Malaysian Palm Kernel Cake as Animal Feed

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INTRODUCTION

The oil palm sector is one of the major industries in Malaysia. Since the 1970s, Malaysia has been the largest producer and exporter of palm oil products in the world. In the year 2000, Malaysia produced 10.84 million tonnes of palm oil which accounted for 49.9% of the world palm oil production or about 9.4% of world total production of oils and fats. Malaysia exported 9.08 million tonnes of palm oil during the year 2000. Malaysia is also the largest producer and exporter of palm kernel products, especially palm kernel oil and palm kernel cake (PKC). In the year 2000, Malaysia produced 1.38 million tonnes of palm kernel oil and 1.64 tonnes of PKC. Of these, 0.52 million tonnes of palm kernel oil and 1.35 million tonnes of PKC were exported.

TABLE 1. MALAYSIA: ANNUAL PRODUCTION OF PALM KERNEL AND PKC (t)

Year	Palm kernel	PKC
1975	232 821	n.a
1980	557 066	278 559
1985	1 211 887	633 316
1990	1 844 737	1 038 221
1995	2 395 588	1 293 144
1996	2 488 750	1 383 034
1997	2 636 000	1 435 104
1998	2 429 468	1 345 277
1999	3 025 690	1 624 134
2000	3 162 760	1 639 227
2001*	1 366 360	729 197

Notes: n.a - not available.
*January - May.
Sources: Malaysian Department of Statistics (1985); PORLA (1999); MPOB (2000).

PRODUCTION OF PKC IN MALAYSIA

The palm kernels are crushed to yield palm kernel oil and PKC. The yield of PKC is 50%. Since 1996, Malaysia has been producing more than 1.3 million tonnes of PKC annually (*Table 1*). Most of the PKC produced is exported, especially to Europe for use as an ingredient in animal feed formulations.

The European Union (EU) countries absorb more than 85% of Malaysian PKC annually and the Netherlands is the biggest importer of Malaysian PKC among the EU countries (*Table 2*). Asian countries which import Malaysian PKC are South Korea and Japan. In 2000, approximately 1.1 million tonnes or 90% of Malaysian PKC exports to the EU were taken by the Netherlands (*Table 3*).

PKC COMPOSITION

There are two types of PKC depending on the process to get it, *i.e.* either through mechanical or

TABLE 2. MALAYSIAN EXPORT OF PKC (t)

	1997	1998	1999	2000	2001*
EU	998 749	965 070	1 062 986	1 214 698	615 404
Japan	7 004	7 363	13 732	13 113	3 398
South Korea	81 979	179 909	123 434	106 730	100 090
Singapore	-	-	0	6 715	0
Other countries	-	-	6 017	8 676	25 863
Total	1 087 732	1 152 342	1 206 169	1 349 932	744 839

Note: *January - May.
Sources: PORLA (1999); MPOB (2000).

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TABLE 3. MALAYSIAN EXPORT OF PKC TO EU COUNTRIES (t)

	1997	1998	1999	2000	2001*
Belgium	0	0	0	3 304	0
Germany	29 762	44 910	28 610	104 083	33 542
Ireland	16 795	0	0	0	0
Italy	0	4 199	0	0	5 000
Netherlands	863 986	895 714	1 034 376	1 097 933	535 728
Portugal	0	5 882	0	0	0
Spain	0	0	0	9 377	35 128
U. Kingdom	88 207	14 365	0	0	6 005
Total	998 749	965 070	1 062 986	1 214 698	615 404

Note: *January - May.
Sources: PORLA (1999); MPOB (2000).

TABLE 4. MINERAL CONTENT IN PKC

Mineral	Composition
Calcium, %	0.29
Phosphorus, %	0.79
Magnesium, %	0.27
Iron, mg kg^{-1}	4.05
Copper, mg kg^{-1}	28.5
Zinc, mg kg^{-1}	77.0
Manganese, mg kg^{-1}	225.0

Source: Extracted from Yeong *et al.* (1983).

solvent process (*Figure 1*). In Malaysia, mechanical extraction by screw press is the most widely used. The solvent extraction process is generally not used currently due to its higher cost.

The fat content makes PKC an energy feed. PKC also contains approximately 16% fibre. Fibre is considered an essential nutrient for dairy cattle, since cattle fed insufficient fibre often develop metabolic or digestive problems (Miller and O'Dell, 1969). About 17% crude fibre, on a dry basis, is enough to prevent adverse effects of a deficiency for lactating cows (NRC, 1978).

The high phosphorus to calcium ratio in the PKC makes it a good choice to be used for dairy cow feed. These two elements are critical nutrients in the feed, not only as the major elements forming the mineral bases of bones and teeth, but also as the key minerals required in biochemical energy transformation in all body cells. Other elements such as magnesium, copper, zinc and iron, which are essential to animals are also available in PKC (*Table 4*).

USE OF PKC IN CATTLE FEED FORMULATIONS

PKC is a useful source of protein and energy for livestock and it is commonly used in animal feed especially for ruminants (Hutagalung, 1981). Almost all exported Malaysian PKC is used in dairy cow feed (Osman, 1986). PKC is used as a common ingredient in German and Dutch with dairy ration approximately 10% of the cake in the ration, whereas in Malaysia, dairy farmers

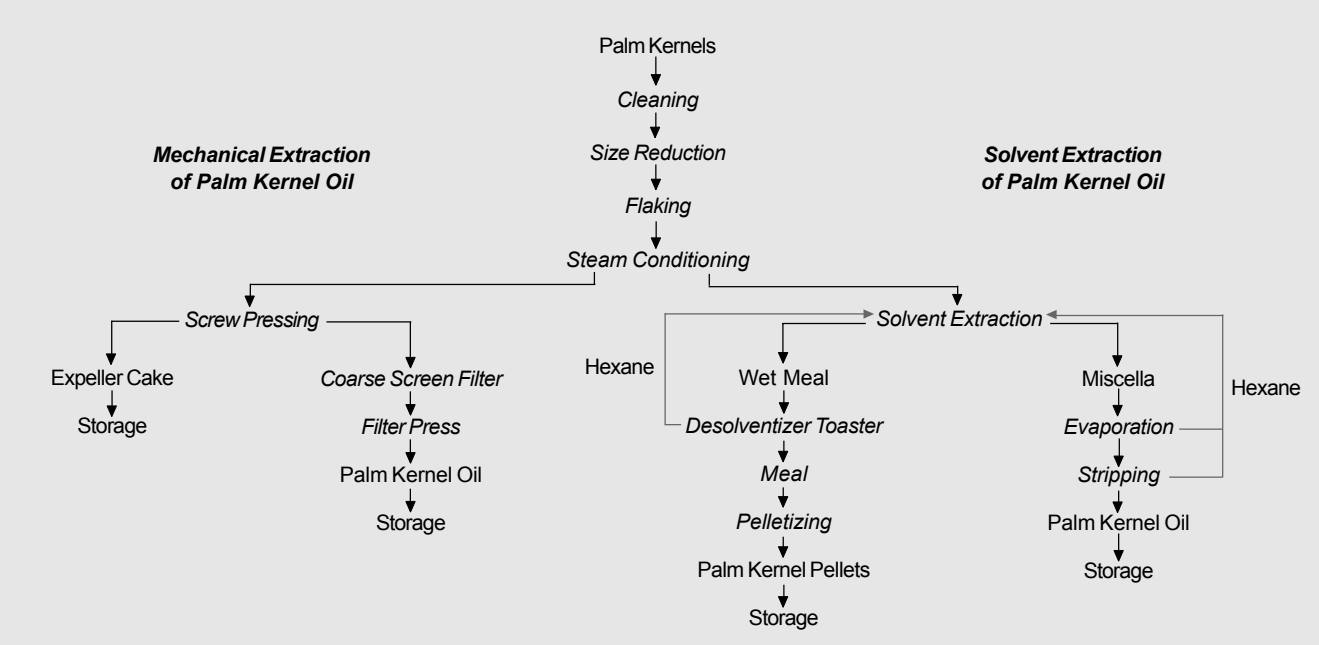

Figure 1. Extractions of palm kernel oil.

use more than 50% (Osman and Hisamuddin, 1999).

The biological value of PKC is 61%-80% for sheep (Devendra, 1978). Feeding palm kernel-based diets to dairy cows has been shown to increase the milkfat content, enhance the firmness of butter and produce good quality meat (Witt, 1952; Morrison, 1956). The milk of dairy cattle fed with PKC tends to produce a firm butter and a ration of 2-3 kg of PKC daily is satisfactory for adult cattle (Bo Gohl, 1981).

Feedstuff rations theoretically can be made up of one or more types of feeds. It needs to have at least 10% protein, 65% total digestible nutrients (TDN), 0.33% calcium, 0.28% phosphorus and about 2200 I.U./kg of vitamin A. Switching over from a grass-based diet to 100% PKC can be done overnight without any observed ill effects (Mustafa *et al.,* 1991). However, a one week change period is recommended in which is gradually reduced until withdrawn completely. Mixed supplements of multiminerals need to be added to PKC at a rate of 2%-3% of the total feed or given as a block lick. Molasses is sometimes added to coax the animal to eat the PKC.

Under intensive management, a supplement of PKC to grass-molasses-based diets has improved the daily weight gains of growing Zebu-Holstein dairy bulls compared to those receiving either grass or grass-molasses mixture (Camoens, 1979). Feeding of Sahiwal-Friesian crossbreds solely on solvent extracted PKC in a commercially operated feedlot showed an average daily weight gain of 749 g and feed conversion of 7 kg feed consumed to 1 kg weight gain (Mustaffa and Hawari, 1985). Under controlled conditions, Sahiwal-Friesian crossbred calves grew at 760 g day^{-1} with a PKC feed conversion ratio of about 1 kg weight gain for every 6 kg of feed consumed. Brahman Cross feeder cattle have been known to put on up to 1.3 kg weight gain daily when fed intensively with 100% PKC. For Brahman Cross cattle, 0.85 kg of average daily gain (ADG) is a common and accepted performance (Mustaffa and Hawari, 1985).

CONCLUSION

PKC has been accepted as one of the components in animal feeds, especially in the EU. Its nutritional value, attractive prices compared to other meals and long-term availability make PKC more competitive in international meal market.

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