International Journal of Basic, Applied and Innovative Research
IJBAIR, 2017, 6(2): 38 - 45
ISSN: 2315 - 5388 www.arpjournals.com; www.antrescentpub.com E-ISSN: 2384 - 681X

RESEARCH PAPER

EFFECT OF CUCUMBER CONSUMPTION ON SERUM LIPID PROFILE AND LIVER ASPARTATE TRANSAMINASE AND ALANINE TRANSAMINASE IN APPARENTLY HEALTHY UNDERGRADUATE STUDENTS.

Ezeodili VK[1], Ihim AC[1], *Ogbodo EC[1], Ezeugwunne IP[1,2], Analike RA[3], Onah CE[5], Amah UK[1], Okwara JE[1], Ezego AI[4], Ugwu MC[1], Oguaka VN[2], Asebioyo SJ[6], Meludu SC[1,2].

[1]Department of Medical Laboratory Science, Faculty of Health Sciences, NnamdiAzikiwe University, Nnewi Campus; [2]Department of Human Biochemistry, Faculty of Basic Medical Sciences, NnamdiAzikiwe University, Nnewi Campus; [3]Department of Chemical Pathology, Faculty of Medicine, Nnamdi Azikiwe University, Nnewi Campus; [4]Department of Environmental Health Science, Nnamdi Azikiwe University, Nnewi Campus; [6]Department of Human Anatomy, Faculty of Basic Medical Sciences, Nnamdi Azikiwe University, Nnewi Campus, [5]Department of Chemical Pathology, Nnamdi Azikiwe University Teaching Hospital, Nnewi.
*Corresponding Author.s E-mail: augustinee442@gmail.com

Published: 30th June, 2017

***Endorsed By**: Innovative Science Research Foundation (**ISREF**) and International Society of Science Researchers (**ISSCIR**).*
***Indexed By**: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society; and IRMS Informatics India (J-Gate)*

ABSTRACT

This study was designed to investigate the effect of oral intake of cucumber on Serum lipid profile and liver enzymes (AST and ALT) in young apparently healthy students. A total of 29 subjects (14 males and 15 females) were recruited. Each subject was advised to abstain from cucumber and similar vegetables consumption for two weeks. Thereafter, they received 400 g of whole cucumber for 21days prior to their daily breakfast. 5mls each of baseline (day zero) and post consumption (day 22) samples were collected after overnight fast into plain containers for the estimation of biochemical parameters. Serum TC, TG, HLD, LDL, AST, and ALT were analyzed using standard methods. There was a significant decrease in the mean serum TC, TGand HDL profile levels in post cucumber consumption when compared to the pre-cucumber consumption (4.38±0.39 Vs 3.82±0.33; 1.16±0.29 Vs 0.89±0.22; 1.15±0.12 Vs 1.0±0.114; p=0.000). However, serum levels of LDL, AST and ALT did not differ significantly between pre and post–cucumber consumption. This study revealed hypolipidaemic effect of cucumber consumption with no harmful effect on the liver. Therefore, cucumber consumption could be of importance in prevention and management of cardiovascular diseases.

Keywords: Cucumber, Total Cholesterol, Triglyceride, Low Density Lipoprotein, High Density Lipoprotein, Aspartate transaminase, Alanine transaminase.

INTRODUCTION

The use of plants as source of remedies for the treatment of diseases can be traced back to the prehistoric times (Lawrence and Bennett, 1995; Ankita *et al.,* 2012) and medicinal herbs are being increasingly studied by pharmacological researchers (Sinclair, 1998). Indian Ayurveda medicine used herbs as early as 1900BC describing about 700 medicinal plants (Aggarwal *et al.,* 2007). According to the World Health Organization (WHO) more than 80% of the world's populations, rely on traditional medicine for their primary health care, majority of which use plants or their active principles (Gupta *et al.,* 2005).

The use of plant resources mainly for herbal medicine, food, forages etc. in Nigeria, represents a long history of human interaction with the environment and their in-vitro and in-vivo properties against microbial pathogens, have been widely reported (Hashish and Gomaa, 2003; Iwalokun *et al.,* 2004).

Cucumber (*Cucumissativus*) belongs to the family cucurbitacae. In general, there are 118 genera and 825 species worldwide (Rai *et al.,* 2008) among which 30 *cucumis*species are found in Asia and African. Plants of this family have many medicinal and nutritional benefits (Gill and Bali, 2011). The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on the human body (Edeoga *et al.,* 2005). These chemicals are termed as phyto-chemicals. Egypt is the largest African producer. Research has shown the presence of the phytochemical called terpenoids in Cucumissativus extract (Ankita *et al.,* 2012). Terpenoids are known to possess medicinal potency against malaria, viral, bacterial and fungal agents (Egwaikhide, 2010; Malik *et al.,*2013).

Studies have shown the antioxidant effect of C. sativus in rats (Gill *et al*., 2009), substantial anti-inflammatory activity, anti-ulcer effect (Gill *et al*., 2009), saponins have heamolytic property, induced cytotoxicity effect (Rao and Sung,1995), antitumor and anti-mutagenic activities and can lower the risk of human cancers, by preventing cancer cells from growing(Nafiu *et al.,*2011). Phytosterols have alsobeen found in the extracts of cucumis sativa (cucumber). Phytosterols have a significant hypocholesterolemic effect (Castro *et al.,* 2005).Cucumber has been found to contain saponins and phytosterols which have hypocholestaemic effect and this may be utilized at least as an adjuvant in the management of patients with cardiovascular diseases in our environment. Therefore, this research would be directed towards evaluating the effect of cucumber consumption on serum lipid profile and liver aspertate transaminase and alanine transaminase in apparently healthy undergraduate students in Nnamdi Azikiwe University, Nnewi Campus, Anambra state, Nigeria.

MATERIALS AND METHODS

Study Area: Nnamdi Azikiwe University, Okofia-Otolo, Nnewi campus comprising of the College of Health Sciences which houses the faculties of Basic Medical Sciences, Health Sciences and Technology and Medicine. It is located in the suburb of Nnewi - a popular town in Anambra State Nigeria. The environment is poorly developed and lacking basic amenities such as housing, road, communication, electricity and potable water compared to campuses located in urban areas.

Study Design: A total of 29 subjects (14 males and 15 females) between 18 and 28 years old were recruited. The subjects were essentially medical students. Each subject was advised to abstain from cucumber and similar vegetables consumption for two weeks. Thereafter, they received 400g of whole cucumber for 21days prior to their daily breakfast. 5mls each of baseline (day zero) and post consumption (day 22) samples were collected after overnight fast into plain containers for the estimation biochemical parameters (LDL, HDL, TC, TG) respectively. Lipid profile (HDL, LDL, TC and TG) and Liver enzymes (AST and ALT) were assayed using enzymatic method as described by Haeckel, 1981; Miller *et al*., 2002; McGowan, 1983; Rifal and Warnick, 1994, and Reitman and Frankel, (1957) respectively.

Ethical Consideration: Ethical approval was obtained from the Faculty of Health Sciences and Technology ethical committee, NnamdiAzikiwe University, Nnewi campus, Anambra State, Nigeria for sample collection.

Inclusion and Exclusion criteria: Apparently healthy male and female Subjects that consume cucumber and are between 18-28years of age not on drugs were recruited for the study. Subjects younger than 18years or older than 28years old that do not consume cucumber and other similar vegetables who are on drugs and have cardiovascular diseases were excluded from this study.

Statistical analysis: Statistical package for social science (SPSS; version 20) was employed in the analysis of the data collected. The results for anthropometric parameters and lipid parameters were expressed as mean± standard deviation and compared between the groups using student's t- test; with level of significance set at $p<0.05$. Correlation of parameters was done using Pearson's correlation.

RESULTS

The mean age(years), height (metres), weight (Kg) and body mass index (Kg/m^2) were (23.3 $\pm$ 2.24 years, 1.63 $\pm$ 0.88 m, 62.62 $\pm$ 11.11 Kg, and 23.34 $\pm$3.19 Kg/m^2) respectively. The subjects were from young and apparently healthy population.

When the anthropometric parameters were compared between the male and female subjects, there were a significant difference in the mean age and height of the male than female subjects. However, there was no significant difference in the mean weight of both sexes and in general, no significant difference in mean body mass index (BMI) of the subjects compared. (P<0.05), (See Table 1).

The result showed that there was a significant difference in the mean serum concentrations of the lipid profile (TC, TG, HDL) parameters pre- and -post cucumber consumption. However, the serum LDL was not significantly decreased after 3weeks of cucumber consumption compared to the pre-consumption. (See table 2).

There were no significant differences in the mean serum TC, TG, LDL, and HDL, aspartate transaminase and alanine transaminase levels of the males when compared to female subjects before cucumber consumption (p<0.05). (See table 3).

There were no significant differences in the mean serum levels of all parameters compared between both sexes in post cucumber consumption in the apparently healthy subjects (p<0.05). (See table 4).

Table 1 The Anthropometric Parameters of Subjects Studied (Mean + SD; n=29).

Parameters	All Subjects (n=29)	Male (n=14)	Female (n=15)	t-value	p-value
Age (year)	23.3+2.4	24+2.4	2 2.5+2.4	2.122	0.043*
Height (meter)	1.63+0.88	1.69+0.86	1.59+0.62	3.526	0.002*
Weight (Kg)	62.62+11.11	65.79+8.85	59.67+12.42	1.534	0.137
BMI (Kg/m^2)	23.34+3.19	23.6+2.59	23.51+3.57	0.296	0.770

***Statistically significant at P<0.05**

Table 2 Lipid profile and liver enzymes before and after 3weeks of cucumber consumption (Mean + SD; n=29).

Variables	Pre-cucumber Consumption	Post-cucumber Consumption	t-value	p-value
TC(umol/l)	4.38±0.39	3.82±0.33	5.854	0.000*
TG (umol/l)	1.16±0.29	0.89±0.22	3.893	0.000*
LDL (µmol/l)	2.53±0.56	2.49±0.51	0.247	0.806
HDL (umol/l)	1.15±0.12	1.0±0.114	4.893	0.000*
Aspartate transaminase (mmol/l)	10.24±2.31	9.52±2.15	1.236	0.221
Alanine Transaminase	7.41±2.21	7.97±2.26	-0.940	0.351

***Statistically significant at P<0.05**

There was a strong positive correlation between AST and ALT in the pre-sample of the male population. This was statistically significant (n=14; p<0.05). Also, there was a strong correlation between AST and ALT and a moderate correlation of ALT with age (r=0.427; p=0.021) which were both significant in the pre-sample of all population (n=29). (See table 5).

There was a strong negative correlation between AST and HDL in the post-sample of the male population. This was statistically significant ($p<0.05$). Also, there was a strong positive correlation between AST and LDL in the post-sample of the female population. This was statistically significant ($p<0.05$). (See table 6).

Table 3 Gender Distribution in lipid profile and liver enzyme before cucumber consumption (Mean + SD; n=29).

Variables	Males (n=14)	Females (n=15)	t-value	p-value
TC (µmol/l)	4.2786±0.47097	4.4800±0.28082	1.41	0.17
TG (µmol/l)	1.2279±0.26810	1.0887±0.29667	-1.322	0.197
LDL (µmol/l)	2.4864±0.62541	2.5660±0.51408	0.375	0.710
HDL (µmol/l)	1.1686±0.11825	1.1327±0.12244	-0.802	0.429
AST (µ/l)	17.8571±2.50713	9.7333±1.98086	-1.238	0.226
ALT (µ/l)	0.7857±2.57737	7.0000±1.88982	-1.044	0.306

*Statistically significant at P<0.05.

Table 4: Gender Distribution in lipid profile and liver enzyme 3weeks post-cucumber consumption (Mean + SD; n=29).

Variables	Males (n=14)	Females (n=15)	t-value	p-value
TC (µmol/l)	3.8929±0.31736	3.7600±0.34600	-1.075	0.292
TG(µmol/l)	0.9564±0.22589	0.8333±0.21205	-1.514	0.142
LDL(µmol/l)	2.3864±0.62967	2.5920±0.36710	1.083	0.288
HDL(µmol/l)	1.0157±0.10711	0.9847±0.12235	-0.725	0.475
AST (µ/l)	9.7143±2.46291	9.3333±1.87718	-0.47	0.642
ALT(µ/l)	7.2857±2.75761	8.6000±1.50238	1.609	0.119

***Statistically significant at P<0.05**

Table 5 the levels of Association between Parameters Studied before cucumber consumption.

Parameters	Subjects(n)	Correlation Coefficient Pearson r	p-value
Ht Vs Wt	29	0.642	0.000*
Wt Vs BMI	29	0.802	0.000*
AST Vs ALT	29	0.665	0.000*
ALT Vs Age	29	0.427	0.021*

*** Statistically significant at P<0.05.**

Table 6 The levels of Association between Parameters Studied Post cucumber consumption

Parameters	Subjects(n)	Correlation Coefficient Pearson r	p-value
Ht Vs Wt	29	0.642	0.000*
Wt Vs BMI	29	0.802	0.000*
AST Vs HDL	29	-0.597	0.024*
AST Vs LDL	29	0.56	0.03*

***Statistically significant at P<0.05. Ht=height; Wt=weight**

DISCUSSION

Cucumis sativus (Cucumber) has been found as a suitable functional food for medicinal purposes such as diabetes, hyperlipidemia, hypertension (as diuretic), gall bladder stones, constipation and dyspepsia in Asian Traditional Medicine (Trease *et al.,* 2002). The important of serum lipids in antherosclerosis and coronary heart disease has been proved by many scientists. Growing evidence has demonstrated the cardiovascular disease risk to be positively associated with TC and TG, and inversely associated with HDL (Cullen, 2000; Cziraky, 2008; Cooney *et al.,* 2009). The serum lipid level was therefore determined at the end of the experiment. In this study, cucumber consumption significantly reduced serum TC and TG concentration in apparently healthy subjects.

Furthermore, there was a significant decrease in serum HDL concentration in apparently healthy subjects. However, the decrease in serum LDL concentration was not statistically significant. This result was in line with the study carried out by Xiao-Qian *et al.* (2012), on the effects of bioactive components of sea cucumber on the serum, liver, lipid profile and lipid absorption, which revealed that both the saponin and polysaccharide treatment significantly reduced the serum TC concentration ($p<0.01$ and $p<0.05$) and their work also revealed that TG was decreased ($p<0.05$), but in contrast to our findings, none of the sea cucumber treatments changed the serum HDL concentration. Tanaka *et al.* have reported that 5% black sea cucumber supplementation significantly reduced the serum TC concentration and increased the ratio of HDL and TC in rats (Tanaka *et al.,* 2003). According to the study of Gao *et al.*dietary sea cucumber (Cucumariafrondosa) improved the disturbed lipid metabolism induced by a high-cholesterol diet, with a significant decrease of the TC and LDL content in the serum (Gao *et al.,* 2009). The present findings, therefore, strengthen the hypolipidemic effect of cucumber.

Again, the result of our study revealed that there was a decrease in AST with a mean of 0.724 and an increase in ALT with a mean difference of -0.552 after the administration of cucumber, but both were not statistically significant (AST, P=0.221; ALT, P=0.351).In contrast, Xiao-Qian *et al.* carried out a study on dietary saponins of sea cucumber alleviate orotic acid-induced fatty liver in rats via PPARα and SREBP-1c signaling, and the result showed that activities of critical enzymes in the liver involved in lipid biosynthesis, including fatty acid synthase (FAS), malic acid (MA), and glucose-6-phosphate dehydrogenase (G6PDH) were significantly increased ($p<0.01$ and $p<0.05$), implying an enhancement of lipogenesis in liver(Xiao-Qian *et al.,* 2012). The liver plays a central role in lipid transport and metabolism, and is likely to contribute to the onset and progression of several chronic diseases, including atherosclerosis, diabetes and obesity (Adams *et al.,* 2005). Our result revealed that consumption of cucumber has no deleterious effect on liver enzymes (AST and ALT) probably because they are not involved in hypolipidemic effect of other liver enzyme (FAS, MA and G6PDH).

CONCLUSION

From the current study, we conclude that cucumber has significant anti-hyperlipidaemic effects with no deleterious effects on the liver and is able to keep the body hydrated. Therefore, cucumber can be useful, at least as an adjunct, in the therapy of cardiovascular diseases. However, further study is necessary for the screening of chemical compounds and the structure elucidation of the respective hypolipidaemic property as well as their extraction mechanism.

RECOMMENDATIONS

Based on our findings, we recommend that adequate nutritional and health education strategies be adopted to enlighten the general public on the beneficial effects of cucumber. Cucumber can be used in the therapy and management of cardiovascular diseases. Further studies should be carried out to fully understand the full benefit of cucumber consumption.

ACKNOWLEDGEMENT

I am highly indebted to my supervisor, Prof. S.C. Meludu, whose intellectual powers, critical and thorough supervision made this study a reality. Much thanks to my lecturer and supervisor, A.C Ihim, for his fatherly support and encouragement throughout this project. I really cannot thank you enough for your understanding and tolerance throughout this project. Finally, I will always be indebted to you, my ever loving parents, Engr. Christ and Dr. S.U. Ezeodili for your parental advice, encouragement and support towards my academic pursuits. I pray that God in his infinite goodness will replenish you as much as you have given. I really cannot thank you all enough.

REFERENCES

Adams, L.A., Angulo, P., Lindor, K.D. (2005). Nonalcoholic fatty liver disease. CMAJ; 172(7): 899-905.

Aggarwal, B.B., Sundaram, C., Malani, N. and Ichikawa, H. (2007). Curcumin, the Indian Solid Gold. Journal of *Advanced Experimental Medical Biol*ogy; 595:1-75.

Ankita, S., Kaur, P., Gupta,R. (2012).Phytochemical screening and antimicrobial assay of various seeds extracts of CucurbitaceaeFamily.International Journal of Applied Biology and Pharmaceutical Technology;3 (3) 401-409.

Cooney, M.T., Dudina, A., de Bacquer, D., Wilhelmsen, L., Sans., S., Mentotti, A., de Bacquer, G., Jousilahti, P., Keil, U., Thomsen, T., Whincup, P., Graham, I.M., Score investigators. (2009). *Atherosclerosis;* 206: 611-616.

Cullen, P. (2000). Evidence that triglyceride is an independent coronary heart disease risk factor. *American Journal of Cardiology*; 86: 943-949.

Cziraky, M.J., Watson, K.E., Talbet, R.L. (2008). Targeting low HDL-cholesterol to decrease residual cardiovascular risk in the managed care setting. *J. Mang. Care Pharm.*; 14: S3-S8.

Edeoga, H.O., Okwu, D.E., and Mbaebie ,B.O. (2005). Phytochemical constituents of some Nigerian medicinal plants. *African Journal of Biotechnology;* 4 (7) 685-688.

Egwaikhide,P.A., Bulus,T. and Emua, S.A. (2010). Antimicrobial activities and phytochemical screening of extracts of the fever tree, Eucalyptus globulus. *Electronic Journal of Environmental, Agricultural and Food Chemistry*; 9 (5) 940-945.

Gao, S.,Wang, J.F.,Wang, Y.M.,Liu, Z.D.,Li, X.L.,Xue, C.H. (2009). *Journal of WuhanUniversity*; 55: 324–328.

Gill, N.S., and Bali, M. (2011). Isolation of antiulcer Cucurbitane type triterpenoid from the seeds of Cucurbita pepo. *Research Journal of Phytochemistry*; 5 (2) 70-79.

Gill, N.S., Garg, M., Bansal, R., Sood, S., Muthuraman, A., Bali, M.,and Sharma, P.D. (2009). Evaluation of antioxidant and antiulcer potential of Cucumissativum L. seed extract in rats. *Asian Journal of Clinical Nutrition*; 1 (3) 131-138.

Gupta, M.P, Solís, P.N., Calderón, A.I., Guinneau-Sinclair, F., Correa, M., Galdames, C., Guerra, C., Espinosa, A., Alvenda, G.I., Robles, G. and Ocampo, R. (2005). Medical ethnobotany of the Teribes of Bocas del Toro, Panama. *Journal of Ethnopharmacol*ogy; 96:389-401.

Haeckel, R. (1981). Assay of Creatinine in serum with use of fuller's earth to remove interferents. *Clinical Chemistry*; 27(1): 179-183.

Hashish, M.N. and Gomaa, N.F. (2003). The inhibitory effects of garlic (*Allium sativa*) on growth of some microorganisms. *Journal of Egpytian Public Health. Associ*ation; 78(5-6):361-372.

Iwalokun, B.A., Ogunledun, A., Ogbolu, D.O., Bamiro, S.B., Jimi- Omojola, J. (2004). *In-vitro* antimicrobial properties of aqueous garlic extract multi-drug resistant bacteria and *Candida* species from Nigeria. *Journal of Medicinal Food*; 7(3):327-333.

Lawrence, D.R., Bennett, P.N., (1995). *Clinical Pharmacology* ELBS with Churchill Livingston, Edinburgh, p. 686.

McGowan, M.W. (1983). A Peroxidase coupled method for the colorimetric determination of serum triglyceride. *Clinical Chemistry*; 29: 538 -539.

Miller, W.G., Waymack, P.P., Anderson, F.P., Ethridge, S.F., Jayne, E.C. (2002). Performance of four homogeneous direct methods for LDL-cholesterol. Clinical Chemistry; 48: 489-498.

Nafiu, Olugbemiro, M., Akanji, Adewumi, M., Yakubu, and Toyin, M. (2011). Phytochemical and Mineral Constituents of Cochlospermumplanchonii (Hook. Ef. x Planch) Root. Bioresearch Bulletin: 342-347.

Rai, M., Pandey, S., and Kumar, S. (2008). Cucurbit research in India: a retrospect. Indian Institute of Vegetable Research Varanasi:285-294.

Rao, A.V., and Sung, M.K.(1995). Saponins as anticarcinogens. *The Journal of Nutrition;*125(3):717S-724S.

Reitman, S., Frankel, S. (1957). A method of assaying liver enzymes in human serum. *American Journal of Clinical Pathology;* 28: 56 – 58.

Rifal, N., Warnick, G.R. (1994). Laboratory Measurement of lipids, lipoproteins and apolipoproteins. AACC Press, Washington, DC, USA.

Sinclair, S. (1998). Chinese herbs: a clinical review of Astragalus, Ligusticum.

Tanaka, K., Nishizono, S., Kase, A., Ogura, S., Kurita, M., Murakami, T., Kugino, K., Matsumoto, H., Ikeda, I. (2003). Effects of dietary black sea cucumber on serum and liver lipid concentrations in rats. *Journal of Japanese Society of Nutrition and Food Science*;56:175–179.

Trease, G.E. and Evans, W.C. (2002). Trease and evanspharmacognosy. 15th ed. London: WB Saunders: 419–473.

Xiao-Qian, H.U., Jie, X.U., Yong, X.U.E., Zhao-Jie, L.I., Jing-Feng, W., Jia-Hui, W., Chang-Hu, X.U.E., Yu-Ming, W. (2012). Effects of bioactive components of sea cucumber on the serum liver, lipid profile and lipid absorption. *Journal of Bioscience Biotechnology and Biochemistry*; 76(12): 2214-2218.

AUTHORS' CONTRIBUTIONS

All authors (Ezeodili VK, Ihim AC, Ogbodo EC, Ezeugwunne IP, Analike RA, Onah CE, Amah UK, Okwara JE, Ezego AI, Ugwu MC, Oguaka VN, Asebioyo SJ, Meludu SC) contributed to the completion of this research work and were actively involved in the presentation of this manuscript.