Advantages of Palm Kernel Oil over Coconut Oil in Foods

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INTRODUCTION

Palm kernel oil has been assuming ever-increasing importance in recent years. Following the introduction of the pollinating weevil to West Malaysia in 1982, kernel extraction ratios have leaped from around 3.5% of FFB weight to 6 per cent.

With the projected increase of Malaysia's crude palm oil production to more than four million tonnes, the kernel crop will touch nearly 1.2 million tonnes, and by the end of the century palm kernel oil is forecast to rank fifth in volume in the world trade in oils, only slightly behind coconut oil.

Palm kernel oil and coconut oil are the two major lauric oils, which are in demand for industrial and specific edible applications. Palm kernel oil and palm oil, though derived from the same plant, are entirely different in terms of chemical composition and physical characteristics. Palm kernel oil is useful in specific applications, particularly in specialty fats.

Palm kernel oil received by Malaysian refiners is of good quality, typically below 2% in free fatty acids. Palm kernel oil can be processed into a variety of products with different characteristics suitable for a wide range of end-use applications. The main areas of usage for palm kernel oil are in confectionery fats, simulated dairy products, biscuit cream, industrial margarines, nut-roasting and spray oils. Palm kernel oil possesses certain distinct advantages over coconut oil in food applications even though they can be used interchangeably.

CHARACTERISTIC OF PALM KERNEL OIL AND COCONUT OIL

Of the two lauric oils, palm kernel oil is a more useful raw material for edible products than coconut oil. This is related to the slight differences in their chemical composition.

The fatty acid composition of the two oils is shown in *Table 1*. Both have a high percentage of lauric acid (C12:0) together with a fair amount of lower fatty acids (C8:0 and C10:0); of the two oils, palm kernel oil has rather less of these short-chain acids. Oleic acid (C18:1) is the main unsaturated fatty acid in both oils, which makes them very stable to oxidation. The oleic acid content of palm kernel oil is significantly higher than that of coconut oil.

Table 2 shows how the fatty acids are combined into triglycerides (defined by carbon numbers) in the two oils.

The C36 triglycerides — which consist mainly of trilaurate — are the largest fraction, in percentage terms, in both oils. The higher percentage of short-chain fatty acids in coconut oil is reflected in the higher percentage of triglycerides with lower carbon numbers (28—34). Hence also the melting point of coconut oil is lower (24°C) than that of palm kernel oil (28°C). With regard to food technology and food flavour, the lower percentage of the shorter chain fatty acids in palm kernel oil is desirable, since they have a very much lower flavour threshold than longer chain acids, and hence if liberated give rise to a very unpleasant taste. The flavour threshold values of some relevant fatty acids are as follows:

TABLE 1. TYPICAL FATTY ACID COMPOSITION OF PALM KERNEL OIL AND COCONUT OIL

Fatty acids	Palm kernel oil (824)	Coconut oil (875)
C6:0	0.3	0.6
C8:0	4.1	7.8
C10:0	3.6	5.9
C12:0	44.7	46.2
C14:0	14.6	16.8
C16:0	7.9	9.4
C16:1	0.2	—
C18:0	2.7	2.3
C18:1	14.6	8.7
C18:2	3.4	2.1
C18:3	1.8	0.1
C20:3	2.1	0.1

TABLE 2. TYPICAL TRIGLYCERIDE COMPOSITION OF PALM KERNEL OIL AND COCONUT OIL.

Triglycerides	Palm kernel oil	Coconut Oil
C28	0.5	0.8
C30	1.3	2.7
C32	6.7	11.3
C34	8.8	15.0
C36	21.3	19.1
C38	16.3	16.9
C40	9.8	10.7
C42	9.3	8.1
C44	6.8	4.8
C46	5.3	2.9
C48	6.0	2.7
C50	2.4	2.1
C52	2.4	1.7
C54	2.8	0.9
C56	0.1	—

Butyric acid (C4)	0.6 ppm
Caproic acid (C6)	2.5 ppm
Caprylic acid (C8)	350 ppm
Lauric acid (C12)	700 ppm
Stearic acid (C18)	15 000 ppm

HYDROGENATION OF PALM KERNEL OIL

Hydrogenation is carried out to remove all the small amounts of linoleic and linolenic acids (C18:2 and C18:3) and some or all of the oleic acid (C18:1). By this means, the oxidative stability of the product is greatly enhanced, which is a prerequisite for confectionery fats. From the solid fat content profile of palm kernel oil and coconut oil, it can be seen that palm kernel oil is slightly softer in consistency than coconut oil at lower temperatures. This is due to the higher content of mono- and di-unsaturated triglycerides in palm kernel oil.

Because of the higher levels of unsaturation in palm kernel oil, there is a greater flexibility in terms of application as compared with coconut oil. Palm kernel oil can be hydrogenated from a melting point of 28°C to 41°C—44°C, palm kernel olein from 23°C—25°C to 45°C—46°C and palm kernel stearin from 31°C—32°C to 35°C. On the other hand, coconut oil with its lower level of unsaturated acid can only be hydrogenated to a melting point of 35°C, which is too low for some applications especially in the tropics or in summer. Hence palm kernel oil and its fractions give greater flexibility in terms of application with the range of melting points attainable by controlling the extent of hydrogenation. The effect of hydrogenation on the solid-fat profile of palm kernel oil is shown in *Figure 1.*

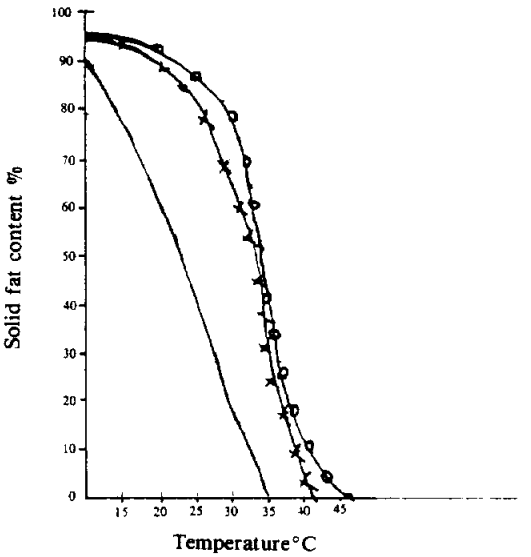

Figure 1. Solid-fat Profile of Palm Kernel Oil
(Refined palm kernel oil, m.p. 28°C:
Palm kernel oil hydrogenated to m.p. 35°C: x — x — x
Palm kernel oil hydrogenated to m.p. 41°C: o — o — o