

Enzymatic interesterification of palm stearin and palm olein blend catalyzed by sn-1,3-specific lipase: interesterification degree, acyl migration, and physical properties

ABSTRACT

Acyl migration of fatty acid at sn-2 is often observed alongside enzymatic interesterification (EIE), causing the loss of lipase selectivity toward the acyl group at sn-1,3. In this study, an oil blend consisting of palm stearin (PST) and palm olein (POL) was interesterified via a chemical interesterification (CIE) and enzymatic method using a packed bed reactor. Characterization in terms of the triacylglycerol (TAG) compositions, sn-2 fatty acid distributions, and solid fat content profiles was performed. In comparison to that of CIE fats, EIE fats showed different modification effects on the solid fat content. Under similar reaction conditions, different interesterification degrees (IDs) were obtained according to the various blend ratios. Using the same mass ratio of substrates (POL/PST of 9:1), the EIE reaction time and temperature affected the ID and the change in the fatty acyl group at the sn-2 position. Under the reaction time of 46 min, an ID of 94.41% was acquired, while at 80 °C, the degree of acyl migration at sn-2 was 92.87%. EIE with high acyl migration exhibited a lower crystallization rate than that of EIE with low acyl migration. However, the effect of acyl migration on crystal polymorphism and oxidative stability was insignificant. Outcomes from this study are meaningful for the establishment of a theoretical basis for a controlled positional-specific EIE that is catalyzed by sn-1,3-specific lipase.

Keyword: Interesterification degree; Acyl migration; Physicochemical properties