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# SCREENING OF NOVEL YEAST INULINASES AND FURTHER APPLICATION TO BIOPROCESSES

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## Abstract

Inulin is a carbohydrate composed of linear chains of β-2,1- linked D-fructofuranose ue through a sucrose-type linkage at themolecules terminated by a glucose resid reducing end. The tubers of several plants, such as Jerusalem artichoke, chicory, dahlia and yacon, contain a large amount of inulin. This polymer can be actively hydrolyzed by microbial inulinases to produce glucose, fructose and value-added products as inulo-oligosaccharides. The glucose and fructose produced by inulin hydrolysis can then be used in bioprocesses.

Great attention is focused on renewable sources in fuel ethanol production and Jerusalem artichoke is one of the most interesting materials among unconventional raw materials, due to the high production of fermentable sugars. Tubers contain about 25% dry matter, consisting mostly from carbohydrates, being inulin the most important one, reaching 50-60% of dry matter.

This work is focused on Jerusalem artichoke inulin applications either for bioethanol production or fossil fuels biodessulfurization (BDS) process. For bioethanol production, is advantageous the use of a microorganism that produces the enzymes required for a direct conversion of biomass to ethanol (consolidated bioprocessing - CPB). CBP is gaining increasing recognition as a potential breakthrough for low-cost biomass processing. In this context, the inulinase biosynthesis potential of some yeasts strains isolated from different sources was evaluated in a medium containing Jerusalem artichoke juice (25% v/v), as well as their ability to simultaneously produce ethanol from the fermentable sugars released from Jerusalem artichoke's inulin hydrolysis. Three novel strains presenting extracellular inulinase activity (1678 U/L) and able of a CBP from inulin to ethanol were isolated. The best microorganism was the yeast strain Talf 1, producing 60g/L of bioethanol from Jerusalem artichoke juice containing about 150 g/L inulin.

Moreover the enzymatic extract of this strain was further added to Jerusalem artichoke juice to hydrolyse the inulin producing a high fructose levels syrup to be used within a fossil fuels BDS process by *Gordonia alkanivorans* strain 1B. This strain wasn't able to grow in inulin as the only carbon source, however in a SSF process with inulin and inulinases, strain 1B grew and desulphurized the dibenzothiophene (DBT), a fossil fuels model compound. Promising results are being obtained pointing out the Jerusalem artichoke hydrolysed juice as a less expensive alternative carbon source for BDS processes.

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