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## Microwave PRE-Treatment for Improving Oil Recovery of Mechanical Extraction of *Jatropha curcas* L

SEBASTIAN ROMULI, SHKELQIM KARAJ, JOACHIM MÜLLER

*University of Hohenheim, Inst. of Agricultural Engineering, Tropics and Subtropics Group, Germany*

### Abstract

Jatropha kernel contains up to 60 % of oil. Mechanical pressing of Jatropha kernel is an attractive technique to extract the oil. However, the process still has the drawback of low oil recovery efficiency caused by the high tenderness of the material. Thermal pre-treatment of kernel before pressing is seen as a relevant solution, because it increases the temperature of the material, that leads to higher temperature of press head and thus stimulates more oil to be mechanically extracted from the kernel. Among the existing treatments, microwave pre-treatment has received great interest because the heat generated from the electromagnetic field develops in the inner of the kernels and simultaneously inhibits hydrolysis triggered by the enzymes during pressing.

The objective of this study was to investigate the optimum condition of pre-treatment to achieve the highest oil recovery efficiency of *J. curcas* kernels. The mechanical screw press Komet D85-1G was used to conduct the experiments. Nozzle with 6 mm diameter, press cylinder with 1 mm bore size, screw press with choke worm shaft ring size 16 mm, and rotational speed at 19 rpm were set. To support the process, each screw head was constantly heated using a heating device, which was set at 100, 120, and 140°C. The microwave power from 160 to 800 Watt, and the heating time of kernel from 1 to 4 minutes were determined as the process variables.

Oil recovery, capacity, torque, and temperature were monitored and the performance of the process was described. The important physicochemical properties to evaluate the oil quality such as acid value, and carbon residue were also evaluated and compared with oil extracted without using any pre-treatment. The optimum condition of pre-treatment significantly improved the oil recovery and quality.

**Keywords:** Heat, Jatropha kernel, microwave pretreatment, oil recovery efficiency