THE USE OF PALM PRODUCTS IN TOFFEE

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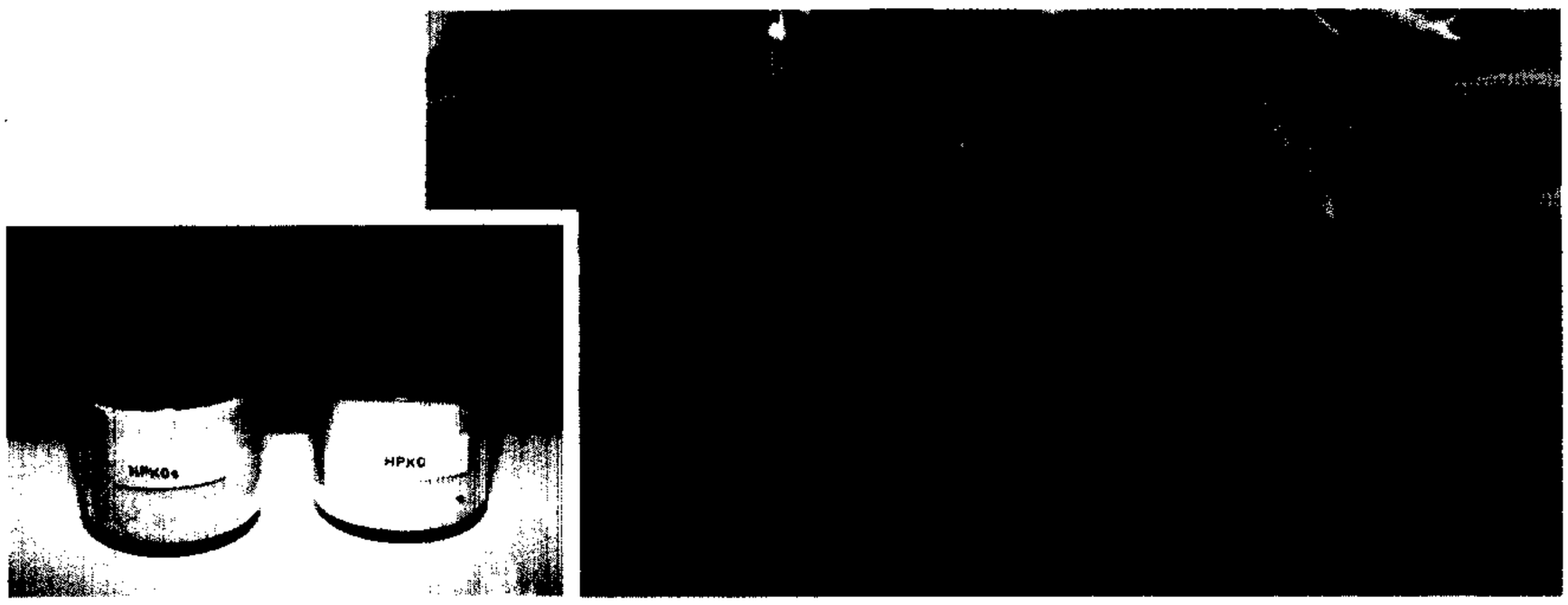

INTRODUCTION

Toffee can be defined as being essentially like highly-cooked caramels with a harder texture. The production of toffee of good texture and taste with an attractive colour and long shelf-life is a worthwhile aim which requires some care to achieve.

Our experimental toffees were initially made from sugar, glucose and water solution boiled to a soft 'crack'; they contained only a little fat and no milk. Later, milk was added to produce toffee of a hard and 'chewy' texture.

FORMULATION

The basic formulation for toffee developed in PORIM is as follows:

Ingredients	Weight (g)
Granulated sugar	75
42 DE glucose syrup	217.5
Full cream sweetened condensed milk	147.5
Fat	60
Salt	2
Water	15
Lecithin	0.5

Toffee was made by the emulsification method. The ingredients were premixed and emulsified at 60°C for 15 minutes; the temperature was then increased to 123°C in 25 minutes.

TYPES OF FAT USED IN TOFFEE

Traditionally, the fat used in toffee is butter and from the flavour standpoint this is certainly significant. Good toffee can also be made from vegetable fats with high oxidation stability and for many years the recognized 'toffee butter' was hardened palm kernel oil (Minifie, 1980). Other fats have also been used, notably hardened coconut and hardened fish oils, but there are some difficulties with carry-over of flavour.

The inclusion of fats in the formulation affects the texture by giving body to the toffee and providing chewiness, lubrication and reasonable resistance to moisture penetration and absorption.

Fats with higher melting points (35°C - 45°C) are preferred in hotter climates (Lees and Jackson, 1973). Since toffee for such climates should be harder, lower melting fats are unsuitable because the toffee produced will be greasy, mainly because of slow migration of the fat from the body of the toffee to the surface. This will increase its susceptibility to rancidity owing to the increase in exposure to the atmosphere.

A good quality toffee should contain 24% - 28% condensed milk and about 18% - 20% fat calculated as percent of raw material on the out turn. For a cheaper product the quantity of milk fat can be reduced but the eating quality will be inferior.

Several types of fats have been tried in the PORIM toffee formulation *(Table 1)*. Data on the properties of these fats are given in *Table 2.*

TABLE 1. FATS USED IN PORIM TOFFEE FORMULATIONS

Code	Fat
1	Interesterified Hydrogenated Palm Kernel Oil and Palm Oil (IE HPKO + PO)
2	Hydrogenated Palm Kernel Stearin (HPKOs)
3	Palm Kernel Olein and Palm Olein (PKOo + POo)
4	Hydrogenated Palm Kernel Oil (HPKO)

TABLE 2. PROPERTIES OF FATS IN PORIM TOFFEE FORMULATIONS

Code	1 (IE HPKO + PO)	2 (HPKOs)	3 (PKOo + POo)	4 (HPKO)
Slip melting point (°C)	37.5	36.4	32.6	32.5
Iodine value (Wij's)	0.7	0.5	42.6	0.5
Solid fat content (%)				
5°C	92.7	96.7	58.0	96.3
10°C	90.9	95.8	42.3	95.4
15°C	88.5	95.0	25.6	94.9
20°C	77.2	93.2	15.6	93.9
25°C	60.5	84.5	10.9	83.4
30°C	40.5	47.9	7.9	47.2
35°C	14.5	6.5	5.0	2.4
37°C	6.5	2.9	3.6	1.6
40°C	2.1	-	2.3	-

The melting points of the fats were in the range of 32°C to 37°C. Palm kernel olein with palm olein (PKOo + POo) has the highest iodine value (42.6), i.e. the degree of unsaturation is very high. Hydrogenated palm kernel stearin (HPKOs) has a similar solid fat content to hydrogenated palm kernel oil (HPKO) but at higher temperatures, the solid fat content profile is steeper. The solid fat content profile of palm kernel olein with palm olein (PKOo + POo) seemed to be flatter than those of the other fats.

As shown in *Table 3*, after being stored at 20°C for one month, toffee produced from hydrogenated palm kernel stearin (HPKOs) had the highest yield value: a higher yield value means a harder sample. Toffees produced from the interesterified hydrogenated palm kernel oil with palm oil (IE HPKO + PO) and from palm kernel olein with palm olein (PKOo + POo) had the lowest yield value and were softer in texture.

TABLE 3. HARDNESS OF TOFFEE MADE WITH DIFFERENT FATS

Code	Hardness (Yield Value g/cm^2)
1 (IE HPKO + PO)	37
2 (HPKOs)	456
3 (PKOo + POo)	25
4 (HPKO)	221

Data on the moisture content of toffees after one month of storage at 20°C are shown in *Table 4*. Toffee of optimum quality has a final moisture content of around three percent. In this case the sample made with hydrogenated palm kernel stearin (HPKOs) had the optimum quality. Toffee made from the interesterified hydrogenated palm kernel oil with palm oil (IE HPKO + PO) had the highest moisture content. High moisture content in toffee can result in the development of graining which is undesirable and must be prevented.

TABLE 4. MOISTURE CONTENT OF TOFFEE MADE WITH DIFFERENT FATS

Code	Moisture Content (%)
1 (IE HPKO + PO)	4.76
2 (HPKOs)	3.33
3 (HPKOo + POo)	3.50
4 (HPKOo)	2.26

The toffee samples were assessed for loss in shape, gloss and any changes in the surface appearance. Toffee produced from the hydrogenated palm kernel stearin (HPKOs) had good stand-up properties after storage at 20°C for one month. However, palm kernel olein with palm olein (HPKOo + POo) produced toffees which were greasy and had poor stand-up.

In a preference test conducted in PORIM, toffee made from hydrogenated palm kernel stearin (HPKOs) was preferred to the other samples by most of the panels in terms of texture, taste, appearance and long shelf-life.

These results show that hydrogenated palm kernel stearin (melting point 36°C) can produce toffee of higher quality. In comparison the other palm oil products tried were less suitable and the toffee produced was inferior in terms of the quality and shelf-life.

REFERENCES

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