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Original Research Article

Actions of Fresh Red Palm and Cow Fat Blend Oil on the Redox Status of Treated Wistar Rats

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Abstract: The present study was conducted to determine the effect of consumption of fresh red palm and cow fat blend oils on the redox status of rats. A total of 60 rats were divided into 4 groups of 15 rats each. Group A served as normal control and were fed with pelleted growers feed. Group B were fed with pelleted growers feed mixed with 2ml/kg b.wt of red palm oil. Group C were fed with pelleted growers feed mixed with 2ml/kg b.wt of cow fat oil while Group D were fed with pelleted growers feed mixed with 2ml/kg b.wt of a blend of red palm oil and cow fat oil. Animals were sacrificed after 28 days. Blood was collected for the estimation of SOD, MDA, GPX, CAT, Vit A and E by enzyme linked immunosorbent assay with kits obtained from Sunlong Diagnostic Ltd, China. Results were presented as mean $\pm$ standard deviation with $p<0.05$ considered significant. There was a significant increase in the MDA concentration of rats treated with cow fat oil ($p=0.001$) compared to the rats treated with red palm oil, blend of red palm oil and cow fat oil as well as the normal rats. There was also significant increase in the concentrations of SOD ($P=0.013$), GPx($P=0.002$), CAT($P=0.007$), CAT($P=0.011$), Vit A ($P=0.009$), Vit E ($p=0.018$) for the rats treated with red palm oil and those treated with a blend of red palm oil and cow fat oil compared to those treated with cow fat oil as well as the normal rats. These finding suggests that red palm oil and a blend of red palm and cow fat oil contains more antioxidant and could be more beneficial to health than the cow fat oil.

Keywords: Red palm oil, Cow fat oil, Blend oil, Oxidative stress, Wistar rats, Antioxidants.

INTRODUCTON

Dietary oils are lipids (fats0 made from plants, animals or synthetic compounds used in almost all types of human diet preparations including frying, baking and extrusion (Folade *et al.*, 2017). They are important source of lipids which cannot be synthesized by the body and a major constituent of biomembranes and building block for several hormones. There is a convincing evidence that the nutrient composition of dietary oils such as the fatty acid composition (the proportion of saturated to unsaturated fats; and monounsaturated to polyunsaturated fats) and natural antioxidants such as tocophesols, tocotrienols and carotene could alter the physiology of treated animals as well humans (Rauchova *et al*., 2018; Gugolek & Kowalska, 2020; Olaniru *et al.,* 2020). Many studies have reported the alteration of redox status of animals and humans due to the consumption of dietary lipids (Abid *et al*., 2021; Jafari *et al*., 2021). Blending is a simple process of combining two or more dietary oils to alter the physicochemical and nutritional properties (Dhyani *et al*., 2018). Emerging evidence highlights that blend oil could be more beneficial to health than the individual use of the oils (Liu *et al*., 2023). The present study was therefore designed to evaluate the effect of consumption of fresh red palm oil and cow fat blend oil on the redox status of treated rats.

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MATERIALS AND METHODS

Red palm and cow fat oil: The red palm oil and cow fat oil were purchased from a local market (Nkwo Ogbe) at Ihiala, Ihiala Local Government Area, Anambra State, Nigeria.

Wistar Rats: Wistar rats (rattus nervigicus) weighing between 150-250g were procured from Chris Animal Farm and Research Laboratories, Awka, Anambra State, Nigeria. They were maintained under standard conditions of light (12/24 hours), temperatures (25-29ºC) and free access to water at the Animal House of the department of Biochemistry in an aluminium wire guaze cage and fed with growers pellet feed (Pfizer, Nigeria Ltd) for a period of two weeks acclimatization prior to experimental protocol.

Ethical Considerations: Ethical clearance was obtained from the Animal Research Ethical Committee of Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria.

Sample Size: The sample size for the study was calculated using the maximum sample size relation according to one way analysis of variance.
n = maximum Df/k+1

Where
DF = between-subject error
k = the number of groups
n = the maximum number of rats per group

Experimental Design

A total of 60 male wistar rats weighing 150-250g were randomly divided into 4 groups of 15 rats each. Group A served as normal control and were fed with pelleted growers feed. Group B were fed with pelleted growers feed mixed with 2ml/kg b.wt of red palm oil by oral gavage. Group C were fed with pelleted growers feed mixed with 2ml/kg b.wt of cow fat oil while Group D were fed with pelleted growers feed mixed with 2ml/kg b.wt of a blend red palm oil and cow fat oil (ratio 1:1) by oral gavage. Animals were sacrificed by euthanasia using chloroform after 28 days. Three millilitres (3mls) of blood were collected by cardiac puncture for the estimation of serum concentrations of SOD, GPx, CAT, MDA, Vit A and E.

Sample Analysis

Serum concentrations of superoxide dismutase (SOD), glutathione peroxidase (GPx), catalase (CAT), malondialdehyde (MDA), vitamic A (Vit A) and vitamin E (vit E) were determined by the enzyme linked immunosorbent assay technique using kits obtained from Sunlong Diagnostic Ltd, China and Mindray-96A Microplate Read, Mindray, Shenzhen, China.

Principle

The color change of tetramethylbenzidine (TMB) substrate of the respective analyte by the addition of a stop solution is detected at 450nm. The optical density of the mixture is compared to the standard curve to determine the concentration of the analyte in the sample.

Procedure

Fifty (50)µl of all samples, standards and controls were added to the microplate wells that were precoated with a purified antibody of the respective analyte and incubated at 37ºC for 30 minutes. Following incubation and washing for three times with the wash buffer, 50µl of bitin-labeled antibodies were added to form an immune complex with streptavidin-horseradish peroxidase conjugate reagent. Unbound enzymes were eliminated following incubation for 15 minutes at 37ºC and three times washing. Fifty (50)µl of stop solution was added and the blue color changed to yellow after 15 minutes. The concentration of analytes and the shade of the respective solution were positively associated after measurement at 450nm using the Mindray-96A microplate reader.

Statistical Analysis

The statistical analysis of the obtained result were performed by one way analysis of variance in the statistical package for social sciences version 23 (IBM Incorporated, Armok, NY). Results were presented as mean $\pm$ SD and $p<0.05$ considered significant.

RESULTS

Rats treated with cow fat oil revealed significant increase in malondialdehydae levels compared to the normal rats, those treated with red palm oil and a blend of red palm oil and cow fat oil. There was a significant increase in the

superoxide dismutase, glutathione peroxidase, catalase, vitamin A and C levels of the rats treated with red palm and a blend of red palm oil and cow fat oil compared to those treated with cow fat oil and normal rats.

Some pro-oxidant and anti-oxidant concentrations of rats treated with red palm oil and cow fat blend oil

Parameter	Group A (control)	Group B (RPO)	Group C (CFO)	Group D (RPO + CFO)
MDA(mg/ml)	3.19±1.37	3.21±0.86	7.55±1.93	4.68±0.92
SOD(u/ml)	9.30±1.68	12.11±2.03	8.90±1.63	11.60±2.72
GPx(u/ml)	3.72±0.81	5.60±1.001	3.02±0.62	5.52±0.00
CAT(Mu/ml)	400±28.4	458±29.2	367.8±33.8	422.8±26.7
VitA(mg/100ml)	2.00±0.38	3.32±1.1	1.83±0.33	3.16±0.64
VitaA(mg/100ml)	2.90±0.44	6.92±2.6	2.23±0.75	5.81±1.63

Result represented mean ± standard deviation of group values (n = 15)*, significant at p<0.05, SOD; superoxide dismutase, GRx, glutathione peroxidase, MDA, malondialdehyde, CAT, catalase, Vit A, Vitamin A, Vit E, Vitamin E, RPO, Red palm oil, CFO, cow fat oil.

DISCUSSION

An imbalance in the pro-oxidant/anti-oxidant molecules alters the redox status and could result in oxidant stress. The significant increase in the superoxide dismutase, glutathione peroxidase, catalase, vitamin A and E levels in the rats treated with red palm oil and a blend of red palm oil and cow fat oil compared to those treated with cow fat oil and normal rats in the present study suggests that red palm oil and the blend of red palm oil and cow fat oil may contain a high quantity of anti-oxidants compared to cow fat oil alone. This is similar to the findings of some other studies who reported that a blend of soya bean oil with rice bran oil, sesame oil, sea buckthorn oil, camellia oil and peanut oil provided important antioxidants beneficial for the prevention of chronic diseases (Bhatnagar *et al*., 2009; Khatoon, 2000). This is agrees to the report that at blend of coconut oil, sunflower and rice bran oil showed less peroxide formation and greater oxidative stability than the individual oils. Red palm oil is a rich natural source of antioxidants and contains equal amounts of saturated and unsaturated fatty acids.

CONCLUSION

The findings of the present study support the claims that blend oil could be more beneficial to health compared to the individual oils since the consumption of the cow fat oil reduced the antioxidant levels of the treated rats unlike the red palm oil and the blend of red palm oil and cow fat oil.

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