

Optimization of reaction parameters for production of structured lipid from coconut (*Cocos nucifera*) and sesame (*Sesamum indicum*) oils using Response Surface Methodology (RSM)

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Structured lipids are triacylglycerols (TAG) that are restructured or modified to change the fatty acid composition and/ or their positional distribution in glycerol molecules. Structured lipids are produced by interesterification to have the desired fatty acid composition for improved nutritional or functional properties. The effect of certain reaction parameters (temperature, time and weight ratio of oils) on enzymatic inter-esterification of coconut (*Cocos nucifera*) oil (CO) and sesame (*Sesamum indicum*) oil (SO) was studied using response surface methodology (RSM). Aqueous lipase derived from *Rhizomucor miehei*, diluted in phosphate buffer (pH 8) was used at 0.2% (v/w) of the substrate. A three-factor and three-level face-centred cube design with 20 runs was employed to optimise the following reaction parameters: temperature (45-65°C), time (16-48 h) and weight ratio of oils (CO:SO; 70:30 to 50:50). The degree of inter-esterification (DI) and the ratio of monounsaturated and polyunsaturated fatty acids (MUFA:PUFA) were used as response variables. TAG fractions were separated using thin layer chromatography (TLC) and fatty acid composition of the TAGs was determined using gas liquid chromatography (GLC).

The linear effects of all three factors were significant for the DI which ranged from 9.12 ± 1.63 to 26.31 ± 1.78 while the MUFA:PUFA ratio ranged from 1.24 ± 0.01 to 1.66 ± 0.07 . The linear effect of oil ratio and interaction effect of time and oil ratio too showed significant effects. A temperature of 57.12°C, time of 16 h and a 50:50 weight ratio of oil (CO:SO) were found to be the optimum conditions. According to the response surface regression analysis, R² value for DI and MUFA:PUFA ratio were 0.80 and 0.82, respectively. Models fitted for both DI and MUFA:PUFA ratio were significant with non-significant lack of fit. Therefore, the constructed models and data provide useful information to scale up the production of structured lipids from inter-esterification of CO and SO. The novel lipid produced contains beneficial fatty acids from both coconut and sesame, namely, medium chain fatty acids from coconut oil and MUFA and PUFA from sesame oil which could possibly be used in the production of healthy fat-based products.

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