

Continuous Production of Prebiotic Pectic Oligosaccharides from Sugar Beet Pulp in a Continuous Cross Flow Membrane Bioreactor

Authors : Neha Babbar, S. Van Roy, W. Dejonghe, S. Sforza, K. Elst

Abstract : Pectic oligosaccharides (a class of prebiotics) are non-digestible carbohydrates which benefits the host by stimulating the growth of healthy gut micro flora. Production of prebiotic pectic oligosaccharides (POS) from pectin rich agricultural residues involves a cutting of long chain polymer of pectin to oligomers of pectin while avoiding the formation of monosaccharides. The objective of the present study is to develop a two-step continuous biocatalytic membrane reactor (MER) for the continuous production of POS (from sugar beet pulp) in which conversion is combined with separation. Optimization of the ratio of POS/monosaccharides, stability and productivities of the process was done by testing various residence times (RT) in the reactor vessel with diluted (10 RT, 20 RT, and 30 RT) and undiluted (30 RT, 40 RT and 60 RT) substrate. The results show that the most stable processes (steady state) were 20 RT and 30 RT for diluted substrate and 40 RT and 60 RT for undiluted substrate. The highest volumetric and specific productivities of 20 g/L/h and 11 g/gE/h; 17 g/l/h and 9 g/gE/h were respectively obtained with 20 RT (diluted substrate) and 40 RT (undiluted substrate). Under these conditions, the permeates of the reactor test with 20 RT (diluted substrate) consisted of 80 % POS fractions while that of 40 RT (undiluted substrate) resulted in 70% POS fractions. A two-step continuous biocatalytic MER for the continuous POS production looks very promising for the continuous production of tailor made POS. Although both the processes i.e 20 RT (diluted substrate) and 40 RT (undiluted substrate) gave the best results, but for an Industrial application it is preferable to use an undiluted substrate.

Keywords : pectic oligosaccharides, membrane reactor, residence time, specific productivity, volumetric productivity

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