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## Original Article

# Effect of *Sida corymbosa* leaf extract on the activity of serum liver enzymes of alloxan-induced diabetic albino wistar rats in College of Health Science and Technology, Nnamdi Azikiwe, 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 liver enzymes activity 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 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 but group B received ethanol while group C received only water for 7 days. Blood samples were collected into plain containers for estimation of biochemical parameters (ALT, AST and ALP) respectively. Serum ALP, ALT and AST were analyzed using standard methods. There was a significant decrease in the mean serum activities of ALT, AST, and ALP respectively after SC administration when compared with the control group (P=0.001, 0.000, and 0.001 respectively). Again, the result showed a significant decrease in the mean weight of the albino rats post SC administration (P=0.000). This study revealed the deleterious effect of SC use on the liver. Therefore, care should be taken in the use of SC in prevention and management of liver diseases especially at high therapeutic dosage level.

## 1. Introduction

'Health is dearer than wealth' as quoted by Hamilton [1]; so, the value of medicinal plants is more than what it is in the marketplace, i.e. it can be said to be essentially infinite. Human beings have been utilizing plants for basic preventive and curative health care since time immemorial [2]. As many as 35,000 – 70,000 species of plant have been used at one time or another for medicinal purposes [3]. From historical records, the human use of plants or floral parts to enhance physical and spiritual well-being goes back thousands of years and is difficult to date precisely [4]. However, from those records, it is apparent that most of the early people, such as the Assyrians, Babylonians, Egyptians and ancient Hebrews, were familiar with the properties and use of many medicinal plants [5]. The practice of medicine using medicinal plants flourished most during the Greek civilization, when historical personalities like Hippocrates (born 460 BC) and Theophrastus (born 370 BC) practiced herbal medicine. The *materia medica* by Hippocrates listed around 400 medicinal plants and later the encyclopaedic work of Discordies, '*De materia medica*' (published in 78 AD), which featured about 600medicinal plants, have been regarded as the forerunners of all modern pharmacopeias and authoritative texts on botanical medicine. In the middle Ages, the great Greek Pharmacist physician, Galen (131-200 AD), wrote about 500 volumes describing hundreds of recipes and formulations containing a large number of medicinal plants. He was the first person to describe the procedures and methods of preparing therapeutic recipes, including the ingredients of both plant and animal origins [6]. This doctrine, expatiated by Galen, has been the basis of allopathic and homeopathic systems of medicine practiced today.

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 [7]. Traditional herbal medicine has been a constant source of substances for the treatment of a variety of diseases [8]. According to Manadhar [9], 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 [10]. 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 [11]. 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 [12]. 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 [13].

In developing countries there is a general belief among the consumers that the use of medicinal plants is always safe because they are "natural". However, evidences suggest otherwise and some studies suggest that some of the herbs can be associated with health hazards. Medicinal plants can contain many active chemical compounds and also other substances of great complexity like mucilages, polyphenols, polysaccharides, etc. [14]. That may modulate and modify the effects of

any "active principles". Thus, some herbal remedies can be toxic or can act either as agonists or antagonists of the active principles. Therefore, the study of the effect of *Sida corymbosa* leaf extract on the serum liver enzyme activity of alloxan-induced diabetic albino wistar rats in College of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria is of paramount importance.

## 2. Materials and methods

**2.1 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.

**2.1 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.

**2.2 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±2ºC temperature and relative humidity 45-55% under 12:12 h light-dark cycle. Rats were fed with standard rat chow and water *ad libitum*.

**2.3 Ethical consideration**

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

**2.4 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.

**2.5 Induction of hyperglycemia in albino wistar rats**

This was executed by methods described by Szkudelski [15]. Generally, the induction of diabetes using alloxan is a useful experimental model for studying the effects of hypoglycemic agents [15]. Alloxan and the products of its reduction, dialuric acid, establish a redox cycle with the formation of superoxide radicals. These radicals undergo dismutation to hydrogen peroxide with simultaneous massive increase in cytosolic calcium concentration, resulting in the destruction of pancreatic beta cells and severe hyperglycemia [15].

**2.6 Animal treatment**

Animals were divided into three groups each, consisting of ten rats. Rats in the first group (A) received400mg/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 liver enzymes (ALT, AST and ALP) respectively using standard methods as described by Rifal and Warnick [16]; Tietz [17]; Shephard *et al* [18] respectively.

**2.7 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 $p<0.05$.

## 3. Results

**Table 1: Serum Liver enzyme activity in Alloxan –Induced Diabetic rat with *Sida corymbosa* treatment (A), with ethanol treatment (B) and in control group (C)**

| GROUP | ALT | ALP | AST | WEIGHT |
|---|---|---|---|---|
| A (n=10) | 40.20±1.14 | 78.20±11.161 | 40.20±1.93 | 98.80±1.03 |
| B (n=10) | 38.80±1.40 | 94.90±9.34 | 38.30±1.75 | 119.40±1.17 |
| C(n=10) | 35.60±3.81 | 40.10±15.70 | 36.10±2.60 | 100.60±0.84 |
| F(P)-value | 9.406 (0.001) | 69.945 (0.000) | 9.272 (0.001) | 150.00 (0.000) |
| A V B | <0.05 | <0.05 | <0.05 | <0.05 |
| A V C | <0.05 | <0.05 | <0.05 | <0.05 |
| B V C | >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 group A, B and C using (ANOVA); AVB =comparison of parameters obtained in A with B; B V C - comparison of parameters obtained in B with C; AV C- comparison of parameters obtained in A with C.

The mean serum levels of all the parameters (ALT, ALP, AST, and Weight) studied were statically significant at p<0.05 respectively, using ANOVA table. (Table 1)

In this study, the mean serum ALT activity was significantly increased in the rats treated with *Sida corymbosa* when compared with those with ethanol treatment (40.20±1.14 vs 38.80±1.40; p=0.001), whereas, there was a significant decrease in the mean serum ALP activity in the rats administered with *Sida corymbosa* in comparison with those that received *ethanol* treatment (78.20±11.161 vs 94.90±9.34; p=0.000). More so, the mean serum AST activity was significantly higher in the rats after *Sida corymbosa* treatment when compared with before *Sida corymbosa* administration (40.20±1.93 vs 38.30±1.75; p=0.001). Interestingly, the mean weight of the rats was significantly decreased after *Sida corymbosa* treatment when compared with before *Sida corymbosa* administration (98.80±1.03 vs 119.40±1.17; p=0.000). (Table 1)

Furthermore, there was a significant increase in the mean serum ALT activity in the *Sida corymbosa* treated rats compared with the control (40.20±1.14 vs35.60±3.81; p=0.001). Again, there was a significant increase in the mean serum ALP activity in the rats administered with *Sida corymbosa* in comparison with the control group *(*78.20±11.161vs 40.10±15.708.29±1.51; p=0.000). More so, the mean serum AST activity was significantly raised in the rats after *Sida corymbosa* treatment when compared with the control (40.20±1.93 vs 36.10±2.60; p=0.001). However, the mean weight of the rats was significantly decreased after *Sida corymbosa* treatment when compared with the control group (98.80±1.03 vs 100.60±0.84; p=0.000). (Table 1)

Interestingly, the mean serum ALT and AST were not significantly increased in the rats with *Sida corymbosa* treatment when compared with the control group (p>0.05). However, the mean serum ALP activity was significantly increased in the rats treated with ethanol when compared with the control group (94.90±9.34 vs 40.10±15.70; p=0.000). Again, the mean weight of the rats was significantly increased in the rats that received ethanol treatment when compared with the control group (119.40±1.17 vs 100.60±0.84; p=0.000). (Table 1)

## 4. Discussion

Indigenous medicinal plants were and are still one of the sources of modern medicines [19]. Moreover the trend of using phytotherapy as alternative medicine has increased the interest for the tropical plants' pharmacognosy [20]. This study investigated the effect of *Sida corymbosa* leaf extract on the serum liver enzyme activity of alloxan-induced diabetic albino wistar rats in College of Health Sciences and Technology, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.

In this study, the mean serum ALT, AST and ALP activities were significantly increased in the rats treated with *Sida corymbosa* when compared with those of the control group ($P<0.05$). This elevation of the serum enzymes in the serum enzymes in the treated group indicates hepatocellular damages [21]. Previous studies [22, 23] reported that the increase in the activity of these enzymes in the plasma is often observed as a consequence of liver damage. The elevation in AST and ALP in the treated group may suggest that other non-specific tissue damage also occurred because these enzymes have a wider distribution beyond liver [24-26].

Importantly, the relative organ weight is also an important index of physiological and pathological status in man and animals. The heart, liver, spleen, kidney and lung are the primary organs affected by the metabolic reactions induced by toxicants [27].

The results revealed a relationship between these enzymatic markers and liver function and this was demonstrated by the decrease of liver weight ($p<0.05$).

## 5. Conclusion

The mean serum ALT, AST and ALP activity differed significantly in the treated group in comparison with the control group with a corresponding decrease in the mean weight of treated animals. This study therefore, revealed a deleterious effect of *Sida corymbosa* on the liver. However, there still remains the need for elucidating the molecular structures and the precise pharmacology of the active principles.

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