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QUALITY ASSESSMENT OF PALM OIL SOLD IN MAJOR MARKETS IN ABIA STATE, NIGERIA

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ABSTRACT

This paper examines the quality of palm oil samples obtained from different locations in Abia State, Nigeria in terms of their physicochemical properties. The results obtained showed that the saponification value (SV) ranged from 129.04 – 198.03KOH/g of oil. The free fatty acid (FFA) of the palm oil samples ranged from 2.73 – 2.89mgKOH/g of oil, peroxide value (PV) 7.90 – 8.80meq/kg and the iodine value (IV) 52.61 – 53.48 Wiji's. The moisture content was in the range of 0.14-0.16% while the carotene content ranged from 1082 – 1458mg/kg. The results obtained after the analysis of variance (ANOVA) showed that there were no significant differences (P>0.05) in the specific gravity, smoke, flash and fire points, moisture content, saponification value, peroxide value and free fatty acid values of the palm oil samples. However, there were significant differences (P<0.05) in the melting point and carotene content of the palm oil samples respectively.

Key words: Quality assessment, palm oil, physiochemical properties, market.

INTRODUCTION

The oil palm (*Elaeis guineesis*) is one of Africa's most important oil producing plants (Vickery and Vickery, 1979). 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 (Hartley, 1988). The oil palm fruits produce two types of oil, palm oil which is extracted from the pericarp of the fruit and palm kernel oil from the seeds, both of which are important in the world trade. Palm oil is an important vegetable oil which has an increasing consumer interest in tropical West Africa. It contains approximately 50% saturated fats and 40% unsaturated fats. The light yellow to orange-red colour of palm oil is due to the fat soluble carotenoids, which are responsible for the high vitamin A content (Ugwu et al,. 2002). Industrially, palm oil could be refined to give a light coloured product which could be used in the manufacture of margarine, shortenings, biscuits, cooking fats, ice-cream, bakery fats as well as cooking oils (Ihekoronye and Ngoddy, 1985). The quality of palm oil could be affected by improper post harvest handling, processing and storage technique. Again there is wide spread speculation that palm oil is being adulterated for the sole purpose of profit maximization. The adulteration ranges from the use of colour dyes, water and other illegal food additives which could affect the quality of palm oil in terms of nutritive value, wholesomeness, utilization, safety and shelf-life. The quality of palm oil is generally determined by the percentage of free fatty acid, moisture and dirt content. The produce is traditionally bought on a 5% free fatty acid basis with penalties for exceeding this figure (Hartley, 1988). The main objective of this work was to assess the quality of the palm oils sold in major markets in Abia State, Nigeria.

MATERIALS AND METHODS

The palm oil samples used for the study were bought from different oil markets in three locations, namely Aba, Umuahia and Umuopara in Abia State, Nigeria. Five samples of palm oil were collected from different sellers in each of the three locations for analysis.

Analysis:
The specific gravity was determined using a pycrometer gravimetric method as described by Pike (2003). The smoke, fire, flash and melting points were determined according to the method of Pearson (1976). The moisture content was carried out by the Official Standard Method (AOAC,1990). Lovibond tintometer (AOCS, 1993) was also used to determine the colour of the oil samples. Acid values, iodine values, saponification values, unsaponifiable matters, peroxide values and free fatty acids (FFA) were determined using Pearson's method (1976). Carotene content was determined spectrophotometrically using the method described by Ojiako and Akubugwo, 1997.The value obtained for each parameter was the mean of the duplicate determinations of the five representative samples from each location.

Experimental Design and Statistical analysis
Completely randomized design (CRD) was used in this experiment according to Snedecor (1956). Analysis of variance (ANOVA) was used to test the data obtained while Turkey's test method was used to compare the means.

RESULTS AND DISCUSSIONS

The physicochemical properties of the oil samples are presented in Tables 1 and 2. As seen in Table 1, there was no significant difference (P>0.05) in the specific gravity (SG) of the palm oil samples. The values obtained were closely related to the standard range of 0.898 – 0.907 approved by Standard Organization of Nigeria (SON 2000).

The physical analysis (Table 1) also revealed that the smoke and flash points of the oil samples were not significantly different (P>0.05). The high value obtained for these physical properties are indicative of the suitability of the oil palm samples for frying.
There were significant differences (P<0.05) in the melting points (Table 1) of the respective oil samples. The palm oil sample from Umuahia had the highest melting point of 35.1°C followed by samples from Aba (31.9°C) and Umuopara (31.0°C). The melting point values obtained are within the range of 27 – 50°C as specified by SON (2000). Thus, the oil samples will remain liquid at room temperature. Saponification values (SV) obtained for the palm oil samples (Table 1) ranged from 192.64 to 198.03 mgKOH/g. The values are within the expected range of 195 – 205 mgKOH/g of oil for edible palm oils as specified by SON (2000) and NIS (1992). The high saponification values of the palm oils is an indication that the oils will be most suitable for soap making.

Table 1: physicochemical properties of palm oil samles

Properties	Aba	Umuahia	Umuopara
Moisture content (%)	0.14[a]	0.16[a]	0.6[a]
Specific gravity	0.877[a]	0.832[a]	0.880[a]
Smoke point (°C)	114.4[a]	115.2[a]	116.6[a]
Flash point (°C)	227.8[a]	296.3[a]	296.4[a]
Fire point (°C)	316.4[a]	322.4[a]	317.8[a]
Melting point (°C)	31.9	35.1[a]	31.0[c]
Saponification value mg/KOH/g)	192.64[a]	197.76[a]	198.03[a]
Unsapoinfable matter (g/kg)	7.80[a]	7.60[a]	7.70[a]
Free fatty acid (FFA) mgKOH/g	2.73[a]	2.84[a]	2.89[a]
Iodine value Wij's	52.61[a]	53.48[a]	53.03[a]
Peroxide value (meq/kg)	7.90[c]	8.30[a]	8.80[a]
Carotene content (mg/kg)	1274.4[a]	1458.4[b]	1882[c]

Means in the same row with the same superscripts are not significantly different (P>0.05).

Table 2: The colour value (Lovibond unit) of the palm oil samples.

Samples	Lovibond unit
Aba	2.74R + 26.8Y
Umuahia	2.68R + 27.0Y
Umuopara	2.90R + 26.6Y

R = red, Y = yellow

As observed from (Table 1) the values obtained for unsaponifiable matter showed no significant difference (P>0.05). However, the unsaponifiable values are less than the maximum value of 10g/kg as stated by SON (2000) and NIS (1992) for edible palm oils. The amount of unsaponifiable matter found in edible oils is usually small, thus any high value obtained may indicate contamination or adultration (Ihekoronye and Ngoddy, 1985).
The free fatty acid (FFA) values were not significantly different (P>0.05). Generally the free fatty acid (FFA) shows the level of rancidity taking place in the oil. However, the free fatty acid ranging from 2.73 – 2.89 mgKOH/g are lower than the maximum free fatty acid content of 3.5mgKOH/g of oil specified by SON (2000).
The iodine value which is the measure of the level of unsaturation in the oil samples (AOCS, 1993) ranges from 52.6 to 53.48 Wij's with no significant difference (P>0.05) (Table 1). The iodine values obtained were within the standard range of 45 – 53 Wij's as recommended by SON (2000)and NIS (1992). However, the values obtained indicate that the oil samples are highly unsaturated and therefore susceptible to

oxidation. The addition of antioxidants may be necessary to prolong the storage stability of the oils. The peroxide value determines the extent to which the oil has undergone rancidity, thus it could be used as an indication of the quality and stability of fats and oils (Ekwu and Nwagu, 2004). As presented in (Table 1), the peroxide values ranged from 7.90 – 8.80meq/Kg and are closely related to the standard value of 10meq/Kg specified by SON (2000) and NIS (1992). The high values of peroxide obtained could indicate the onset of primary oxidation due to lipid degrading enzymes like peroxidase and lipoxygenase (Onyeka *et al.*, 2005

There was no significant difference (P>0.05) in the moisture content of the oil samples. The values obtained were similar to the recommended value of 0.29% for fresh oil by SON (2000) and (NIS 1992). The low moisture content obtained will encourage the storage stability of the oil palm samples. The result presented in Table 1 also shows that there were significant differences (P<0.05) in the carotene content of the respective oil samples. This could be as a result of differences in the species of the palm fruit, processing and storage methods. The carotene of palm oil decreases with the time of storage. Palm oil is usually rich in vitamin A with carotene as its precusor (Ihekorokye and Ngoddy, 1985). Thus low levels of carotene in the oil samples indicate low levels of vitamin A. The palm oil from Umuopara showed the lowest carotene content, which indicates long storage period of the oil sample. However, the values obtained were within the range of 500 – 2000 mg/kg set by (SON (2000).

Table 2 shows the colour value of the palm oil samples which is another indication of oil quality (Ekwu and Nwagu, 2004). The lovibond colour values (Table 2) of the palm oil samples were within the standard range of 2.5 – 3.0 red and 26 – 28 yellow as specified by SON (2000).

CONCLUSION

The results obtained from the study showed that the quality of the palm oil samples investigated were within the standards recommended by SON (2000) and NIS (1992). It is therefore reasonable to conclude that palm oil samples investigated were not contaminated or adulterated and also the processing and storage methods employed were adequate. The results also indicated the suitability of the oil samples for domestic or industrial applications as well as export trade.

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