BATCH FERMENTATION OF D-GLUCOSE/CELLOBIOSE MIXTURES BY CLOSTRIDIUM ACETOBUTYLICUM ATCC 824: ENERGETIC AND CARBON SOURCE REGULATION

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Lignocellulosic biomass presents an interesting alternative to fossil carbon sources as a source of renewable energy that respects the environment. Indeed, this abundant resource can be converted by a wide range of thermal, chemical and biological techniques to compounds that can be used as substrate in anaerobic fermentation to produce biofuels and building blocks.

As a general rule, micro-organisms possess regulation mechanisms that ensure the sequential use of the carbon and energy sources present in their environment. These regulations may consequently play a vital role in biomass to energy and building blocks conversion performances. Clostridium acetobutylicum, a promising biomass transformation organism, has the capacity to utilize a wide variety of compounds as carbon and energy sources. These compounds may be present in a complex mixture produced from cellulose conversion. Therefore it is of high importance to understand the potential synergy or inhibiting effects of the cellulose-derived products. The aim of this work is to study this regulation mechanism by using glucose and cellobiose as model substrates, provided alone and in mixtures to Clostridium acetobutylicum. Our experiments show a total consumption of both substrates, alone or in mixtures, with an increment of 30% of microbial growth production of cellobiose over glucose. A diauxic growth (cell growth in two phases) occurs in the presence of different mixtures of D-glucose and cellobiose. In general, D-glucose is the preferred substrate and after its complete consumption, when exhausted, the growth kinetics exhibits an adaptation time, of approximately 1-2 hours, before to be able to use cellobiose (figure 1). This adaptation is probably due to an induction stage that is also accompanied of acid consumption (lactic acid). This study provides a first approach to understand the metabolic changes related to substrate utilization in *Clostridia*.

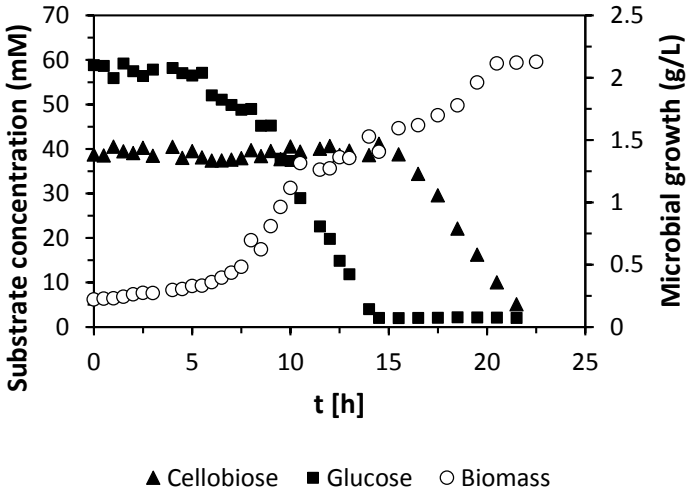

Figure 1. C. acetobutylicum growth kinetics and glucose/cellobiose consumption. Initial glucose and cellobiose concentrations were 58,9 and 38,8 mM respectively. Pre-culture substrate was cellobiose