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Quality Assessment of Crude Palm Oil on Sale in Selected Markets in Rivers State, Nigeria

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***Abstract*— Palm oil is one of the major fats and oils produced and traded in the world today. It forms an important ingredient in the diet of most people in West Africa. The quality of palm oil in mostly determined by physiochemical parameters such as the free fatty acid, acid values, moisture content, iodine, perioxide and saponificaiton values. This study examined the quality of palm oil on rate in three selected major markets, (mile 1, Creek Road and Choba Markets) in Rivers State, Nigeria. Triplicate samples were purchased from the three different markets and analyzed.**

Moisture contents were determined using hot plate and petridish methods. FFA, acid values, iodine, perioxide and saponification values, was determined by titration methods. The contents; 6.09-7.781% for FFA:12.12-15.48mgKOH/g for acid value; 44.29-51.73 Wiji's for iodine; 9.80-10.70meg/kg for peroxide and 180.90-196.35 mgKOH/g for saponification; these results showed that the two key quality parameters of the palm oils analyzed exceeded the acceptable values indicating that the palm oil on sale in these markets are of poor quality.

Enlightenment and promotion of improved processing, good handling and storage practices that would ensure high quality palm for markets in Rivers should be carried out by regulatory agencies.

***Index Terms*— Quality Assessment, physiochemical parameters and Crude Palm oil.**

I. INTRODUCTION

The tropical rainforests of West and Central Africa are endowed with abundant high value indigenes fruits and medicinal tree species. The oil palm (Elaesis guinensis) is one of Africa's most important oil producing plants. The oil palm exists in a wild, semi wild and cultivated state in the tree land areas of the equatorial tropics in Africa, South-east Asia and in America [1]. The crop remains one of the most important economic crops in the tropics. In Africa, many households heavily depend on these resources for their fruits, medicinal, food, constructions needs and their livelihoods and income. Nigeria used to be the world's largest producer of oil palm (Elaeis Guineensis), before the crude oil boom era which has seen Malaysia takes the lead position [2]. It also accounted for about 72% (1.3 million tones, per annum) of Nigeria's total vegetable oil production and contributed to the country's foreign exchange earned yearly in past decades.

Oil palm is appreciated by most people in the southern and eastern parts of Nigeria because of its level of utilization with respect to the various products and by –products that can be obtained from it, such as; palm oil, palm kernel oil and palm kernel cake. Oil palm gives the highest yield of oil per unit area, compared to any other of producing plant when processed and it produces two distinct oils; palm oil and palm kernel oil which are of great importance[3].

Red palm oil is used in cooking, making soap, candle and margarine [4]. Palm kernel oil can be extracted from the nut. The residue obtainable in the process of palm kernel oil extraction otherwise called palm kernel cake is used as livestock feed. Palm kernel shelves are also useful as energy source and industrial cooking oil, raw material for manufacturing industries for soap, creams, margarines and confectionaries [5]. Elasis guineensis is pinnate leaved having dense clusters of crowded flowers and bright red fruit that yield high quality palm oil. The importance of quality palm oil cannot be overemphasized as it is the main vegetable oil consumed in the world today, accounting for 33% of all oils consumed globally, closely followed by Soya oil with 30^20[6].

Nevertheless, the quality of crude palm oil (IPO) is essential in determining its application. The high nutritional value especially its high oil content greatly predisposes it to deterioration [7].

The aim of this paper is to ascertain the quality and edibility of crude palm oil (CPO) sold in selected major markets of Port Harcourt in Rivers State. Hence it is to determine its fitness for both consumption and by experimental comparison of its properties, with obtained set international standard.

II. MATERIALS AND METHODS

FIELD SAMPLING

The palm oil samples used for this work are five 750ml bottles of palm oil purchased from different sellers in three congregate locations of mile 1, creek Rd, and Choba markets in Rivers State , Nigeria and taken to the laboratory for analyses, the samples were tagged alphabetically (A, B,C) according to their locations for easy identification before analysis[8].

Specific gravity method

The apparatus used for this analysis are pyrometer, weigh balance and water bath. The dry pyrometer was filled with three different prepared samples in such a manner to prevent entrapment of air bubbles after removing the cap of the side arm. The stopper was inserted and immerses in water bath at 300°c and held for 30 minutes. The oil that came out of the capillary opening was carefully wipe off and removed the bottle from water bath, cleaned and dried it thoroughly. The

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cap of the side arm were removed and quickly weighed to ensure that the temperature does not fall below 30°c.the specific gravity at 30°c was calculated by

Specific gravity = weight volume of sample/ weight volume of water.

Moisture content method

The moisture content experiment was carried out by weighed 15gram of well mixed crude palm oil of three different samples into tarred filter flask containing a magnetic bar as part of tarred weight. 5ml acetone was added into tarred filter flask using graduated cylinder. The flask was stoppered by placed in glycerol bath which was heated by means of electric hot plate. The flask was placed under vacuum with continuous stirring and heated at 100°c for 20 minutes. The flask was removed from the hot plate and cooled at the room temperature while maintaining the vacuum. Vacuum was carefully released and the flask was dried and placed in desiccator for a few minutes and weighed.

Free fatty acids and acid values method

The three samples of crude palm oil were melted at 70° in order to form a homogenous solution. The three samples was weighed 5gram each and placed into an Erlenmeyer flask, 50ml of neutralized solvent (ethanol) was placed into the flask and placed the flask on the hot plate and regulate the temperature at 40 °c. The three samples in the flask were shaking gently and titrate with standard alkali (sodium hydroxide) to the first permanent pink colour.

Peroxide value method

The three samples of crude palm oil were collected and kept in a cool dark place before the analysis was carried out. 2.0gram of the three samples were weighed and placed into 250ml flask, 50 ml of acetic acid chloroform solution swirl was added into the each sample and dissolved in the solution. 0.5ml of saturated potassium iodide was added to the flasks with graduated pipette swirl for one minute, then 50ml of distilled water was added and few drops of starch solution were also added. The solution was titrated with 0.01N sodium thiosulphate solution by adding it gradually with constant vigorous shaking until the blue color was disappeared.

Saponification method

The three samples of crude palm oil were melted at 70°c and filtered with filter paper to remove any impurities and last traces of moisture. The samples were mixed thoroughly and weighed 20gram of the each of the three samples into a 0.29 gram Erlenmeyer flask. 50ml of the alcoholic potassium hydroxide solution was pipette into the flask. Blank test was concluded to determine along with the samples. The sample flasks and blank flasks were connected with air condensers kept on water bath, boiled gently but steadily until saponification was complete as indicated by absence of any oily matter and appearance of clear solution. Clarity was achieved within one hour of boiling. After the flask and the condenser have cooled, 10ml of hot ethyl alcohol neutral to phenolphthalein was used to washed down the inside of condenser. The excess potassium hydroxide with 0.5N hydrochloric acid used about 10ml; phenolphthalein indicator was also used for titration.

Iodine value method

A 0.34 gram test of the three samples were heated with iodine monochloride (wijs) solution (precisely prepared by solution of iodine tetrachloride, with addition of iodine power such that 5ml of the solution consumed 10.03ml of 0.1N (sodium thiosulphate). One hour reaction time in the dark was allowed, after which the excess lodine monochloride was determined by titration with standardized 0.1N sodium thiosulphate.

III. RESULTS AND DISCUSSION

Table 1: TOTAL ANLAYSES RESULTS

ANALYSES	SAMPLE A	SAMPLEB	SAMPLE C
Specific gravity	0.91	0.59	0.79
% FFA	6.09mgKOH/g	7.78mgkoH/g	7.78mgkoH/g
Acid value	12.12mgkoH/g	15.48mgkoH/g	14.03mgkoH/g
Iodine value (Wijs)	44.29 g	49.30g	51.78g
Peroxide value	9.8meg/kg	10.70meg/kg	10.70meg/kg
Saponification	180.980mgkoH/g	192.10mgkoH/g	192.10mgkoH/g

Table 2: COMPARISON OF TEST ANALYSIS WITH THE INTERNATIONAL ACCEPTABLE STANDARD BY CODEX

TEST ANALYSES	SAMPLE A	SAMPLE B	SAMPLE C	CODEX ACCEPTED
Specific gravity	0.91	0.59	0.79	0.5-10%
% FFA	6.09mgKOH/g	7.78mgkoH/g	7.78mgkoH/g	0.15-0.25%
Acid value	12.12mgkoH/g	15.48mgkoH/g	14.03mgkoH/g	418-55MGKOH
Iodine value (Wijs)	44.29	49.30	51.78	56-62
Peroxide value	9.8meg/kg	10.70meg/kg	10.70meg/kg	192-202MGKOH/G
Saponificaition	180.980mgkoH/g	192.10mgkoH/g	192.10mgkoH/g	

IV. DISCUSSION

The above tabulated parameters such as the specific gravity, %FFA, % moisture content, Acid value, peroxide value, iodine value and saponification values, were used in this study to access the quality of palm oil on sale in selected major consumption markets in Rivers State. Generally, the quality of palm oil is mostly determined by the FFA and moisture contents [9]. Different international bodies, authorities, institutions and locals such as PORAM, CODEX, AOCS, NIS, IUPAC, BSF, SON,, have over the years published standards for consumption against which key parameters of crude palm oil with lower moisture content, provides better quality than that with higher moisture content because the more the moisture content, the more rapid the oil deteriorates in quality.[10],[11],[12],[13],[14]. The results showed that the values 1.40%, 2.47% and 1.87% of the moisture contents of samples, A, B & C are higher and do not fall within the range of the accepted standard[15].

Safe moisture content for fresh oil as reported by SON norms for edible palm oil falls within 0.15-0.25% thus making the palm oil samples below standard for consumption. This is not satisfactory because the amount of water and volatile matter present in the oil determines the rate of its degeneration.

It is also seen from the result table that the FFA of the samples do not satisfy the standard range but rather exceeded the recommended values.

(that is, the %FFA values 6.09%, 7.78% and %05% of the samples respectively under consideration exceed the standard values by a maximum of 2.78 obtained from sample B. the higher the FFA, the lower the palm oil quality and vice versa. The peroxide value for sample A is within the acceptable standard while that of sample B & C fall a little higher than the standard.

The result values 44.24, 49.30 and 51.78 of the iodine test (if the sample does not exceed the standard thus showing that there is little or no unsaturated sigma bond in the samples.

The saponification values of the samples are found to be withing the acceptable standard and satisfy consumption exception sample A which is below the codex standard. A high saponificaiton value indicates high proportion of low fatty acids since saponificaiton value is inversely proportional to the average molecular weight or length of fatty acids.

Therefore analyses and results obtained from the oil samples purchased from mile 1 market, creek road market and Choba main market represented in samples A, B and C respectively in this study showed that the samples did not meet two key parameters requirement, the %FFA and moisture content. The samples value exceeded that of the accepted range values by 1-3% thereby raising concerns of fitness for consumption the results thus, show that there is need for improvement on and monitoring of the process for the production of CPO for consumption.

It is worthy of note that several works on quality assessment of crude palm oil sold in markets and from processing mills have been carried out in different parts of Nigeria, Africa and around the globe.[16].

V. CONCLUSION

The quality assessment of CPO sold in selected major markets, mile 1, creek road and Choba market in Rivers State showed that the physiochemical parameters such as FFA and moisture content were high and exceed the expected international standard values, for consumption.

A high level of moisture content and FFA in CPO is undesirable as it leads to ranacid taste, lower price and increases the costs of refining. These poor key parameters suggest that the oil palm fruits were stored a bit longer before processing. This could trigger health related problems to individual that consumes such CPO.

However, other parameters such as peroxide, iodine and saponification values were satisfactory and met the required standard values.

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