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Effect of Photo-Oxidized Groundnut oil (Arachis *Hypogea)* on the Liver Enzymes of Albino Rats

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Abstract: *The effect of photo-oxidized groundnut oil on the liver enzymes of albino rats was studied by measuring the biochemical indices of the rats fed with photo-oxidized groundnut oil. Physicochemical measurement of the groundnut oil exposed to sunlight for 90 hours was carried out to determine the effect of sunlight on the quality of the oil. The physicochemical parameter studied was relative density, viscosity, peroxide value and free fatty acid value. The result obtained show that the relative density, viscosity peroxide value and free fatty acid value increased with exposure. Biochemical analysis was conducted to determine the effect of photo-oxidized groundnut oil on the liver condition of the albino rats. Biochemical indices of liver function determined include Aspartate aminotransferase (AST), Alanine amino transferase (ALT) and alkaline phosphate (ALP).The result show increase in AST, ALP and reduction in AIT in rats fed with oxidized oil-based diet.*

Keywords: *Photo-oxidation, biochemical analysis, physicochemical parameters, liver, enzymes, groundnut oil, albino rats.*

1. INTRODUCTION

Vegetable oils are triglyceride extracted primarily from seeds and nuts of vegetables. They are composed of triglyceride as contrasted with the waxes which lack glycerine in their structure. Vegetable oils form a good part of human diet. Their exposure to direct sun light in open markets and under fluorescent light in super markets results in off-flavours, colour defects as well as loss in nutritional quality of the oil1. .In the process the essential fatty acids and vitamin present are oxidized and their nutritive values reduced. Groundnut belongs to the legume or bean family. It contains essential vitamins which have been found to have protective function against cancer2.. The fatty acid compositions of the groundnut oil are; palmitic acid l.-4.5%, linoleic acid 12-43%, stearic acid 1.0-4.5%, Eicogenic acid 0.7-1.7%, ligonoceric acid 0.5-2 5%, Arachidic acid 0.7-1.7% and Oleic acid 36-38%,therefore it is predominantly unsaturated in nature. This makes the oil prone to oxidation3.

2. MATERIALS AND METHODS

Sample Collection: Groundnut seeds were bought from mile 3 market in Nkpolu-Oroworukwo, Port-Harcourt, Rivers state. They were cleaned and milled, after which the oil was extracted by solid solvent extraction method using diethyl ether (99.1%)

2.1. Animal Collection

Twelve albino rats were bought from the animal farm of the department of Applied and Environmental Biology, University of Port-Harcourt. The albino rats were grouped into four groups, A, B, C, D of three in each group. The rats were fed with normal feed for two weeks for complete acclimatization.

2.2. Oil Exposure

The extracted groundnut oil was exposed to sunlight for a period of 90 hours in a transparent pyrex beaker. Unexposed sample was kept in the dark to serve as control. Groundnut oil Administration: after two weeks of acclimatization, group A (control) was fed with normal feed and water only, group B was fed with normal feed mixed with 2mls of oxidized oil and water, group C was fed with normal feed mixed with 4mls of oxidized oil and water and group was fed with normal feed mixed with unoxidized oil and water for a period of fourteen days. The animals were sacrificed and their blood samples taken to the lab for biochemical analysis.

3. RESULTS

The results of the physicochemical and biochemical analysis are presented in tables 1 and 2 below.

Table1. *Result of Physicochemical Parameter*

Physicochemical Parameter	Values before exposure	Values after exposure
Density	0.910 g/ml	0.922 g/mi
Viscosity	33.0 Cs	42.0 Cs
Peroxide value	8.0 mEq/kg	42.7 mEq/kg
Free fatty acid value	2.0%	4.10%

Table2. *Results of Enzymatic Activity*

Group	AST	ALT	ALP
A	56.7±4.0 ji/L	31.0+ 5.20 \i/L	48.33± 5.77 (i/L
B	77.0±11.0u/L	21.0 ± 4.00 u/L	71.6 ± 11.0 ji/L
C	79.0±17.3ji/L	21.7± 2.3m/L	131.7 +13.5 M./L
D	67.0±!7.32p/L	23.0 ± 17.32 ji/L	50.0 ± 6.56 [i/L

4. DISCUSSION

The results of the physicochemical analysis on table l show that the viscosity and densitv of the groundnut oil are lower in the unexposed sample than the exposed sample. This means that oxidation increases the density and the viscosity of oil samples. Similar reports have been given4. It explains that the viscosity and density decreased with increased in unsaturation and increase with saturation and polymerization. Similar report have been made earlier 5. Viscosity depends on sheer stress and temperature. Sheer-stress do not affect the storage of the oil used for-edible purposes but radiation (sunlight) does affect it.

When the groundnut oil was photo-oxidized the kinetic energy also increases which enhanced movement of molecule and reduces intermolecular forces. The peroxide value of the exposed oil and the unexposed oil sample shown in table1 show that the peroxide value increased with exposure..The peroxide value increased from 8.0mEq/kg to 42.0mEq/kg. The initial PV of 8.0mEq/kg indicates relatively good quality oil. This increase in the PV is as a result of deterioration of the oil forming a primary product of hydroperoxide which eventually breaks down to form other product such as aldehyde and ketones leading to rancid product 1.

The results of the free fatty acid of the oil shown in table1 show that the value increased from 2.0-4.1% This increase can be attributed to oxidation of carbon-carbon double bonds to give the free fatty acids. Other factor such as temperature may have also contributed to the formation of free fatty acids. Earlier esearchers, 4 have made similar report. It has also been mentioned 6, that free fatty acid% indicates loss of nutritive value.

The results on table 2 show that the AST levels increased significantly ($p>0.05$) in the rats fed with oxidized oil (group B and C), compared to those fed with unoxidized oil (group D). While the activity of the enzyme remained unaltered in the rats fed with water and normal feed only (control, group A). This increase in the activity of the enzymes indicates toxicity as a result of formation of high molecular weight compounds such as hydroperoxide and other products like aldehyde and ketone as reported 7.

The ALP level was highest in rats fed with 4ml of oxidized oil, while the ALT activities were not significantly affected in the rats fed with 2mis oxidized and 2mls unoxidized oil. The ALT values of the control (group A) were found to be higher than those fed with oxidized oil. This can be attributed to inhibition of the enzyme causing reduction in their activity. The AST, ALT and ALP levels of rats fed with 4mls of oxidized oil were significantly higher than those fed with 2mls oxidized and 2mls unoxidized oil. This can be attributed to increase in the quantity of the ingested oxidized oil causing malfunction of the liver enzyme. Malfunction reduces production of bile, reduced metabolism of protein and carbohydrate, and increases sugar levels8..

5. CONCLUSION

Exposure of the oil to sunlight accelerated photo-oxidation. The increasing change in the physicochemical parameter measured indicates that the oil deteriorated on exposure. The elevated levels of the enzyme (AST, ALT and ALP) maker Indicated liver damage, causing leakage of enzyme

from cell. Consequently the significant release of these enzymes and their increased activity in the animal fed with oxidized groundnut oil can be interpreted as a result of liver cells destruction and alteration in the membrane permeability.

REFERENCES

[1] A .L. Ihekoronye and P.O. Ngodi (1985). Food Science Technology for propics. Macmillan Publishers, London and Basignstoke Edition, pp293, 311,106,108 127,130,194-200.

[2] G Galil and K. Kigel (1995). The Hydrotime Conception Seed Germination and Dormancy .*Springer links, 30:* 349-360.

[3] N.J Maduelosi,, F.G Obomanu, and G.K Fekarurhobo (2012). Dye Sensitized Photo-oxidation of Some Vegetable Oils. J. Emerging Trends in Eng. and Appl. Sci.. 3 (5): 740-742.

[4] G.K., Fekarurhobo, F.G., Obunmanu, and N.J. Madueiosi,(2009).Effect of Short term Exposure to Sunlight on the Quality of some Edible oils. *Research J. .Appl. S ci.* 4(5): 152- 156.

[5] J.K., Kim, N.N., Lee. and Y.S Lee, (2010).correlation of fatty acid Composition of Vegetable with Rheologicai Behaviour Uptake. Food *chemistry.* 118: 398-402.

[6] E.N Onyeike, and , J.U Oguike (2003). Influence of Heat Processing Methods on the Nutrient Composition and Lipid Characterization of Groundnut (Arachis Hypogea) Seed Pastes. BIOKEMISTRI, 15(1):34-43.

[7] B. Muik, , D. Moiina, and .M Ayora-Canada. (1999). Direct Monitoring of Lipid Oxidation in Edible oil Fouruer Transformation Raman Spectroscopy. *Chemistry and Physics of lipids,* 137: 173-182.

[8] Wikipedia, 2015.