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Determination of The Fatty Acid and Anti-Oxidant Vitamin Profile Nigerian Rubber and Palm Kernel Seed Oils

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Abstract

The rubber seed is a semi-dried substance that does not contain any unusual fatty acid but is a rich source of polyunsaturated fatty acids that make up more than 50% of its total fatty acid composition. The palm kernel oil is one of the most widely used of the lauric acid oil which contains a high level of saturated fatty acids such as lauric acid. The fruits are fleshy and elongated, egg-shaped and of a reddish colour

The oils from the two seeds were extracted with hexane using the soxhlet extraction technique. These oils were later screened by determining their fatty acid and anti-oxidant vitamins by the use of GC-FID. The rubber seed oil had oleic-24.06mg/kg; linoleic-22.50mg/kg; linolenic-36.30mg/kg and palm kernel had:lauric-45.81mf/kg; myristic-18.23mg/kg; palmitic-6.94. In other words rubber seed oil was composed more of unsaturated fatty acids while the palm kernel oil was composed more of saturated fatty acids. The oils were also screened for anti-oxidant vitamins with a GC-FID, and were found to contain vitamin E and other vitamins which make them vital materials for industrial applications.

Key words: Rubber, Palm Kernel, lauric, Oleic, Vitamin, Fatty Acids,.

Introduction

The rubber seed oil has potential applications in the manufacture of some consumer goods (Iyayi *et al*, 2007). It has been shown to have many industrial applications including the manufacture of fatty acids (Chin *et al*, 1977), paint, soap (Chin *et al*, 1977, Gandhi *et al*, 1990) and surface coatings (Aigbodin and Pillai, 2000). However, the incidence of high free fatty acids in the oil may be a limiting factor in its application in the synthesis of some compounds such as vulcanized oil (Fernando, 1971). Attempts to deacidify the oil by using the alkali refining resulted in high

refining losses (UNIDO, 1989). But studies carried out by Ebiwele and others in 2010 showed that rubber seed oil could be de-acidified by chemical means - a reesterification process using glycerol in the presence of a catalyst and under a vacuum. Research has also shown that rubber seed oil may not be a good source of anti-oxidants, but it can provide adequate essential metals in nutrition (Ononogbu *et al*, 2001).

The kernel nut of oil palm is cracked and milled before extraction of the palm kernel oil. And because it has a low degree of unsaturation, the oil possesses a high oxidative stability (Young, 1983). In the southern part of Nigeria, the oil is used for cooking, frying and even as cream in some families. The nut has a hard shell which surrounds a kernel. It is from these kernels that palm kernel oil is extracted (Detheux, 2004). In the food industry, it is used in the preparation of certain traditional dishes and in the constitution of food fats (Dosumno and Ochu, 1995, Alexey *et al*, 2000). In the non-food industry, its higher lauric acid proportion gives this oil an important characteristic used in the preparation of soap and other beauty care products. This property also characterizes its strong use in the traditional pharmacopoeia (Sahmial *et al*, 1998).

Methodology

Analysis of the Fatty Acids

The fatty acid composition of the rubber seed and palm kernel seed oils was investigated using the Gas-Chromatography technique. Chloroform/methanol containing 0.005% butylated hydroxytoluene, to act as antioxidant, was added to 100ml of sample and mixed vigorously for one minute, then left at 4⁰C overnight. Then 1ml of 0.9% NaCl was added and the sample was mixed again. The chloroform phase containing lipids was collected, pooled and dried under nitrogen, and then subjected to methylation. Peaks were identified by comparisons with fatty acid internal standards area and its percentage for each resolved peak was analysed using an atlas software integrator. The temperature was programmed at 60⁰C and held for 6 minutes, then increased to 110⁰C at 1⁰C/min for 5 minutes. The injector and detector temperatures were set at 90⁰C and 110⁰C respectively.

Determination of Antioxidant Vitamins of the seed oils:

The vitamins of these oils were analyzed with a GC-FID System. The following equipment parameters were used:

Column pressure	20psi
Split Ratio	50:1
Column Temperature	250 ⁰ C-320 ⁰ C
GC Carrier Gas	He, H ₂ and Air

An aliquot of the extract was applied to the hexane preconditioned solid phase of the extraction column. The internal standard used was dihydro-vitamins of the vitamins, of which 1ml was injected into the GC, and since not all the vitamins have

the same absorbance at a particular wavelength, the instrument was programmed to change wavelength in the course of a run.

Results and Discussion

Rubber Seed Oil

Saturated Fatty Acid(mg/kg)

Palmitic	16.57
Stearic	9.53

Unsaturated Fatty Acid(mg/kg)

Oleic	18.38
Linoleic	22.50
Linolenic	36.30

Palm Kernel Seed Oil

Saturated Fatty Acid(mg/kg)

Caprylic	3.23
Capric	3.06
Lauric	45.81
Myristic	18.23
Palmitic	6.94
Stearic	1.89

Unsaturated Fatty Acid(mg/g)

Oleic	3.51
Linolenic	0.13

Anti-Oxidant Vitamins(mg/kg)

Palm Kernel Seed Oil

V _E	0.91
V _K	0.72
V _{BCOMP}	0.10

Rubber Seed Oil

V _E	2.05
V _{BCOMP}	0.27

From the results on fatty acid composition, there is a higher level of saturation in the fatty acids of the palm kernel oil whereas there is a higher level of unsaturation in the fatty acid of rubber seed oil. In the formulation of paint generally, oils with a high level of saturation, like the palm kernel, are used in the production of emulsion paint while the rubber seed oil can be used in the production of oil paint. Beare-Rogers and others, in their work in 2001 and 2002 showed that lauric acid comprises about half of the fatty acid in palm kernel oil. This is in support of the result as shown above. From

the results, it can be seen that vitamin E is the most active and abundant antioxidant vitamin in all these oils. In the case of the coconut oil, the native coconut oil has a higher amount of vitamin E. All the other vitamins are in trace amounts. Research by Reboul and others in 2006 has revealed that vitamin E is the most abundant in these oils and that alpha-tocopherol is the most active form of vitamin E. Akinson and others in 2008 have found that vitamin E prevents the oxidation of polyunsaturated fatty acids. Herrera, Packer and others in 2001 also found that vitamin E stops the production of reactive oxygen.

Conclusion

There is a higher level of unsaturation and a higher level of saturation in the fatty acids of rubber seed oil and palm kernel seed oil respectively. Although both oils have vitamin E, this is higher in rubber seed oil than palm kernel seed oil.

Acknowledgment

We are grateful to the department of Pure and Industrial Chemistry, University of Port Harcourt for their support. We are also grateful to the Federal Government of Nigeria for funding the work through the Tertiary Education Trust Fund.

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