Optimization of Enzymatic Interesterification of Coconut (*Cocos nucifera*) and Sesame (*Sesamum indicum*) Oils using *Thermomyces lanuginosus* Lipase by Response Surface Methodology

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ABSTRACT. Blends of coconut (*Cocos nucifera*) oil (CO) and sesame (*Sesamum indicum*) oil (SO) were enzymatically interesrerified using aqueous lipase derived from *Thermomyces lanuginosus* and the reaction conditions were optimized using Response Surface Methodology (RSM). A three-factor, three-level central composite design (face centred cube design) was employed to optimize the reaction parameters, namely temperature (45-65 °C), time (16-48 h) and mass ratio of oils (CO:SO; 70:30 - 50:50). Lipase, diluted in phosphate buffer (pH 8) was used at 0.2% (v/w) of the substrate. Degree of interesterification (DI), and the ratio of monounsaturated and polyunsaturated fatty acids (MUFA:PUFA) of triacylglycerols (TAGs)were used as response variables. Triacylglycerol (TAG) fractions of the samples were separated using Thin Layer Chromatography (TLC) and the fatty acid composition of TAGs was determined using Gas-Liquid Chromatography (GLC). The linear and squared effects of temperature and time were significant ($p < 0.05$) for DI while the reaction conditions did not exhibit a significant ($p < 0.05$) effect on MUFA:PUFA ratio. The optimum conditions for enzymatic interesterificationwere45 °C (temperature), 40.24 h (time) and 70:30 (weight ratio of CO:SO).Under these optimized conditions, the DI was 28.98% and MUFA:PUFA was 1.50±0.06. According to the response surface regression analysis, the R2 value for DI versus reaction parameters was 91.85% and MUFA:PUFA ratio versus reaction parameters was 61.82%. Therefore it can be concluded that enzymatic interesterification can effectively be applied to develop nutritionally and functionally superior modified oilknown as structured lipids using coconut and sesame oils.

Keywords: Coconut oil, interesterification, lipase, optimization, sesame oil