I10. Industrial and Food Microbiology and Biotechnology

P415. Effect of increased air pressure in gluconic acid production by *Aspergillus niger*

Sílvia Fernandes, Marlene Lopes, Isabel Belo
Centre of Biological Engineering, University of Minho, Braga, Portugal

E-mail: *silvia.fernandes@ceb.uminho.pt*

Gluconic acid (GA) is an organic acid with many applications in food and chemical industries. GA is produced mainly by biotechnological processes and *Aspergillus niger* is the most used microorganism. This acid is obtained by the oxidation of glucose catalyzed by the enzyme glucose oxidase and this reaction has a high oxygen demand. Usually, oxygen is the major limiting factor of the process in common stirred tank bioreactors. This limitation can be overcome by increasing the total air pressure of the bioreactor. The goal of this work is the study of the improvement of oxygen mass transfer rate (OTR) from air to culture medium in the production of GA by *A. niger* 9213 using an hyperbaric bioreactor. Batch cultures were performed using glucose as substrate in the presence of calcium carbonate, in a stainless steel stirred tank bioreactor of 400 mL of working volume, at 1 vvm of aeration rate under 1 bar and 4 bar of total air pressure, corresponding to OTR values of 384 $mg \cdot L^{-1} \cdot h^{-1}$ and 768 $mg \cdot L^{-1} \cdot h^{-1}$, respectively.
The increase of air pressure led to a significant improvement of GA production. A 5-fold increase on GA productivity was reached (around 3 $g \cdot L^{-1} \cdot h^{-1}$) by the air pressure raise as well as on glucose uptake rate. The positive effect of pressure on GA production by *A. niger* was obtained using spores solution as inoculum or a pre-grown mycelium culture.
The use of air pressure increase is an effective alternative way of OTR improvement and this showed its applicability for GA production. It presents several advantages compared to the use of oxygen- enriched air that is costly and requires special handling.

Acknowledgements: This study was supported by the Portuguese Foundation for Science and Technology (FCT) under the scope of the strategic funding of UID/BIO/04469/2019 unit and the PhD grant SFRH/BD/129475/2017, and BioTecNorte operation (NORTE-01-0145-FEDER-000004) funded by the European Regional Development Fund under the scope of Norte2020 - Programa Operacional Regional do Norte.