Cake margarine provides lubrication, improve palatability (tenderness or shortness) and good taste to cakes. In the production of cake margarine, it is important that the oil blend has the right solid fat content (SFC) profile, $\beta'$ crystal stability as well as possesses manageable crystallisation rate. These properties will ensure good quality cake margarine with the desired functional properties, e.g., firmness and plasticity over a wide range of usage temperature, and excellent creaming and baking performance. A good cake margarine produces cakes of high volume with soft and tender texture, and impart excellent organoleptic properties, e.g., richness, creaminess, slow flavour-release and clean mouth feel (www.walterrauag.com; www.unimills.com). A rather flat SFC profile with about 20% at working temperature (25°C-35°C) and less than 3% at 40°C is desirable as it aids the structural formation of the cakes and ensure a clean mouth feel, respectively (Berger, 1985; Podmore, 2002). The $\beta'$ crystal which appears as a small needle or rod-shaped crystal with a size of less than 1 μm results in a fine crystal network that confers good plasticity and good creaming properties (deMan, 1998). Rapid crystallisation of the blends upon processing is important to ensure that the cake margarine does not develop post hardening and granular crystals upon storage. All these attributes are determined by the solid phase or hardstock of the oil blend.

Palm products, e.g., palm oil (PO) and palm stearin or blends thereof are frequently used as hardstock for cake margarine (deMan, 1998; Miskandar and Nor Aini, 2010; Miskandar and Noor Lida, 2011; Pederson, 1998). However, another important solid fraction of PO i.e., soft palm mid fraction (PMF) with iodine value (IV) of 40-45 and melting point of 28°C-30°C, has limited application in cake margarine formulations due to its triacylglycerol (TAG) composition. PMF is the by-product from fractionation of palm olein (IV56-58) into super palm olein (IV >62), a common practice in palm olein exporting countries e.g., West Asian countries, India, China and Pakistan. It is high in disaturated-monounsaturated ($S_2U$) symmetrical TAG, i.e., the POP (39.2%) and PLP (12.7%), where ‘P’ is palmitic, ‘O’ is oleic and ‘L’ is linoleic acids. The $S_2U$ symmetrical TAG stabilise in $\beta$-triple chain packing and have slow crystallisation. Formulation of cake margarine with fats high in such TAG may results in poor product plasticity and firmness at working temperatures, post-hardening and granular crystals (30−140 μm) development upon storage (Timms, 1984; Lumor et al., 2008). Restructuring of the fatty acid (FA) distribution in the TAG molecules of PMF substantially reduces its
symmetrical S₂U TAG content, expedites its crystallisation rate, stabilises the blend in β’ crystals and improves its SFC profile at usage temperatures of 25°C-35°C. Thus, the PMF is more suitable to be used as the hardstock for cake margarine formulation.

THE HARDSTOCKS

The PMF-based hardstocks have sufficient SFC and right plasticity over a wide range of usage temperature (25°C-35°C), rapid crystallisation upon processing and stabilise in mixture of β’ and β crystals with β’ crystals dominating at usage temperatures (25°C-35°C). These properties are required to produce a good cake margarine formulations. The SFC and crystallisation profiles of the hardstock are shown in Figure 1 and Figure 2, respectively.

PRODUCT’S APPLICATION

The PMF-based hardstocks are suitable for production of good quality cake margarine which possesses good creaming and baking performance. Successfully formulated blends that are able to mimic the SFC profile of commercial cake margarine blends with good plasticity over a broad temperature range are shown in Figure 3. Cake margarine blends having a reduced saturated FA or balance saturated, monounsaturated and polyunsaturated FA could also be formulated using the PMF-based hardstocks. Post-hardening and granulation, which frequently occurs in margarine formulated with high amounts of PMF if not carefully processed, are also averted/reduced by using PMF-based hardstocks in the formulations.

TECHNOLOGY OFFERED

MPOB offers the formulations of PMF-based hardstocks suitable for cake margarine formulations.

PRODUCT’S NOVELTY

- Free of trans FA.
- Rapid crystallisation.
- Stable in mixture of β’ and β crystals with β’ crystals dominating.
- Provide the right plasticity over a wide range of usage temperature.
- Do not develop post-hardening and granulation of products upon storage.

ECONOMIC FEASIBILITY

Production of PMF-based hardstocks are economically feasible to manufacturers who have abundance of PMF from fractionation of palm oil products.

![Figure 1. SFC profile of PMF-based hardstock (blue) as compared to that of PMF (red).](image-url)
REFERENCES


