

A NEW BIOFUEL PRODUCTION BY USING RESPONSE SURFACE METHODOLOGY AND *RHIZOPUS ORYZAE* DERIVED LIPASE

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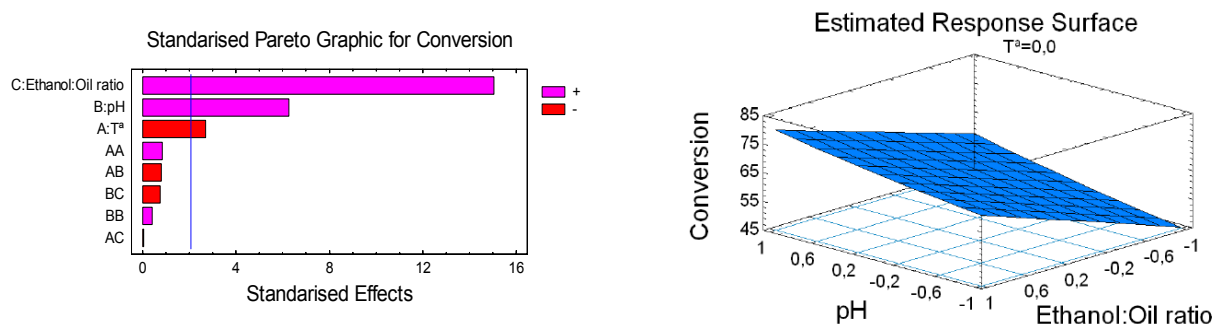
Introduction

Biodiesel has recently become more attractive because of its environmental benefits and the fact that it is made from renewable resources. Currently, biodiesel is commercially made by alkalicatalyzed transesterification of an oil or fat with an alcohol, usually methanol, a process that shifts the glyceride fatty acids from glycerol to methanol, producing fatty acid methyl esters and glycerol [1]. Though efficient in terms of reaction time, the chemical approach to synthesize biodiesels from triglyceride has drawbacks, such as the difficulty in the recovery of glycerol and the energy-intensive costs of the process. In contrast, biocatalysts allow for synthesis of specific alkyl esters, easy recovery of glycerol or no production, and transesterification of glycerides with high free fatty acid content [2]. Therefore, the production of enzymatic biodiesels by lipase-catalyzed chemical reactions under mild conditions has become of commercial interest. An optimized enzymatic synthesis of biodiesel improves the conversion yield and reduces the cost of production in most favourable conditions. The present work focuses on the reaction parameters that affect lipase from *Rhizopus oryzae* (LR) catalyzing the transesterification of sunflower oil with ethanol in free solvent media. The main objectives of this work were to develop an approach that would enable us to better understand relationship between the variables (reaction time, temperature, pH, enzyme amount, substrate molar ratio, and added water content) and the response (percent weight conversion); and to obtain the optimum conditions for biodiesel synthesis using multi level factorial design.

Results and discussion

Results have been summarised in Figure 1. You can see the great influence of the ratio oil / ethanol (proportion), and to lesser extent of pH, while other parameters did not affect significantly.

Figure 1. Pareto Graphic and surface response for conversion.



Conclusions

Lipase from *Rhizopus oryzae* can be used as biocatalyst at optimum conditions to prepare a new kind of biofuel with composition and properties suitable to use in diesel engines. This method has the advantages of avoiding the generation of glycerol as byproduct in the process and its short reaction time. This process minimizes waste generation and maximizing efficiency of the process.

Acknowledgements

This research has been supported by the Instituto Andaluz de Biotecnología (Junta de Andalucía, Project BIOANDALUS 08/13/L35), Consejería de Educación y Ciencia de la Junta de Andalucía (FQM 0162), (FQM 0191), Ministerio de Educación y Ciencia Project CTQ 2007-65754-PPQ, Ministerio de Ciencia e Innovación CTQ 2008-01330/BQU).

Keywords: Lipase; *Rhizopus oryzae*; Biofuel; Ethanolysis; Fatty Acid Ethyl Ester (FAEE); Monoglyceride ¹⁹

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