

Physicochemical properties of enzymatically produced palm-oil-based cocoa butter substitute (CBS) with cocoa butter mixture

ABSTRACT

Ternary-blend of palm mid-fraction/palm kernel oil/palm stearin shows comparable palmitic (P), oleic (O), and POP compositions to cocoa butter (CB) which is selected to produce cocoa butter substitute (CBS) using enzymatic interesterification. This study aims to investigate physicochemical properties of CBS and compatibility of CBS/CB. Fatty acid, triacylglycerol, melting profile, solid fat content (SFC), polymorphism, and crystal morphology are determined using GC, HPLC, DSC, pNMR, XRD, and PLM. Ternary-blend and commercial stearic/oleic acids are mixed to produce blend (80% ternary-blend/15% stearic/5% oleic) with three major fatty acids composition comparable to CB. Interesterified blend under optimized conditions of 4% lipase (w/w), incubation time of 6 h at 60 °C shows a melting endotherm at 33.5 °C, similar to CB. The composition of triacylglycerols (POSt and StOSt) of interesterified blend is significantly ($P < 0.05$) increased compared to non-interesterified blend. SFC and polymorphism of interesterified fat are different from CB at 24 °C. Subsequently, the CBS (interesterified blend) is added into CB at varying concentrations (w/w). A total of 5–20% of CBS/CB shows similar melting behavior and polymorphism to CB. A desirable monotectic effect is observed at 15–25 °C for these blends. Therefore, interesterified blend is potentially used as CBS to be added up to 20% with CB for chocolate production.

Keyword: Cocoa butter substitutes; Compatibility; Interesterification; Lipase; Microstructure