RESEARCH PAPER

EFFECT OF SIDA CORYMBOSA LEAF EXTRACT ON THE SERUM BLOOD GLUCOSE, TOTAL PROTEIN, ALBUMIN AND BILIRUBIN LEVELS OF ALLOXAN-INDUCED DIABETIC ALBINO WISTAR RATS

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ABSTRACT

This study was designed to investigate the effect of *Sida corymbosa* (SC) leaf extract on plasma glucose, serum total protein (TP), Albumin (ALB) and Bilirubin in 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. Group A received SC treatment, B was without SC 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 but not in group B while group C received only water for 7 days. Fasting blood samples were collected into fluoride oxalate and plain containers for estimation of the biochemical parameters respectively. Plasma glucose and serum TP, ALB and Bilirubin were analyzed using standard methods. There was a significant decrease in the mean plasma glucose (100.60 ± 0.84Vs193.70 ± 0.84; $p<0.05$) whereas serum levels of Total bilirubin (TBIL) and Direct bilirubin (DBIL) (10.34 ± 0.49 vs 9.84 ± 0.94; 2.69 ± 1.00 vs 2.62 ± 0.06; $p<0.05$) were significantly increased after SC treatment when compared to the pre- treatment. Serum TP and Albumin levels has no significant difference in this study. This study revealed hypoglycaemic and hepatoprotective effect of SC use. Therefore, SC consumption could be of importance in prevention and management of diabetes mellitus and liver disorders

Keywords: Sida corymbosa, Protein, Albumin, Bilirubin, Glucose.

INTRODUCTION

Traditional medicine has existed before the invention of orthodox drugs and it is older than civilization. From time immemorial, man has been in search for plant, animal and other materials that can be used to take care of the pains, deformities and diseases that inflict some of the unfortunate members of our society (Mrinmay and Ashok, 2014). According to Bassey and Effiong (2011), man has over time depended on plants for survival particularly for food and medicinal purposes. This is because of its availability and cost. Man acquired the knowledge of the usefulness of plants by trial and error and passed on the information from generation to generation and in our environment mostly without documentation (Bassey and Effiong, 2011). Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources (Pradhan *et al.,* 2013). The search for better

and cheaper ways of treating diseases began before the advent of civilization. Medicinal plants play a key role in health care (Narasinha *et al.,*2013), Lucy *et al.,* 2014).

Meanwhile, *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.,* 2012). *Sida corymbosa* popularly called broom weed or wire weed has been reported to have potentials of curing liver diseases (Narasihna *et al.,* 2012). 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. In Sierra Leone, it is known as 'Kissi soso', Kona sum', 'Mende lelu', 'Nanande', 'Susu Legeti', Tenne', Kuruike and 'Port loko'. 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).

Blood glucose level is the amount of glucose (sugar) present in the blood of a human or animal (Kahn *et al.,* 2005). The boody naturally tightly regulates blood glucose levels as a part of metabolic homeostasis (Cornell *et al.,* 2011). With some exception, glucose is the primary source of energy for the body cells, (not verified in body) and blood lipids (in the form of fats and oils) are primarily a compact energy store (Yang, 2012). Diabetes mellitus is characterized by persistent hyperglycaemia from any of several causes, and is the most prominent disease related to failure of blood sugar regulation (Warade *et al.,* 2014).

Protein are group of biological compounds which are present in every live cells, organ and tissue of the body (Gonen *et al*., 2005). The total protein test measures the total amount of two classes of protein found in the fluid portion of your blood. These are Albumin and Globulins. Benefit of protein includes production and smooth functioning of enzymes and hormones and provides cellular and muscular health (Milo and Ron, 2013). Albumin is a type of protein that is normally found in the blood (Harper et al., 2007). It is an important nutrient that helps build muscle, repair tissue, and fight infection. But it should be your blood, not your urine (Zunszan *et al*., 2003).

Bilirubin is substance made when your body breaks down old red blood cells (Pirone *et al.,* 2010). It is also part of bile, which your liver makes to help digest the food you eat. Bilirubin that is bound to certain protein is called Unconjugated or indirect. Conjugated or direct bilirubin travels freely through your bloodstream to your liver (Stocker *et al*., 2006). Interestingly, there have been anecdotal (an account which supports an argument but not scientific or statistical analysis) reports that this plant products (*Sida corymbosa*) after consumption has effect on blood glucose, total protein, albumin and bilirubin but there is no much scientific evidence to support this speculation. The use of traditional medicine and medicinal plants in Africa especially Nigeria is gaining more awareness due to its efficacy and recent advances in research in this area (Amaeze *et al.,* 2011). The paradigin shift from the use of synthetic chemicals in food and its detrimental effects necessitates the search of plants for their therapeutic roles in combating symptoms and diseases with safety, efficacy and dependability as compared to costly synthetic drugs, many with adverse effects (Desai and Chackalamannil, 2008). X-raying the above facts, it became important to investigate the effects of *Sida corymbosa* extract on glucose, total protein, albumin and bilirubin levels of alloxan induced diabetic wistar rat in 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 from Okofia College of Health Sciences and Technology, Nnamdi Azikiwe University Nnewi campus, Anambra state Nigeria in the month of January, 2016 and identified by Mrs. B.O. Aziagba, Department of Botany, Nnamdi Azikiwe University, Akwa.

Preparation of the plant extract: The method used is based on the method described by kalita *et al* (2013), although with some modification. About 150 g of dried leaves of *Sida corymbosa* were taken in a 1000 mL of the round bottom flask

and extracted for 72 h by a continuous hot percolation process using the solvent ethanol as solvent. The extracts were filtered through the Whatmann filter paper to remove impurities. The extracts were then concentrated by vacuum distillation, cooled and placed in desiccators to remove the excessive moisture.

Animals used for the study: Wistar albino rats (100g) of both male and female were obtained from the Institute 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*.

METHODOLOGY

Animals were divided into three groups each, consisting of ten rats. Rats in the first group(A) received 0.05mg/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 glucose, TP, ALB, TBIL and DBIL by using standard methods as described by Bergmeyer and Bernt, 1974; Ryan and Chopra, 1976; Tietz,1987; Shogo *et al*., 1988) respectively.

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 Unhealthy Wistar rats with weight less or above 100g were excluded from the study in order to ensure accuracy and uniformity in result interpretation.

Statistics: Statistical package for social science (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 $p < 0.05$.

RESULT

The serum levels of all parameters studied, (FBS, Albumin, TP, TB, and DB) were statistically at $p < 0.05$ respectively using ANOVA table. In this study, the serum levels of FBS, TB, DB and Albumin were statistically significant when compared between alloxan induced diabetic rats with *Sida corymbosa* treatment and those without *Sida corymbosa* at $p < 0.05$ but serum levels of Albumin and Total protein were statistically insignificant as shown in the table below (Table 1).

Table 1: Plasma FBS and serum Albumin, Total protein, Total bilirubin and Direct bilrubin in alloxan induced diabetic rat with Sida treatment (A), without Sida treatment (B) and control (C) (Mean±SD, n=10).

Group	FBS	Weight (g)	Albumin	Total protein	Total bilirubin	Direct bilirubin
A (n=10)	100.60±0.84	100.00±0.52	28.20±1.14	52.90±0.74	10.34±0.49	2.69±1.00
B (n=10)	193.70±54.03	199.40±1.17	24.54±5.53	43.85±8.08	9.84±0.94	2.62±0.06
C (n=10)	100.10±2.64	100.60±0.84	21.30±3.17	41.71±5.56	11.12±1.04	2.44±0.22
F (p) = Value	29.774 (.000)	150.000 (.000)	8.521 (.000)	10.934 (.000)	5.634 (.009)	7.893 (0.002)
A v B	<0.05	< 0.05	> 0.05	> 0.05	< 0.05	< 0.05
A v C	< 0.05	> 0.05	>0.05	>0.05	< 0.05	< 0.05
B v C	> 0.05	>0.05	< 0.05	< 0.05	>0.05	>0.05

**Key: F (P) – Value = Mean ±SD of parameter compared among group A, B and C using (ANOVA); AvB P- Value = Mean ±SD of parameter compared between group A and B using (t-test); BvC P- Value = Mean ±SD of parameter

compared between group B and C using (t-test); AvC P- Value = Mean ±SD of parameter compared between group A and C using (t-test).

However, when the alloxan induced diabetic rats with _Sida corymbosa_ treatments were compared with the control group, all the parameters (FBS, TB, DB) except albumin and total protein showed a statistically significant difference.

In the present study, the serum levels of TP and ALB were statistically significant when the alloxan induced diabetic rats without treatment were compared with the control group in contrast to the mean serum levels of FBS, DB and TB which were statistically insignificant at $p < 0.05$.

DISCUSSION

The plants of _Sida corymbosa_ family seem to be a promising plant with great medicinal values in the management of diabetes, hyperlipidenmia and related conditions (Narasinhn _et al_., 2012; Pradhna _et al.,_ 2013; Ajithabia _et al.,_ 2012).

In this study, _Sida corymbosa_ administration significantly reduced the serum glucose concentration in the alloxan induced diabetic rats with Sida treatment. This result confirms the report of (Bhattacharya _et al.,_ 2007) in which they investigated the antidiabetic effect of ethanoic leaf extract of _S. corymbosa_ in alloxan induced diabetic mice and found that there was a significant decrease in mean serum glucose concentration in those mice treated with the Sida extract. Other similar studies in rats also did show the reducing effect of _P. corymbosa_ on the blood glucose level (Okwuosa _et al.,_ 2011; Ashok _et al_., 2012). The antihperglycemic effect of _S. corymbosa_ may also be due to the presence of hypoglycemic saponin and alkaloid. The decrease level of fasting blood sugar in the alloxan induced diabetic rats with _S. sorymbosa_ treatment maybe as a result of its stimulation of insulin release from the pancreatic-beta-cells (Magistertti, 2000; Young, 2007).

The present study shows a significant increase in mean serum levels of both total bilirubin and direct bilirubin whereas serum level of total protein as well as albumin were increased although they did not differ significantly. This is in agreement with the study by (Lucy, 2014) shows a significant increase in the mean serum levels of albumin, total protein and total bilrubin following the treatment of the alloxan induced diabetic rats with _Sida corymbosa_ leaf extract. This result is in concordance with the study of the effect of ethanonic leave extract of Sida corymbosa on carbon tetrachloride induced hepatotoxicity in albino rats (Ajithabai, 2012). This may be due to its ability to enhance the conjugation function of the liver. From the current study, _Sida corymbosa_ has significant antihyperglycemic and hepatoprotective effects. Therefore, _Sida corymbosa_ can useful, at least as an adjunct, in the therapy of diabetes and liver disorders. However, further research should be carried out to unravel find the full benefit and potential of this plant.

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AUTHORS' CONTRIBUTIONS

All authors (Ogbodo EC, Onyekwelu PC, Ezeugwunne IP, Analike RA, Okeke KU, Madukwe DUP, Njoku CM, Oguaka VN, Okwara EC, Amah UK), contributed to the completion of this research work and were actively involved in the presentation of this manuscript.