# Effect of Oral Administration of "Gadagi" Tea on Lipid Profile in Rats

*A.M. Gadanya, M.S. Sule and M.K. Atiku
**Department of Biochemistry, Bayero University, Kano, Nigeria**
[*Correspondence Author: E-mail: gadanyaa4038@buk.edu.ng;☎: +234(0)8023730272.]

**Abstract:** Effect of oral administration of "Gadagi" tea on lipid profile was assessed in 50 healthy male albino rats which were grouped and administered with different doses(mg/kg) i.e low dose (380mg/kg, 415mg/kg, 365mg/kg, 315mg/kg for "sak", "sada" and "magani" respectively), standard dose (760mg/kg, 830mg/kg, 730mg/kg for "sak', "sada" and "magani" respectively) and high dose ( 1500mg/kg, 1700mg/kg and 1460mg/kg for "sak'', "sada" and "magani" groups respectively) for a period of four weeks. Animals that were not administered with the tea constituted the control group. At the end of fourth week, the animals were sacrificed and their serum Total Cholesterol (T. Chol), HDL–Cholesterol (HDL Chol), Triglyceride (TRIG), very low – density lipoproteins (VLDL) and Low Density Lipoproteins (LDL) levels were determined. Although no significant difference(P<0.05) was found between the experimental groups and the control group using analysis of variance (ANOVA), mean serum LDL, T. Chol and TRIG levels were slightly lower in rats orally administered with "magani" at standard dose level than that of the control rats. Thus, it could be suggested that "magani" especially at standard dose could reduce some of the risk factors of cardiovascular disease.
**Keywords:** "Gadagi" tea, Lipid profile, Cholesterol.

## INTRODUCTION
A lipid profile, also known as lipid panel or coronary risk panel, measures serum total cholesterol, HDL cholesterol, LDL–cholesterol and triglyceride. Cholesterol is doubtless the most publicized lipid, notorious, because of the strong correlation between high levels of cholesterol in the blood and the incidence of human cardiovascular disease (David and Michael, 2008). Epidemiological study (Henry *et al.*, 2003; Gordon *et al.*, 2002) has shown that, the level of total serum cholesterol is a strong predictor of the likelihood that an individual will develop heart disease and to a much lesser degree, stroke. However, elevated levels of the lipoprotein fractions, LDL and VLDL, are regarded as artherogenic and prone to cause artherosclerosis, and levels of these fractions rather than the total cholesterol levels correlate with the extent and progress of artherosclerosis (Brunzell *et al.*, 2008). According to lipid hypothesis, abnormally high cholesterol levels (hypercholesterolemia), that is higher concentration of LDL and lower concentration of HDL, are strongly associated with cardiovascular diseases because these promote atheroma development in arteries (atherosclerosis). There is increasing evidence that intake of sour tea (*Hibiscus sabdariffa*) has hypoglycemic and hypolipidemic effects (Muzaffar-Khosravi *et al.*, 2009)

"Gadagi" tea is a special type of tea prepared and sold to various people engaged in strenuous jobs to achieve different purposes, such as stimulation, medication, agitation and total ability to endure any hardship involved in goal attainments. It is a concoction of several herbs and shrubs, which is believed to posses so many medicinal values by the users. All herbs contain substances that may cause undesirable side effects or interact with medication (Gadanya, 2011). The composition of the 3 major types of "Gadagi" tea, viz: "Sak","sada" and "magani" has been reported previously (Gadanya *et al.*, 2011).

There is a high rate of consumption of "Gadagi" tea in Kano and some other parts of northern Nigeria (Gadanya, 2011). There is the need to assess the linkage between the consumption of the tea and incidence of cardiovascular diseases. Therefore, the research work reported in this paper was aimed at finding out the the effect of "Gadagi" tea consumption on lipid profile.

## MATERIALS AND METHODS
### Dose Selection and Preparation
Samples of "sak", "sada" and "magani" types of Gadagi" tea were obtained from Kofar Wambai Market, Kano, Nigeria (one of the oldest and the most popular "Gadagi" tea market). They were subjected to direct heating process. Residues were obtained and weighed using a weighing balance. The standard dose (760mg/kg, 830mg/kg, 730mg/kg, for "sak', "sada" and "magani" respectively) was prepared in 1cm³ of solvent

whereas the low dose (380mg/kg, 415mg/kg, 365mg/kg, 315mg/kg for "sak", "sada" and "magani" respectively) was prepared in 0.5cm³ of solvent and high dose (1500mg/kg, 1700mg/kg and 1460mg/kg for "sak'', "sada" and "magani" groups respectively) was prepared in 2 cm³ of solvent (Gadanya *et al.*, 2011).

.

**Experimental Design**

Fifty (50) experimental male albino rats were divided into four groups based on the type of "Gadagi" tea i.e. one control group and three experimental groups (for the three types of "Gadagi" tea). The control group consisted of five rats while the other three groups were further divided into three equal sub – groups each consisting of five rats. The three sub groups were for Standard dose (760mg/kg,830mg/kg,730mg/kg for"sak',"sada"and "magani" respectively); Lowdose (380mg/kg, 415mg/kg, 365mg/kg, 315mg/kg for "sak", "sada" and "magani" respectively) and high dose (1500mg/kg, 1700mg/kg and 1460mg/kg for "sak'', "sada" and "magani" groups respectively).They were administered the doses of the tea orally using syringe once daily for a period of four weeks. At the fourth week, all the rats were sacrificed. Blood samples were collected and centrifuged to obtain sera for lipid profile analysis.

**Methods of Analysis**

Serum triglycerides (TRIG), very Low density lipoprotein (VLDL) and total cholesterol (T. Chol) levels were measured using the method of Carl and Edward (1983).Determination of serum high density lipoprotein (HDL-Chol) fraction was carried out using Lopes-Virella (1977) method, and serum low density lipoprotein (LDL) level was estimated using Friedwald *et al.*, (1972) formula.

Data collected were subjected to Analysis of variance (ANOVA) using the General Linear Model (SPSS for Windows).

**RESULTS AND DISCUSSION**

Serum total cholesterol (T. Chol), HDL-Cholesterol (HDL- Chol), Triglycerides (Trig), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels of albino rats administered orally with "sak", "sada" and "magani" for 4 weeks are presented in Tables 1-3. The mean T.Chol, HDL – Chol, Trig and VLDL levels of all the experimental rats in the different experimental groups of "sak" (Table 1), "sada"(Table 2) and

"magani"(Table 2) were lower than those of the control group. No significant difference was found between the experimental groups and the control group using analysis of variance (ANOVA). However, a slight decrease in mean serum total cholesterol level was found in rats administered orally with "sak" at standard and at high dose levels, "sada" at low dose level and "magani" at low and standard dose levels. This could probably be attributed to the level of tannins present in the tea (Gadanya, 2011) which have been reported to have cholesterol lowering property (Shiavone *et al.*, 2008). Diets containing tannins at low dosages (0.15 – 0.2%) may improve well being (Shiavone *et al.*, 2008). Mean serum HDL-cholesterol level of rats orally administered with "sak" (Table 1) at low and standard dose levels, "sada" (Table 2) at low dose level and, "magani" (Table 3) at low and standard dose levels was significantly lower (P<0.05) than that of the control rats. Lower serum HDL-cholesterol level is not beneficial to health, in view of the reported negative association between HDL-cholesterol levels and cardiovascular disease (Kerver *et al.*, 2003).

Mean serum triglyceride level was slightly lower than that of the control rats at all the tested dose levels of "sak", "sada" and "magani". Mean serum VLDL level of the experimental rats was lower than that of the control rats. Reduced serum triglyceride level is an indication of utilization of either stored fats or triglyceride in circulating VLDL for energy purposes (Kerver *et al.*, 2003).

Mean LDL level was significantly lower (P<0.05) at standard dose level of "magani" (using t-test). Reduced LDL level is beneficial to the health, in view of the reported positive association between LDL-cholesterol levels and cardiorvascular disease (Kerver *et al.*, 2003). From the results, although no significantly difference was found using ANOVA, the mean serum LDL and total cholesterol levels were slightly lower at standard dose level of "magani" than that of the control group, it could be suggested that, "magani" could probably reduce some of the risk factors of cardiovascular disease at standard dose level. The decreased HDL-cholesterol level could be associated with increased risk of cardiovascular disease but only when there is increased LDL-cholesterol level, which was not the case following the administration of the tea.

**Table 1:** Serum Lipid Profile of albino rats orally administered "Sak" for four (4) weeks.

| Group | Dose (mg/kg) | T. Chol (mmol/L) | HDL (µmol/L) | Trig (µmol/L) | VLDL (µmol/L) | LDL (mmol/L) |
|---|---|---|---|---|---|---|
| Control | - | 2.19 ± 0.31 | 0.74 ± 0.14 | 1.95 ± 0.51 | 0.89 ± 0.23 | 0.56 ± 0.26 |
| Low Dose | 380 | 1.98 ± 0.31 | 0.60 ± 0.16 | 1.40 ± 0.16 | 0.64 ± 0.08 | 0.75 ± 0.42 |
| Standard Dose | 760 | 1.81 ± 0.22 | 0.62 ± 0.71 | 1.47 ± 1.90 | 0.67 ± 0.86 | 0.52 ± 1.51 |
| High Dose | 1520 | 1.78 ± 0.28 | 0.64 ± 0.11 | 1.62 ± 0.15 | 0.74 ± 0.66 | 0.40 ± 0.24 |

Values are mean ± standard deviation (n =3)

**Table 2:** Serum lipid profile of albino rats orally administered "Sada" for four (4) weeks.

| Group | Dose (mg/kg) | T. Chol (mmol/L) | HDL (µmol/L) | Trig (µmol/L) | VLDL (µmol/L) | LDL (mmol/L) |
|---|---|---|---|---|---|---|
| Control | - | 2.19 ± 0.31 | 0.74 ± 0.14 | 1.95 ± 0.51 | 0.89 ± 0.23 | 0.56 ± 0.26 |
| Low Dose | 435 | 1.61 ± 0.27 | 0.47 ± 0.09 | 1.39 ± 0.17 | 0.63 ± 0.80 | 0.50 ± 0.20 |
| Standard Dose | 870 | 0.21 ± 0.01 | 0.64 ± 0.19 | 1.47 ± 1.59 | 0.67 ± 0.75 | 0.79 ± 1.20 |
| High Dose | 1740 | 2.11 ± 0.27 | 0.72 ± 0.74 | 1.57 ± 0.22 | 0.71 ± 0.10 | 0.68 ± 0.25 |

Values are mean ± standard deviation (n =3)

**Table 3:** Serum lipid profile of albino rats orally administered "Magani" for four (4) weeks.

| Group | Dose (cm³) | T. Chol (mmol/L) | HDL (µmol/L) | Trig (µmol/L) | VLDL (µmol/L) | LDL (mmol/L) |
|---|---|---|---|---|---|---|
| Control | - | 2.19 ± 0.31 | 0.74 ± 0.14 | 1.95 ± 0.51 | 0.89 ± 0.23 | 0.56 ± 0.26 |
| Low Dose | 365 | 1.65 ± 0.00 | 0.43 ± 0.45 | 1.30 ± 0.12 | 0.59 ± 0.51 | 0.63 ± 0.32 |
| Standard Dose | 730 | 1.53 ± 0.11 | 0.58 ± 0.05 | 1.53 ± 1.13 | 0.70 ± 0.06 | 0.25 ± 0.04 |
| High Dose | 1460 | 2.11 ± 0.17 | 0.62 ± 0.07 | 1.51 ± 0.12 | 0.69 ± 0.57 | 0.80 ± 0.14 |

Values are mean ± standard deviation (n =3).
T. Chol  = Total cholesterol;
HDL = High Density Lipoproteins;
Trig = Triglycerides;
VLDL = Very Low Density Lipoprotein
LDL = Low Density Lipoproteins

## REFERENCES

Brunzell, J.D., Davidson, M., Furberg, C.D, Goldberg, R.B. and Howard, B.V. (2008). Lipoprotein management in patients with cardiometabolic risk *American Diabetes Association and the American College of Cardiology Foundation*, **31(4):** 811-22.

Carl, A. and Edward, R.(1983).*Teiz Fundamentals of Clinical Chemistry*.WB Saunder's company, London. Pp.419-715.

David, L.N. and Micheal M.C. (2008). *Principle of Biochemistry.* Fifth edition. W.H. Freeman and company, New York. Pp.831-844.

Friedwald, W.T., Levy, R.I. and Fredrickson, D.S. (1972).Determination of LDL-cholesterol without use of the preparative ultracentrifuge. *Clinical Chemistry*, **18:** 499-502.

Gadanya, A.M. (2011). Biochemical and Toxicological studies on "Gadagi"tea in rats. *Ph.D Thesis.* Department of Biochemistry, Bayero University Kano, P2.

Gadanya, A.M., Sule, M.S. and Atiku, M. K. (2011). Acute Toxicity Study of "Gadagi" tea on rats. *Bayero Journal of Pure and Applied Sciences*, **4(2):**147-149.

Gordon, D.J., Probstfield, J.L., Garrisson, R.J., Castelli, W.P., Knoke, J.D. and Tyroler, H.A. (2002). High-density lipoprotein cholesterol and cardiovascular disease. *Four prospective American Studies Circulation*, **79(1):** 8-15.

Henry, R., Black, F., Mike, S. and David, N. (2003). Cardiovascular risk factors. *American Journal of Nutrition,* **76:** 93-99.

Kerver, J.M., Eunjang, L.B. and Won, O.S. (2003). Dietary patterns associated with risk factors for cardiovascular disease in healthy adults. *American Journal of Clinical Nutrition, .***78:** 1103-1110.

Lopes-Virella, S. (1977). Determination of serum cholesterol. *Clinical Chemical Acta,* **37:** 193-195.

Muzaffar-Khosravi, H., Jalili-Khanababadi, B.A., Afkhami, M. and Fatehi, F. (2009). Effect of sour tea (*Hibiscus sabdariffa*) on lipid profile in patients with type II diabetes. *Journal of Alternative Complementary Medicine,* **15(8):** 899-903.

Shiavone, A., Gup, K. and Tassone, S. (2008). Effects of a natural extract of chestnut wood on digestibility, performance traits and nitrogen balance of broiler chicks. *Poultry Science,* **87(3):** 521-527