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EFFECT OF DIFFERENT CARBON SOURCES ON EXOPOLYSACCHARIDE PRODUCTION BY *Enterobacter* A47

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Abstract

The bacterium *Enterobacter* A47 (DSM 23139) secretes a fucose-containing exopolysaccharide (EPS) when grown on glycerol byproduct from the biodiesel industry. In this work, different carbon sources, including carbohydrates (glucose and xylose) and organic acids (citrate), were tested to evaluate their impact on cell growth and EPS synthesis.

Enterobacter A47 revealed to be a rather versatile bacterium, being able to grow synthesize EPS on all the tested compounds. Glucose proved to be the best source for both growth and EPS production, resulting in a high specific growth rate (~0.47 h^{-1}) and a high specific productivity (1.70 gEPS/gCDW). The use of xylose resulted in cell growth and EPS productivity similar to values obtained previously for glycerol. Although, citrate was also used for EPS synthesis, the productivity was lower than for glycerol or the carbohydrate substrates tested.

The use of different substrates has led to the synthesis of polymers with different composition in terms of sugar monomers and also acyl substituents. For all assays, the main sugar components were glucose, fucose, galactose and glucuronic acid, but their relative proportion varied. Similarly to the EPS synthesized from glycerol, in the xylose assay the EPS main sugar monomer was fucose (38%mol). On the other hand, this polymer was more enriched in glucuronic acid (18%mol) than the EPS in the glycerol assay (10%mol). The EPS obtained in the glucose and xylose assays, but the fucose content was lower in the former (29%mol). In the citrate assay the EPS main sugar monomer was glucose instead of fucose and the presence of new monomers (rhamnose, mannose and glucosamine) was detected in trace amounts (2-3%mol).

In the glycerol and glucose assays, the EPS had similar acyl substituents composition that accounted for 22-23%wt of the polymers' dry weight, being pyruvate the most abundant (14-15%wt). The EPS produced from citrate had a higher succinate content (13%wt) than all the other EPS of this study (2%wt), as well as a lower pyruvate content (6%wt).

All the EPS synthesized in this study were high molecular weight biopolymers ($1x10^6$-$2x10^6$), within the range of previously reported values for EPS produced by *Enterobacter* A47.

Overall, these results were interesting, since xylose, glucose and citrate, are present in various agro-industrial residues, such as lignocellulosic materials, citrus waste, and others wastes or byproducts. Thus, this bioprocess may be used to valorise those types of low cost materials into different value-added biopolymers.