

Fractionation of palm kernel oil by short path distillation

ABSTRACT

Fractionation of palm kernel oil (PKO) by short path distillation (SPD) at two feed flow rates (135 g/h and 195 g/h) and six distillation temperatures, TDis (200, 210, 220, 230, 240 and 250 °C) was investigated. Other distillation parameters, such as vacuum pressure (0.001 mbar), blade rotation speed (400 rpm) and temperature of the feed material (60 °C) were kept constant. The fractionated products, known as residue and distillate, were analysed for physico-chemical properties including fatty acid composition (FAC), triacylglycerol (TAG) composition, slip melting point (SMP), thermal analysis by differential scanning calorimetry (DSC) and solid fat content (SFC). Product yield was measured as well. Crystallisation behaviour of PKO and the fractionated products were studied by measurement of isothermal crystallisation, TCr at 0, 5, 10, 15, 20 and 25 °C. The distillates, collected at all fractionation temperatures, were enriched with caprylic, capric and lauric acids. These fractions were also concentrated with low molecular weight and C36 TAGs. Distillates obtained at higher TDis (230-250 °C) exhibited higher in SMP and SFC. On the other hand, the residual oils collected at all fractionation temperatures contained higher amount of long-chain fatty acid and palmitic acid. These fractions were enriched with high molecular weight TAGs. Residues obtained at lower TDis (200-220 °C) were low in SMP and comparable SFC with PKO. Changes in fatty acid and TAG composition resulted in different crystallisation behaviour of the fractions. Distillates collected at all fractionation temperatures crystallised in a sharper peak while residues obtained at higher TDis (230-250 °C) showed broader crystallisation peaks, as shown by the DSC thermograms.

Keyword: Palm kernel oil; Short path distillation; Palm kernel distillates; Palm kernel residues; Crystallisation behaviours