

Development of a Lipase-catalyzed Neutralization Process Utilizing Jatropha Raw Oil Envisaged to Undergo Conversion to Biodiesel

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Jatropha curcas L. is a plant of the genus *Euphorbiaceae* and widespread throughout the tropics and subtropics. The plant grows quickly, survives in poor, stony soils and is resistant to drought. Since the seeds of *Jatropha* are rich in non-edible oil¹, research focus is set on the production of biodiesel from the oil. The objective of this research activity was the development of an enzyme-assisted, in particular lipase catalysed, process for the neutralisation of crude *Jatropha* oil. The main aim of this enzymatic process was to increase the oil yield compared to conventional neutralization and to reduce the consumption of chemicals and water, respectively. Furthermore as the resulting oil should be used as feedstock for biodiesel production, the remaining free fatty acid content should not exceed 1%. To further improve the sustainability of the process, glycerol -a by-product from biodiesel production -was applied to esterify the free fatty acids in the oil. The efficiency of the neutralisation reaction was analytically evaluated using wet chemical and gas chromatographic measurements. As the main process parameter, the dispersion of glycerol in the reaction medium was identified. Therefore it was important to develop a suitable method for its emulsification first. After that, further parameters influencing the reaction were identified and several lipases were screened concerning their efficiency in the neutralisation reaction. A carrier-bound lipase from *Rhizomucor miehei* was selected for further optimization due to its high activity and stability in the process. Optimum conditions were defined with regard to glycerol and enzyme concentration as well as reaction time and temperature. By this the initial free fatty acid content of 2.0% was decreased to 0.4%. The enzyme-assisted neutralisation process for *Jatropha* oil can contribute to a more sustainable utilization of natural resources due to an increased oil yield, less waste water accumulation and the absence of aggressive chemicals.

[1] Brittain, R., Lutaladio, N.: *Jatropha: A Smallholder Bioenergy Crop. The Potential for Pro-Poor Development*. In: FAO (ed.) *Integrated Crop Management*. Vol.8. Rom (2010)