PALM KERNEL CAKE AS AN EXFOLIANT IN PERSONAL CARE PRODUCTS

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The oil palm sector represents one of the major industries in Malaysia. The country has been one of the largest producers and exporters of palm oil products in the world. Malaysia is also one of the main producers and exporters of palm kernel products, especially of palm kernel oil and palm kernel cake (PKC) (Hishamuddin, 2001; Yusof *et al.*, 2006).

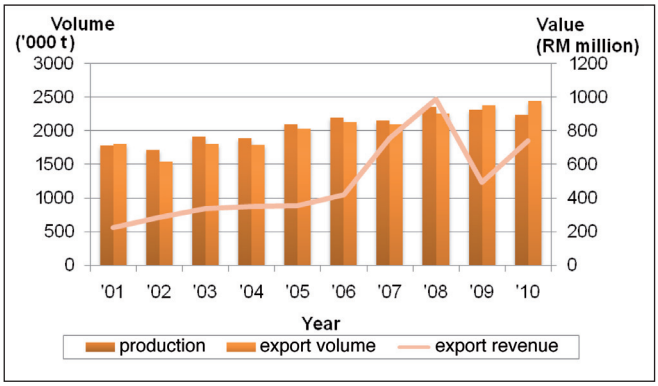
PKC is an important by-product of palm kernel oil extraction. It has long been utilised either as an ingredient in animal compound feeds, or as a straight animal feed, particularly for ruminants. It is an important feed component because of its nutritional value, especially its high protein content (*Table 1*). PKC is also very competitive in terms of price and long-term availability compared to other oil meals. The production of PKC is not seasonal as the oil palm produces fruits all year round which makes it readily available throughout the year.

TABLE 1. AMINO ACID PROFILE OF PALM KERNEL CAKE

Protein/Amino acid	Composition (%)
Total protein (as % of PKC), consisting mostly of the following amino acids:	**16.06**
Alanine	0.92
Arginine	2.18
Aspartic acid	1.55
Cystine	0.20
Glutamic acid	3.15
Glycine	0.82
Histidine	0.29
Isoleucine	0.62
Leucine	1.11
Lysine	0.59
Methionine	0.30
Phenylalanine	0.73
Proline	0.62
Serine	0.69
Theorinne	0.55
Tryptophan	0.17
Tyrosine	0.38
Valine	0.93

Source: Tang (2001).

In the oil palm industry, PKC helps to generate substantial export earnings for Malaysia (Ahmad Borhan *et al.*, 2005). *Figure 1* shows the statistics of the production, export volume and export revenue of PKC over the past 10 years. It clearly shows that the production and export of PKC have increased steadily since the year 2001. However, in terms of revenue, the increment has been inconsistent as its price is highly dependent on the foreign market and on fluctuations in the world's oil meal prices. It will therefore be very beneficial if the usage of PKC could be diversified to add more value and at the same time to make its price less dependent on the oil meal world market.



Source: MPOB (http://econ.mpob.gov.my/economy/EID_web.htm).

Figure 1. Production, export volume and value of PKC.

In the personal care product industry nowadays, consumers are more aware of the benefits of exfoliation, and thus this has created a higher demand for exfoliating products. Body scrubs and exfoliating shower gels are products formulated with cross-polymers, which are small

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beads or particles that act as the exfoliating agent. These products are specially formulated to help remove dead cells from the surface layer of the skin. Currently, various solids are used: some natural, *e.g.* oat bran, molasses extract, aloe leaf powder and apricot seed powder, while others are synthetic, *e.g.* polyethylene and oxidised polyethylene. It is anticipated that PKC has the potential to be utilised in scrub products because it is readily available in a dry, powdered form which is similar to the commercial natural-type exfoliants such as walnut shell powder. In addition, the high protein content of PKC may be beneficial to the skin especially after the exfoliation process, when the skin barrier has been disrupted. The competitive price and availability of PKC throughout the year provide further attractive advantages for its use in the personal care product industry.

PALM KERNEL CAKE IN BODY SCRUB

A body scrub product has been formulated using PKC as the exfoliant (*Figure* 2). The amount of PKC used in the formulation was 10% w/w. An efficacy evaluation was carried out that determined the effectiveness of PKC in its function as an exfoliant in the product. The skin of human volunteers was patched with dansyl chloride as a pretreatment prior to the test. Each volunteer was subjected to four different treatments, i.e. tap water (*control wet*), without treatment (*control dry*), product without PKC (*placebo*) and product with PKC (*PKC scrub*). The treatments were carried out for seven consecutive days. The skin conditions were evaluated before and after treatment with the products by measuring the intensity of the dansyl chloride spot, transepidermal water loss (TEWL), skin pH and skin redness.

The rate of removal of dansyl chloride, *i.e.* intensity reduction, was an indication of the effectiveness of the scrub in removing dead skin cells. The results show that the incorporation of PKC in the scrub increased the effectiveness of removing the dansyl chloride spot (*Figure 3*).

Figure 2. Body scrub with palm kernel cake.

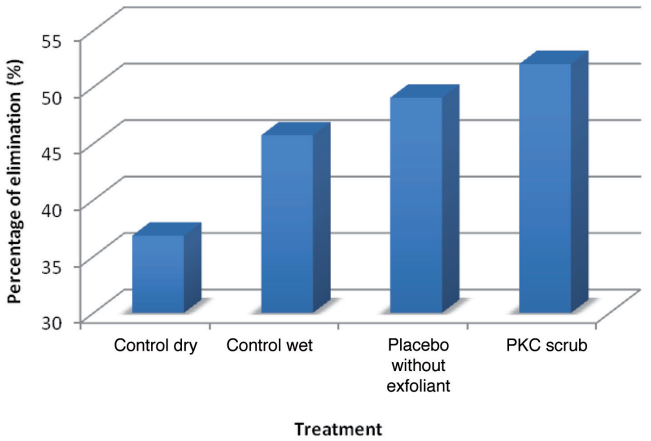

Figure 3. Percentage of dansyl chloride spot eliminated after treatment.

Figure 4 shows the TEWL values where a slight increment was observed for the area treated with the PKC scrub. This is a normal scenario when scrub products are used because the exfoliating process tends to disrupt the skin barrier. However, statistical analysis concluded that the effects were not significant compared to the control. *Figures 5* and *6* show the results for skin pH and skin redness (a* value) after treatment with the products. It was proven that the usage of the product with PKC did not affect skin pH. It also did not induce significant redness to the skin although it was used every day. This means that the use of PKC did not irritate the skin or cause excessive friction to the skin surface.

MARKET ANALYSIS

As the economy improves with the advancement of technologies, consumers become more sophisticated and are more aware of their personal

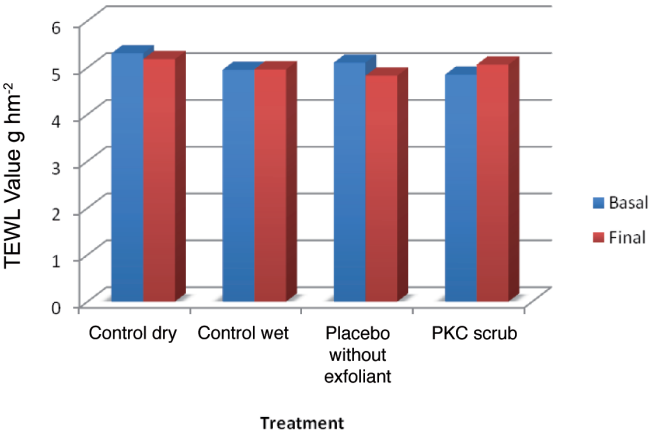

Figure 4. Average TEWL before and after treatment.

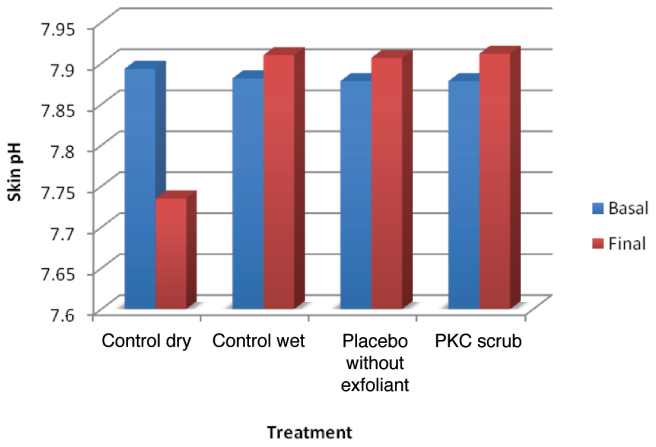

Figure 5. Average skin pH before and after treatment.

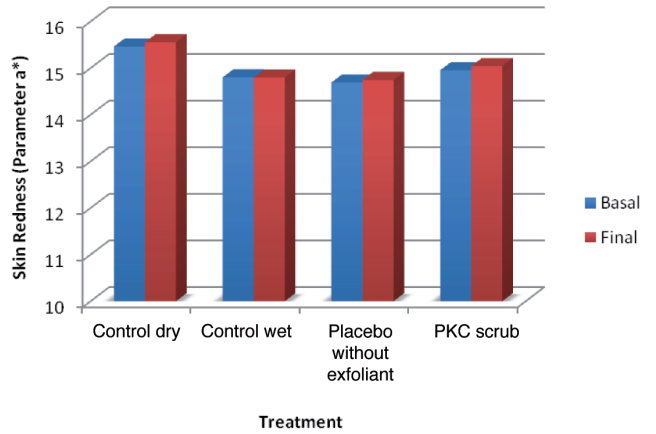

Figure 6. Average skin redness (a value) before and after treatment.*

hygiene. Besides the development of new value-added products containing vitamins, extra moisturising and aroma-therapeutic properties have also boosted the sales of these personal care products. This has been proven when the sales of shower products in Malaysia reached RM 403 million in 2004 (*Table 2*).

PKC is one of the products from the oil palm industry that generates substantial export earnings for Malaysia. However, the price of and demand for PKC are dependent on the foreign market and on fluctuations in the world's oil meal prices. The utilisation of PKC as an exfoliant in personal care products has the potential to promote new market demand for PKC which will make the industry less dependent on foreign market price fluctuations. Currently, the commercial exfoliants used in personal care products cost more than RM 50.00 kg^{-1}, depending on the source of material and quantity purchased. In contrast, the cost of raw unprocessed PKC is only about RM 0.50 kg^{-1}. With some additional treatment processes, *e.g.* grinding and sterilisation, it is estimated that the cost of the targeted end-product would still be cheaper than or comparable to the current commercial exfoliants.

COST ANALYSIS

It is assumed that the cost of producing PKC as an exfoliant will only include the cost of installation of additional facilities for grinding, sterilisation and packing of PKC in existing palm oil mills, which is estimated to be less than RM 500 000, and the cost of additional manpower comprising two to three operators. With the cost of unprocessed PKC at about RM 0.50 kg^{-1}, it is estimated that the processed PKC can be sold up to at least RM 10.00 kg^{-1}, which is much more than when it is used as a feed meal and yet is considerably lower than the prices of existing commercial exfoliants.

CONCLUSION

The potential use of palm kernel cake (PKC) in personal care products, specifically in scrub products, has been found. The results showed that a body scrub with PKC as the exfoliant enhanced the removal of dead skin cells. It was also shown that PKC did not affect the skin pH of the volunteers.

There was also no significant irritation (as shown by skin redness) observed after one week of usage of the product. Overall, the utilisation of PKC in personal care products is expected to benefit both

TABLE 2. SALES OF FACIAL CLEANSERS AND SHOWER PRODUCTS IN MALAYSIA

Product	Year (RM million)					
	1999	2000	2001	2002	2003	2004
Facial cleansers	177.00	185.20	193.30	201.00	210.00	220.50
Shower products	348.50	364.10	377.20	385.00	394.20	403.30

Source: Euromonitor (2005).

the personal care product industry and palm oil millers kernel crushers. The availability of PKC throughout the year at a competitive price is a supply assurance to the personal care product industry, and, at thesame time, the palm oil milling industry can boostits revenue with the value-added PKC.

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