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EFFECT OF *SIDA CORYMBOSA* LEAF EXTRACT ON THE SERUM LIPID PROFILE LEVELS OF ALLOXAN-INDUCED DIABETIC ALBINO WISTAR RATS IN COLLEGE OF HEALTH SCIENCES AND TECHNOLOGY, NNAMDI AZIKIWE UNIVERSITY, NNEWI CAMPUS, ANAMBRA STATE, NIGERIA

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ABSTRACT

This study was designed to investigate the effect of *Sida corymbosa* (SC) leaf extract on serum lipid profile levels of alloxan induced diabetic albino wistar rats. A total of 30 albino wistar rats each weighing 100g were assembled and divided into 3 groups (A-C) consisting of 10 rats each. Group A received SC treatment, B received ethanol treatment while group C served as the control group. 400mg/kg of aqueous extract of SC leaf was administered orally to the rats in group A, ethanol in group B, while group C received only water for 7 days. Blood samples were collected into plain containers for estimation of biochemical parameters (TC, TG, LDL, and HDL) respectively. Serum TC, TG, LDL, and HDL were analyzed using standard methods. There was a significant decrease in the mean serum levels of TC, TG, and LDL respectively after SC administration when compared with the control group (P=0.000 respectively). Again, the result showed a significant decrease in the mean weight of the rats post SC administration (P=0.000). However, there was a significant increase in the mean serum level of HDL after SC administration when compared with the control group

(P=0.000). This study revealed the hypolipidaemic effect of of SC use. Therefore, SC use could be of therapeutic importance in the prevention, and management of cardiovascular diseases.

KEYWORDS: *Sida corymbosa* (SC), Total cholesterol (TC), Triglyceride (TG), Low density lipoprotein (LDL), High density lipoprotein (HDL), Weight.

INTRODUCTION

Medicinal plants have been used for the treatment of several human diseases over the century and have been very important in the health care delivery of every nation at one stage or the other (Oluma *et al.*, 2004). Recent research has focused on natural plant product as alternatives to the existing drugs for disease remedy in developing countries (Aiyegoro *et al.*, 2007). Plant derived medicines have been part of traditional health care in most parts of the world for ages and there is increasing interest in them as sources of agents to fight microbial diseases (Mohana *et al.*, 2008: Ghaleb *et al.*, 2009; Ajayi and Akintola, 2010). The medicinal value of these plants lies in their chemical constituent which produces a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds (Itoro *et al.*, 2013). The world primary means of treating diseases and fighting infections has been the use of medicinal plant species. From ancient times, plants have been rich sources of effective and safe medicines (Rusell *et al*., 2006). Traditional herbal medicine has been a constant source of substances for the treatment of a variety of diseases (Kunwar *et al*., 2010). According to Manadhar, (2002), traditional herbal medicine has been used since ancient times in many parts of the world. About 85% of the traditional herbal medicines used for primary healthcare are derived from plants (Farnsworth, 2004). In Africa, traditional herbal medicine derived from plants forms an integral part of life in many indigenous communities as a readily available alternative to allopathic medicines (Wagate *et al*., 2010). Plants have been an indispensable source of both preventive and curative traditional herbal medicinal preparations for many people in Africa. Traditional herbal medicine is of great value, and more than 70% of the people in Africa refer to traditional herbal healers concerning health issues (Tijjani *et al*., 2009). Traditional herbal medicine has flourished in Africa and has continued to be the main source of health in the rural communities and is heavily relied on by the majority of the sub-Sahara African population. In Africa, traditional herbal medicine was used to cure diseases until colonialists introduced the use of the counter and prescription drugs (Mahonge *et al.*, 2006).

Sida is one of ethnomedicinally important genus of plants (Pradhan *et al.*, 2013) which belongs to the family called malvaceae (Ajithabai *et al.*, 2012). Sida plants have over 200 species which are used in treatment of diseases such as diarrhea, ulcer, gonorrhea and hepatic diseases (Narasihna *et al.*, 2013). *Sida corymbosa* popularly called broom weed or wire weed has been reported to have potentials of curing liver diseases (Narasihna *et al.*, 2013). It is found growing in most parts of Nigeria as common weeds. In the South Eastern part of Nigeria, it is called 'Udontike', 'Udonwatakaike', 'Udoike' and 'Acharaike' in the Northern Nigeria, it is called 'Miyartsanya' or 'Karkashinkwado' (Lucy *et al.*, 2014), while in the South Western part of Nigeria, it is called 'Ose patu, 'Ose putu' or 'Sanrin' (Lucy *et al.*, 2014). The plant is an erect, basally perennial shrub with hairy stem (Lucy *et al.*, 2014) which measures between 0.5 m to 2 m in height. The flower and seed are yellow and dark in colour. *Sida corymbosa* survives in all seasons (rainy and dry seasons) (Agyakwa and Akobundu, 2005). *Sida corymbosa* is one of popular plants in Nigeria used by a lot of local people to treat disease such as diarrhea, dysentery and stomach ulcer (Alebiosu *et al.*, 2012). In view of the aforementioned effects of *Sida corymbosa*, it became very imperative for us to investigate the effect of *Sida corymbosa* on the serum lipid profile levels in alloxan-induced diabetic albino wistar adult rats in College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

MATERIALS AND METHODS

Study location

The study was carried out at The Human Biochemistry Laboratory, Nnamdi Azikiwe University. It is located in the suburb of Nnewi - a popular town in Anambra State Nigeria.

Collection and identification of plant

The *Sida corymbosa* plant was collected in Okofia from the premises of College of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi campus, Anambra State, Nigeria in the month of January, 2016 and identified by Mrs. Aziagba B.O., Department of Botany, Nnamdi Azikiwe University, Akwa.

Animals used for the study

Wistar albino rats (100g) of both male and female were obtained from the Institute's Animal House and maintained at 25±2 ºC temperature and relative humidity 45-55% under 12:12 h light-dark cycle. Rats were fed with standard rat chow and water *ad-libitum*.

Ethical consideration

The protocol was approved by the Faculty of Health Sciences and Technology ethical committee, Nnamdi Azikiwe University, Nnewi campus, Anambra State, Nigeria.

Inclusion and exclusion criteria

Apparently healthy Wistar rats weighing 100g were included for the study while Wistar rats weighing below or above 100g were excluded from the study in order to ensure accuracy and uniformity in result interpretation.

Animal treatment

Animals were divided into three groups each, consisting of ten rats. Rats in the first group (A) received 400mg/kg *Sida corymbosa* dissolved in ethanol while the second group of rats (B) received ethanol. Rats in groups 3 were normal rats and served as the control groups (C). All the animals received their respective assigned treatment daily for a period of seven days. Rats were daily fasted over night before *Sida corymbosa* treatment. On day 8, the animals were anesthetized with ether, and blood was collected using cardiac puncture. Serum was then separated for the estimation of lipid profile parameters (TC, TG, LDL, and HDL respectively) using standard methods. Biochemical parameters (TC, TG, HDL, and LDL) were assayed using standard enzymatic methods as described by Roeschlau *et al*. (1974); Tietz, (2006); Burstein *et al*. (1980); and Assman *et al.* (1984) respectively.

Statistical Analysis

Statistical package for social sciences (SPSS) version 20 was employed in the analysis of the result. The results for the parameters studied were expressed as Mean± SD and the data were analyzed for general group differences using one-way ANOVA while post-HOC comparison was used to determine the inter-group differences. Level of significance was set at $p<0.05$.

RESULTS

The mean serum levels of all the parameters studies were statically significant at $p<0.05$ respectively using ANOVA (see table 1). In this study, the mean serum level of high density lipoprotein was significantly increased (0.72±0.8 vs 0.61±0.3; p=0.000), when the alloxan induced diabetic rats with *Sida corymbosa* treatment were compared with those rats with ethanol treatment. However, the mean serum levels of total cholesterol, triglyceride as well as low density lipoprotein were significantly decreased (2.39±0.09 vs 2.61±0.6; 0.58±0.03 vs 0.43±0.05; 1.09±0.01 vs 1.53±0.6; p=0.000) respectively when the alloxan induced diabetic

rats with *Sida corymbosa* treatment were compared with those rats with ethanol treatment. Again, following administration of *Sida corymbosa*, there was significant decrease in the mean weight of the rats (98.80±1.03 vs 119.40±1.17; p=0.000) compared to those rats with ethanol treatment (see table1). However, when the subjects with *Sida corymbosa* treatment were compared with the control group, all the parameters differed significantly (p<0.05), (see table 1).

Furthermore, comparing the parameters studied between the rats group with ethanol treatment and control groups indicates significant changes in the mean serum level of parameters studied (p<0.05). However, the mean serum level of low density lipoprotein did not differ significantly in this group (P>0.05) (see table 1).

Table 1: Serum lipid profile levels in alloxan induced diabetic rat with *Sida corymbosa* treatment (A), with ethanol treatment (B) and Control group (C) (Mean ± SD, n = 10).

Group	Total Cholesterol (Mmol/L)	LDL (Mmol/L)	HDL (Mmol/L)	Triglyceride (Mmol/L)	Weight (g)
A (n=10)	2.39±0.09	1.09±0.01	0.72±0.8	0.58±0.03	98.80±1.03
B (n=10)	2.61±0.6	1.53±0.6	0.61±0.3	0.43±0.05	119.40±1.17
C (n=10)	1.89±0.14	1.03±0.08	0.72±0.06	0.61±0.04	100.60±0.84
F (p)-valve	78.707 (.000)	228.508 (.000)	9.969 (.000)	54.655 (.000)	150.000 (.000)
AVB	<0.05	<0.05	<0.05	<0.05	<0.05
AVC	<0.05	<0.05	<0.05	<0.05	<0.05
BV C	<0.05	<0.05	>0.05	<0.05	<0.05

All values are expressed as Mean± Standard deviation (SD) with p<0.05 considered as significant.

Keys:

F (p)-value = mean± SD of parameter compared among groups A, B, and C (using ANOVA). A V B = comparison of parameters obtained in A with B; AVC = comparison of parameters obtained in A with C; B VC = comparison of parameters obtained in B with C.

The mean serum levels of Triglyceride and Low density lipoprotein was positively correlated in the control group. Interestingly, there were significant statistical correlations between TG vs LDL, and HDL vs Weight respectively in alloxan induced diabetic rat with *Sida corymbosa* treatment (A), (p<0.05), (see table 2).

Table 2: Level of association between TG, TC, LDL, HDL and Weight in alloxan induced diabetic rat with *Sida corymbosa* treatment (A) (Mean ± SD, n = 10).

Parameter	Pearson r correlation	P-value
TG vs LDL	0.677	0.032
HDL vs Weight	-0.671	0.034

***Statistically significant at p<0.05**

Furthermore, there was significant statistical correlation between LDL vs HDL in alloxan induced diabetic rat with ethanol treatment (A), (p<0.05), (see table 3).

Table 3: Level of association between parameters studied in alloxan induce diabetic rat with ethanol treatment (B) (Mean ± SD, n = 10).

Parameter	Pearson r correlation	P-value
LDL vs HDL	-0.660	0.038

***Statistically significant at p<0.05**

DISCUSSION

This study investigated the effect of *Sida corymbosa* on the serum lipid profile levels in alloxan-induced diabetic albino wistar adult rats in College of Health Sciences, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

In the present study, the mean serum levels of total cholesterol, triglyceride as well as low density lipoprotein were significantly decreased (2.39±0.09 vs 2.61±0.6; 0.58±0.03 vs 0.43±0.05; 1.09±0.01 vs 1.53±0.6; p=0.000 respectively) when the alloxan induced diabetic rats with *Sida corymbosa* treatment were compared with those rats with ethanol treatment. Interestingly, the mean serum level of high density lipoprotein was significantly increased after *Sida corymbosa* treatment (0.72±0.8 vs 0.61±0.3; p=0.000). This is in consonance with the findings of Martins *et al*. who carried out comparative evaluation of the protective effect of the ethanolic and methanolic leaf extracts of *Sida acuta* against hyperglycaemia and alterations of biochemical and haematological indices in alloxan diabetic rats and reported a significant decrease in the mean plasma levels of both TC and TG (Martins *et al.,* 2010). Similarly, Kaur *et al*. also reported ameliorative effect with aqueous extract of *Sida cordifolia* at the dose of 1,000mg/kg (Kaur *et al.,* 2011). Also, the present study is in agreement with the work of Mahrukh et al. who investigated the anti-hyperglycemic, anti-hyperlipidemic and antioxidant potential of alcoholic-extract of sida cordifolia (areal part) in streptozotocin-induced-diabetes in wistar-rats (Mahrukh *et al*., 2014). The

hypocholesterolemic effect of *S. corymbosa* may be due to overall inhibition of fatty acid synthesis (Chi *et al.*, 1982; Kaur *et al.*, 2011). The significant reduction of LDL level in *S. corymbosa* treated rats may be due to the activation of LDL receptors in hepatocytes thus reducing the serum LDL level or may be due to the inhibition of cholesterol synthesis pathway (Rang *et al.*, 1999). The effect of *S. corymbosa* extract to decrease triglycerides may be through increase of insulin levels. Insulin activates the enzyme lipoprotein lipase and hydrolyses triglycerides and the deficiency in insulin, thereby causes hypertriglyceridemia (Kaur *et al.*, 2011). More so, these results may be due to the presence of biologically active compounds such as alkaloids, flavonoids, anthraquinones, cardenolides, polyphenols, saponins and tannins, some of which may exhibit hyopolidaemic effects.

CONCLUSION

In conclusion, there was a significant decrease in the mean serum levels of TC, TG, and LDL respectively, with a corresponding decrease in the mean weight of the rats whereas, HDL level was significantly increased after SC administration when compared with the control group. This study revealed the hypolipidaemic effect of of SC use. Therefore, SC use could be of therapeutic importance in the prevention, and management of cardiovascular diseases.

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