EFFECTS OF *CAPSICUM FRUTESCENS* SUPPLEMENTED DIET ON LIPID PROFILE OF WISTAR RAT.

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ABSTRACT

The effects of *Capsicum frutescens* (C.F.) supplemented diet on lipid profile and body weight of Wistar rats was evaluated in this present study. Fifteen male Wistar rats were divided into three groups. Group 1 (control) received normal feed + water adlibitum, group 2 (Test 1) received 2% C.F. + normal feed and water adlibitum, while group 3 (Test 2) received 3% C.F. + normal feed and water adlibitum. After three weeks of the procedure, all animals fasted overnight were subjected to chloroform anesthesia and blood samples were collected into lithium heparin container for lipid profile test using biochemical analyser (Reflotron plus kit). Statistical analyses of result by one way analyses of variance (ANOVA) showed that group 2 (2% C.F.) significantly ($P<0.05$) caused increase in HDL-cholesterol, and decrease serum triglyceride, total cholesterol, LDL and VLDL cholesterol against the group 1(control). Group 3 (3% C.F.) significantly ($P<0.05$) decreased serum HDL cholesterol and increased serum triglyceride, total cholesterol, LDL and VLDL cholesterol against the group 1(control) and group 2. Percentage increase in body weight was highest in group 1 (55.9%), followed by groups 2 (12.3%) and least in group 3 (9.92%). This result pattern suggests that 2% *Capsicum frutescens* incorporated in diet of wistar rats improved the lipid profile against that of 3%. Therefore regular incorporation of low dose of *Capsicum frutescens* in diet as supplement would aid a long way in ameliorating overweight, obesity and hypercholesterolemia associated with cardiovascular problems as well as diabetes.

INTRODUCTION

Alterations in the concentration of major lipids like cholesterol, High density lipoprotein cholesterol (HDL-C), Low density lipoprotein cholesterol (LDL-C) and triglycerides help to give use-ful information on the predisposition of the heart to atherosclerosis and its associated coronary heart disease (Chawla, 1999; Abolaji, *et al.*, 2007). High blood cholesterol concentration is an important risk factor for cardiovascular disease (Wang, 1999). The lipid profile which includes total cholesterol, HDL-cholesterol (often called good cholesterol), LDL-cholesterol (often called bad cholesterol), and triglycerides, is a group of tests that are often ordered together to determine risk of coronary heart disease. Lipid profile tests have been shown to be good indicators of whether someone is likely to have a heart attack or stroke caused by blockage of blood vessels (hardening of the arteries) (Delores, 2011).

Regular consumption of plant foods are associated with numerous health benefits rooted in their various physiological effects as a result of their phytochemical and nutritional constituents (Hunter and Fletcher, 2002). Green leafy vegetables are particularly important in promoting health because of their rich sources of nutrients (Gupta and Prakash, 2009).

Capsicum frutescens, a house hold vegetable belonging to the family, Solanaceae, is a species of chili pepper that has been used in traditional folk medicine for the treatment of respiratory tract infections, asthma, digestive ailments, weight loss, fevers and sore throats. A number of research studies have shown multiple pharmacological effects of capsaicin on a variety of physiological systems such as cardiovascular system, gastrointestinal tract, metabolic rate, and pain relief (Chaiyata, 2003). The active substance that gives the hot and spicy flavor in *Capsicum frutescens* identified as capsaicin contains nutritional values such as; Vitamin A, Vitamin C, Proteins, Steroidal Alkaloidal Glycosides (Solanine and Solasadine), Fats, and Carotenoids (Chaiyata, 2003).

In the past three decades, it has been ex-

perimentally documented that several common spices can also exert numerous beneficial effects (Srinivasan, 2005). These physiological effects of spices in most instances have been attributed to the main spice active principles present in them. Among these physiological influences, spices reported to exhibit hypolipidemic and antioxidant properties have far-reaching health implication (Manjunatha and Srinivasan, 2008). This study was designed to investigate the effects of *Capsicum frutescens* incorporated diet on lipid profile of Wistar rats.

MATERIALS AND METHODS

Materials

Plant material

Red Chili (*Capsicum frutescens*), was purchased from Abraka market in Ethiope East Local Government Area, Delta State. The plant was authenticated by Dr. Mrs. N.E. Edema in the Department of botany, Faculty of Science, Delta State University, Abraka. It was then powdered using electrical blender and stored in airtight bottle before use.

Animals

Fifteen Wister rats (80-135g body weight range) were procured from the International Institute of Tropical Agriculture, (IITA), Ibadan Nigeria. The animals were acclimatized for a minimum of 14-days prior to the experiment. They were housed in the animal house unit in the Department of Anatomy, Faculty of Basic Medical Science, Delta State University Abraka. They were kept in well ventilated wooden cages and were exposed to 12 hours of natural daylight and darkness and fed with standard rat feed and water adlibitum. Procedures followed in raising the experimental animals were in accordance with the ethical standards of the Institutional Animals Ethics Committee (IAEC).

Methods

Experimental Design

The animals were randomized into groups as follows;

Group 1: Control: Received normal feed and water ad libitum

Group 2: Test 1: Received normal feed + 2% C.F. and water ad libitum

Group 3: Test 2: Received normal feed + 3% C.F. and water ad libitum

(Eman *et al*., 2010).

The treatment was done twice daily for twenty one days. Initial and final body weights of animals were also recorded.

Blood Collection and Biochemical Assay

After three weeks of exposure to *Capsicum frutescens* supplemented diet, all overnight fasted rats were subjected to chloroform anesthesia and blood samples were collected into lithium heparin bottles using cardiac puncture. The tubes were then centrifuged at 4000rpm for 2minutes to obtain serum for biochemical evaluation of lipid profile parameters (Total cholesterol, triglyceride, and high density lipoprotein) using Reflotron plus kits.

Statistical Analyses

The results of this study were expressed as mean $\pm$ SEM of five animals per group and were further analyzed by one way analyses of variance (ANOVA) using statistical package for social science (SPSS, 16). Difference between group means were tested with post Hoc-Turkey's test for multiple comparison and significance was considered when P value was less than 0.05 ($P<0.05$) Student's dependent t-test was used to analyze the significant difference between initial and final body weight.

RESULTS

Table 1: Effects of *Capsicum frutescens* supplemented diet (C.F.S.D) on lipid profile of Wistar rats.

	High Density Lipoprotein (HDL), mg/dl	Low Density Lipoprotein (LDL), mg/dl	Very Low density Lipoprotein (VLDL), mg/dl	Total Cholesterol (mg/dl)	Triglyceride (mg/dl)
Group 1: Normal feed:	33.98 ± 2.63	36.75 ± 4.44	11.58 ± 1.00	84.2 ± 4.0	57.9 ± 5.0
Group 2: Normal feed + 2% C.F.	52.9 ± 1.00[a]	7.84 ± 2.45[a]	10.2 ± 0.75	65.5 ± 5.1[a]	51.0 ± 3.8
Group 3: Normal feed + 3% C.F.	31.42 ± 2.03[b]	42.82 ± 3.57[b]	15.68 ± 0.77[ab]	89.9 ± 1.7[b]	78.4 ± 3.9[ab]

Values are expressed as mean ± Standard error of mean (SEM), n=5.
[a]P<0.05: Significant when compared with control (group 1).
[b]P<0.05: Significant when compared with group 2.
[c]P<0.05:Significant when compared with group 3.

From result of statistical analyses on lipid profile parameters by one way analyses of variance (ANOVA), group 2 (52.9 ± 1.00) had significantly (P<0.05) increased serum HDL when compared with group 1(33.98 ± 2.63), while group 3 (31.42 ± 2.03) had significantly (P<0.05) reduced serum HDL level when compared to group 2.

Group 2 (7.84 ± 2.45) had significantly (P<0.05) reduced serum LDL when compared with group 1(42.82 ± 3.57). While Group 3 (42.82 ± 3.57) had significantly (P<0.05) increased serum LDL level when compared with group 2.

The serum VLVL level of Group 2 (10.2 ± 0.75) was reduced when compared with group 1 (11.58 ± 1.00) but did not attain statistical significance. However, the VLDL of group 3 (15.68 ± 0.77) was significantly increased when compared with groups 1 and 2.

Group 2 (65.5 ± 5.1) had significantly (P<0.05) reduced serum total cholesterol level when compared with group 1 (84.2 ± 4.0). While serum total cholesterol of group 3 was significantly (P<0.05) increased when compared with group 2.

Group 2 (51.0 ± 3.8) had reduced serum triglyceride level when compared with group 1 (57.9 ± 5.0) but was not statistically significant (P>0.05). However, group 3 (78.4 ± 3.9) had significantly increased serum triglyceride level when compared with group 1(P<0.05) and group 2 (P<0.05).

Table 2: Effects of *Capsicum frutescens* supplemented diet on body weight of Wistar rats.

	Initial body weight (g)	Final body weight (g)
Group 1: Control:	93 ± 4.4	145.0 ± 12.04* (55.9%)
Group 2: Test 1: feed + 2% C.F.	106 ± 7.0	119.0 ± 5.1[ns] (12.3%)
Group 3: Test 2: feed + 3% C.F.	121 ± 6.6	133.0 ± 6.4[ns] (9.92%)

Values are expressed as mean ± Standard error of mean (SEM).
**P<0.05: Significant when compared with initial body weight. [ns]P<0.05: Not significant when compared with initial body weight. Values in parenthesis show the percentage increase in body weight when initial and final values were compared.*

Statistical analyses by independent students t-test revealed a significant (P<0.05) increase in body weight of group 1 when initial mean value (93 ± 4.4) was compared with final mean value (145.0 ± 12.04). On the other hand, no statistical significant differences (P<0.05) were observed when group 2 initial (106 ± 7.0) and final body weight value (119.0 ± 5.1) as well as when group 3 initial (121 ± 6.6) and final body weight value (133.0 ± 6.4) were compared. However marginal increase in body weight was observed. Group 1 (55.9%) has the highest percentage gain in body weight followed by group (12.3%) and least in group 3 (9.92%)

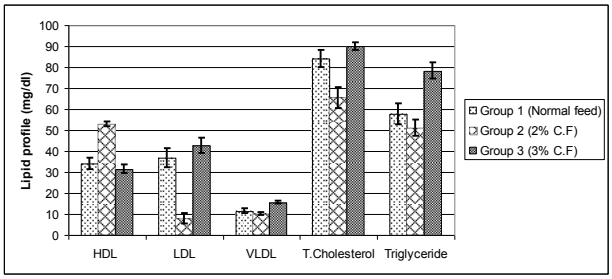

Figure 1: Effects of Capsicum frutescens supplemented diet on lipid profile of Wistar rats.

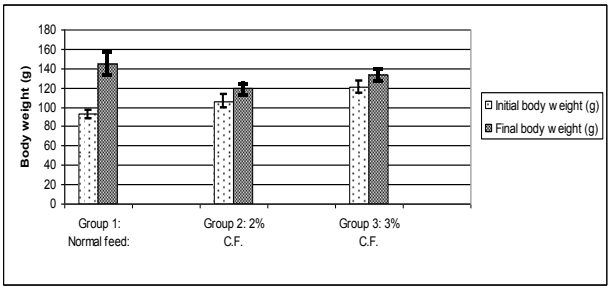

Figure 2: Effects of Capsicum frutescens supplemented diet on body weight of Wistar rats.

DISCUSSION

The present study investigated the effects of *Capsicum frutescens* supplemented diet on serum lipid profile of Wistar rats. From results of the study, Wistar rat's feed supplemented with 2% *Capsicum frutescens* significantly increased serum high density lipoprotein (HDL) but significant caused a decrease in serum total cholesterol, triglyceride, low density lipoprotein, and very low density lipoproteins cholesterols when compared with group 1 (control) counterpart. The physiological changes exhibited by C.F.S.D could be attributed to its chemical constituent. *Capsicum frutescens* had been reported to be fortified with Vitamin A, Vitamin C, Proteins, Steroidal Alkaloidal Glycosides (Solanine and Solasadine), Fats, Carotenoids (Chaiyata, 2003) and these components has been reported to possess hypolipidemic and antioxidant properties (Manjunatha and Srinivasan, 2008). It is therefore not surprising that consumption of diet supplemented with the plant promoted hypolipidemic effect in rats.

Conversely, Wistar rat's feed supplemented with 3% of *Capsicum frutescens* (C.F.) significantly reduced serum high density lipoprotein (HDL), and significantly increased serum total cholesterol, triglyceride, low density lipoprotein, and high density lipoproteins cholesterols when compared with control group. This changes may be attributed to the toxic effects associated with higher dose of C.F. incorporated in the diet of rats in group 3. High dose of *Capsicum frutescens* has been reported to induce toxicities in humans and experimental animals (Saito, 1996; Lewis, 2002).

Marginal increased in body weight depicted by reduced percentage increase in body weight of Wistar rats in groups 2 (12.3%) and 3 (9.92%) when compared to group 1 (55.9%) may be due to capsaicin presence in *Capsicum frutescens* which has been reported to cause weight reduction (Chaiyata, 2003).

CONCLUSION AND SUGGESTION

There are several healthy benefits that one can get by eating *capsicum frutescense*. In light of the foregoing, the incorporation of capsicum frutescence in experimental animals' diet had revealed a significant increase in HDL cholesterol, and significant decrease in LDL, VLDL, Triglyceride, and total cholesterol when compared with control group and 3% group. Increasing HDL cholesterol level and decreasing LDL and VLDL levels is required for a better cardiovascular performance. Group 2 (2%) and group 3 (3% C.F.) caused decrease in body weight when compared with the control group.

Therefore regular incorporation of low dose of *capsicum frutescens* diet as supplement would help to ameliorate overweight, obesity and hypercholesterolemia associated with cardiovascular problems as well as diabetes. Further investigation should also be carried out on the histological nature of organs of Wistar rats subjected to different doses of capsicum frutescens used in the present study.

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