

# Shelf life studies of oil samples of coconut (*Cocos nucifera*) in Ghana

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## SUMMARY

Two samples A and B of the oil of coconut (*Cocos nucifera*) were stored for 3 months under ambient conditions (24-28 °C). The changes in the levels of free fatty acid and peroxide values were monitored at monthly intervals in the 3-month period. During this period, the free fatty acid (calculated as lauric acid) rose from 0.2 to 0.6 per cent for oil sample A, and from 0.2 to 0.8 per cent for oil sample B. The peroxide values were less than 10 for either oil sample after 3 months. This indicated a shelf life of more than 3 months for both oil samples.

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## Introduction

The world production of coconut oil was 2854000 tonnes in 1983 (Leufstedt, 1990). Berger & Hassan (1984) have stated that coconut oil as a lauric oil has sharp melting character, making it very useful in confectionery products and foods with a high fat content. It is used in margarine, low-calorie spreads, cooking and frying, synthetic creams, and biscuits.

When kept under storage, the oil becomes rancid leading to the development of off-flavours. The rancidity becomes so pronounced that the taste is unacceptable to the consumer.

In this study, two samples of coconut oil were stored under ambient conditions in the range 24-28 °C, and the rancidity was measured by means of the peroxide values.

## RÉSUMÉ

ANKRAH, E. K.: *Étude de la durée de conservation avant vente des échantillons d'huile de coco (Cocos nucifera) au Ghana.* Deux échantillons A et B de l'huile de coco (*Cocos nucifera*) étaient conservés pour 3 mois sous des conditions ambiantes (24-28 °C). Les changements dans les niveaux d'acide gras libre et les valeurs de peroxyde étaient surveillés à intervalle mensuel dans la période de 3 mois. Pendant cette période, l'acide gras libre (calculé comme acide laurique) s'élevait de 0.2 à 0.6 pour cent pour l'échantillon d'huile A et de 0.2 à 0.8 pour cent pour l'échantillon d'huile B. Les valeurs de peroxyde étaient moins que 10 pour n'importe quel échantillon d'huile après 3 mois. Ceci indiquait une durée de conservation avant vente de 3 mois pour tous les deux échantillons d'huile.

## Materials and methods

Two samples of coconut (*Cocos nucifera*) oil, each 750 ml, were purchased from two different sellers at the market in Accra. These were tightly covered in bottles and labelled samples A and B. The oil samples were kept on the laboratory bench under ambient conditions (range 24-28 °C) for 3 months for storage observation.

## Characterization of coconut oil samples

The coconut oil samples were identified by determining the refractive index as well as the saponification, iodine and peroxide values according to methods described by Pearson (1976). The moisture and free fatty acid levels were also determined.

### Measurement of rancidity

The free fatty acid and peroxide values of the two coconut oil samples were determined at the start of the experiment and then at monthly intervals for 3 months. These values were determined according to methods described by Pearson (1976).

*Free fatty acid.* To a mixture of 25 ml each of diethyl ether and ethanol, 1 ml of 1 per cent phenolphthalein solution was added, followed by neutralization with 0.1 *N* NaOH. Five grams of the coconut oil sample were mixed with the neutral solvent and titrated with 0.1 *N* NaOH solution. The percent free fatty acid was calculated as lauric acid.

*Peroxide value.* About 1 g of oil was weighed. Then 1 g of powdered potassium iodide and 20 ml of solvent mixture containing 2 volumes of glacial acetic acid and 1 volume of chloroform were added. The mixture was boiled for 30 seconds. The content was quickly poured into a flask containing 20 ml of potassium iodide solution (5 per cent). The mixture was titrated with 0.002 *N* sodium thiosulphate solution and starch was used as indicator. A blank was also performed simultaneously. The peroxide value was calculated as milli equivalent of peroxide oxygen per kilogram of oil.

### Results and discussion

Table 1 shows the results for characterization of

the coconut oil samples A and B at the start of the experiment. The refractive index, saponification, and iodine values fell within the standard ranges for coconut oil (Cocks & Van Rede, 1966). This indicated that the two coconut oil samples were genuine samples.

Table 2 shows the changes in the levels of free fatty acid and peroxide values of coconut oil samples A and B stored for 3 months under ambient conditions at the range 24-28 °C. At the end of 3 months' storage, the free fatty acid contents in coconut oil sample A rose from 0.2 to 0.6 per cent and those of sample B from 0.2 to 0.8 per cent, being an increase of 200 and 300 per cent, respectively. The peroxide values of coconut oil sample A also rose from 4.1 to 8.5, and those of sample B from 2.7 to 9.4, representing an increase of 107 and 248 per cent, respectively.

According to Pearson (1976), a rancid taste is often noticed when the peroxide value is between 10 and 20. The peroxide values of 8.5 and 9.4 found for coconut oil samples A and B, respectively, indicated that the samples could be stored for more than 3 months before rancidity could be detected.

Sukoncheun-Sringam & Siriwan-Nettiwarawon (1989) have observed that the hydrolytic and ketonic types of rancidity occurred in coconut oil.

Coconut oil contains a high level of two saturated fatty acids, lauric (41-56 per cent) and

TABLE I  
*Characterization of Coconut Oil Samples A and B Compared with the Standard Range Values*

<i>Name of sample</i>	<i>Moisture (%)</i>	<i>Free fatty acid (%)</i>	<i>Refractive index at 40 °C</i>	<i>Saponification value</i>	<i>Iodine value</i>	<i>Peroxide value (milli equivalents peroxide oxygen per kg oil)</i>
Coconut oil sample A	0.1	0.2	1.447	264	8.1	4.1
Coconut oil sample B	0.1	0.2	1.447	261	8.4	2.7
Standard* range	-	-	1.448-1.450	255-263	7.0-9.5	-

\*According to Cocks & Van Rede (1966)

TABLE 2

Changes in the Levels of Free Fatty Acid and Peroxide Values of Coconut Oil Samples A and B Stored for 3 Months at Ambient Temperature (24-28°C)

Name of sample	% free fatty acid (as lauric acid)				Peroxide value (milli equivalents peroxide oxygen per kg oil)			
	Storage period in months							
	0	1	2	3	0	1	2	3
Coconut oil sample A	0.2	0.4	0.5	0.6	4.1	5.6	7.5	8.5
Coconut oil sample B	0.2	0.3	0.5	0.8	2.7	5.0	7.1	9.4

myristic (13-23 per cent) acids, and also low degree of unsaturation (4-16 per cent). The oil therefore possesses a high oxidative stability as reported by Young (1983).

Additionally, tocopherol, a natural anti-oxidant in unrefined coconut oil, causes the product to remain fresh for several months as observed by Thieme (1968).

The study has shown that for coconut oil to have long shelf life, it should be tightly covered and stored in the room under ambient conditions (range 24-28 °C). Some market retailers expose the oil without any cover for sale. This practice may cause an increase in the dissolved oxygen content of the oil, leading to increased oxidation and hence earlier deterioration of the product (Leong, 1995).

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