Effect of agitation and temperature on the enzymatic synthesis of oligosaccharides and dextran in orange juice

LEITE A. (1), FONTELES T. (1), FERNANDES F. (1), RODRIGUES S. (1), OLIVEIRA A. (1)
1 Federal University of Cear, Fortaleza, Brazil

The production of potentially prebiotic fruit juices has been extensively investigated, mainly by enzymatic via. However, there is a lack of studies involving scale-up and the importance of some process parameters. This work evaluated the effect of temperature and agitation on the synthesis of oligosaccharide and dextran in orange juice by dextransucrase from Leuconostoc mesenteroides B-512F. Firstly, the syntheses were performed in a batch reactor at 30 °C, with a synthetic medium containing glucose, fructose (reducing sugars), and sucrose as substrate. A factorial experimental design allowed for determining the optimum carbohydrate concentration. The synthesis in orange juice was carried out by adjusting the sugar concentration to the optimum found with synthetic media - sucrose (75 g/L) and reducing sugars (75 g/L), where reducing sugars were glucose and fructose in equimolar proportions. Magnetic and mechanic stirred-tank reactors at 25 (MAG25, MEC25) and 30 °C (MAG30, MEC30) for 24 h were employed using orange juice as substrate, and samples were taken at regular intervals. The final reducing sugar concentration decreased at 25 °C and increased at 30 °C. MAG25 resulted in the lowest sucrose concentration and favored dextran production. Sucrose was almost totally depleted at 6 h of processing with similar amounts of oligosaccharides for MAG25 and MEC25. Oligosaccharides with a higher degree of polymerization (DP) were produced at 30 °C, and low temperature led to the production of lower DP. The temperature was the more remarkable parameter. Although MAG25 and MEC25 were the best conditions to synthesize oligosaccharides and dextran in orange juice, MEC25 is more suitable and feasible for large-scale production. The oligosaccharides produced in orange juice were resistant to simulated digestion and consumed by the human colonic microbiome, resulting in a higher relative abundance of beneficial bacteria.