

HIGHLY DIGESTIBLE PALM KERNEL CAKE (PKC) FOR ANIMAL FEED

ROHAYA MOHAMED HALIM; RIDZUAN RAMLI; CHE RAHMAT CHE MAT;
NU'MAN ABDUL HADI; NASRIN ABU BAKAR and ASTIMAR ABDUL AZIZ



MPOB INFORMATION SERIES • ISSN 1511-7871 • JULY 2017

MPOB TT No. 619

Palm kernel (PK) consignments to the kernel crushing plant (KCP) usually have high dirt & shell content ranging from 6% to 11% (Rohaya *et al.*, 2002). Conventional processing of such consignments produces palm kernel cake (PKC) with high shell (>12%) and crude fibre (>18%) content. PKC is a nutritious by-product generated from PK after the crude palm kernel oil (CPKO) is extracted using a mechanical process (screw press).

In 2016, Malaysia exported about 2.4 million tonnes of PKC (Source: Malaysian Oil Palm Statistics 2016). About 90% of PKC produced from 43 KCP in Malaysia was marketed to EU countries, New Zealand and South Korea as feed ingredient with high ratio (50%-80%) for ruminants. However, the use of this commercial PKC for chicken feed is currently limited due to the high content of fibrous material and shell.

High shell content affects the feeding value for animal in terms of low protein content and energy availability. Whereas, fibrous material comprises mainly insoluble mannose-based polysaccharides or Mannan cannot be digested by manogastric animals such as chicken and swine as they have a simple stomach and are unable to tolerate highly fibrous feed.

Even though a lot of work has been carried out to reduce the fibrous content in PKC using enzymes (Sharmila *et al.*, 2014), the yield was not really encouraging. Furthermore, the process requires enzymes which are expensive. Enzymes can hydrolyse only a limited amount of Mannan in PKC (Wan Zahari *et al.*, 2004), therefore the pre-treatment of PKC is necessary before it can be used as chicken feed.

MPOB in collaboration with Hur Far Engineering and Sime Darby Plantation Sdn Bhd developed a pre-cleaning system to remove shell in the PK prior to the oil extraction process. Reduction of shell in PK enhances the edibility of the PKC as

feed ingredient especially for both ruminants and non-ruminants. This product is classified as premium grade PKC.

The Technology (Pre-cleaning System)

This dry separation system (*Figure 1*) consists of 3 stage winnowing columns which function as a shell removal system to reduce shell content in palm kernel consignments from $\geq 6\%$ to $\leq 4\%$ with acceptable kernel losses. The light particles and small shell fragments are discharged at the column No. 1. The big shell fragments will be discharged at column No. 3 and kernel with low shell content will be collected from column No. 2 and column No. 3 (*Figure 2*). This low shell kernel serves as a raw material to the KCP for the extraction of CPKO and production of high nutrient value of PKC.

The Product (Premium Grade PKC)

Premium grade PKC is commercially produced at the Sime Darby KCP by processing PK with shell content $<4\%$ as feeding material (*Figure 3*). This PKC (*Figure 4*) contains low shell ($\leq 6\%$), high crude protein ($\geq 16.5\%$) and low crude fibre ($\leq 10\%$), therefore highly digestible by chicken at ratio between 30%-50% and ruminants ($>50\%$). It also a good source of energy & protein and the substitution of premium PKC in feed formulation reduces the use of imported raw material (corn, soybean, fish meal and wheat pollard).

Commercial PKC contains $>12\%$ shell, $<15\%$ crude protein, and $>18\%$ crude fibre, digestible by ruminants but not suitable for monogastric animals. The comparison of the composition premium and commercial PKC is tabulated in *Table 1*.

Application as Feed Ingredient

Commercial feeding trials using 20 000 chicken and 1000 Free Range Chicken (Ayam Kampung) indicated that, premium grade PKC is enriched ingredient for chicken feed (*Figure 5*) that is

ISSN 1511-7871



9 771511 787001

Head of Corporate Implementation and Consultancy Unit, Malaysian Palm Oil Board. 6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.
Tel: 03-8769 4574 Fax: 03-8926 1337 E-mail: tot@mpob.gov.my Website: www.mpob.gov.my





Figure 1. Pre-cleaning system installed at the Sime Darby kernel crushing plant.

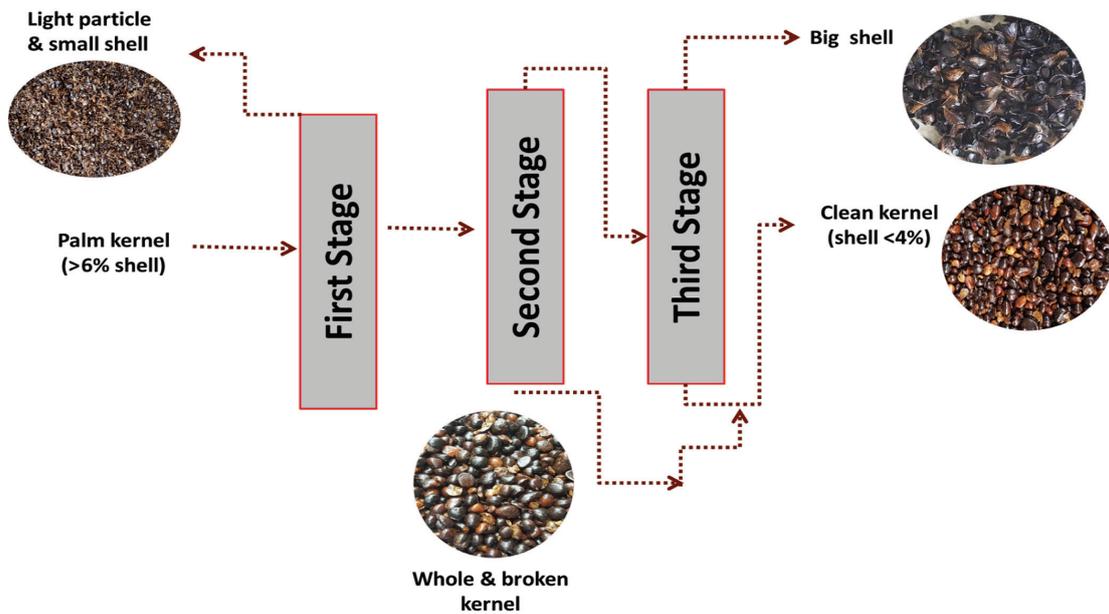


Figure 2. Separation principle of the pre-cleaning system.

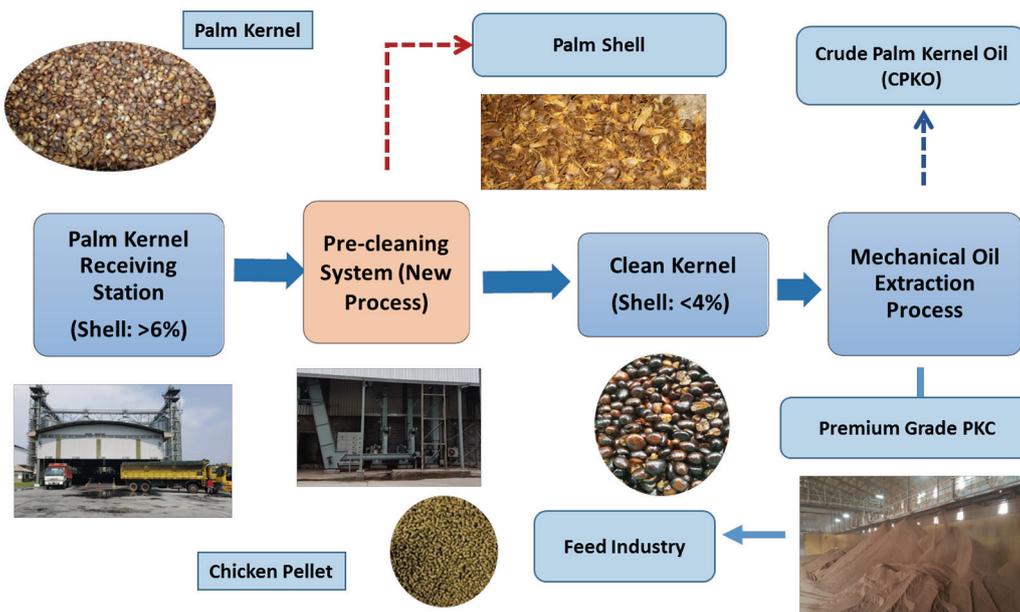


Figure 3. Process flow for commercial production of premium grade palm kernel cake (PKC) using pre-cleaning system.



Malaysian Patent Application No. PI 2016000794

Figure 4. Commercial production of premium grade PKC at the Sime Darby kernel crushing plant (KCP).

TABLE 1. COMPARISON BETWEEN PREMIUM AND COMMERCIAL GRADE PALM KERNEL CAKE (PKC)

Composition (%)	Premium grade PKC	Commercial PKC
Protein	16.50 ± 0.10 (min)	14.00 ± 0.10 (min)
Crude fibre	10.00 ± 0.50 (max)	20.00 ± 0.50 (max)
Fat	7.00 ± 0.50 (min)	7.00 ± 0.50 (min)
Moisture	8.00 ± 0.25 (max)	8.00 ± 0.25 (max)
Dirt and shell	6.00 ± 0.25 (max)	15.00 ± 0.25 (max)



Figure 5. Palm-based animal feed.

able to enhance the growth performance (body weight gain and feed intake) comparable to that of commercial chicken as shown in *Figures 6a* and *6b*.

THE BENEFITS

High Cost Saving and Stabilising the Price of Feed

Premium grade PKC can be used to substitute conventional feed ingredients such as corn, soyabean, rice bran, wheat pollard and fish meal at reasonable ratios. Therefore it will increase the utilisation of local raw material as an ingredient in feed formulation and reduces the production cost of the feed, as feed material contributes to more than 70% of the production cost.

Substitution of 30% premium grade PKC in the feed formulation is equivalent to 25%-28% of corn

and 2%-5% of soybean replacement. The cost saving by substitution with 30% PKC is RM 0.22 per kg feed.

Based on recent statistics reported in 2016, Malaysians consume around 1.8 million chickens daily (index mundi, 2017). By substituting 30% PKC, the cost saving per broiler is RM 0.52 based on a feed conversion ratio (FCR) of 1.7. The total cost saving on feed for 1.8 million chickens is RM 0.93 million per day or equivalent to RM 341 million per year.

Promotes Economic Growth in Malaysia

PKC as chicken feed has enormous potential to promote economic growth in Malaysia and reduce the dependency on imported feed material. Currently, the market is importing more than 50% of raw material (corn and soybean) for chicken feed formulation. The value of corn imported by Malaysia in the year 2015 from Argentina and Brazil was USD 417 million and USD 321 million respectively (Utusan Malaysia, 2016). These numbers are increasing every year as there is a lack of supply to cater for the rising demand of animal feed. The price of corn increased from RM 330 in 2000 to RM 1080 t⁻¹ in 2016 and the price of soybean in 2016 was RM 2100 t⁻¹ compared to RM 550 to RM 600 for the price of the premium PKC.

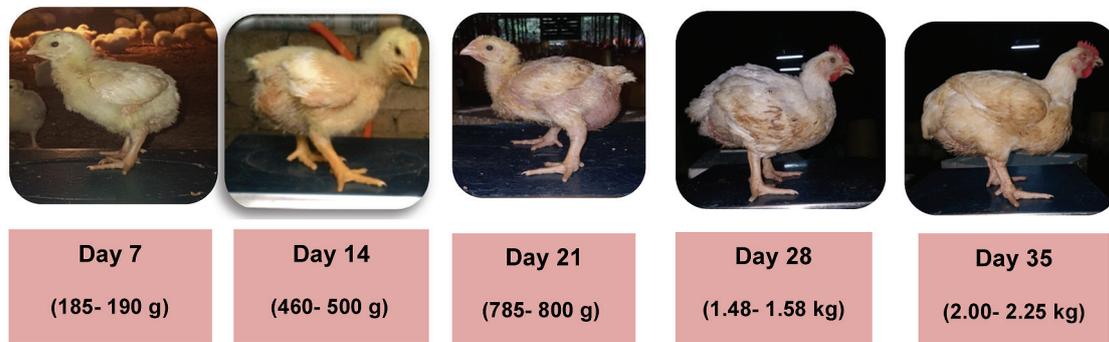


Figure 6a. Growth performance of chicken fed with palm-based feed.



Figure 6b. Growth performance of chicken fed with commercial feed.

The rising cost of feed meal has adversely affected the feed industry leading to an increase in chicken price in the local market. Hence, the time has come to substitute imported raw material with more local feed material in the feed blend. Substitution of the feed ingredient with 30%-45% of premium grade PKC will reduce the imported raw material significantly.

REFERENCES

INDEX MUNDI (2017). Malaysian Broiler Meat (Poultry) Domestic Consumption by Year. Retrieved 1 Jun 2017, from <http://indexmundi.com>.

MPOB (2017). Monthly export of oil palm products. Retrieved 6 April 2017, from <http://bepi.mpob.gov.my/imdex.php/en/statistics/export/171-export-2017/763>.

ROHAYA, MH and OSMAN, A (2002). The Quality of Malaysian Palm Kernel: Effect of Shell and Broken Kernel on the Quality of Final Products. Proceeding of 2002 National Seminar on Milling, Refining Technology, Quality and Environment, 19-20 August 2002, Magellan Sutera Hotel & Spa, Kota Kinabalu, Sabah.

SHARMILA, A; ALIMON, AR; AZHAR, K; NOOR, H M and SAMSUDIN, A A (2014). Improving nutritional values of palm kernel cake (PKC) as poultry feeds: a review. *Malaysian Society of Animal Production* 17(1): 1-18.

UTUSAN MALAYSIA (20 June 2016). *Potensi penggunaan isirung sawit (PKC) dalam makanan ternakan.*

WAN ZAHARI, M and ALIMON, A R (2003). Use of palm kernel cake and oil palm by-products in compound feed. *Palm Oil Developments* 40 (June 2004): 5-9.

For more information, kindly contact:

Head of Corporate Implementation
and Consultancy Unit, MPOB
6, Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor, Malaysia
Tel: 03-8769 4574
Fax: 03-8926 1337
E-mail: tot@mpob.gov.my
www.mpob.gov.my