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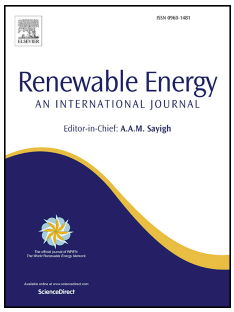

Is cellulase production by solid-state fermentation economically attractive for the second generation ethanol production?

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Is cellulase production by solid-state fermentation economically attractive for the second generation ethanol production?

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Abstract: The cost of enzymes for the enzymatic route of the second generation ethanol production is a crucial bottleneck to turn this process into a reality. Solid-state fermentation (SSF) is an environmentally friendly process of enzyme synthesis, although little is known about the costs associated to it. Therefore, this work analyzed economical scenarios of cellulase production by SSF in a pilot plant integrated to both a first and a second generation ethanol processes. The chosen substrate for the enzyme production was composed by sugarcane bagasse and wheat bran, cultivated by the thermophilic fungus *Myceliophthora thermophila* I-1D3b at 45^{o}C during 96h. The estimation of the most important economic indicators showed that the SSF process is economically attractive, due to its easy integration to the main process, and its revenue is up to four fold greater than electricity cogeneration. Economic indicators, such as the internal rate of return (IRR) and payback, were higher than those usually accepted by Brazilian investor in the sucro-energetic sector. Nevertheless, return on investment (ROI) was under than that recommended by the literature. The sensitivity analysis showed strong influence of the enzyme activity on the economic indicators, being the most important parameter for the project profitability.

Keywords: enzyme, cellulase, solid-state fermentation, economic analysis, second generation ethanol.

1. INTRODUCTION

Bio-based processes are receiving a massive attention from the scientific community, since they are sustainable and ecologically friendly alternatives to face the finite stocks of fossil resources and the greenhouse effects. Examples of using agro-industrial residues and