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Study characterizations of coconut (*Cocos nucifera*) oil extracted through wet and dry methods

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Abstract

Historically, Indonesia had lots of coconut tree (*Cocos nucifera*) spreading almost all of the thousand islands, with famously named as 'negeri nyiur melambai'. Before the year of 1970-iest, in Indonesia, the people used coconut oil as the one of oil for frying foods. The people planted coconut tree intensively. Yet, after the year of 1970-iest, some new verieties of palm tree was introduced then the palm trees were planted extensively and intensively, the coconut oil was almost extinguished since then. Mostly now people use palm oil as frying oil. The use of coconut products now are only limited to meat and water of young coconut fruit and as some parts of food sauces. So, population of coconut tree is now drastically decreased. In this research was to study the possibility of prospective material of coconut oil as other than frying oil such as first-generation biodiesel feedstock. In the study, coconut oils were extracted through dry method and wet method. The coconut oil also was extracted through soxhlet method as reference of total coconut oil. Parameters used in the study were yield, relative density, iodine value, and saponification number. The data showed that coconut oil extracted through dry method has yield of 22,12%, relative density of 0,915 (40°C/water 20°C), iodine value of 8,5 wisj, and saponification number of 260 mg KOH/g oil. And, coconut oil extracted through wet method has a yield of 23,67%, relative density of 905 (40°C/water 20°C), iodine value of 7,5 wisj, and saponification number of 250 mg KOH/g oil

Keywords: coconut oil, extraction, wet method, dry method.

Introduction

Coconut (*Cocos nucifera*) is one the most important crops grown in the humid tropics. More than 11 million farmers, mostly smallholders with low income, grow the palm in 90 countries. More than 80% of the total world production comes from the Asia–Pacific countries, which are near neighbours of Australia. Coconut also grows well in moist tropical regions of Australia, particularly northern Queensland. Plantations have been established in the past but the palm is now mostly used for ornamental purposes. Coconut is still used as the symbol of the Australian tropics to attract tourists from around the world to come on holiday in these regions.(Core, 2005)

Cocos Nucifera trees, otherwise known as coconut palm trees, grow abundantly along the coast line of countries within 15o of the equator. They prosper in sandy, saline soil and in tropical climates. A healthy coconut tree will produce approximately 120 watermelonsized husks per year, each with a coconut imbedded inside. There are three constituents of the Cocos Nucifera that can be used for fuel: the husk, the coconut shell, and the coconut oil that is in the white coconut "meat", or copra as it is usually called. Thus, the coconut tree is a very abundant, renewable resource of energy. We have been investigating the production of energy from these
three constituents of coconuts and their husks.

The coconut oil is in the copra, or white "coconut meat", as seen in Figure 3. A typical coconut will have 0.36 kg of copra, including water, meal and coconut oil. Drying removes the 50% of the mass that is water, leaving 0.18 kg of dry copra, 67% of which is coconut oil, or 12kg. The most efficient extraction that can be done in a village using hand operated presses is 75% of this oil, or 0.09 kg/coconut. Coconut oil has a density of 890 kg/m3, or .89kg/liter. Thus, 0.1 liter of coconut oil can be produced from each coconut. The cost of the coconuts and the labor to process them in a rural village setting in Papua New Guinea is about $0.07/coconut, or $.70/liter. (Bradley et.al., 2006)

Coconut is the actual nut from the Coconut Palms: Coconut Palms are the most widespread tropical agricultural crops grown abundantly not only in PNG but all parts of the South Pacific and parts of Asia. It is naturally sustainable agricultural resource of tropical islands. Coconut Palms are one of the few crops that can tolerate poor sandy soils with saline water and survives frequent cyclones. Coconut Palms can bear a bunch of fruits each month for about 65 of their 70 to 80 year life span. Coconut Palms require minimum maintenance. Coconuts are and have been way of life for the

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indigenous island people. They call the coconut palm the "Tree of Life" (Pumwa, 2009)

The world's energy consumption is estimated to be 3.36 x 1020 J per annum and is projected to increase to up to 6.3 x 1020 J in the year 20502. Due to this high demand, energy shortage poses specific risks on the transportation sector and some industries that are dependent on liquid fuels such as diesel (Pascual, 2004).

The decline in the coconut industry has been recognized for decades (Wright & Persley 1988) but little significant effort has been made to prevent further decline. The productivity potential of coconut has not been increased and now more than half of the existing plantations are becoming too old for continued copra production. (Samosir *et al.*, 2005)

During the last four decades coconut management in Indonesia has been focused on traditional farming systems that have an inherent low productivity and limited product diversity, and that cater for the direct needs of the household alone. Some advances in coconut technology, such as the development of new methods for cultivation of superior varieties, were made before 1980 but most have been more recent. In the 1981–90 period advances were made in germplasm collection, crop replanting, intercropping, pest and disease control, and better product processing. In the next period, 1991–2000, efforts were focused upon processing technology and integrated farming systems. Future research is likely to make use of molecular and biotechnological approaches for the production of resistance varieties (e.g. to control Kalimantan wilt disease) and clonal propagation of elite palms. Other developments might include improved biocontrol for pests such as *ryctes* and *Sexava*, the expansion of organic farming, the improvement of virgin coconut oil quality and the establishment of an International Coconut Genebank for the South-East and East Asian region in North Sulawesi province. These and other strategies will be used to build self-supporting coconut farming communities, develop coconut agribusiness and value-add to traditional coconut products to raise the living standards of Indonesian coconut farmers. (Novarianto & Warroka, 2005)

Materials and Methods

Fresh of coconut fruit had taken from Transmigration Community of Telang, South Sumatera. Two methods of extraction were performed, namely wet method and dry method. Wet method,meat from nipa kernel was ground, then water (60°C) was added, and pressed (2000 kgf). Nipa milk then heated at tempeture of 105°C until the emulsion of oil had been separated, and oil then was taken and yield was determined. Dry method, fresh meat from nipa kernel was dried using vacuum oven at temperature of 70°C for 24 hours, then the dry meat of nipa kernel was pressed (2000 kgf), then the oil was taken and yield was determined. The two methods of extraction were repeated 5 times. In this study, soxhlet extraction of meat kernel nipa oil was also applied, and yield was determined as well as the characteristics, namely viscosity, iodine value, and saponification number. The data analysis were using SAS.

Result and Discussion

The extraction of coconut oil through wet method (Table 1.) had higher yield (23.67%) compared to that of through dry method (22.12%) ($p < .001$)

The characteristic of coconut kernel oil that extracted through wet method showed that relative density of 905, iodine value of 7.5, and saponification number of 250 had lower that of through dry method, relative density of 915, iodine value of 8.50, and saponification number of 260. (Table 2.)

Table 1 The Effect of Wet and Dry Method of Coconut Oil Extraction on Yield for All Treatments

Treatment	Least Square Means[1]	Probability > T Comparison of all means	
		Wet	Dry
Wet	23.67	---	.0001
Dry	22.12		---

[1]Least Square Means of yield (%)

Table 2 The Characteristics of Coconut Kernel Oil

Characteristics	Wet	Dry
Relative density, 40 °C /water 20°C	905	915
Iodine Value , wisj	7.50	8.50
Saponification Number, mg KOH/g	250	260

Summary

Coconut oil extracted through dry method has yield of 22,12%, relative density of 0,915 (40°C/water 20°C), iodine value of 8,5 wisj, and saponification number of 260 mg KOH/g oil. And, coconut oil extracted through wet method has a yield of 23,67%, relative density of 905 (40°C/water 20°C), iodine value of 7,5 wisj, and saponification number of 250 mg KOH/g oil

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