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EFFECTS OF METHANOL LEAF EXTRACT OF *CORCHORUS OLITORIUS* ON LIVER FUNCTION AND LIPID PROFILE IN WISTAR RATS.

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ABSTRACT

This research is aimed at investigating the effect of methanolic extract of Corchorus olitorius on the liver function and lipid profile of albino Wistar rat. Thirty albino Wistar rat used for this experiment were randomly shared into five groups of six rats each. Animals in group E served as the normal control and received dimethyl Sulphur oxide (DMSO). Those in groups A, B, C and D served as the test group and received 100, 150, 250 and 300mg/kg of the extract respectively. The treatment was carried out for fourteen days. On the fifteenth day, the rats were sacrificed and blood was collected by cardiac puncture into plain tubes for biochemical investigations. Extraction and all biochemical analysis were carried out using standard laboratory techniques. Administration of the extract resulted in decrease in the lipid parameters in all experimental units when compared to control group. The liver enzyme parameters such as ALP was found to have increased non-significantly ($p<0.05$) in group A, B, C and D respectively compared to normal control while AST and ALT levels was found to be lowered significantly in the groups compared to normal control.

KEYWORDS: Liver function, lipid profile, Medicinal plants, liver enzymes and biochemical analysis.

INTRODUCTION

Over 400,000 species of tropical flowering plants have medicinal properties, a factor that may have traditional medicine cheaper than modern medicine (Arun *et al.*, 2012). Use of traditional medicines in treatment management of various diseases is now encouraged by World Health Organization (WHO) due to their readily availability, cost effective and high potency against some diseases (Divatar, 2012). The bioactive constituents or plant extract may be used for the treatment of various diseases and these would be used as a new formulation for the novel drugs discovery in pharmaceutical industries (Singh, 2017). There is virtually no plant on earth without any health benefit; however, there are many plants yet to be discovered with health benefits.

Medicinal plants can be defined as plants that are commonly used in treating and preventing specific ailments and diseases and that are generally considered to be harmful to humans. These plants are either "Wild plant species" those growing spontaneously in self-maintaining populations in natural and semi-natural ecosystems and could exist independently of direct human actions or the contrasting "Domesticated plants species" those that have arisen through human actions such as selection or breeding and depend on management for their existence (Oladeji O., 2016).

Through recent researches on herbal plants there have been great developments in the pharmacological evaluation of various plants used in traditional systems of medicine. Consequently, plants can be described as the major source of medicines, not only as isolated active principles to be dispensed in standardized dosage form but also as crude drugs for the population (Oladeji O., 2016).

Jute (*Corchorus sp*.) is an annual flowering plant which belongs to the family *Malvaceae* comprising 40 genera and 400 species. The genus has, however, been classified in a number of different families including *Tiliaceae* and it is the most significant source of natural fiber, covering about 80% of global bast fiber production (Islam *et al.*, 2017). *Corchorus olitorius* is a culinary and medicinal herb, widely used as a vegetable in several countries in Asia and Africa. The plant is native to tropical and subtropical regions throughout the world. In Africa, it is reported as a wild or cultivated vegetable in many countries including Benin republic, Nigeria, Cameroon, Ivory Coast, Sudan, Kenya, Uganda, Zimbabwe, and Egypt. Nigeria has a great potential for domestic and export market (Olawuyi *et al.*, 2014). It has different common names in different places such as in North Africa and the Middle east it's called **malukhiyah,** in Turkey and Cyprus, its known as **molohiya** or **molochas**, while in Nigeria to the Yoruba's it is known as **Ewedu**, to the Hausas it is known as **Rama**, in Northern Ghana

it's called **Ayoyo**. In philipines, *C. olitorius* is known as **saluyot**. The leaves either fresh or dried are cooked into a thick viscous soup or added to stew or soup and are rich sources of minerals and vitamins.

Leaves of C. olitorius possess an abundance of antioxidants compounds associated with various biological properties, which include diuretic, analgesic, antipyretic, and anti-microbial activities, anti-tumor and phenolic antioxidative compounds, hypoglycemic (Raut Smita, 2012), hypolipidemic and anti-obesity. It is an herbaceous vegetable with considerable diversity in agronomic characters which are yet to be adequately exploited for development and selection of improved types. C. olitorius is one of the diverse traditionally vegetables, constituting the traditional mixed cropping systems on farmers plot and home gardens in West, Central and North Africa. Leaves of *C. olitorius* are mainly known to have rich sources of many chemical compounds. There are 17 active nutrient compounds in jute leaves including protein, fat, carbohydrate, fiber, ash, sodium, potassium, phosphorus, riboflavin, ascorbic acid, thiamine, niacin calcium for strong bones and teeth, iron for healthy red blood cells and beta-carotene which is good for eyesight.(Islam, 2013).

The phytochemical screening of Corchorus olitorius revealed that it contains bioactive chemicals such as Flavonoid, Steroid, Alkaloid, Quinones, Phenol, Saponin, Terpenoid and Tannins.

The liver is an essential organ that has many functions in the body, including making proteins and blood clotting factors, manufacturing triglycerides and cholesterol, glycogen synthesis and bile production (Jameson, JL, 2018). Liver function tests are a misnomer as many of the tests do not comment on the function of the liver but rather pinpoint the source of the damage. The tests measure the levels of certain enzymes such as Alanine Transaminase (ALT), Alkaline Phosphatase (ALP), Aspartate Transaminase (AST) and proteins in the blood. Some of these tests measure how well the liver is performing its normal functions of producing protein and clearing bilirubin, a blood waste product. Other liver function tests measure enzymes that liver cells release in response to damage or disease. Liver function tests can be used to screen for liver infections, such as hepatitis, monitor the progression of a disease, such as viral or alcoholic hepatitis, and determine how well a treatment is working, measure the severity of a disease, particularly scarring of the liver (cirrhosis) and monitor the possible side effects of the medications administered.

This present work therefore studied the effect of methanolic leaf extract of *Corchorus olitorius* on the liver function and lipid profile in albino wistar rats.

Fig. 1: Corchorus Olitorius Leaves (Jute Mallow).

MATERIALS AND METHODS

Materials

The following materials/apparatus and equipments were used for the experiment work: Albino wistar rats, weighing balance, feed, distilled water, rubber cages, water bath, hand gloves, sample chloroform, filter paper, dissecting kit, refrigerator, syringes and needle, a pair of scissors and forceps, dissecting board, spectrophotometer, EDTA bottle, Plain bottle, blood sample, methylated spirit, and Corchorus olitorius leaves.

Chemicals and Reagents

The assay kits for Aspartate Transaminase (AST), Alanine Transaminase (ALT), Alkaline Phosphatase (ALP), Triglyceride (TG), Total Cholesterol and High density Lipoproteins (HDL-cholesterol) were gotten from Randox Laboratories Ltd.Admore Diamond road, Crumlin, Co Antrim United Kingdom.

Collection of Plant Sample

Fresh plants of Corchorus olitorius were collected at Bwari market, Abuja Nigeria.

Preparation of Extract

The whole Plant parts (leaves and stem) were washed, air dried, blended to a powered form. The blended sample was soaked in 2000ml of 95% methanol for 48 hours with occasional shaking after which it was sieved using a muslin cloth and afterwards filtered through a Whatman filter paper. The filtrate was concentrated using a rotary evaporator at 50°c and further concentrated with a thermostatic water bath at 50^0C. The concentrate (paste) was collected, weighed, and kept in sterile bottles and stored in a refrigerator at 8-10°C until usage.

Animals

Thirty adult albino wistar rats were used for the experiment. The Thirty albino wistar rats were obtained from an animal farm in Kaduna state, Nigeria. The rats were housed in the Animal House of Veritas University Abuja to acclimatize for three days. While being acclimatized, rats were fed with standard rat feed and deionized water and maintained at standard laboratory conditions of 12 hours light/12 hours dark periodic alternations, temperature: 22-28∘C and 40-50% relative humidity (USNIH 2019).

Table 1: Animal groupings and treatment schedule.

RATS GROUPS	GROUP TITLE	TREATMENT ADMINISTERED
GROUP A	Treatment group one	100mg/kg BW of Corchorus olitorius plant extract.
GROUP B	Treatment group two	150mg/kg BW of Corchorus olitorius plant extract.
GROUP C	Treatment group three	250mg/kg BW of Corchorus olitorius plant extract.
GROUP D	Treatment group four	300mg/kg BW of Corchorus olitorius plant extract.
GROUP E	Normal control	Feed and distilled water.

Animal Sacrifice

At the end of the 14 days, food was withdrawn from the rats and they were fasted overnight but had free access to water. They were then euthanized under chloroform vapor and sacrificed. A midline incision was made through the anterior abdominal wall of the rats. Whole blood was collected using cardiac puncture using sterile syringes and needles. 5ml of blood samples were collected, from the descending abdominal aorta, in EDTA anticoagulated tubes for liver function and lipid profile analysis. These treatments were conducted daily and observations noted for the 14 days.

Data Analysis

Stastical Analysis

Data were treated by ANOVA (analysis of variance) and mean separation was done using SPSS statistical analyzer. Results were presented as mean ± standard error of mean significant differences among treatment while Statistical analysis was done using two-way analysis of variance followed by post-hoc test on SYSTAT 10.6. Statistical significance was considered at $p<0.05$.

Results showing The effect of methanolic extract of *Corchorus olitorius* on Triglyceride and VLDL-Cholesterol activity of treated rats.

The bar chart represented with blue color indicates Triglyceride activity while the bar chart represented with orange color indicates VLDL-Cholesterol activity. As shown in the table 3, the activity of Triglyceride was found to be lower in group B, C and D administered 150, 250 and 300mg/kg body weight compared to the triglyceride activity of the normal control group (group E). On the other hand, non-significant ($p<0.05$) increase was observed in the TG activity of group A rats administered 100mg/kg body weight of extract when compared to the control group.

The activity of VLDL-Cholesterol was found to be higher in group A(17.99 ± 2.86), B(25.51 ± 11.02) and C(14.80 ± 3.28) when compared to the VLDL-Cholesterol activity of the normal control rats(group A). On the other hand, there was a significant ($p<0.05$) decrease in the activity of VLDL-Cholesterol of group D(4.01 ± 0.88) when compared to the normal control group.

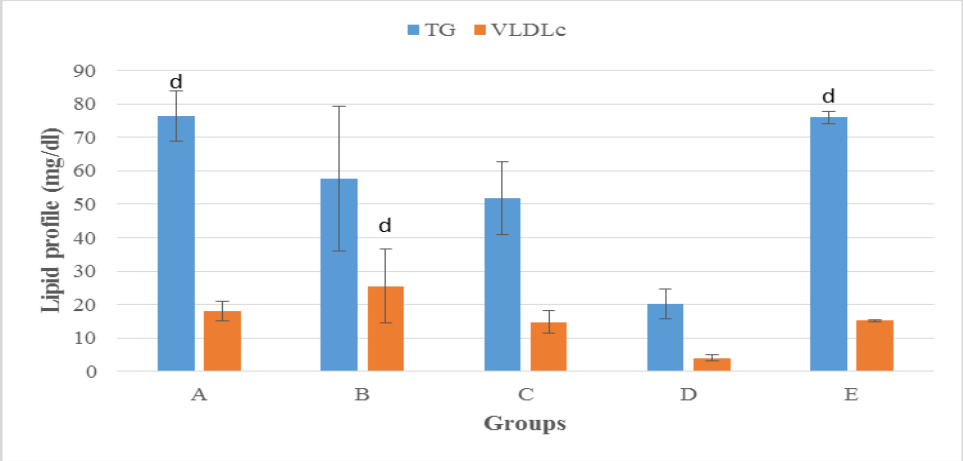


Figure 2: Comparison of TG and VLDL-C levels in the different experimental groups.

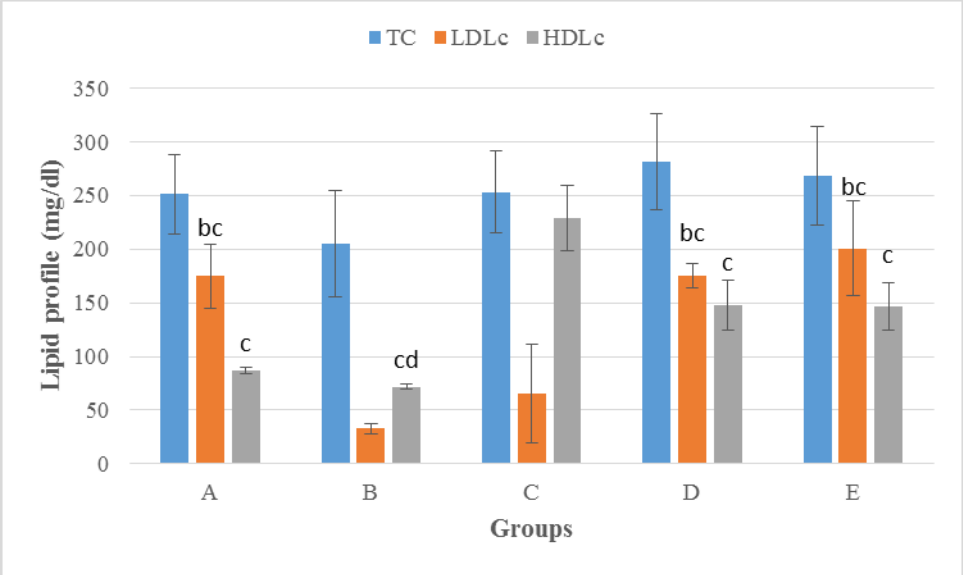
d = P < 0.05 vs group D

The effect of methanolic extract of Corchorus olitorius on TC, HDL-C and LDL-C activity of treated rats.

The bar chart represented with blue color indicates Total Cholesterol level, the orange color indicates LDL-C while the ash color represents HDL-C. The TC activity was found to be significantly ($p<0.05$) lower in group A(250.99 ± 37.34), B(205.09 ± 49.00) and C(253.22 ± 37.76) when compared to the TC activity of the normal control group(268.00 ± 46.22). While there was a non-significant increase in group D(281.32 ± 44.82) when compared to the TC of the normal control group(Group E).

The LDL-C activity was found to be significantly ($p<0.05$) lower in group A, B,C and D compared to the LDL-C activity of the normal control group (group E).

As shown in table 3,there was a non-significant increase in the HDL-C activity of group C compared to the HDL-C activity of the normal control group(group E). On the other hand, the HDL-C activity of group A, B and D was found to be significantly ($p<0.05$) low when compared to the HDL-C activity of the normal control group (group E).



a = P < 0.05 vs group A
b = P < 0.05 vs group B
c = P < 0.05 vs group C
d = P < 0.05 vs group D
e = P<0.05 vs group E

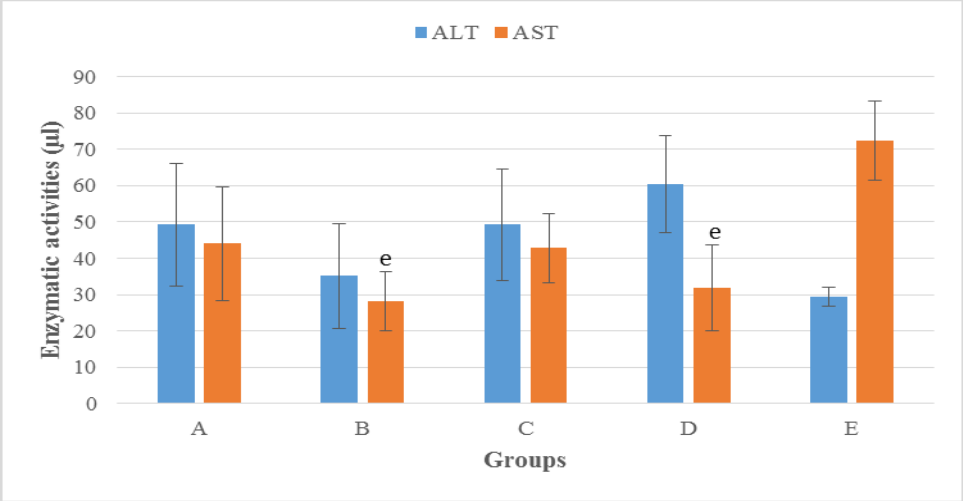
Figure 3: Comparison of TC, LDL-C and HDL-C levels in the different experimental groups.

The effect of methanolic extract of Corchorus olitorius on Alanine transferase (ALT) activity of treated rats.

As shown in the table above, there was a non-significant increase in the ALP activity of group A, B, C and D administered 100, 150, 250 and 300mg/kg body weight of the extract as compared to the ALT activity of the normal control (Group E). When compared with group D rats given the dosage (300mg/kg body weight of extract), group A,B,and C had ALT activity that were found to be non-significantly ($p<0.05$) lower.

The effect of methanolic extract of Corchorus olitorius on Aspartate transferase (ALT) activity of treated rats.

The AST activity was found to be significantly lower in group A, B, C and D administered 100, 150,250 and 300mg/kg body weight of extract when compared to the AST activity of the normal control.

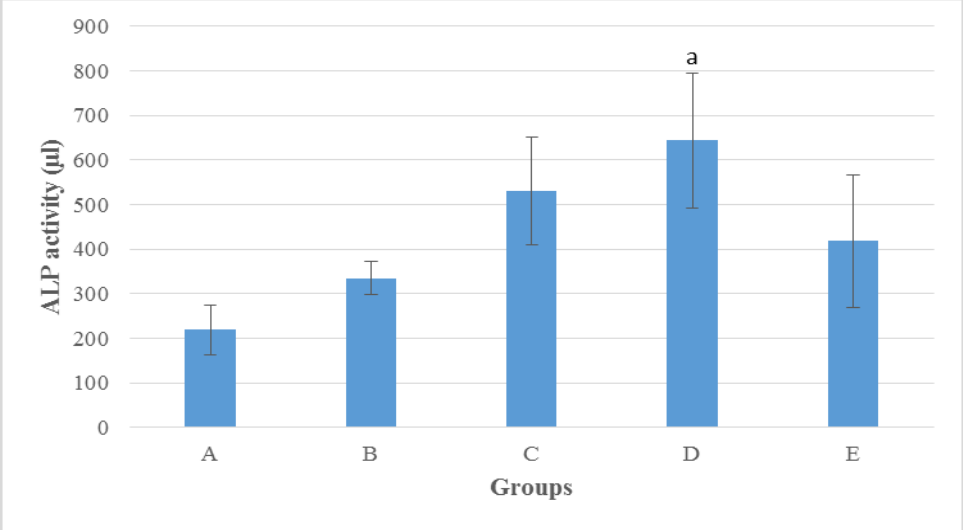


	e = P < 0.05 vs group E		
ALT : There was no significant difference among the groups			

Figure 4: Comparison of ALT and AST levels in the different experimental groups.

The effect of methanolic extract of Corchorus olitorius on Alkaline phosphatase (ALP) activity of treated rats.

The ALP activity was found to be significantly ($p<0.05$) lower in group A and B administered 100mg/kg body weight and 150mg/kg body weight of the extract when compared to the ALP activity of the normal control rats (Group E). On the other hand, non-significant ($p<0.05$) increase was observed in the ALP activity of group C and D rats administered 250mg/kg body weight and 300mg/kg body weight of extract when compared to the control group.



a = P < 0.05 vs group A

Figure 5: Comparison of ALP levels in the different experimental groups.

DISCUSSION

Lipids are one of the necessary components which control cellular functions and homeostatis. Liver plays an essential role in lipid metabolism, several stages of lipid synthesis and transportation. Therefore, it is reasonable to expect an abnormal lipid profile in those with severe liver dysfunction.

Lipid and lipoprotein anomalies play a major role in the succession of atherosclerosis and cardiovascular diseases (Sharma *et al.*, 2012). In this study, the albino wistar rats were subjected to the extract of *Corchorus olitorius* to observe its effects on the cholesterol level and the liver enzymes of the rats.

From the findings above, a significant decrease was observed in the concentration of the parameters of the blood lipid profile from the normal control group to the case group (test group) but a significant increase was observed in total cholesterol concentration of group D administered 300mg/kg body weight of the extract. The findings of this study indicate that Corchorus olitorius lowers the cholesterol level and thus reduces the risk of cardiovascular diseases and atherosclerosis. HDL and

LDL are two of the four main groups of plasma lipoproteins that are involved in lipid metabolism and the exchange of cholesterol, cholesterol esters and triglycerides between tissues. HDL takes cholesterol from the cells in the body to the liver. The liver breaks it down or passes it out of the body as a waste product. LDL on the other hand, takes cholesterol from the liver to the cells. Cells use cholesterol but too much can build up in the arteries. This buildup in the arteries can cause health problems such as angina, heart attacks and heart failure (Saurabh, 2018).

The biochemical indices observed in the liver of albino wistar rats in this study are useful markers for accessing the functional capacity of the organ. Biochemical indices of the liver if altered will impair the normal function of the organ. The effect of *Corchorus olitorius* on the liver enzyme levels was assessed by analyzing the concentration oof serum liver enzymes which serves as key markers for liver damage and injury. In this study, AST activity (Aspartate aminotransferase) which is an enzyme found mostly in the heart and the liver showed a significant decrease in the treated animal in group A, B, C and D when compared to group E(normal control). The decreased AST level observed in the treated rats can be specified to the normal functional activity of the liver. ALT (Alanine aminotransferase) levels obtained from treatment groups A, B, C and D with values A, B, C and D respectively showed a significant increase when compared to that obtained for the normal control group. Elevated levels of ALT often suggests the existence of other medical problems such as viral hepatitis, congestive heart failure, liver damage, bilary duct problems e.t.c.

Serum alkaline phosphates (ALP) levels may increase greatly with liver tumors and lesion, and may show an adequate increase with diseases such as hepatitis. For this study,rats of group C and group D with values C and D had a not-significant different when compared to the normal control group E . Abnormal levels can signify a severe underlying medical conditions relating to the liver, bones or gallbladder.

CONCLUSION

In conclusion, this study showed that the administration of methanolic extract of *Corchorus olitorius* may have hepatoprotective and hypolipidaemic effects.

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