"Gheorghe Asachi" Technical University of Iasi, Romania

FROM SEEDS TO BIODIESEL: EXTRACTION, ESTERIFICATION, TRANSESTERIFICATION AND BLENDING OF *Jatropha curcas* OIL

**Carmen María Fernández[1], Miriam Solana[1], Luca Fiori[2],
Juan Francisco Rodríguez[1], María Jesús Ramos[1]*, Ángel Pérez[1]**

[1]*University of Castilla-La Mancha, Institute of Chemical and Environmental Technologies (ITQUIMA),
Department of Chemical Engineering, Avd. Camilo José Cela s/n 13071, Ciudad Real, Spain*
[2]*University of Trento, Department of Civil and Environmental Engineering, 38123 Trento, Italy*

Abstract

The aim of this research was to find the optimal method of extracting oil from jatropha seeds and to discovery a technically viable process in which high quality biodiesel can be produced. To begin with, the oil extraction yield obtained with solvent extraction was 34%, using n-hexane in 2 hours. Then, the properties and fatty acid composition of jatropha oil were investigated. We must emphasize that jatropha oil contains about 11% of free fatty acids (FFA), which is far beyond the 1% FFA threshold that allows oil to be converted into biodiesel by transesterification by means of an alkaline catalyst. The FFA was reduced to 0.2% by means of an esterification reaction using a homogeneous acid catalyst in 80 minutes. Therefore, conventional transesterification was carried out so as to obtain a satisfactory result. Then, the comparative in situ transesterification process (that is, extraction and transesterification occurring in one step) was optimized too. Finally, the cetane number, iodine value and cold filter plugging point (CFPP) of several biodiesels (pure jatropha biodiesel and their binary and ternary blends with grape, rape and palm biodiesels) were measured and simulated based on their composition.

Key words: esterification, extraction, in situ transesterification, Jatropha curcas, transesterification

Received: October, 2011; Revised final: October, 2012; Accepted: November, 2012

---

* Author to whom all correspondence should be addressed: e-mail: MariaJesus.Ramos@uclm.es; Phone: +34 926 295300; Fax: +34 926 295242