

**ASSESSMENT OF NUTRITIONAL COMPOSITION OF PALM KERNEL  
CAKE WITH VARYING PARTICLE SIZES**

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**Thesis Submitted in fulfillment of the requirement for the Degree of Master of  
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## **DEDICATION**

This research is dedicated to ALL-sufficient ALLAH who has been my strength all along since I was born and my hope in the years ahead. It is also dedicated to the memory of my late father Alh. Oladokun Tihamiyu Adio may his soul continues to rest in the most perfect peace and to the memory of my mother Mrs. B. A. Oladokun who is alive may GOD Almighty keep and be pleased with her at all time. I equally extend the dedication to all my siblings and well-wishers for their endless support in one way or the other.

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In as much as the future remains unknown and becoming scary, there will always be a need to carry out research capable to create a sustainable development without compromising with the generation ahead. This brought about the idea to conduct a study on the nutritional composition of palm kernel cake (PKC) with varying particle sizes. PKC as an example of agro-industrial by-product (AIBP) is an important end-product of palm kernel oil (PKO) from the fruits of palm oil (*Elaeis guineensis*) which is readily available in many tropical environments among which are Malaysia, Nigeria and Indonesia. PKC is known to be characterized by a poor nutritive value due to the presence of high amount of non-starch polysaccharides (NSPs) within its cell wall. Therefore, PKC utilization into the ration of monogastric animals is very limited. The general aim of this research is to evaluate the chemical constituents of PKC that was physically treated into different sieve and particle sizes. The PKC samples studied were from three sources derived from Malaysian Agricultural Research and Development Institute (MARDI), Department of Veterinary Services, Terengganu (DVST) and Yuwang Palm Oil Mill with history of mechanical extracted types. The

samples were physically treated and separated into different sieve sizes of 0.5mm, 1mm, 2mm and 3mm. Each portion was further treated and divided into six particle sizes and they were named as A1, A2, B1, B2, C1, C2. The As, Bs and Cs samples represent big, medium and small particle sizes. Following the physical treatment, every sample was analyzed to determine the composition of crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL), acid insoluble ash (AIA), ash, moisture content (Mc) and dry matter (DM) concentration. The results however revealed that the chemical constituents in PKC physical treatment varies from each other and particle sizes under 0.5mm sieve generally appeared to be the poorest as compared to other particle sizes where  $P < 0.05$  at various treatment levels. The findings further showed a significant difference ( $P < 0.05$ ) of PKC based on their sources. Sample obtained from MARDI recorded higher values in term of ADF (54.43%), ADL (27.85%), ash (16.4%) and Mc (13.16%). PKC collected from DVST has the highest CP (14.56%), AIA (9.68%), DM (92.28%) content while Yuwang Palm Oil Mill PKC type was higher in NDF concentration (68.92%). It can be concluded that, PKC physical treatment could improve the availability of dietary protein while getting rid of undesirable particles in PKC.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu  
sebagai memenuhi keperluan untuk ijazah Sarjana Sains

# **PENILAIAN KOMPOSISI NUTRIEN ISIRUNG KELAPA SAWIT YANG BERBEZA SAIZ**

**OLADOKUN ABDULLAH ADISA**

**Oktober 2015**

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**Pusat Pengajian : Sains da Teknologi Makanan**

Masa hadapan yang tidak menentu dan agak merisaukan memaksa kita menjalankan penyelidikan yang mampu mewujudkan pembangunan mampan dengan mengambil kira keperluan generasi akan datang. Ini membawa kepada idea untuk menjalankan kajian mengenai komposisi nutrisi hampas isirong kelapa sawit (PKC) dengan pelbagai saiz zarah. Sebagai contoh, PKC adalah merupakan bahan sampingan agro industri (AIBP) yang penting dalam penghasilan minyak isirong sawit (PKO), iaitu dari buah kelapa sawit (*Elaeis Guineensis*) yang boleh diperoleh di kebanyakan persekitaran tropika. Antaranya ialah Malaysia, Nigeria dan Indonesia. PKC diketahui mempunyai ciri-ciri pemakanan yang tidak baik disebabkan oleh kehadiran jumlah polisakarida bukan kanji (PPR) yang tinggi di dalam dinding sel. Oleh itu penggunaan PKC ke dalam makanan haiwan monogastrik adalah sangat terhad. Tujuan kajian ini umumnya untuk menilai jujuk kimia PKC yang dirawat secara fizikal dan menggunakan tapisan mengikut saiz zarah yang berbeza. Sampel PKC yang dikaji ini terdiri dari tiga sumber yang diperoleh dari Institut Penyelidikan dan Kemajuan Pertanian Malaysia (MARDI), Jabatan Perkhidmatan Veterinar Terengganu (DVST), dan Kilang Kelapa Sawit Yuwang dengan diekstrak secara mekanikal. Sampel diasingkan kepada saiz pengayak yang berbeza iaitu 0.5mm, 1mm,

2mm dan 3mm. Setiap bahagian dibahagikan kepada enam saiz zarah dan dilabelkan sebagai A1, A2, B1, B2, C1, dan C2. A, B dan C mewakili sampel yang bersaiz besar, sederhana dan kecil saiz zarahnya. Selepas rawatan fizikal, setiap sampel dianalisis untuk menentukan komposisi protein mentah (CCP), serabut neutral detergent (NDF), asid serat detergent (ADP), asid detergent lignin (ADL), asid abu tidak larut (AIA), abu kandungan kelembapan (MC) dan bahan kering (DM). Hasilnya mendapati bahawa kandungan kimia dalam PKC yang diberi perawatan fizikal antara satu sama lain. Saiz zarah pengayak 0.5mm bawah umumnya menjadi yang paling buruk berbanding dengan saiz zarah yang lain dimana  $P < 0.05$  dikesan pada pelbagai peringkat rawatan. Dapatan kajian menunjukkan perbezaan yang signifikan ( $P < 0.05$ ) daripada PKC bergantung kepada sumber-sumber asalnya. Sampel yang diperoleh daripada MARDI mencatatkan nilai yang lebih tinggi dari segi ADF (54.43%), ADL (27.85%), abu (16.4%), dan kelembapan (13.16%). PKC yang dikumpul daripada DVST mempunyai CP tertinggi (14.56%), AIA (9.68%), DM kandungan (92.28%). Ini dapat diberi kesimpulan bahawa rawatan PKC fizikal boleh meningkatkan protein diet sedia ada dan dapat menyingkirkan mana-mana zarah yang tidak diinginkan.