.
- Enzymatic synthesis process of FOS and Levan is easy and simple over the Chemical synthesis process with high yield of product.
- The FOS and Levan being as a prebiotic molecule have wide range of applications in food, medicine, and cosmetic industries.
- Both the products FOS and Levan can be prepared by employing this enzyme using low-cost raw sugar substrates.
- Synthesized by-products i.e. Melibiose and Manninotriose also have applications in various industries.

### STAGE OF DEVELOPMENT

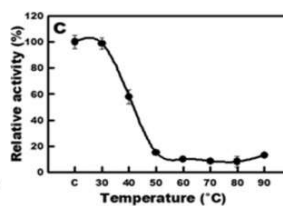
The technology has been validated at the laboratory scale. Currently, the technology is at R&D stage with primary proof of concept established at bench scale.



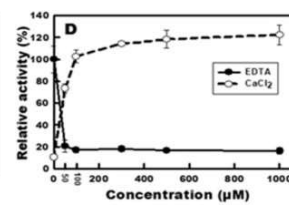
The maximum enzymatic activity of the enzyme was obtained in the pH range of 5 to 6, with 5.5 as the optimum pH



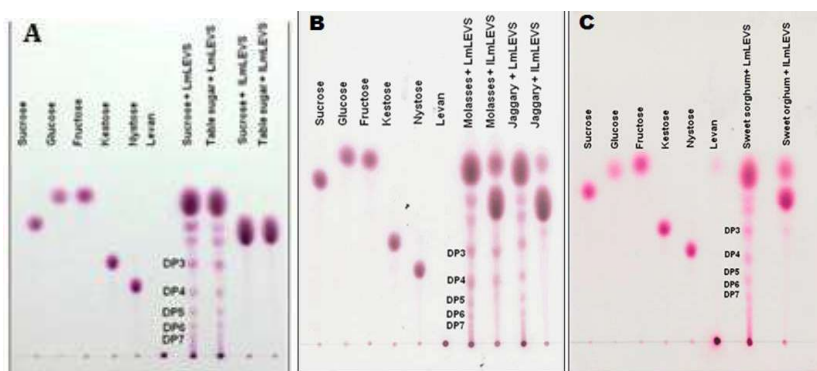
The enzyme exhibited the maximum enzymatic activity at 30 °C



Thermal tolerance test showed that the enzyme showed the catalytic activity between 25-50°C



Enzyme showed more catalytic activity when treated with 100 µM Ca<sup>2+</sup> ions with 50 µM EDTA



TLC chromatography showed the production of Fructo-oligosaccharides and Levan, generated by catalytic action of recombinant enzymes by using Sucrose and Table sugar (Fig-A), Molasses and Jaggery (Fig-B) and sweet sorghum juice (Fig-C) as feedstocks.

## APPLICATION

This enzymatic process is highly promising for the production of FOS and Levan from low-cost raw sugar, table sugar and jiggery. Further, cane molasses can also be used as feedstock to transform the *in-situ* sucrose into FOS and Levan. The polymer Levan is useful in making biofilm.

## INTELLECTUAL PROPERTY

Patent application has been filed in India.

## LICENSING OPPORTUNITY

BCIL is looking for suitable industrial partner for commercialization of this novel recombinant enzyme technology for the production of Fructo-oligosaccharide and Levan from low-cost raw sugar substrates.

## Reference:

- <https://www.verifiedmarketresearch.com/product/global-fructooligosaccharide-fos-market-size-and-forecast-to-2025/>
- <https://www.maximizemarketresearch.com/market-report/fructo-oligosaccharides-fos-market/123240/>

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