

Optimization of fermentation conditions for propionic acid production using sugarcane syrup by *Propionibacterium acidipropionici*

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Propionic acid is an organic acid that has high growth inhibition on fungi and bacteria. In the form of ammonium, sodium, calcium, and potassium salts it is widely used as preservative in animal and human foods. Propionic acid is also used as a chemical intermediate in the synthesis of cellulose fibers, herbicides, perfumes, and pharmaceuticals. Propionic acid can be produced by *Propionibacterium acidipropionici* in anaerobic fermentation process. Although the fermentation process was studied many years ago, strain differences performance, culture conditions and medium composition are not well understood. To date, no economically viable industrial process exists that uses this microorganism. We used sugarcane syrup in order to take advantage of sugars and micronutrients to enrich the culture medium, decreasing the use of synthetic inputs and reduce production cost. A strain selection, factorial design and response surface techniques were used to optimize the culture and medium conditions. The experiments were realized in bioreactors to maintain adequate control of variables. We performed an experimental design to select significant variables by Plackett and Burman design (PB). We analyzed the process performance in function of 3 responses: yield (g/g), volumetric productivity (g/l.h) and final product concentration (g/l). We performed a 3 strains selection of *P. acidipropionici* (4875, 4965 and 25562). *P. acidipropionici* 4875 and *P. acidipropionici* 4965 showed a better performance than *P. acidipropionici* 25562. We chose *P. acidipropionici* 4875 to perform the optimization. The process and culture medium variables evaluated were pH, temperature, stirring speed, inoculum concentration, sugarcane syrup (main carbon source), yeast extract (nitrogen source), micronutrients and KH₂PO₄ (phosphate source). After determination of significant variables and selecting the most important we will perform a complete factorial design to find the optimized points of each variable in study.

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