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Short Communication

Storability and quality indices of palm oil in different packaging containers in Nigeria

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Palm oil was obtained from Linkjon commercial processing oil mill with food grade equipment at Umunze in Anambra State. The samples were stored at ambient conditions for one year in five different containers (transparent plastic, opaque blue plastic, opaque white plastic, green bottle and transparent bottle). Quality indices were determined for moisture content, free fatty acid (FFA), acid value and saponification value at bimonthly interval using standard methods. Moisture content varied between 1.0 and 1.5% in all treatments during the 12 months storage period. The initial value for FFA was 4.18% and this increased to 11.85% for palm oil stored in green bottle and lowest with 10.16% in palm oil stored in opaque blue plastic container at the end of storage. Saponification values increased from initial 191 to 250 among the treatments within the storage period. The increases observed in FFA, acid and saponification values could be attributed to moisture absorption from storage environment and oxidation. Although the values of the quality parameters varied with the type of storage containers used, there were no significant differences (P≤0.05) among treatments.

Key words: Palm oil, quality indices, storability, containers.

INTRODUCTION

Palm oil is an essential part of diet of man and animals and also plays leading roles in some manufacturing industries. The oil is unique having approximately 50% saturated fats and 40% unsaturated fats (Arowora and Fafunso, 1999). The distinctive colour of the oil is due to fat soluble carotenoids that are also responsible for the high vitamin content (Kruger et al., 2007). Most of the crude palm oil for domestic consumption and industrial purposes is processed in mills without food grade equipment. The process involved does not meet International standards for food quality and safety. The quality of the oil therefore varies depending on the processing method and different packaging materials (Okonkwo, 2011). One of the most important quality parameters in edible oil refining industry is low content of free fatty acid (FFA) and oxidative products (Kusum et al., 2011). Therefore, the importance of quality and safe palm oil low in FFA content in human nutrition for healthy life cannot be over emphasized (Ghot, 2007).

This work determined the storability and quality indices of palm oil produced from food grade equipment at Linkjon agro-processing oil mill using different packaging containers.

MATERIALS AND METHODS

The palm oil was obtained from Linkjon agro-based oil mill, Eziagu, Orumba South LGA in Anambra State. Red palm oil was dispensed into five different storage containers. The transparent plastic, opaque white plastic and opaque blue plastic were 750 ml container of 2 mm thickness and aperture of 25 mm with threaded seal cap, while the green bottle and transparent bottle (control) were 750 ml glass bottles of 5 mm thickness and aperture of 23 mm with threaded seal cap. Triplicate samples were used for treatments and control, arranged on laboratory table at completely randomized

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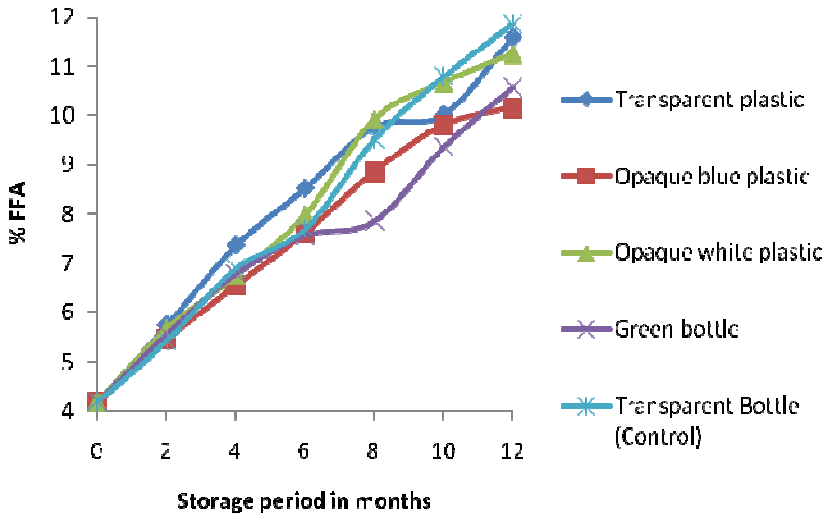

Figure 1. Effect of storage on FFA values.

design (CRD) at ambient conditions. The quality indices (moisture content, free fatty acid (FFA), acid value, and saponification value) for the palm oil were determined at initial and bimonthly interval for the 12 months storage period using the AOAC (2000) methods of analysis. The data obtained were subjected to ANOVA and differences between means tested.

RESULTS AND DISCUSSION

The results of the quality indices of palm oil during 12 months storage in the different containers are as shown in Figures 1 to 3. The initial FFA content of the batch of palm oil used for the experiment was 4.18%. There were increases among treatments in FFA (10.16 to 11.85%) at the end of storage period which did not differ significantly (P≤0.05) in all the storage containers (opaque blue plastic, green bottle, opaque white plastic, transparent plastic and transparent bottle respectively). The quality of the palm fruits used in processing palm oil is an important factor in the storage and quality of the oil. Deteriorated fruits would yield oil high in FFA and other quality indices of the palm oil. Storage containers are also important in keeping quality of palm oil in storage.

The initial FFA value of 4.18% was high which was reflected in the initial moisture content of 1.0 and 1.4% after 12 months; and the trend increased throughout the storage period. There were no significant differences (P≤0.05) among treatments in FFA values obtained (Figure 1). These findings are in accordance with Frank et al. (2011) who reported FFA value of 4.71% at initial and 10.26% in semi-mechanized extraction of palm oil after 10 weeks of storage. This is contrary to Abulude et al. (2007) who obtained FFA values (0.72-1.02 and 0.6-1.14%) for *Jatropha curcas* (Physic nut) and *Helianthus annuus* (Sunflower), respectively for oils stored at ambient conditions for 4 months in polythene, glass, metal and plastic bottles. High acid values are usually indicative of spoilage or high moisture which enables the enzyme lipase to convert the triglycerides to free fatty acids. FFA content is the most used index for determining the quality of palm oil and must not exceed 5% (expressed as palmitic acid) according to Codex Alimentarius/FAO/WHO (2005). Figure 2 showed that the initial acid value was 9.15 and increased to between 22.27 and 25.95 among treatments at the end of 12 months storage. This was contrary to the work of Abulude et al. (2007) who obtained (13.00-50.00 and 36.00-59.00) for *Jatropha curcas* and *Helianthus annuus* after 4 months storage in different containers. Figure 3 showed that the initial saponification value (mg KOH/g oil) was 191.12 at initial and increased to 223.45 in palm oil stored in transparent plastic compared to 229.61 to 249.97 in other storage containers at the end of 12 months.

Generally, it was observed in this study that the FFA, acid value (AV) and saponification value (SV) increased in all treatments during the 12 months storage period which is in accordance with previous studies (Abulude et al., 2007; Frank et al., 2011). The increase in the quality indices as indicators of reduction in quality of the palm oil may be attributed to the initial quality of the palm fruits used for processing of the oil. When this occurs there is the likelihood of microorganisms affecting the oils, which in turn may lead to spoilage. Another factor is absorption of moisture from the laboratory environment and oxidation of the red palm oil, since Linkjon oil mill is food grade mill (Okonkwo, 2011).

Conclusion

The opaque bottles reduced light absorption by the stored palm oil which normally leads to oxidation of the product and increase in free fatty acids and rancidity.

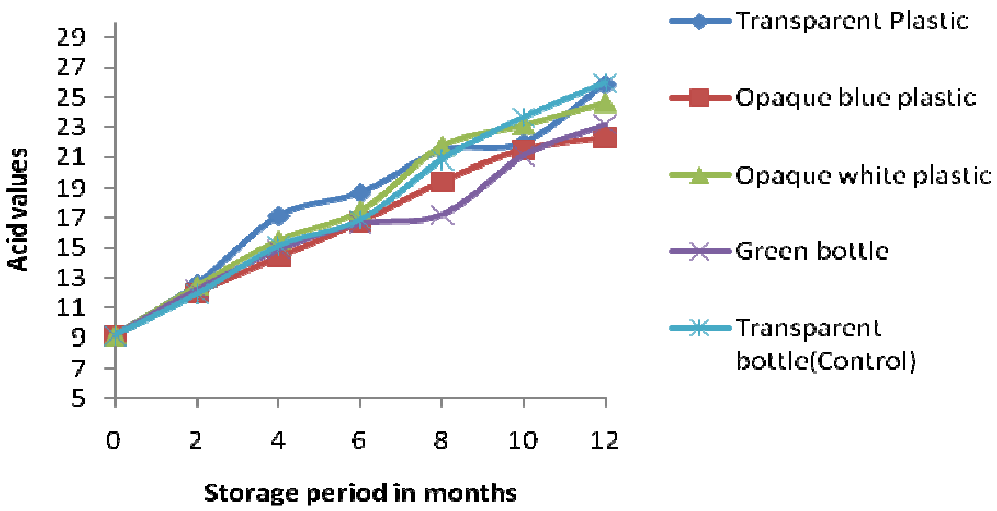

Figure 2. Effect of storage period on acid value.

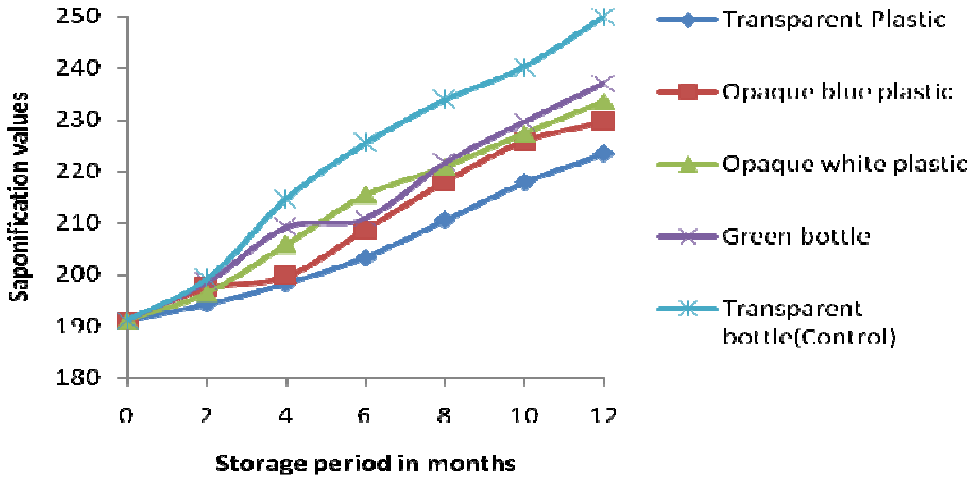

Figure 3. Effect of storage period on saponification value.

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