Continuous production of chitooligosaccharides by an immobilized enzyme in a dual-reactor system

A chitosanolytic activity found in a commercial α-amylase from *Bacillus amylolyquefaciens* (BAN) was covalently immobilized onto glyoxal agarose beads (25% recovery of activity) and assessed for the continuous production of chitooligosaccharides (COS). The immobilization did not change the reaction profile (with chitotriose and chitobiose as major products, using chitosans of different polymerization and deacetylation degrees), but significantly increased the enzyme thermostability. A two-step process was proposed, in which chitosan was first hydrolyzed in a batch reactor to a viscosity that could flow through a packed-bead reactor (PBR), thus avoiding clogging of the column. The relationship between hydrolysis degree of chitosan (1% w/v) and viscosity of the solution was assessed in a batch reactor. A 50% hydrolyzed chitosan did not cause any clogging of the PBR. Under these conditions, the productivity of the PBR at the lowest dilution rate was 37 gCOS L⁻¹ h⁻¹, with a conversion yield of 73%. In contrast, at the highest dilution rate, the productivity was nearly 200 gCOS L⁻¹ h⁻¹, but the conversion yield dropped to around 40%.

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