

# Supercritical Ethanolic Transesterification of Residual Oil of Palm Pressed-Fibers (*Elaeis guineensis* Jacq.)

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## 1. INTRODUCTION AND ANALYSES

The present study aimed the utilization of the resulting fibers from the industrial pressing of palm oil. The palm-pressed fibers (PPF) were physio-chemically characterized and were determined the overall yields of CO<sub>2</sub> supercritical extraction at temperatures of 40 and 60 °C and pressures of 150, 300 and 450 bar. The oily extracts of palm-pressed fibers were analyzed by gas chromatography and carotenoids content; the oily extract obtained in the best condition was characterized by acid, peroxide, saponification, refractive indexes and relative density. Afterwards, transesterification reactions were carried out using ethanol and supercritical CO<sub>2</sub> as co solvent and the following conditions: molar ratios of 20:1 and 40:1 (ethanol:oil); CO<sub>2</sub> mass of  $5.31 \times 10^{-7}$  g; temperatures of 150, 250, and 350 °C; periods of 10, 20, 30, 40, and 60 minutes; pressure of 200 bar and stirring at 600 rpm. The product obtained in the transesterification was analyzed for its content of fatty acid esters.

## 2. RESULTS AND DISCUSSION

The operational condition of the highest overall yield of the oily extract (6.09%) was obtained at 40 °C and 450 bar (Fig. 1). The oily extracts of palm-pressed fibers presented low carotenoids content (5.32 – 26.11 µg/g oil). They also presented more than 80% of saturated fatty acids and their physio-chemical characteristics met or were close to those determined by the *Codex Alimentarius*. Supercritical transesterification showed maximum yield of esters of 99.33%, in the operational condition with molar ratio of 40:1, 150 °C and 60 minutes (Fig. 2.).

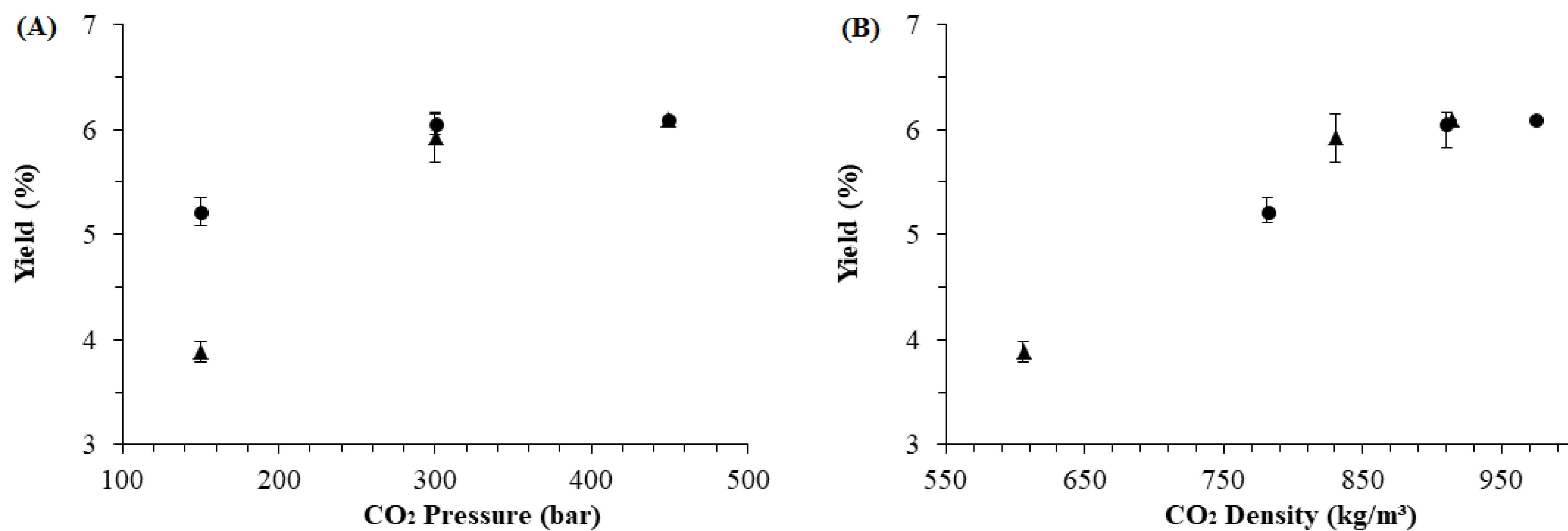


Fig. 1. Global yield isotherms of PPF (*Elaeis guineensis* Jacq.) oil, (●) 40 °C and (▲) 60 °C.

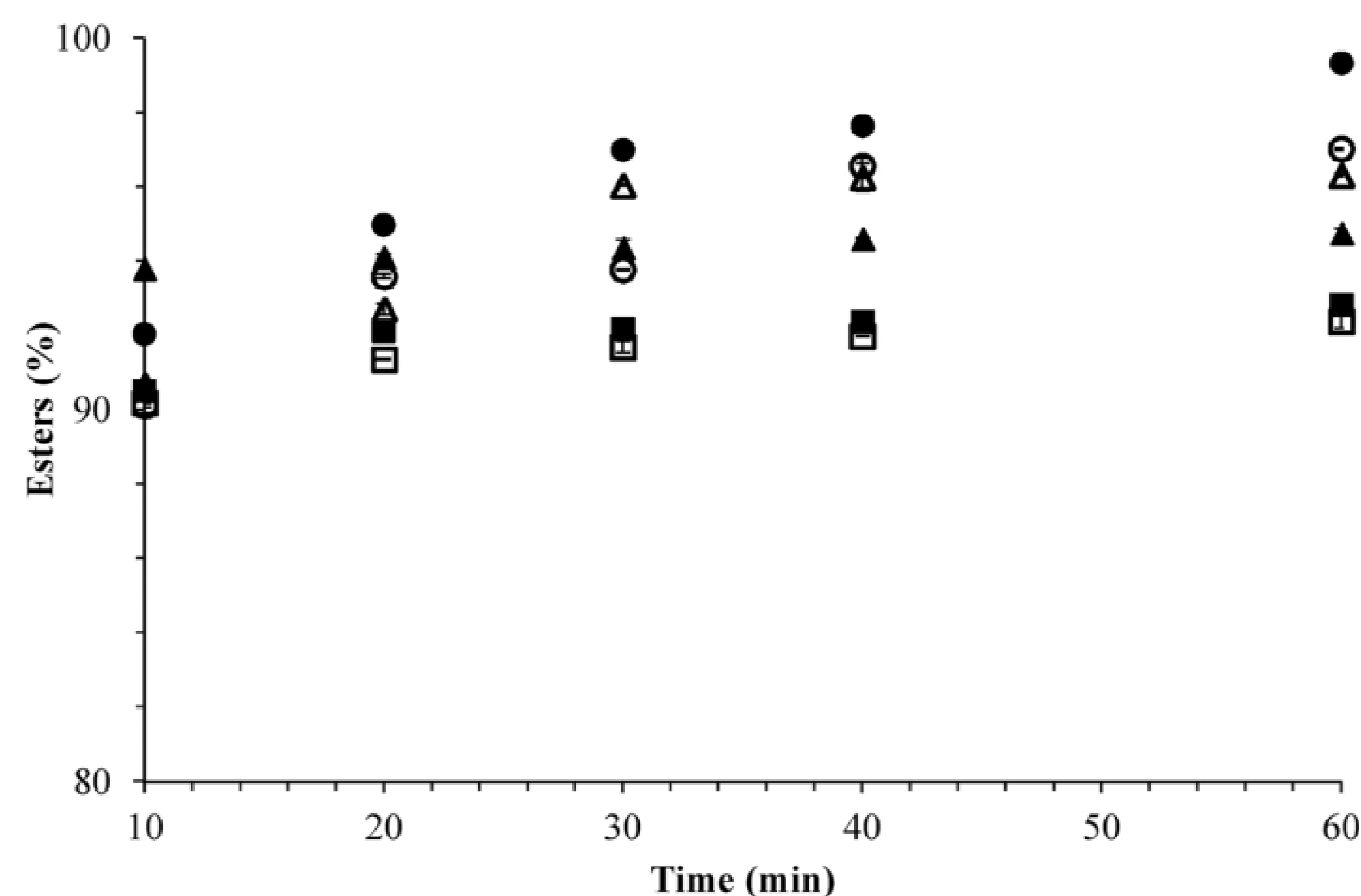


Fig. 2. Conversion rate of ethyl esters in different molar ratios and combinations of temperature and reaction times (○) 20:1 – 150 °C, (△) 20:1 – 250 °C, (□) 20:1 – 350 °C, (●) 40:1 – 150 °C, (▲) 40:1 – 250 °C, (■) 40:1 – 350 °C.