

# Enzymatic Modification of *Nigella sativa* (Black Cumin) Seed Oil with Conjugated Linoleic Acid to Produce Structured Lipids

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Conjugated linoleic acid (CLA) is a collective term for a mixture of positional and geometric isomers of linoleic acid in which the two double bonds are conjugated. CLA has various biochemical properties, such as a reduction in cancer incidence, a beneficial effect on atherosclerosis, a decrease in body fat content, and an improvement of immune function. CLA also lowers the insulin resistance and consequently insulin levels. On the other hand, *Nigella sativa* L, also known as black cumin, is a member of the Ranunculaceae family and its seeds are exclusively used for seasoning and pharmaceutical purposes. *Nigella sativa* seeds also are a good source of a linoleic-type oil that contains over 60% of this essential fatty acid in its composition.

The objective of this study was to enhance the nutritional properties of *N. sativa* oil by the incorporation of CLA into their triacylglycerols (TAG). The structured lipids were produced from *N. sativa* oil by acidolysis with CLA. Effects of reaction parameters (reaction time, substrate mol ratio and enzyme load) on the incorporation of CLA were studied and reaction conditions were optimized.

In general, acidolysis reactions were conducted using 1.0 g of substrates, Lipozyme TL IM (*Thermomyces lanuginosa*) and 5 mL hexane in an orbital shaker at 200 rpm and at 50 °C. At first, acidolysis products consisted of TAG and free fatty acids (FFA) were filtrated to remove the enzyme. Then the TAG products were separated from FFA by deacidification with 0.02 M NaOH and their fatty acid compositions were determined by gas chromatography.

Series of acidolysis reactions were carried out using the enzyme load of 3-15% (w/w of substrates) and varying the mole ratio of *N. sativa* oil to CLA from 1:1 to 1:5 for 2-8h. The optimal mole ratio of substrates, time and enzyme amount were established as 1:3, 6h and 12%, respectively. At these optimal conditions, the structured lipid containing 38% CLA was obtained.

Thus obtained CLA-rich *Nigella sativa* oil would be used as a source of dietary CLA and linoleic acid in the formulation of food products.