Enzymatic Interesterification of Hard Stocks

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Abstract

The objective of this study was to use enzyme interesterification to produce two hard stocks which were based on hard stocks used in the manufacture of margarine and pastry fats. Both of these two hard stocks produced need to be fast crystallizers; one with a low melting point for spreadable margarine whiles the other with a higher melting point for pastry fats. Commercial hard stocks were provided by Bakels Edible oil (BEO) Ltd. The study was divided into three stages. In the first stage, three commercial lipase enzymes supplied by Novozymes, including Novozyme 435, Lipozyme RM IM and Lipozyme TL IM, were used to interesterify tallow stearin, palm stearin and fully hardened coconut oil mixed in different ratios. The most promising fat blend with the lipase enzyme was selected for optimisation trials in stage two of the study. In stage two, the amount of lipase enzyme was investigated along with the time required to process these fats in order to optimise the interesterification method as both enzymes and production time are cost factors associated with the successful application of this hard stock. The commercial lipase enzymes are the key to the interesterification process and are expensive hence in stage three of this study, the reusability of the enzymes was looked into in order to determine the maximum number of uses that can take place for one dose of enzyme during batch processing. The resulting interesterified fats at the end of each stage were tested for physical properties such as melting point, solid fat content, rate of crystallization, and change in specific heat during crystallization and chemical composition of triglyceride content. The best result for spreadable margarine was a blend of palm stearin and fully hardened coconut oil at 50%:50% and interesterified with 4% of Lipozyme TL IM at 65°C for 8 hours to achieve a melting point of 44°C. The best processing method for pastry margarine was blend of tallow stearin and fully hardened coconut oil at 70%:30% interesterified with 4% of Lipozyme RM IM at 65°C for 8 hours to achieve a melting point of 44°C. Both of these interesterified hardstocks were also fast crystallisers as determined using differential scanning colorimetry and nuclear magnetic resonance instrumentation. Each batch of enzyme was able to be reused up to seven times if washed with acetone and deionized water.

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Contents

List of Abbreviations

Abbreviation	Full name
SFC	Solid fat content
DSC	Differential scanning calorimetry
HPLC	High pressure liquid chromatography
TAG	Triglyceride
ECN	Equivalent carbon number
TS	Tallow stearin
PS	Palm stearin
FHCO	Fully hardened coconut oil
TSFHCO	Tallow stearin and fully hardened coconut oil
PSFHCO	Palm stearin and fully hardened coconut oil
TSPS	Tallow stearin and palm stearin
Cp	Caprylic acid
C	Capric acid
L	Lauric acid
M	Mysteric acid
P	Palmitic acid
O	Oleic acid
S	Stearic acid

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