

Physicochemical and Nutritional Properties of Stored Palm Oil

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Abstract: The physicochemical and nutrient properties of stored palm oil was assessed in this study. Stored and freshly produced palm oil samples were obtained from Ngor-Okpala L.G.A of Imo state, Nigeria The acid, iodine, ester, refractive index, moisture content, sap, peroxide and viscosity values were assessed using standard biochemical methods. Results indicate that acid, iodine, sap, refractive index, esters, viscosity, peroxide and moisture values for both fresh and stored oil were respectively 10.0 and 18.0mg/g; 40.20 and 49.50mg/g; 200 and 210mg/g; 12.2 and 21.2mg/g; 1985 and 1250mg/g; 12.4 and 14.3mg/g; 12.5 and 14.6mg/g, 9.85 and 18.6mg/g. With lower acidic, iodine and peroxide content as observed in the result, fresh palm oil is more suitable for domestic uses while stored palm oil could find use in the industries.

Keywords: Physicochemical, Iodine, Refractive Index, Peroxide, Ester.

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I. INTRODUCTION

Palm oil is an extraction from the fleshy mesocarp of palm fruit (Monde, Cisse-Camara, Ake, Kofi, Guaza, Ijohan et al. 2020). It is an edible vegetable oil obtained from the pulp of the fruit of the oil palm (Nwosu-Obieogu, Aguele, Chiemenam and Adekunle, 2017). Crude palm oil is a complex mixture consisting majorly of glycerides as the major component while carotenoids, tocopherols, tocotrienols, phytosterols, sterols, glycerolipids, squalene and phosphatides represent the minor components (Akinola, Oguntibeju, Adisa and Owojuyigbe, 2010). They also act as biological antioxidants (Monde, et al. 2020). The tocopherols and tocotrienols act as anti-cancer, anti-inflammatory agents (Wu, Lui and Ng, 2008), control atherosclerosis, and decrease cholesterol. The oil is rich in palmitic acid, β -carotene and vitamin E. (Mba, Dumont and Ngadi, 2015). It contains about 15 times more carotenoid than carrot (Adebayo-Oyetoro, Ojoamo, Akinwande and Adeyeye, 2019). Carotenoids are chemical compounds that when absorbed by the human body can be converted into vitamin A. (Embrandiri, Ibrahim and Singh, 2013)

Fresh red palm oil is very healthy for human use since it contains a good proportion of saturated to unsaturated fatty acids and is rich in antioxidants like beta-carotene, tocotrienols, tocopherols, plant squalene, and phytosterol (Oguntibeju et al. 2009). It is rich in 16 carbon saturated fatty acids, palmitic acid, monounsaturated oleic acid and linoleic

acid (omega-6 fatty acid) (10%) (Analava and Sutapa, 2009). Palm oil has a unique natural combination of phytonutrients that cannot be found in other vegetable oils. Its minor components which constitutes about 1% includes carotenes, vitamin E, sterols, pigments, and fatty acids (Embrandiri et al., 2013).

Red palm oil is rich in antioxidant vitamins, trace elements and supplies fatty acids essential for proper growth, development and for general well-being (Ahsan, Ahad and Siddiqui, 2015).

In Nigeria, the traditional (mostly manual), semi-mechanized and mechanized processors are major methods used in the oil processing industry. To a large extent, small holders/traditional processors dominate the sector accounting about for 80 % (Harlyadi, 2020).

The storing of large volumes of oil for long periods under diverse conditions is not an easy task, since many of its characteristics (colour, flavour and clarity), which are necessary to be maintained, deteriorate (Ahsan et al. 2015).

➤ *Palm oil storage and Physicochemical properties*

Palm oil is consumed in the fresh state and/or at various levels of oxidation and confers a lot of benefits. These benefits include reduction in the risk of arterial thrombosis and atherosclerosis, inhibition of cholesterol biosynthesis and platelet aggregation, and reduction in blood pressure

(Embrandiri et al. 2013). However, oxidized palm oil induces an adverse effect on plasma lipid profile, free fatty acids, phospholipids and cerebrosides (de Almeida et al. 2013). Additionally, oxidized palm oil induces reproductive toxicity and organ toxicity particularly of the kidneys, lungs, liver and heart (Mba et al. 2015).

Palm oil, like all oils and fats, is made up mostly of glyceridic materials with some nonglyceridic materials in small or trace quantities (Adebayo-Oyetero et al. 2019). It is this chemical composition that defines the chemical and physical characteristics of palm oil, which in turn will determine the suitability of the oil in various processes and applications (Mba et al. 2015). Palm oil and hardened groundnut oil have the greatest oxidative stability at high temperature, in comparison to animal fats or highly unsaturated oils, with regard to the chemical parameters but also concerning the sensory evaluation (Wu and Ng, 2007).

II. MATERIALS AND METHODS

➤ Collection of Samples

Palm oil samples (freshly produced and stored ones, stored for 6 months) were individually purchased from palm

oil dealers in Ngor-Okpala L.G.A of Imo state Nigeria and subjected to physicochemical and nutritional analyses.

➤ Determination of the Physicochemical and Nutritional Properties of Palm Oil Samples

The freshly produced and stored palm oil samples were subjected to physicochemical assessment. Parameters determined were Acid values, iodine values, ester values, refractive index, moisture contents, sap values, peroxide values and viscosity. These were determined using methods described by Akinola *et al.* (2010) and Delvin, (1997).

III. RESULTS AND DISCUSSION

➤ Physicochemical and Nutritional Properties of Fresh and Stored Palm Oil Samples

The tests conducted on fresh and six months old palm oil samples yielded the following results" Acid value for freshly produced palm oil and stored palm oil were 10.0 and 18.0mg/KOH/g; iodine 40.2 and 49.5mgKOH/g; sap value 200 and 210mg/KOH/g, peroxide value 12.5 and 14.6mg/KOH/g, viscosity 12.4 and 14.3mgKOH/g, Ester value 198.5 and 125mg/KOH/g; Refractive index is 12.2 and 21.2mgKOH/g and moisture content 9.85 and 18.6mg/KOH/g.

Table 1 Physicochemical and Nutritional Properties of Fresh and Stored Palm Oil

Parameters	Fresh oil	Stored oil
Acid value (mg/g)	10.0	18.0
Iodine (mg/g)	40.20	49.50
Sap (mg/g)	200	210
Refractive index (mg/g)	12.2	21.2
Esters (mg/g)	198.5	125
Viscosity (mg/g)	12.4	14.3
Peroxide (mg/g)	12.5	14.6
Moisture	9.85	18.6

➤ Discussion

The results of the physicochemical and nutritional properties of the palm oil samples revealed that the acid value, iodine value, sap content, viscosity, peroxide value and moisture content of the stored palm oil were higher than those of the fresh oil. The acid content of the stored oil was 18.0mg/g when compared with of the fresh oil of 10.0mg/g. The high acid value of the stored oil indicated decrease in oil quality, reduction in thermal stability and increase in rancidity. Further, high acid value also indicated degradation and deterioration as well as improper processing (Hariyadi, 2020). The high iodine value of the store oil which was 49.50mg/g when compared with that of the fresh oil which was 40.20mg/g can also attest to the low quality of the stored oil in comparison with the fresh oil. The high iodine value is a critical indicator of oxidation susceptibility and nutritional quality. Lower iodine value is suggestive of higher oil quality (Noor, Musa and Ghazali, 2020).

Similar reasons can be adduced for the high viscosity, moisture and peroxide values of stored palm oil.

Previous authors have attributed the presence of high methyl ester content in palm oil to the possible addition of additive in the palm oil (Norizzah, Norsyamimi, Zaliha, Nur, Azimah, and Siti, 2014).

IV. CONCLUSION AND RECOMMENDATION

The outcome of this work has showed that stored palm oil had higher values of acid, iodine, viscosity, peroxide and moisture contents when compared with the fresh palm oil. Storage time as well as the processing conditions of the palm oil may be contributory factors to the high values of the parameters as seen in this study.

It is therefore recommended that fresh oil be used for edible purposes due to the low level of the parameters as assessed in this study.

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