

Palm Kernel Oil

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ORIGIN, COMMERCE, PROPERTIES AND USES

In the world of oils and fats, the lauric oils are the "aristocrats". There are very few of them, they move in their own higher price plateau and they do not mix comfortably with the common oils and fats. Among the seventeen major oils and fats in world trade, there are only two lauric oils, namely, coconut oil (CNO) and palm kernel oil (PKO). They are called "lauric" because lauric acid is the major fatty acid in their composition (at about 50%), while no other major oil contains more than about 1% (butter fat contains 3%).

Oil Palm Cultivation

Palm kernel oil is very similar to coconut oil in fatty acid composition and properties. The two trees also look rather similar, both are called "palms" but they belong to different genera. Coconut palm is "Cocos nucifera", while the oil palm, which gives both palm oil (PO) and PKO is "Elaeis guineensis". This tree is generally believed to have originated in the jungle forests of East Africa and there is some evidence that palm oil was used in Egypt at the time of the Pharaohs, some 5000 years ago. Nowadays, however, its cultivation is confined mostly to South East Asia.

The variety cultivated in nearly all the world's plantations is the hybrid "Tenera" which gives the highest yield of oil per hectare of any crop. The relative economic efficiency of the oil palm is easily seen from the following simple calculation – soyabeans in the USA give a yield of about 2.5 tonnes of beans per hectare (1 hectare = 2.47 acres), which translates into about 0.5 tonne of oil and 2 tonnes of meal. Taking the price of meal at about 40% of the price of the oil, the total income to the farmer is equivalent to 1.3 tonnes of oil. In Malaysia, oil palms yield an average of 3.75 tonnes of palm oil, plus 0.6 tonnes of palm kernel oil, plus 0.6 tonnes of palm kernel meal, with income equivalent to 4.5 tonnes of oil. Furthermore, the oil palm is capable of vastly greater yields. PORIM has found trees which give more than double the above yields and their palm oil has the iodine value and fluidity of current super-olein. PORIM is also researching tissue culture which, one day, could push yields to twice as much again.

The palm fruit looks like a plum. The outer fleshy mesocarp gives the palm oil, while the kernel (which is inside a hard shell) gives palm kernel oil. It is rather strange that the two oils from the same fruit are entirely different in fatty acid composition and properties. In palm oil, most of the fatty acids are C16 (i.e. have 16 carbon atoms) and higher, while in palm kernel oil, they are C14 and lower.

Production and Exports

The largest palm kernel oil producing country by far is Malaysia, which accounts for more than 52.8% of world production, while two countries, Malaysia and Indonesia together, account for about 80% of production and 90% of exports. No other country produces more than 8% or exports more than 3%.

A record production of 19.904 million tonnes was registered in 1999; an increase of 19.3 percent over the previous year's production of 16.681 million tonnes. Palm oil share in the global oils and fats production jumped from 16.26 percent in 1998 to 18.7 percent in 1999. The year saw significant rebounds in palm oil supply, exports and consumption.

Palm oil is expected to demonstrate an annual growth of 4.57% over the next five years. Production is expected to reach 26.2 million tonnes by the year 2005, and anticipated to account for around 20% of the global oils and fats supply.

Malaysia and Indonesia will be at the forefront of this production growth, with production forecasts of some 12.2 million tonnes by the year 2005 in Malaysia, while Indonesia is expected to reach 9.4 million tonnes in production.

Exports are likely to grow at an annual rate of 5.55% during the period and jump from 13.8 million to 18.1 million tonnes. Accounting for some 41% of global exports of oils and fats.

Composition and Properties

The major fatty acids in palm kernel oil are about 48% lauric acid (C12), 16% myristic acid (C14) and 15% oleic acid (C18:1). No other fatty acid is present at more than 10% and it is this heavy preponderance of lauric acid which gives palm kernel oil and, indeed, coconut oil, their sharp melting properties, meaning hardness at room temperature combined with a low melting point. This is the outstanding property of lauric oils which determines their use in the edible field and justifies their usually higher price compared with most other oils.

Even after full hydrogenation, the melting point of palm kernel oil does not rise much above mouth temperature and fractionation gives a stearin, which is even sharper melting. Sharp melting fats leave a clean, cool, non-greasy sensation on the palate, impossible to match by any of the common non-lauric oils. Cocoa butter and palm mid-fraction come to mind, but they are much more expensive.

Palm kernel oil is about 82% saturated, which is much more than the major liquid oils, such as soybean which is only 16% saturated or sunflower oil which is 12% saturated. Nutritionally, this may be thought of as a great disadvantage, but such simplistic comparisons are misleading. Lauric oils are only used in foods where a solid fat is needed and, when liquid oils are hydrogenated to a similar consistency, they form not only more saturates, but also trans fatty acids which recent studies have shown to be even more objectionable in regard to blood cholesterol profiles than the saturated ones. Another consideration is that because of their higher price and special properties, lauric oils are only used where clearly necessary and so only reach a modest level in our diet. In the UK, for example, annual per capita disappearance (use for all purposes) for both lauric oils combined is 2.2 kg, as opposed to 35 kg for the non-laurics.

Malaysian palm kernel oil bought from origin is often traded according to the Malaysian Edible Oil Manufacturers' Association (MEOMA) specifications, details of which are shown in Table 3. The same body also sets the trading specifications of the other major products derived from palm kernels, such as palm kernel meal, palm kernel stearin, palm kernel olein and palm kernel fatty acids.

Uses

Because of their similarity in composition and properties, palm kernel oil has similar uses to coconut oil in both the edible and non-edible fields. There are, however, some small differences. Palm kernel oil is more unsaturated and so can be hydrogenated to a wider range of products for the food industry, while coconut oil has a somewhat greater content of the more valuable shorter-chain fatty acids, which makes it a little more valuable for the oleochemical industry.

Palm kernel oil and its hydrogenated and fractionated products are widely used either alone or in blends with other oils for biscuit doughs and filling creams, cake icings, ice-cream, imitation whipping cream, substitute chocolate and other coatings, sharp-melting margarines, etc.

Lauric oils (CNO, PKO) are indispensable in soap making. Good soap must contain at least 15% lauric oils for quick lathering, while soap made for use in sea water is based on virtually 100% lauric oils. Lauric oils also confer hardness, solubility and a feel of quality to soap. Coconut oil has been the traditional fat for this application but, by all accounts, palm kernel oil can substitute it perfectly and possibly with some subtle advantages.

In the oleochemical industry, very large amounts of palm kernel oil are now used for the manufacture of short chain fatty acids, fatty alcohols, methyl esters, fatty amines, amides, etc, for use in detergents, cosmetics and innumerable other products. Until relatively recently, these oleochemical products were traditionally made from coconut oil, but with palm kernel oil supplies increasing at a much faster rate and usually at a price advantage, this oil has been making ever increasing in-roads.

This is a remarkable feat by palm kernel oil given the fact that, in world terms, it was much less well known than coconut oil and its supplies have been rising much more rapidly. The main reason is, no doubt, that users have been increasingly able to substitute one lauric oil for the other and so even out price differences. Malaysia, absorbing over half a million tonnes per annum for her oleochemical industry, no doubt helped palm kernel oil prices, but it cannot be the main reason since, in spite of that, in the last five years world exports of palm kernel oil increased by 33%, as opposed to 25% for coconut oil. The good news for buyers is that the rate of Malaysia's oleochemical expansion is bound to slow down and her palm kernel oil exports should start rising again.

Future Prospects

In world terms, palm kernel oil is still smaller than coconut oil by about one third, but the future belongs to it. It is a co-product of palm oil, it has lower cost of production and it is rising at a much faster rate. Furthermore, the coconut producing countries have exactly the climate and soil conditions required for replanting with oil palms which are more profitable. In the working lifetime of most readers of this article, palm kernel oil will become the major lauric oil.