DU Journal of Undergraduate Research and Innovation
Volume 2 Issue 1 pp 211-217, 2016

Health Benefits of Olive Oil Versus Groundnut Oil Consumption

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ABSTRACT

The imported olive oil and the indigenously produced ground nut oil both contain significantly high levels of Mono Unsaturated fatty acids (MUFA) and adequate levels of the essential fatty acids like the n-6 linoleic acid and the n-3 α- linolenic acid. This composition of oils has been reported to be beneficial for overall health, particularly for cardiovascular health by decreasing LDL levels, increasing HDL levels and has also been shown to have anti-inflammatory properties. Recent studies show, that for a healthy lipid profile a high Mono unsaturated fatty acid /Polyunsaturated fatty acid ratio is desirable and also a high MUFA is beneficial in regulating blood sugar levels. In India a large percentage of the population cannot afford the highly priced olive oil. Also olive oil which has a comparatively lower smoking point than groundnut oil cannot be considered as a premium cooking and frying oil for Indian style of cooking which involves deep frying.

The objective of the present study is to compare various blood parameters in individuals who have been consuming olive oil or groundnut oil for the past one year considering the fact that both oils have comparable nutritional content and properties**.** The preliminary analysis of blood samples from people who have been consuming groundnut and olive oil since one year do not show any significant differences in the biochemical parameters assessed. This justifies our contention that groundnut oil could be a better economically as well as healthy oil for consumption by an Indian population.

Key Words: Anti-Oxidant enzymes, Groundnut oil, Lipid profile, MUFA/ PUFA, Olive oil, Reactive Oxygen species.

INTRODUCTION

The consumption of olive oil in India has increased over the last few years. This is largely because of change in eating habits and influence from the Western countries that promote olive

oil as a healthy oil. Phenolic compounds in olive oil have potentially beneficial biological effects resulting from their antimicrobial, antioxidant and anti-inflammatory activities (1,2) and the fatty acid composition of Olive oil has been shown to have a positive effect on certain physiological parameters, such as plasma lipoproteins, oxidative damage, inflammatory markers, platelet and cellular function (3).

Groundnut, is one of the most important cash crops of our country which is a low priced commodity and a valuable source of all the nutrients (4). Groundnut oil is also widely used in many parts of India for cooking. According to studies by the American Peanut Council, Peanut/groundnut oil is nutritionally similar to olive oil in the proportions of fatty acids it contains, being high in monounsaturated fatty acids and low in saturated fatty acids and that both oils are beneficial for cardiovascular health. The consumption of groundnut oil which is rich in MUFA has been found to slightly but significantly decrease the blood glucose, lipid peroxidation, and lipid profile and increases antioxidant levels in Type II diabetic patients (5) and in diabetic rats (6). Moreover phytosterols in groundnut/peanut oil have been reported to reduce cancer (prostate, breast, colon,) growth (7, 8, 9) and reduce the spread of cancer considerably.

The climatic conditions in India is most suited for growing groundnuts rather than olives which is largely grown in Mediterranean regions and in higher altitudes(10).Groundnut oil reportedly has greater oxidative stability and higher smoking point as compared to olive oil and has been considered as a premium cooking and frying oil (11) as compared to olive oil. Gomez *et. al.,* 2003 have shown that the phenolic compounds in extra virgin olive oil gets damaged very quickly by heat along with a loss of Vitamin E. From the above observations groundnut oil seems to be more appropriate oil for Indian style cooking which involves shallow and deep frying.

Keeping these facts under consideration the present pilot study aims to provide a preliminary assessment of the health benefits of olive oil versus groundnut oil consumption in India, by analyzing biochemical parameters like lipid profile, blood glucose, liver function efficiency, antioxidant status (lipid peroxides & antioxidant enzymes) and inflammatory properties (nitric oxide) in blood samples collected from populations who have been consuming olive oil /groundnut oil as a staple oil for at least 1 yr.

METHODOLOGY

Preparation of the questionnaire and sample collection

A questionnaire pertaining to Personal and Lifestyle information, Oil consumption and medical profile was prepared and the following criteria was adopted for sample collection

- Subjects who have been consuming olive oil/groundnut oil as the staple oil for at least one year.
- Subjects falling in the age group 20-65 of either sex.
- Subjects belonging to similar socio-economic strata (urban, middle and upper middle class).
- Subjects without any serious medical condition.
- Subjects who are not overly obese or underweight (BMI 19-29)

Twenty eight samples (Fourteen of people consuming groundnut oil and fourteen of people consuming olive oil and who fulfilled the above criteria) were collected and processed after screening more than 550 filled in questionnaires. Height, weight, blood pressure and pulse of all subjects was recorded. Blood was collected from subjects in plain vacutainers, EDTA vacutainers

and Fluoride vacutainers. The samples were processed into serum, plasma and Hemolysate and stored at -20^{o}C.

Assay of Biochemical Parameters

Glucose estimation was done by glucose oxidase peroxidase (GOD-POD) method using the glucose estimation kit procured from Span Diagnostics(13). Glucose concentration was calculated using the following formula-

$$\text{Glucose (mg/dl)} = \frac{\text{Absorbance of Sample}}{\text{Absorbance of Standard}} \times \text{Conc. of Std. (mg/dl)}$$

.

Triacylglycerol estimation was done by Glycerol-3 Phosphate oxidase-Peroxidase anti pyrine (GPO-PAP) method using the Triglycerides Test kit**.** Total Cholesterol estimation was done by the cholesterol oxidase peroxidase antipyrine (CHOD-PAP) method using the Cholesterol Test kit.HDL Cholesterol estimation was done by Polyethylene glycol cholesterol oxidase peroxidase antipyrine (PEG- CHOD-PAP) end point assay after the separation of HDL cholesterol from the sample using the Cholesterol Test kit (14,16). All kits were procured from Span Diagnostics. Liver function tests including Bilirubin (15), Aspartate transaminase and Alanine transaminase (16) were measured using commercial kits also purchased from Span diagnostics.

Glucose, Triacylglycerol, Total cholesterol, HDL cholesterol and ,Liver function tests were done in serum separated from blood samples collected from olive oil and groundnut oil consumers.

Lipid peroxide (13) and Nitric oxide (Colorimetric Assay Kit, Biovision) were estimated in plasma separated from the EDTA containing blood samples collected from olive oil and groundnut oil consumers**.**

Antioxidant enzymes like Glutathione reductase (14) Catalase (15)and Superoxide Dismutase.(SOD Assay kit-WST) were estimated in Hemolysates preapared from whole blood samples collected from olive oil and groundnut oil consumers**.**

RESULTS AND DISCUSSION

All the subjects of olive oil and groundnut oil consumption had normal blood fasting levels (Figure-I). Ramesh *et. al.,* showed that consumption of groundnut oil decrease glucose in diabetic rats. Though in our study we have not included diabetic patients the data shows that consumption of groundnut oil for at least one year maintains the blood glucose within normal range.

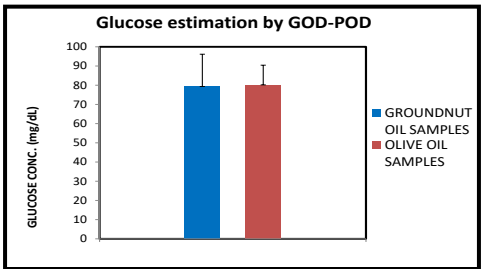

Figure-I: Total glucose values in serum samples of groundnut oil and olive oil consumers are represented as means of standard deviations of two independent group of samples and the assay was done in duplicates for each sample. Total

serum glucose was estimated using Glucose Oxidase-Peroxidase (GOD-POD) method. Sample size: n= 14. Normal range of serum glucose by GOD-POD method = 70-110 mg/dl.

Studies show that consumption of olive oil provides a healthy lipid profile with respect to high HDL, low LDL and low total cholesterol (3). Our data is also in concordance with literature and shows that consumption of groundnut oil for at least 1 year shows the same health benefit as olive oil (Figure-II)

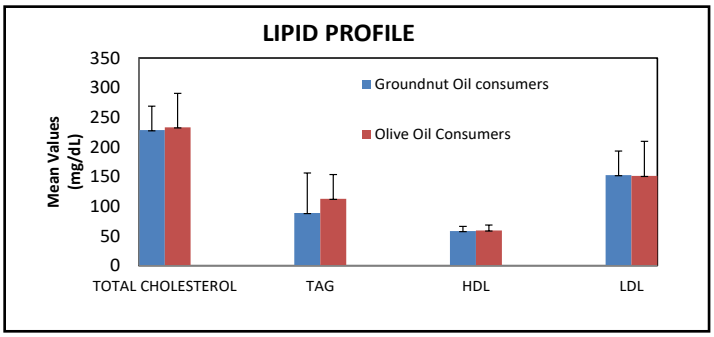

Figure-II Total cholesterol, triglycerides and HDL in serum samples of groundnut oil and olive oil consumers are represented as means of standard deviations of two independent group of sample. The assay was done in duplicates for each sample. Total serum cholesterol was estimated using Cholesterol Oxidase (CHOD-PAP) peroxidase method, Triglycerides by glycerol phosphate oxidase peroxidase (GPO-PAP) method, HDL by polyethylene glycol cholesterol oxidase peroxidase (PEG-CHOD-PAP) method. Sample size: n= 14. Normal range of serum cholesterol by CHOD-PAD method = 150-250mg/dl. Normal range of serum trigkycerides by GPO-PAP method >150mg/dl. LDL was calculated by the Freidwald's formula.

Normal liver function profile in both groups of consumers indicates a normal metabolism in all the individuals and shows no adverse metabolic syndrome in any of the subjects under study (Figure-III)

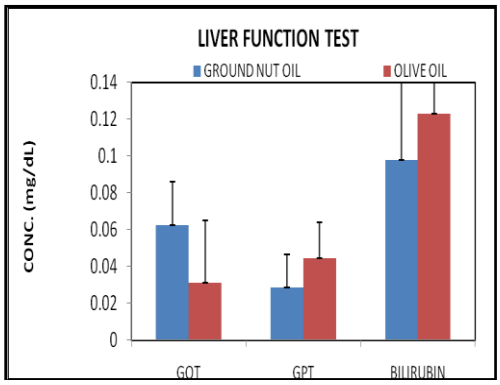

Figure-III: Bilirubin and AST/ALT values in serum samples of groundnut oil and olive oil consumers are represented as means of standard deviations of two independent group of samples and the assay was done in duplicates for each sample. Total serum bilirubin was estimated using Jendrasik Grof method and AST/ALT was estimated by the DNPH colorimetric method. Sample size:,n= 14 . Normal range of bilirubin 0.3-1.23mg/dl

One of the marketing strategies of olive oil is that it contains increased amount of polyphenols /antioxidants which help reduce oxidative stress and promote overall health in consumers. Hence oxidative stress in individuals was assessed in samples collected from olive and groundnut oil

consumers for antioxidant status and antioxidant enzyme levels[Catalase, Glutathione reductase, Superoxide dismutase, lipid peroxidation level] and for inflammatory properties [Nitric oxide levels] (1,2,3). Olive oil consumers showed decreased levels of lipid peroxide levels and adequate activity of antioxidant enzymes.(Figure-IV, V, VI, VII, VIII) However groundnut oil consumers also showed the same lipid peroxide levels as the olive oil consumers, adequate activity of antioxidant enzymes and comparable levels of nitric oxide.(Figure-IV, V, VI, VII, VIII); indicating that ground nut oil was as effective as olive oil on providing protection against oxidative damage and stress.

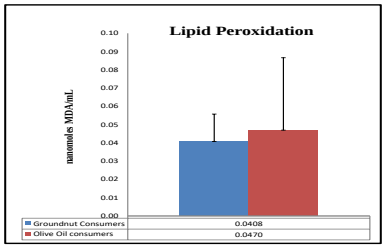

Figure-IV: Serum lipid peroxides levels in ground nut oil and olive oil consumers is represented as the means of standard deviations of two independent set of samples and the experiment was done in duplicate. Lipid peroxidation is measured in terms of Thiobarbituric acid Reactive substances (TBARS) by Beuge and Aust Method. Sample size: n=14,

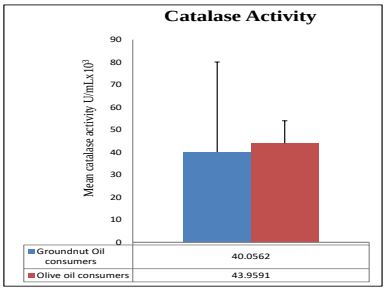

Figure- V: Catalase activity in hemolysates of ground nut oil and olive oil consumers is represented as mean of standard deviations of two independent sets of samples and the assay was done in duplicates. Catalase activity was determined by the method of Aebi et al, n=14.

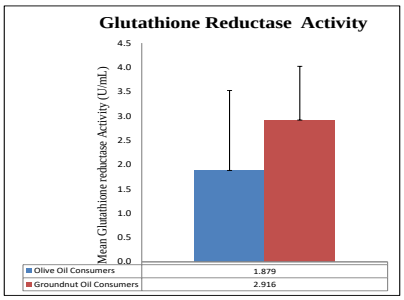

Figure-VI: Glutathione reductase activity in hemolysates of ground nut oil and olive oil consumers is represented as mean of standard deviations of two independent sets of samples and the assay was done in duplicates. Glutathione reductase was determined by continuous enzyme assay. Sample size: n=14.

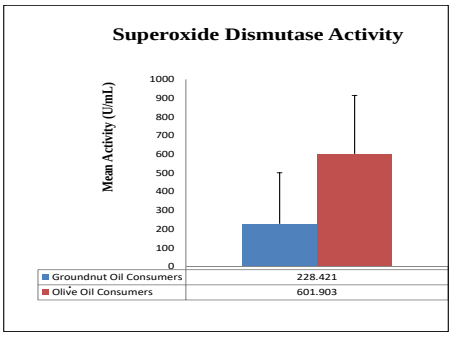

Figure-VII: The superoxide dismutase levels in serum of ground nut oil and olive oil consumers are represented as the mean of standard deviations of two independent set of samples and the experiment was done in duplicates. Determination of Superoxide dismutase activity was done using SOD Assay Kit. Sample size: n=14.

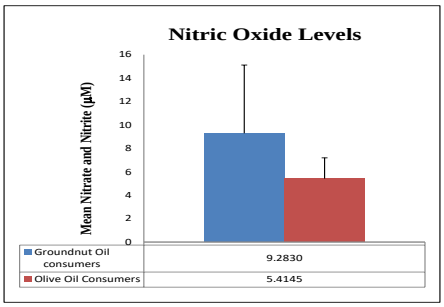

Figure-VIII: Nitric oxide levels in serum of ground nut oil and olive oil consumers are represented as mean of standard deviations of two independent sets of samples and the assay was done in duplicates. Nitric oxide levels were estimated as total nitrites and nitrates using Griess reagents. Sample size: n=14.

CONCLUSIONS

The preliminary analysis of the samples collected shows that the biochemical parameters analyzed in the limited number of samples are comparable for both olive and groundnut oil consumers without any significant difference. Since the subjects tested were from a random sample of the general population and not a controlled group it was expected that the data would show a high degree of variability; however all parameters were seen to be with in the normal clinical range. Keeping in mind all the factors (environmental and genetic) that play a role in determining an individual's health status and their relation to the oil they consume, it is obvious that testing of blood samples of a large population is mandatory before it can be conclusively said which oil is better for consumption, both nutritionally ,economically and socially from the Indian perspective. However, these preliminary results justifies our contention that groundnut oil could be an economically as well as nutritionally a better oil for consumption by an Indian population.

ACKNOWLEDGMENTS

Authors are thankful to Prof Anil K Tyagi, Vice Chancellor of GGSIP University, Dwaraka for mentoring this project study and University of Delhi for funding this work under undergraduate

student research project (DU Innovation Project Scheme 2012-13). We also thank Dr. P Hemalata Reddy, Principal Sri Venkateswara College for providing the infrastructure and support.

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