USE OF COCONUT MILK VERSUS DAIRY MILK IN MALAYSIAN CUISINES : COMPARISON OF NUTRITIONAL VALUE

by

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ABSTRAK

Sebahagian besar makanan dalam masakan Malaysia kita menggunakan santan termasuklah hidangan utama dan pencuci mulut. Tetapi, penggunaan susu sebagai pengganti santan dalam masakan sangat kurang digunakan oleh masyarakat. Hari ini, masyarakat kita kurang terdedah tentang fakta santan dan susu juga perbezaan antara mereka. Kebelakangan ini, terdapat cadangan untuk menggunakan susu sebagai alternatif yang lebih sihat untuk digunakan dalam masakan setiap hari sebagai pengganti santan yang dikatakan tidak sihat. Kajian ini dijalankan untuk menentukan nilai-nilai pemakanan dan penilaian sensori masakan Malaysia yang disediakan dengan santan kelapa dan produk tenusu. Puding kastard dan gulai lemak cili padi telah dimasak menggunakan santan kelapa segar (SK), santan kelapa segera (SKS), susu segar (SS) dan susu sejat (SUS). Analisis proksimat telah dijalankan mengikut prosedur AOAC (1996). Penilaian sensori telah dijalankan dengan menggunakan skala hedonik 7 titik untuk menentukan penerimaan pengguna ke atas produk. Data yang diperolehi telah dianalisis dengan menggunakan perisian SPSS 20.0. Keputusan menunjukkan bahawa puding kastard disediakan dengan menggunakan SS mempunyai kandungan kalori paling rendah secara signifikan ($P < 0.05$) (3.855 kcal/g) berbanding dengan puding kastard disediakan dengan SK (4.690 kcal/g), SKS (4.679 kcal/g) dan SS (4.178 kcal/g). Kandungan lemak (0.28%) dalam puding kastard SS adalah paling rendah ($P < 0.05$) manakala kandungan lemak dalam SK adalah tertinggi (11.61%) diikuti oleh SKS (8.50%) dan SUS (2.75%). Kandungan protein tertinggi terdapat dalam SUS kastard puding (2.98%). Gulai lemak cili padi menunjukkan keputusan yang sama yang mana

SS gulai lemak cili padi mempunyai kalori (4.681 kcal / g) dan lemak (5.68%) paling rendah secara signifikan (P<0.05) berbanding sampel lain. Kandungan kalori (6.764 kcal/g) dan lemak (57.46%) tertinggi ditunjukkan dalam sampel SKS. Kandungan protein tertinggi terdapat dalam SS (5.53%) dan kandungan protein yang paling rendah telah ditunjukkan dalam SKS (0.37%). Keputusan penilaian sensori menunjukkan bahawa puding kastard disediakan dengan SK adalah yang paling menarik berbanding yang lain kerana ia diterima dengan skor tertinggi secara signifikan (P <0.05) dalam semua atribut iaitu aroma (6.06), warna (6.06), rupa (5.60), kelemakan (5.30), kelikatan (5.20), rasa (5.84) dan penerimaan keseluruhan (5.96). Gulai lemak cili padi yang menggunakan SK mempunyai penerimaan ketara tertinggi (P <0.05) juga yang menunjukkan aroma (5.22), warna (5.68), rasa (5.20) dan penerimaan keseluruhan (5.48). Ahli-ahli panel secara keseluruhan menerima 'gulai lemak cili padi' yang dibuat dengan SK dan SKS dalam atribut kelemakan dan berminyak. Kesimpulannya, lebih banyak kajian lanjut perlu dilakukan untuk meningkatkan penerimaan masakan Malaysia yang dibuat dengan susu memandangkan pengguna tidak mahu mengorbankan rasa asli santan yang serasi dengan mereka selama ini.

ABSTRACT

Most of the food in our Malaysian cuisine uses coconut milk in their cooking including main dishes and desserts. But, the use of dairy milk as substitute of coconut milk in cooking is very less used by the community. Today, our community has less exposure on coconut milk and dairy milk as well as their different uses. Lately, there has been suggestion to use dairy milk as a healthier alternative to use in everyday cooking as a replacement for coconut milk which is believed to be unhealthy. This study was conducted to determine the nutritional values and sensory evaluation of Malaysian cuisines prepared with coconut and dairy milk. Custard pudding and 'gulai lemak cili padi' were cooked using fresh coconut milk (FCM), instant coconut milk (ICM), fresh milk (FM) and evaporated milk (EM). Proximate analysis was carried out following the procedures of AOAC (1996). Sensory evaluation was carried out using 7 point hedonic scale to determine the consumer is acceptability of the products. Data obtained was analyzed using SPSS 20.0 software. The results showed that custard pudding prepared using FM had a significantly ($P < 0.05$) lowest calorie content (3.855 kcal/g) compared with custard pudding prepared with FCM (4.690 kcal/g), ICM (4.679 kcal/g) and FM (4.178 kcal/g). The fat content (0.28%) in FM custard pudding was also significantly lowest ($P < 0.05$) while FCM showed the highest (11.61 %) followed by ICM (8.50%) and EM (2.75 %). The highest protein content was found in EM custard pudding (2.98%). The 'gulai lemak cili padi' showed similar results, with FM 'gulai lemak cili padi' by having significantly ($P < 0.05$) lowest calorie (4.681 kcal/g) and fat content (5.68%) among others. The highest content of calorie was (6.764 kcal/g) and fat (57.46

%) were showed by ICM among others. Whereas, the highest protein content was found in FM (5.53%) and the lowest was showed in ICM (0.37%). The sensory evaluation results showed that custard pudding prepared with FCM was the most appealing compared with others as it received significantly highest scores ($P < 0.05$) in all sensory attributes namely aroma (6.06), colour (6.06), appearance (5.60), creaminess (5.30), firmness (5.20), flavor (5.84) and overall acceptance (5.96). Similarly, the 'gulai lemak cili padi' prepared using FCM had significantly the highest acceptability ($P < 0.05$) score in terms of aroma (5.22), colour (5.68), flavor (5.20) and overall acceptability (5.48). Panelists equally accepted 'gulai lemak cili padi' made with FCM and ICM as regards to creaminess and oiliness attributes. In conclusion, more work should be done to improve the acceptability of Malaysian cuisines made with dairy milk as consumers are not willing to sacrifice the classic flavour of coconut milk they have used to.

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LIST OF ABBREVIATIONS

Symbol	*Abbreviations*
%	Percentage
AOAC	Association of Analytical Chemists
APCC	Asian and Pacific Coconut Community
C	Carbon
Ca	Calcium
DRI	Daily recommended intake
EM	Evaporated milk
FA	Fatty acid
FCM	Fresh coconut milk
FDA	Food and Drug Administration
Fe	Ferum
FM	Fresh milk
g	Gram
ICM	Instant coconut milk
K	Kalium
Kcal/g	Kilocalorie per gram
LDL	Low density lipoprotein
LUTS	Lower urinary tract symptoms
MARDI	Malaysian Agricultural Research & Development Institute
MCFA	Medium-chain fatty acids
MCT	Medium chain trigliseride

Mg	Magnesium
mg	*Milligram*
mL	Mililitre
Na	Natrium
^{o}C	Degree celsius
S	Sulfur
UHT	Ultra high temperature
USDA	US,Department of Agriculture

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Malaysian cuisine is not based on one particular distinction of food but a culinary diversity originating from it's multi ethnic population of Malay, Indian, Eurasian, Chinese, Nyonya and the Indigenous peoples of Borneo. A brief look into the past and how this multi ethnic country came to be, is essential in order to comprehend how such a cosmic array of food, has now come to be known all over the world as *Malaysian Food.*

Since there is such diversity within Malaysia, the food can be classified into three major groups, which are Malay, Chinese and Indian. Malay food, like many Asian countries, consists of rice as staple food, eaten with meat, fish and vegetables. An essential ingredient in most of Malay cuisine is coconut milk. The coconut milk is also important in giving the Malay dishes their rich, creamy character. Coconut milk is the basis of Malay fatty dishes. Fatty dishes are typically not hot to taste; it is aromatically spiced and coconut milk is added for a creamy richness. It has been estimated that 25 % of the world's consumption of coconuts is as coconut milk (Gwee, 1988). Many traditional foods in Thailand and other Southeast Asian countries also contain coconut milk as the main ingredient.

Most Malaysian has been using coconut milk in their daily cooking especially the Malay and Indian community. But, the use of dairy milk as substitute of coconut milk in cooking very is rare by the community. Today, our community has less exposure on coconut and dairy milk and their different uses. They believe that high intake of coconut milk relates to heart disease and obesity. Around 92% of coconut fats are saturated fats. This has lead to the belief that coconut fats are bad for health, particularly in relation to ischaemic heart disease. Yet, most of the saturated fats in coconut are medium chain fatty acids whose properties and metabolism are different to those of animal origin (Amarasiri *et al.*, 2006). Medium chain fatty acids do not undergo degradation and re-esterification processes and are directly used in the body to produce energy (Amarasiri *et al.*, 2006). They are not as 'bad for health' as saturated fats. There is a need to clarify issues relating to intake of coconut fats and health, particularly for most populations that still depend on coconut fats for most of their fat intake (Amarasiri *et al.*, 2006).

Coconut milk is the natural oil-in-water emulsion extracted from the endosperm of mature coconut (*Cocos nucifera L.*) and it plays an important role in many traditional foods in Asia and in Pacific regions. In addition, it has been also used as to being used as main ingredient in food industry as instance in beverage production (Prabawani *et al.*, 2011). Coconut milk is obtained from extraction of coconut flesh with or without added water. It contains fat, water, carbohydrate, protein, and ash with the major components being water and fat. Coconut milk is also the best known product of coconut meat

(endosperm), obtained when grated coconut meat is squeezed through a muslin cloth (Akpan *et al.*, 2006).

The fat content of the coconut milk is about 17% of which between 90-92% of these are accounted by saturated fats. Though coconut milk is more saturated than most other oils and fats, about two thirds of the saturated fatty acids are medium chain fatty acids (Dayrit, 2003). The coconut milk is used in the production of virgin coconut oil by controlled low temperature heating and removal of the oil fraction (Akpan *et al.*, 2006). Coconut milk has been shown to be useful in Ayuverdic medicine and in healing mouth ulcers (Nneliand Woyike, 2008) and in the folk-loric management of lower urinary tract symptoms (LUTS) and gastrointestinal cramps. However, little is known about the effect of its consumption on the cardiovascular risk state of those who consume it.

Milk is the natural secretion of the mammary glands, which plays a fundamental role in nutrition, growth, development and immunity (Woo *et al.*, 1995). The milk from each mammalian species is unique in terms of composition and nutritional value (Kataoka *et al.*, 1991). Cow's milk and milk products play important role in human nutrition growth, and development. Fresh cow milk has been reported to contain about 88% water (Kataoka *et al.*, 1991). Milk and milk products are important food item especially for growing children (Keira *et al.*, 2004) due to its nutrients content. It is an excellent sources of calcium, vitamin D, riboflavin, and phosphorus and good source of protein, potassium, vitamin A, vitamin B 12 and niacin. Milk and milk products supply

three of the five minerals (Mg, Ca, K) that were identified as those most needed in children's diet (American ,US department of Agriculture).

Milk is also a white liquid produced by the mammary glands of mammals. It is the primary source of nutrition for young mammals before they are able to digest other types of food. Furthermore, first milk contains colostrum, which carries the mother's antibodies to the baby and can reduce the risk of many diseases in the baby. Milk is an important drink with many nutrients (Pehrsson *et al.*, 2000).

1.2 Justification of Study

As we can see today, most of the food in our Malaysian cuisine uses coconut milk in their cooking including main dishes and desserts. However, people believe that the use of coconut milk in cooking can lead to obesity and heart disease which is associated with a high fat content. Lately, there has been suggestion to use dairy milk as a healthier alternative to use in everyday cooking as a replacement for coconut milk. Definitely, the invention of this replacement of coconut milk in cooking can bring greatest benefits in promoting population's health and indirectly assist in the prevention of several chronic diseases such as diabetes, stroke, heart disease and hypertention. It is because the incidences of preventable chronic diseases are increasing and becoming a major problem currently.

Recently, the increasing trend of obesity among school children has attracted broad attention from people. Various issues have been are discussed and highlighted by various parties including the type of food sold in the canteen and outside the school. Finally, given the various positions related to *nasi lemak* has simply been pointed as the cause of obesity among schooling children. This burning issue has became the fodder of public debate following the rumours that Ministry of Education is going to restrict the selling of *nasi lemak* at school canteens. The rationale for the ban is not the rice but due to the use of coconut milk in the preparation of *nasi lemak.*

Until now coconut milk misconceptions still persist. This happens also among professionals including dietary specialists in Malaysia. The people were advised to reduce the use of coconut in daily cooking. Based on the belief that coconut milk contains high cholesterol. On the contrary, scientific evidences revealed that cholesterol content of coconut milk was considerably low compared to other sources of fat, especially animal based food. Besides, its cholesterol content is lower than other vegetable oils and animal fats (Kamariah L, 2012). This problem is only refers to cholesterol but actually its coming from fat content in coconut milk. Previous research showed that the fat content of coconut milk is an oil or fat emulsion in water (Clement and Villacorte, 1933), is between 31 - 35% as compared to 3 - 4% in cow milk. The composition of saturated fatty acids in coconut milk comprised mainly of lauric acid (48.2%) and myristic acid (16.6%) followed by linoleic acid with the least/lowest percentage (Weiss, 1970).

Coconut milk has a high content of saturated fat and can be processed to produce coconut oil. Coconut oil contains about 92% saturated fatty acids. In general, the more saturated fat in diet, the more LDL(Low Density Lipoprotein) cholesterol in the body. LDL cholesterol refer to bad cholesterol where is linked to heart disease. But not all saturated fat have the same cholesterol raising effect, however most notable among the saturated fatty acids that raise blood cholesterol are lauric and palmitic acids. However, making such distinctions may be impractical in diet planning because these saturated fatty acids typically appear together in the same foods. In addition to raising blood cholesterol, saturated fatty acids contribute to heart disease by promoting blood clotting. Fats from animal sources (meat and milk products) are the main sources of saturated fats in most people's diet. Some vegetable fats (coconut and palm) and hydrogenated fats provide smaller amounts of saturated fats. Selecting skin less poultry and fat free milk products helps to lower saturated fat intake and the risk of heart disease (McGuire, M., & Beerman, K. A., 2007).

In contrary to popular myth, coconut oil (fat) does not transform into bad cholesterol to clog up arteries. In fact, cultures around the world that depend on coconut as their main source of fat have been found to be free of heart disease. The principal fatty acid in coconut milk is lauric acid, which is the same fatty acid found in abundance in mothers' milk and is known to promote normal brain development and contribute to healthy bones (Timmen and Patton, 1989).

There is different taught of issue regarding coconut milk and dairy milk consumption. There is a trend in Malaysia to substitute coconut milk with dairy milk in everyday meals because coconut milk is said to be unhealthy for health. On the contrary, there is also an increase in research among the western countries in the product development such as cheese, whereby coconut milk is used to substitute the dairy milk (cow milk). This is because dairy milk is originated from animals, whereby coconut milk is originated from plant source, which is perceived to be healthier. In addition, coconut milk would be a better option for those who are vegetarian. Moreover, some people are allergic or have lactose intolerance to dairy milk which limits their dairy milk intake. Therefore, more research has been done to search for dairy milk substitute in western food products and coconut milk is said to be one of the most suitable substitute for dairy milk. Thus, dairy milk and coconut milk can serve as substitute for one another, depending on the purpose of substitution. The present study however was focused on the preparation of Malaysian cuisines with the aim to examine the use of both coconut milk and dairy milk in Malaysian cuisines to determine their nutritional values and acceptability.

1.3 Research Objectives

1) To determine the proximate composition (moisture, ash, fat, protein, carbohydrate and calorie) in Malaysian cuisine prepared with coconut milk and dairy milk.
2) To examine the acceptability of Malaysian cuisine prepared with coconut milk and dairy milk.

1.4 Research Questions

1. Are there any difference in proximate compositions of Malaysian cuisine prepared with coconut milk and dairy milk?
2. Are there any difference in sensory evaluation of Malaysian cuisine prepared with coconut milk and dairy milk?

1.5 Hypothesis

Null hypothesis, Ho :

There are **no significant differences** in proximate compositions and sensory evaluation in Malaysian cuisine prepared with coconut milk and dairy milk.

Alternative hypothesis, H_A :

There are **significant differences** in proximate compositions and sensory evaluation in Malaysian cuisine prepared with coconut milk and dairy milk.

CHAPTER 2

LITERATURE REVIEW

2.1 COCONUT MILK AND ITS PRODUCTS

Coconut milk is a milky white oil-in-water emulsion and it was sold in many forms such as canned, UHT or coconut powder. Many traditional foods for example in Thailand, both curries and desserts were containing coconut milk as a main ingredient. The sweetened coconut milk for desserts is typically prepared by adding salt and sugar to fresh or heated coconut milk and mixed thoroughly. Heated coconut milks are expected to retain their white color, stability and natural coconut aroma. Oil separation of coconut milk after heating is normally unacceptable. For savory dishes, on the contrary, coconut milk is added to a mixture of meat and curry paste and then boiled. After boiling, coconut milk is expected to be creamy where the partial separation of oil is required. However, customers require fresh or commercial coconut products to be white, aromatic and creamy, non-flocculated with a long term stability (Berlin, 2009).

The term "coconut milk" is conventionally defined as the aqueous products, free from fiber, extracted from solid coconut endosperm but optionally may include some coconut water. This certain definition was proposed by the Standard Task Force of the Asian and Pacific Coconut Community (APCC) in the year 1994. Coconut milk is produced by grinding the white coconut meat and then squeezing out the milk which

may include water or liquid endosperm (coconut water). Fresh coconut milk normally contains over 34 % fat content.

By Thailand regulations, commercial coconut milk products are differentiated between coconut milks of low-fat content which contains 5-8 % fat, medium-fat content which contains 12-14 % fat, coconut milk which contains 20-22 % fat and coconut cream which contains more than 30 % fat content.

Coconut (*Cocus nucifera*) is the stone of the drupes borne by the coconut palm, a member of the monocotyledonous family Palmae. It is known as the "wonder food" and is regarded as perfect diet because it contains almost all essential nutrients needed by the human body. It is nourishing, strengthening and fattening food. It has high oil content. The protein is of high quality and contains all amino acids essential for the growth and maintenance of the body. It is rich in K, Na, Mg and S. The energy value of the dried coconut is 662 calories per 100 g (Bakhru, 2000). Coconut milk, the oil-protein-water emulsion obtained when the freshly grated meat (endosperm) is squeezed through a muslin cloth, is a well known product in areas that grow coconut.

Coconut milk is also an intermediate in the preparation of coconut oil in some rural areas, notably in Indonesia (Grimwood, 1975). Coconut milk may be considered as a substitute for dairy milk. It may be used by the people who cannot tolerate dairy milk. The milk of fresh coconut serves as a valuable food for children suffering from nutritional deficiency. It has more vitamin. A content than the coconut itself and has adequate minerals. To extend the shelf-life, coconut milk has been processed in many forms such as UHT and canned coconut milk (Jaruwan *et al.*, 2003).