WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.074
Volume 8, Issue 3, 100-105. Research Article ISSN 2277– 7105

DETERMINATION OF BETA- CAROTENE AND VITAMIN A [RETINOL] IN PALM OIL FROM TWO VARIETIES OF PALM FRUITS (ELAEIS GUINEESIS TENERA AND DURA)

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Article Received on
26 Dec. 2018,

Revised on 17 Jan. 2019,
Accepted on 08 Feb. 2019

DOI: 10.20959/wjpr20193-13967

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ABSTRACT

The two varieties of palm fruits, Elaeis guineansis (Tenera) and Elaeis guineensis (Dura) obtained from Ogbeke, Agbani in Enugu state was carried out to determine the Beta-carotene and Vitamin content using a spectrophotometer method (model 22uv/visible) at wavelength of 436 nm. Determination of the Beta-Carotene obtained for the species were 1.45×10^{-1} mg/ml and 1.47×10^{-9} mg/ml for Dura and Tenera respectively, while Vitamin A were 1.82 mg/ml and 0.335 mg/ml for Dura and Tenera Species respectively. The result revealed that Elaeis-tenera had a low beta-carotene content and vitamin A concentration than Elaeis-dura in the study.

KEYWORDS: Tenera, Dura, petroleum ether, acetone

INTRODUCTION

Palm oil is a form of edible vegetable oil obtained from the mesocarp of the oil palm fruits by milling mechanically or by the traditional method (Edem and Akpanabiatu, 2006). It is consist of about 45 - 55% oil, but varies from light yellow to orange-red in color, and melts at 25°C (Duke, 1983).

Abeyeh *et al* and Robbelen *et al* 2000 reported that oil crops are the most valuable commodity in world trade and are regarded as a vital part of the world's food supply. Palm oil contains several saturated and unsaturated fats in the forms of glyceryllaurate (0.1%

saturated), myristate (0.1% saturated) palmitate (44% saturated), stearate (5% saturated), oleate (39% monosaturated), linoleate (10% polyunsaturated) and linolenate (0.3% polyunsaturated) (Coltrell,1991).

Palm oil has been reported to be anodyne, aphrodisiac and diuretic (Tola *et al*., 2003). It is folk remedy for headache, pains, rhenumatism, cardiovascular diseases, thrombosis and atherosclerosis (Ekwenye and Ijeomah 2005). Palm oil is known to be effective diarrhea and dysentery in infant (Ekpa *et al.,* 1996). Red palm oil gets its characteristic dark red colour which comes from carotenes such as alpha-carotene, beta carotene and lycopene (Esterhuyse *et al*., 2005).

Palm oil plant is the highest oil producing plant with an average 3.5 tons and has an increasing consumer interest in tropical West Africa. It contains approximately 50% saturated fats and 40% unsaturated fat, because of its numerous advantageous properties, such as its high thermal and oxidative stability and its plasticity at room temperature (Noor *et al*., 2002). Nursing mothers are encouraged to add red palm oil into their diets to enrich the vitamin A in breast milk (Tan, 1991).

Carotenoids are present in numerous vegetable oils including groundnut oil, soya bean oil, barley oil, yellow maize oil, cotton seed oil, rape seed oil, sun flower oil, olive oil (Alam et al., 2004). Palm oil contains the highest known concentration of agriculturally derived carotenoids (Echegi et al., 2017). This crude palm oil is the world's richest natural source of carotenes in terms of retinol (pro vitamin A).

Palm oil contains about 15-300 times as many retinal equivalent as carrot, leafy green vegetables and tomatoes (Njoku *et al*., 2010).

This paper aims at the determination of Beta- Carotene and Vitamin A in palm oil from two varieties of palm fruits [Elaeis guineensis Tenera (akwu-osukwu) and Elaeis guineensis Dura (akwu-ojukwu).

MATERIALS AND METHODS

Sample Collection

The palm fruits from tenera and dura varieties of oil palm were obtained from Ogbeke Agbani in Nkanu west L.G.A of Enugu State. The palm fruit were separated from the

bunches with a stainless knife and picked manually into clean polyethene bags labeled tenera and dura.

The palm fruits were transported to laboratory, boiled in a basin for about two hours. The boiled fruits were crushed in a mortar and pestle to separate the nuts from the pulp. The pulp was thoroughly stirred in hot water and the crude oil was skimmed off. The fibers were sifted out and finally the nuts were collected and separated from the remaining fibers. The crude palm oil obtained was clarified by boiling after which the oil on the surface was decanted into a sterilized reagent bottle prior for analysis.

Determination of Beta-carotene

20 g of oil sample were weighed into 250 ml conical flask. 10 ml of 95% of ethanol was added and the reacting mixture was heated at 80°C in a water bath for 20 minutes with periodic shaking. The mixture was then cooled to room temperature and 15 ml of water was added for 5 minutes. The samples obtained were dissolved in petroleum ether. Then the mixture was filtered into 250 ml conical flask and made up to mark with the petroleum ether. The absorbance was measured at 436 nm using spectrophotometer (model 22 UV/ Vis). From the absorbance obtained, the concentration of beta-carotene in the sample was calculated, using the formula:

Concentration of Beta-carotene = [KE x Vol x Absorbance (436nm)] /100 x sample weight (g)

Where KE = extinction coefficient = 383, V = volume used for analysis, W = weight of sample in grams.

Determination of Vitamin A

10g of oil sample were weighed into a conical flask with 100 ml of a mixture of 50:50 acetone and petroleum ether using a spectrophotometric method at 390 nm. The mixture was allowed to stand for two hours with periodic shaking. The product obtained was washed with 10% NaCl and transferred to a separating funnel. 5% Na_2C0_3 and 20 ml of distilled water was added to remove extra-carotene until the solution was clear. The standard method of vitamin A was used and the concentration of vitamin A in oil sample was determined and calculated using the formula:

Vitamin A = [Conc. Of the standard x Volume [Volume of curvette x sample weight (g)]

RESULTS AND DISCUSSION

The results of beta-carotene and vitamin A determination of Elaeis –Tenera and Elaeis-Dura.

Table 1: Determination of Beta-Carotene and Vitamin A in E-Tenera.

Expt	B-Carotene	Vit-A
1	$6.6x\ 10^{-9}$ mg/ml	0.317 mg/ml
2	$6.6x\ 10^{-10}$ mg/ml	0.315 mg/ml
3	$6.6x\ 10^{-3}$ mg/ml	0.313 mg/ml
4	$6.6x\ 10^{-5}$ mg/ml	0.312 mg/ml
5	$6.6x\ 10^{-7}$ mg/ml	0.310 mg/ml
Mean	1.47×10^{-9} mg/ml	0.335 mg/ml
S.D	$2.89x\ 10^{-9}$ mg/ml	0.03 mg/ml

Table 2: Determination of Beta-Carotene and Vitamin A in E-Dura.

Expt	B-Carotene	Vit-A
1	$6.6x\ 10^{-1}$ mg/ml	1.837 mg/ml
2	$6.6x\ 10^{-2}$ mg/ml	1.830mg/ml
3	$6.6x\ 10^{-12}$ mg/ml	1.823mg/ml
4	$6.6x\ 10^{-14}$ mg/ml	1.820 mg/ml
5	$6.6x\ 10^{-15}$ mg/ml	1.807 mg/ml
Mean	$1.45x\ 10^{-1}$ mg/ml	1.82 mg/ml
S.D	$2.8x\ 10^{-1}$ mg/ml	0.01 mg/ml

From the result shown in Table 1 and 2, E-tenera have the mean value of 1.47×10^{-9} mg/ml for Beta-carotene and the mean value of 0.335 mg/ml for Vitamin A while E-dura have the mean value of 1.45×10^{-1} mg/ml and 1.82 mg/ml for Beta-carotene and Vitamin A respectively. The results obtained from the determination of Beta-carotene from two varieties of palm fruits revealed that the Elaeis- dura species have more beta-carotene value of 1.45×10^{-1} mg/ml and Elaeis-tenera species have lesser beta-carotene value of 1.47×10^{-9} mg/ml whilst the Elaeis-dura have the highest concentration of Vitamin A value of 1.82 mg/ml and Elaeis-tenenra with the least concentration of vitamin A value of 0.335 mg/ml respectively. Hence Elaeis-tenera showed a low beta-carotene content and vitamin A concentration than E-dura.

CONCLUSION

Since palm oil contains the highest known concentration of agriculturally derived carotenoids, it is considered as the richest source of beta-carotene which are the precursor of vitamin A. Carotenes and Vitamin A play an important roles as nutritional antioxidants that acts as scavengers of the oxygen atom or free radicals or as antioxidants that may provide

oxidative stability to the oil. Therefore it is advisable to consume more of Elaies-dura since it is of more carotenoids than Elaies-tenera.

ACKNOWLEDGEMENTS

Our unreserved gratitude goes all those who contributed to the success of this research and presentation.

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