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BIOETHANOL PRODUCTION FROM DAIRY EFFLUENTS: IMPROVEMENT OF THE PROCESS EFFICIENCY

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Abstract

Whey and scotta are effluents from dairies, coming respectively from cheese and ricotta processing. Whey contains minerals, lipids, lactose (5-6%) and proteins and its BOD is about 30-60 g/l; *scotta* stills contains mainly lactose and at present it is not reused in any way, thus representing a waste whose disposal is a significant cost for dairies. Alternative destinations of these effluents as culture broth for biotechnological transformations can be a way to reach both goals of improving the added value of the agro-industrial processes and of reducing their environmental impact.

In this work we investigated the way to produce bioethanol from lactose of whey and scotta and to optimize the fermentation yields using the yeast *Kluyveromyces marxianus* var. *marxianus*. Batch fermentations were carried out in fermenter at a laboratory scale, with row whey and scotta as culture media in anaerobic conditions. Different temperatures were tested, in order to check if the thermotolerance of the chosen yeast could be useful to improve the ethanol yield. The residues of lactose and galactose were analyzed at the end of each fermentation. The best ethanol yield was reached from scotta at 37°C, but with a high lactose residue and a final low ethanol concentration, indicating a stuck fermentation. The maximum ethanol concentration, even if with a lower yield than scotta, was reached with fermentations of whey at 37°C, in which the sugars were almost completely exhausted. The increase of temperature to 40°C did not improve the ethanol production, neither with whey nor with scotta.

Both matrices can be considered suitable for ethanol production. Even if the final ethanol concentration reached with scotta can still be increased, by reducing the sugars residues, the good yields obtained indicate that this effluent, that at present is only considered a waste, can become a source. The fermentation can be efficient also at low temperatures, that allow to maintain low the costs of the processes.
