

Bioprocessing of sugarcane molasses into gluconic acid by *Aureobasidium pullulans*: effect of oxygen transfer rate in stirred and airlift bioreactors: **Contextualization**

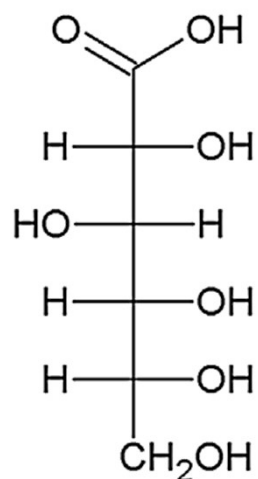


Gluconic acid (GA):

✓ Organic acid E574

✓ Global market of GA — expected to reach a value of **€ 1.9 billion by 2028**

There is an interest in improving GA production



Submerged fermentation
Aspergillus niger from glucose



Aureobasidium pullulans



Sugarcane molasses

- By-product of sugar-cane industry
- 20 times cheaper than pure glucose

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March, 2023

Oxygen is a key factor

$$OTR = k_L a \cdot (C^* - C_L)$$

$$p_G = H_e \cdot C^*$$

$$p_G = y_{O_2} \cdot P_T$$

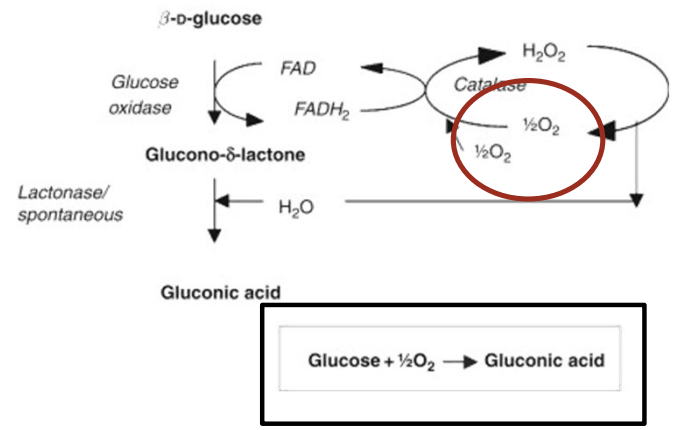
Increased agitation or aeration rates



Increased air pressure

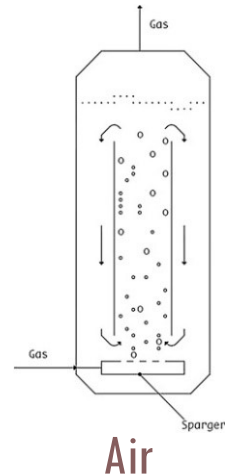


(Henry's and Dalton's law)



- High density cultures
- Complex medium with high sugars concentration

Airlift



Air



Conventional or pressurized STR

✓ Evaluate the effect of increased oxygen transfer rate in three different bioreactors (STR at atmospheric pressure, pressurized STR and air-lift) on sugar consumption and acid production of batch cultures of *A. pullulans*.

STR AT ATMOSPHERIC PRESSURE

PRESSURIZED STR

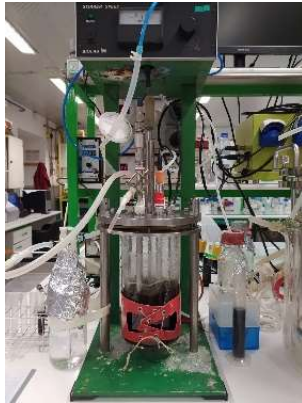
AIRLIFT

- EFFECT OF AGITATION RATE

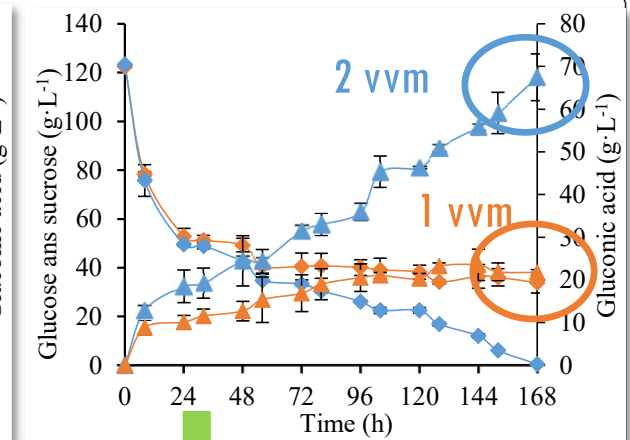
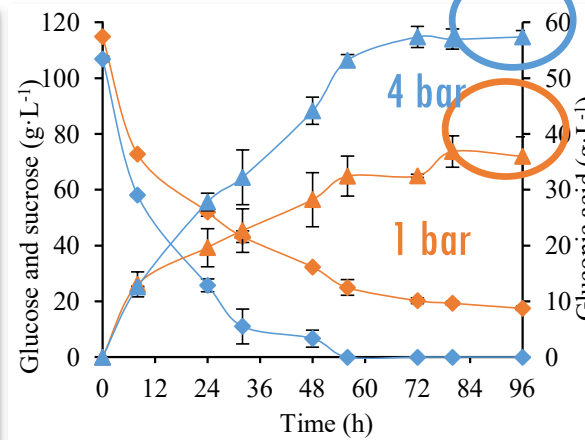
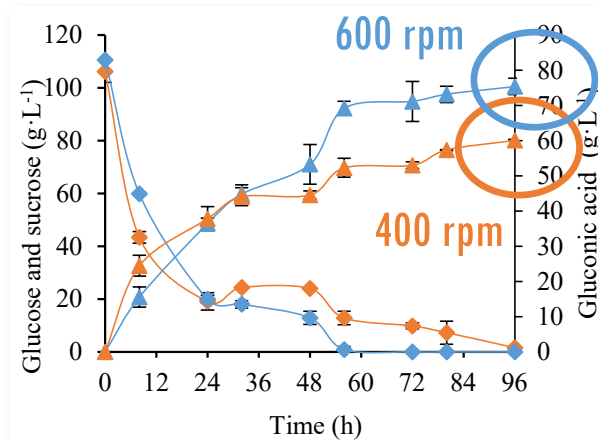
- EFFECT OF AIR PRESSURE

- EFFECT OF AERATION RATE

pH 6.5, 28 °C
Aureobasidium pullulans NCYC 4012
110 g·L⁻¹ of glucose
+ sucrose
3.5 g·L⁻¹ CaCO₃



↑ OTR
↑ GA yield

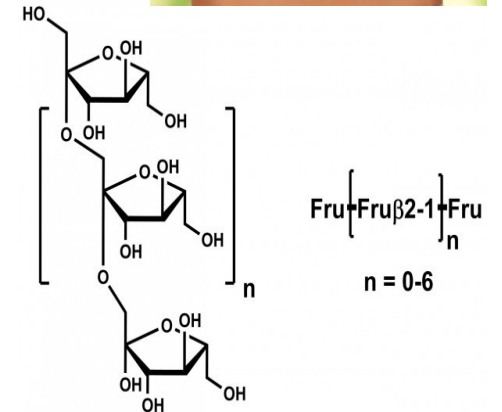


Lower GA productivity

64 g·L⁻¹ of FOS was produced in the first 24 h

The increase of OTR by increasing agitation rate, air pressure, and aeration rate led to a considerable enhancement of GA yield.

Final Remarks



Circular bioeconomy concept



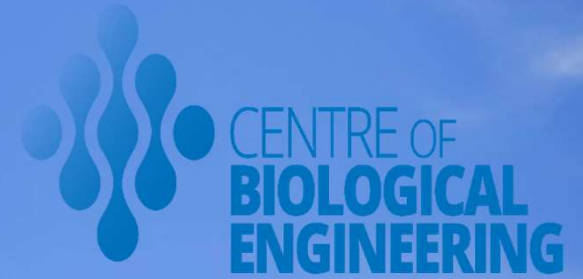
**FOS biosynthesis
(prebiotics)**

Improvement of gluconic acid yield





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*Linking life and technology
to shape the future*

Thank you for your attention!



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This study was supported by the Portuguese Foundation for Science and Technology (FCT) under the scope of the strategic funding of UIDB/04469/2020 unit and the Doctoral grant (SFRH/BD/129475/2017) and LABBELS-Associate Laboratory in Biotechnology, Bioengineering and Microelectromechanical Systems, LA/P/0029/2020.

