

# Modification of Palm and Palm Kernel Oil and their Fractions for Margarine

*Nor'aini Sudin, Miskandar Mat Sahri  
Teah Yau Kun and Flingoh Oh*

In formulating oil blends for making margarines, the food processor has a choice of a number of oils and his choice will depend on various factors amongst which are cost, availability, functionality and the requirements of the consumers. Palm and palm kernel oils and their fractions offer the food processor a choice of oils suitable for incorporation in margarine formulations.

The phenomenon of 'post hardening' is often encountered when using higher amounts of palm oil. Post hardening is a term used to describe margarines which are at first too soft and later become too hard. Post hardening is caused by an increase in the interlocking of the crystals in addition to an increase in the solid phase (Timms, 1991). Several factors have been reported to account for this slow crystallization *i.e.* a high (6% - 8%) content of diglycerides, the presence of PUP and PPU triglycerides and the mutual solution of solid triglycerides in the liquid oil leading to weak nucleation processes (Timms, 1991). Interesterification of palm oil, especially interesterification with other oils, so called corandomization, is often used to overcome post hardening. Blends containing higher amounts (up to 80%) of palm oil can be incorporated without causing post hardening (Timms, 1991).

Evaluation of various blends of palm and palm kernel fractions at PORIM have indicated the suitability of palm and palm kernel fractions as basestocks for margarines. Interesterified palm

stearin and palm kernel olein in the ratios of 70:30 and 60:40 and palm stearin and rapeseed oil in the ratio of 70:30 have been reported to be excellent basestocks (Teah, Y K *et al.*, 1992). Table margarine for tubs can be made by interesterifying ternary mixtures of palm stearin, rapeseed oil or sunflower oil and palm kernel oil or palm kernel olein in the ratio of 40:20:20 (Teah, Y K *et al.*, 1992).

Higher amounts of palm oil may also be incor-



porated if a part of the palm oil or fraction added is hydrogenated. *Tables 1 and 2* show formulations with hydrogenated palm oil with and without a lauric oil.

In optimizing palm oil and its fractions for margarines, blending with fat crystallizing lauric oil, interesterification and hydrogenation techniques may be employed to overcome the slow crystallization associated with the incorporation of high amounts of palm oil.

**TABLE 1. PALM BASED FORMULATION FOR TABLE MARGARINE**

	1	2	3
HPO (42)	30	25	5
PKOo	10		10
SBO	60		35
SFO		50	
PO			50
POo		25	
Solid Fat Content (wideline NMR)*			
Temperature (°C)/Sample	1	2	3
5	20.1	28.3	33.6
10	16.6	22.9	25.5
15	11.9	16.5	16.9
20	8.9	13.9	11.7
25	5.6	8.4	8.5
30	4.0	4.4	5.0
35	2.6	2.0	2.5
40	1.0	0	1.7

**TABLE 2. PALM BASED FORMULATION FOR BAKERY MARGARINE**

	1	2	3	4
HPO (42)	40	50	25	35
PO	30		40	45
PKO		40		5
PKOo			25	
RSO (low erucic)		10		
SFO			10	
SBO	30			15
Solid Fat Content (Wideline NMR)*				
Temperature (°C)/Sample	1	2	3	4
5	52.0	59.1	55.5	51.2
10	45.9	55.9	45.6	44.7
15	36.0	40.0	32.8	35.1
20	28.2	23.4	18.8	27.8
25	20.7	12.6	15.4	16.9
30	12.8	8.2	12.2	10.5
35	7.3	4.8	6.1	5.8
40	2.0	0.8	2.8	2.9
SMP	38.2	35.6	34.9	36.6

Note: \* For solid content measurement, the sample was melted at 70°C for 30 minutes, chilled at 0°C for 90 minutes and kept at the measuring temperatures for 30 minutes prior to measurement.