PALM MID FRACTION-BASED HARDSTOCKS FOR CAKE MARGARINES

NOOR LIDA HABI MAT DIAN; SIVARUBY KANAGARATNAM; MISKANDAR MAT SAHRI; ZALIHA OMAR and RAFIDAH ABD HAMID

734

MPOB INFORMATION SERIES • ISSN 1511-7871 • JUNE 2016 MPOB TT No. 605

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, β' 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 β' 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 β-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

ISSN 1511-7871
9 771511 787001

Malaysian Palm Oil Board, Ministry of Plantation Industries and Commodities, Malaysia
6 Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia. *Tel:* 03-8769 4400 *Fax:* 03-8925 9446 *Website:* www.mpob.gov.my

symmetrical S_2U 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.

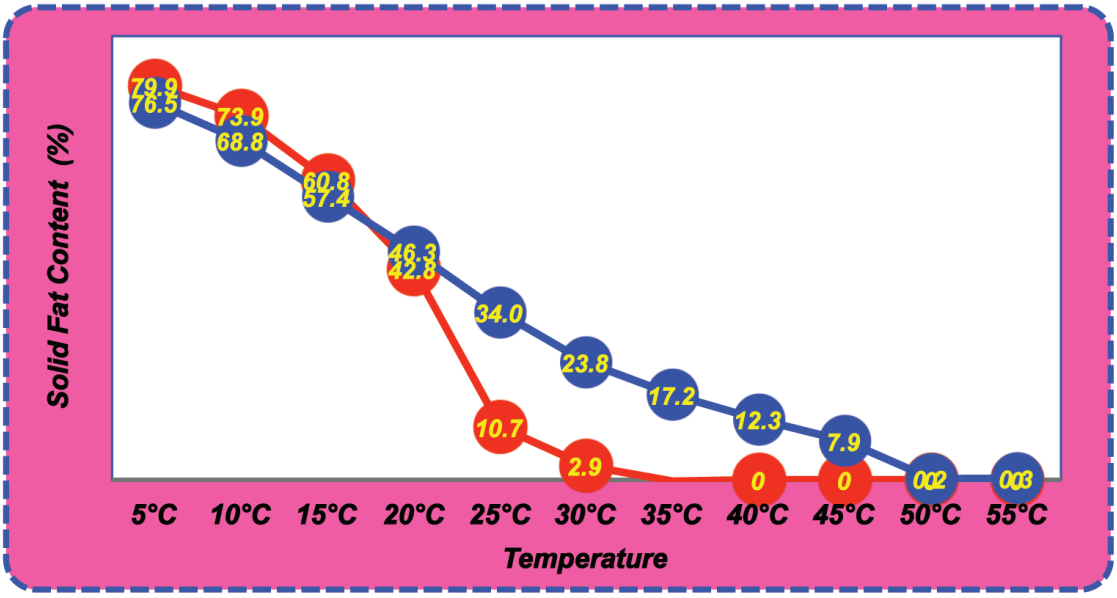

Figure 1. SFC profile of PMF-based hardstock (blue) as compared to that of PMF (red).

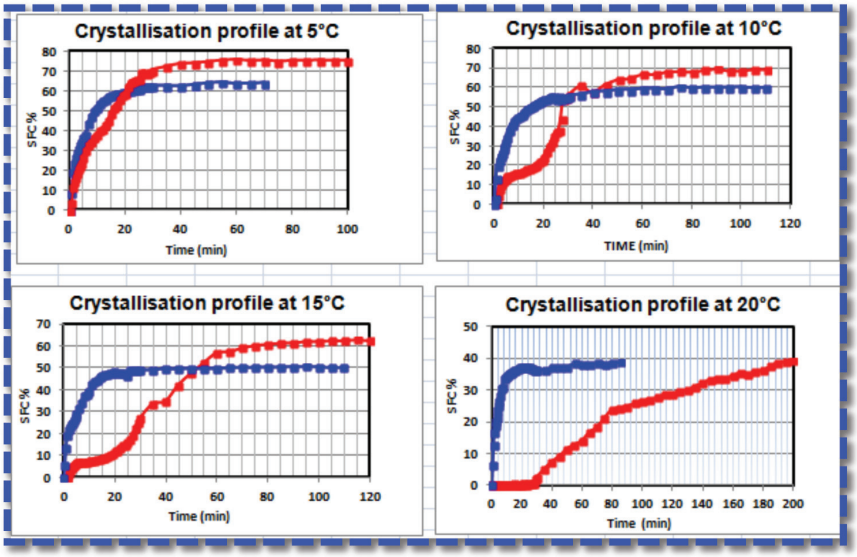

Figure 2. Crystallisation profile of PMF-based hardstock (blue) as compared to that of PMF (red).

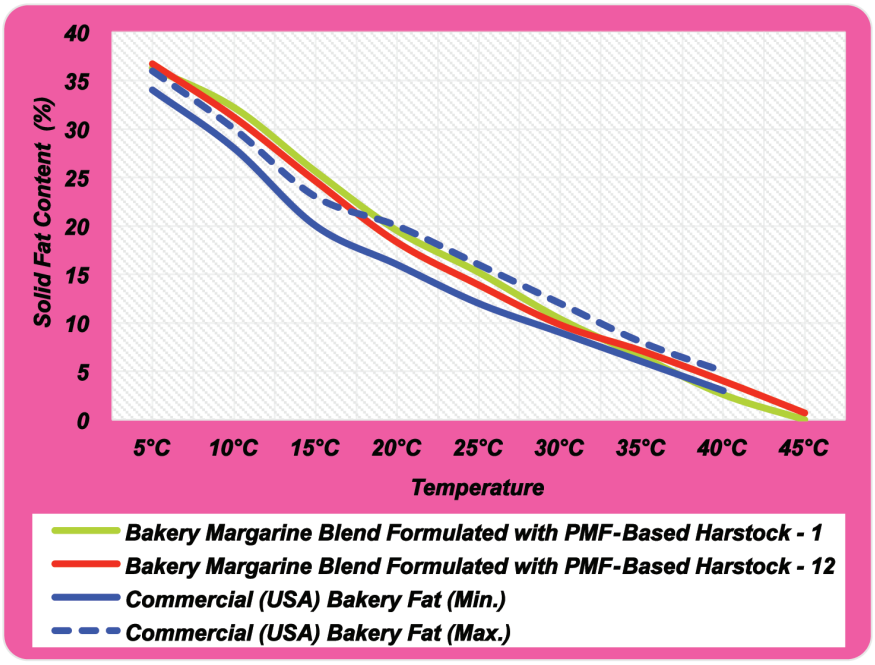

Figure 3. SFC profile of cake margarine oil blends formulated using PMF-based hardstock that mimic the SFC profile of commercial cake margarine blends.

REFERENCES

http://www.walterrauag.com/en/produkte/anwendungen/margarine.php, accessed on 24 March 2016.

http://www.unimills.com/media/Brochures/Delico.pdf, accessed on 24 March 2016.

BERGER, K G (1985). The function of fats in bakery products. Paper presented at the First Product Technology Course, 12-26 November, PORIM, Bangi, Selangor, Malaysia.

PODMORE, J (2002). Bakery fats. *Fats in Food Technology* (Rajah, K K ed.), Sheffield Academic Press, UK. p. 30-67.

DEMAN, J M (1998). Functionality of palm oil in foods. *J. Food Lipids, 5*: 159-170.

MISKANDAR, M S and NOR AINI, I (2010). Palm stearin as low *trans* hard stock for margarine. *Sains Malaysiana, 39*(5): 821-827.

MISKANDAR, M S and NOOR LIDA, H M D (2011). Formulation of *trans* free and low saturated margarine. *J. Oil Palm Res. Vol. 23*: 958-967.

PEDERSON, A (1998). Use of palm, palm kernel, and coconut oils in margarines. *Proc. of the 3rd World Conference Palm and Coconut Oils for the 21st Century*: *Sources, Processing, Applications, and Competition*. Denpasar, Indonesia. p. 85-87.

TIMMS, R E (1984). Phase behavior of fats and their mixtures. *Prog Lipid Res, 23*: 1-38.

LUMOR, S E; KIM, B H and AKOH, C C (2008). Optimization of solid fat content and crystal properties of a *trans*-free structured lipid by blending with palm mid fraction. *J. Agric. Food Chem., 56 (19)*: 9294-9298.

For more information, kindly contact:

Director-General
MPOB
6, Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor,
Malaysia
Tel: 03-8769 4400
Fax: 03-8925 9446
www.mpob.gov.my