

**Título: LEVAN AND ETHANOL PRODUCTION BY SUCCESSIVE FERMENTATION CYCLES USING *Zymomonas mobilis* IMMOBILIZED ON LOOFA SPONGE.**

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**Abstract:**

*Zymomonas mobilis* is a microorganism that presents high potential for the biotechnological ethanol and levan production, because of its high tolerance to ethanol and low biomass production. Loofa sponge is a natural and fibrous material basically composed of cellulose, hemicellulose and lignin with an interlaced structure with high porosity. This support shown advantages, such as good stability to different chemical and physical treatments, biodegradability, non-toxicity, low cost and large surface for cell attachment. The aim of this study was to evaluate the levan-ethanol production by *Zymomonas mobilis* CDBB-603 immobilized on loofa sponge (*Luffa cylindrica*) using repeated bath system. Firstly, discontinuous fermentations were carried out in shake flasks for determinate the better conditions of substrate concentration, temperature and agitation (250 gL<sup>-1</sup> sucrose concentration, 30°C and with no agitation). In this conditions were observed a maximum ethanol and levan production of 13.56 g.L<sup>-1</sup> and 23.94 gL<sup>-1</sup>, respectively. In the sequence, ten successive cycles of fermentation (24 hours each) were carried out in bench reactor using the pre optimized conditions, 200 mL work volume and 12 g loofa sponge with immobilized *Zymomonas mobilis* cells (0.25 gL<sup>-1</sup>). In first fermentation cycle the levan and ethanol production was 16.04 and 29.71 g.L<sup>-1</sup>, respectively. Higher levan production (26.40 gL<sup>-1</sup>) was observed at the fifth fermentation cycle and higher ethanol production (34.64 gL<sup>-1</sup>) was verified at the eighth cycle. Content of immobilized cell varied from 0.25 g.L<sup>-1</sup> (1 cycle) to 0.27 g.L<sup>-1</sup> (10 cycle) and the free cell content varied from 0.62 g.L<sup>-1</sup> (2 cycle) to 2.42 g.L<sup>-1</sup> (8 cycle). Higher substrate assimilation rates were observed at the first cycle (45.43%) and eighth cycle (43.03%). At the last fermentation cycle the immobilized cell content was 0.27 g.L<sup>-1</sup> and it was observed ethanol production of 33.7g.L<sup>-1</sup> and levan production of 24.36g.L<sup>-1</sup>. It was found that the microorganism remained viable and showed potential for levan and ethanol production until the last recycle. Despite the low cell growth and low substrate assimilation rates, immobilized cells remained viable after each recycle and served as starter culture to the next fermentation cycle contributing to prevent down time typical of fermentation discontinuous systems.

**Keywords:** biopolymer; bioethanol; attachment; fermentation.

**Agência de Fomento:** Capes