THE EFFECT OF THE AQUEOUS ROOT EXTRACT OF *TELFAIRIA OCCIDENTALIS* (FLUTED PUMPKIN) ON THE LIVER FUNCTION OF WISTAR ALBINO RAT

BY

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DEDICATION

I dedicate this work to my parents, MR AND MRS ATAKPU, for their continuous support, care and prayers throughout my academic journey in The University of Benin.

ACKNOWLEDGEMENT

My heart is full of thanksgiving and gratitude to Daddy God; for his Strength, Grace and love, all my life. To my supervisor DR. C.O AZUBUIKE whose guidance made this work possible. My appreciation also goes out to my Parents MR and MRS ATAKPU for being a constant source of help and assistance, your care helped me maintain motivation. I am thankful to my siblings – Edeki, Ehis, Ikhide and Aije for being my biggest cheerleaders and inspiring me to keep improving.To my friends: Precious, Eunice, Esther and others too numerous to mention thank you for being part of my journey.

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ABSTRACT

According to the World Health Organization (WHO, 1977) “a medicinal plant is any plant which in one or more of its organ contains substances that can be used for the synthesis of useful drugs”. The term herbal drug means the part(s) of a plant used to produce medicine (e.g. leaves, flowers, seeds, roots, bark, stems, etc). Herbal remedies have been used for centuries to treat various ailments, including hepatic diseases. The aim of this study is to determine the effect of the aqueous root extract of fluted pumpkin (*Telfairia occidentalis*) on the liver of Male Wistar albino rat. Twenty(20) Male Wistar Albino rats weighing between 160g-200g were randomly divided into 5 groups of 4 rats each and acclimatized for two(2) weeks. Group 1 (control) received Grower mash feed and tap water *ad libitum;* Group 2 received 100mg/kg body weight of *Telfairia occidentalis* aqueous root extract; Group 3 received 500mg /kg body weight of Telfairia occidentalis aqueous root extract; Group 4 1000mg/kg body weight of Telfairia occidentalis aqueous root extract; Group 5 received 1500mg /kg body weight of Telfairia occidentalis root extract. Administration of the extract was by orogastric gavage for 2 weeks. Animals were humanely sacrificed using chloroform anaesthesia and blood samples were collected via cardiac puncture. Hepatic function markers including liver enzymes (AST, ALT, ALP), bilirubin, and serum protein (albumin and globulin) levels were assessed. The result showed no significant differences ($P > 0.05$) in the values of the various parameters among the treatment groups compared to the control. In conclusion, It can be deduced that the aqueous root extract of *Telferia occidentalis* may not have a substantial effect on the liver function parameters evaluated in Wistar Albino rats at the dosages tested. Further studies, including histopathological examination and longer-term observations, may provide additional insights into the effects of *Telfairia occidentalis* root extract on liver health.

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Plants offer an alternative approach to the search for novel pharmaceuticals and have been thought to have therapeutic and protective qualities in traditional medicine. Presumably, plants will remain a valuable source of novel molecules that could lead to the development of new and improved medications through potential chemical manipulation.(Shah *et al.,* 2006). Traditional medicinal plants are a therapeutic resource used by the population of the continent specifically for health care, These plants can also be used as raw materials for pharmaceuticals (Kayode *et al*., 2011).

According to the World Health Organization (WHO, 1977) “a medicinal plant is any plant which in one or more of its organ contains substances that can be used for the synthesis of useful drugs”. This definition makes a distinction between plants that are thought to be medicinal but have not yet undergone extensive research and those whose therapeutic qualities and constituents have been proven by science (Kayode *et al.,* 2011).

Recent studies have confirmed the efficacy of several plants in the treatment of liver disease, making them a popular natural remedy choice

for those with liver conditions, as well as those who want to support their liver health (Hong *et al*., 2015). Conventional drug treatments can have undesirable side effects or be ineffective for some patients. Thus, research has explored various herbal remedies as alternative and complementary agents to support liver health due to their perceived safety, efficacy, and cultural acceptance (Rajaratnam *et al.*, 2014). However, it is important to note that herbal supplements can be contaminated with heavy metals, pesticides, pharmaceuticals, and bacteria that can harm the liver. Additionally, many herbs can interact with common medications, which can lead to liver injury and even death (Stournaras, E., & Tziomalos, K. 2015). Patients often self-prescribe these natural products to minimize symptoms and progression in chronic hepatitis, NAFLD, and cirrhosis (Del Prete *et al*., 2012). Several clinical trials support their ability to improve liver enzymes, reduce viral load and fat deposition, and protect against hepatocellular damage from oxidative stress and inflammation (Mancak *et al*., 2024: Gillessen *et al.,* 2020). Proposed mechanisms relate to antioxidation, immunomodulation, antifibrotic effects, enhanced detoxification processes, and stimulation of cellular regeneration pathways (Ramos-Tovar *et al.,* 2020).

1.2. AIM OF STUDY

The aim of this study was to determine the effect of the aqueous root of

Telfairia occidentalis extract on the liver of Wistar albino rat.

1.3 JUSTIFICATION OF STUDY

The liver performs essential biochemical functions related to metabolism, detoxification, and nutrient storage. However, liver disease poses an increasing public health burden worldwide Unfortunately, many pharmaceutical treatments for liver disease have undesirable side effects or contraindications that limit their long-term use. Therefore, it is important to identify natural toxins which are harmful to animals.

This study on the effect of *Telfairia occidentalis* root extract on the liver using a rat model will determine the hepatotoxic potential of this root extract when administered. The root of the fluted pumpkin consists of various substances which when ingested may be detrimental to liver function. Therefore there is need to evaluate its potential toxicity to ensure safe usage.

1.4. RESEARCH QUESTIONS

1. *Does Telfairia occidentalis* root extract have a toxic effect on the liver of Wistar rat?
2. Does pumpkin root extract affect liver function in Wistar albino rat?

1.5. SPECIFIC OBJECTIVE

1. To evaluate the effect of *Telfairia occidentalis* extract on liver function of wistar rat.
2. To evaluate the effect of *Telfairia occidentalis* root extract on various liver enzymes.
3. To evaluate the specific liver functions that *Telfairia occidentalis* root extract effects.
4. To evaluate the recommended duration of *Telfairia occidentalis* extract supplimentation for liver toxicity..
5. To assess levels of liver enzymes (ALT, AST, ALP), bilirubin and serum protein to indicate hepatic injury

CHAPTER TWO

LITERATURE REVIEW

2.1 BOTANICAL DESCRIPTION OF TELFAIRIA OCCIDENTALIS

The fluted pumpkin, scientifically known as *Telfaria occidentalis,* derives its name from the eminent Irish scholar and botanist, Charles Telfairia, who lived from 1778 to 1885 (Ekanem *et al.,* 2010). It is commonly called fluted pumpkin and occurs in the forest zone of West and Central Africa, most frequently in Benin, Nigeria and Cameroon. It is a popular vegetable all over Nigeria. It is rare in Uganda and absent in the rest of East Africa. It has been suggested to have originated from the south-east Nigeria and distributed by the Igbos, who have cultivated this crop since time immemorial. *Telfairia occidentalis* is commonly utilized in traditional medicine, as indicated by Mensah *et al*. (2008). Numerous epidemiological studies have provided evidence supporting the utilization of its bioactive compounds in various animal models, cell culture studies, and clinical trials, thereby confirming its significant pharmacological potential, as outlined by Ogunmoyole *et al.* (2019) and Eseyin *et al*. (2014). It is popularly known as fluted pumpkin (English), ikong ubong (Efik), ugwu (Igbo) and egusi iroko (Yoruba) (Ekanem *et al*., 2010). The leaves are common vegetables used for preparation of soup in Efik, Ibibio

and Igboland (Ekanem *et al.*, 2010).

2.1.1. TAXONOMY OF TELFAIRIA OCCIDENTALIS

Kingdom	Plantae
Division	Tracheophyta
Sub Division	Spermatophyta
Class	Magnoliopsida
Order	Cucurbitales
Family	Cucurbitaceae
Genus	Telfairia Hook
Species	Telfairia occidentalis Hook.
Zoological Name	TELFAIRIA occidentalis

Fig 2.1 Photo *telfairia occidentalis* root (picture taken at the University of Benin)

2.1.2. MORPHOLOGY OF TELFAIRIA OCCIDENTALIS

Telfairia occidentalis is a climbing plant that produces large dark green leaves and edible seeds. The fruits of the plant are mostly characterized by pale green longitudinal ribs and can weigh from 2 to 10 kg, when ripe, can reach a diameter of up to 85 cm and a length of 75cm (Adeyemo and Tijani 2018).

The morphology and taxonomy of the plant have been studied in relation to its economic importance as a tropical vegetable crop (Adeyemo and Tijani 2018). The distinctive fluted fruit shape is a notable characteristic of the plant (Adeyemo and Tijani 2018).

2.1.3 PHYTOCHEMICAL ANALYSIS OF TELFAIRIA OCCIDENTALIS ROOT

Many researchers have reported the phytochemical constituents, nutritional contents and isolates of *Telfairia occidentalis.* Innocent Imosemi 2020 reported the presence of tannins, reducing sugars, glycosides, saponins and sterol and triterperoids in the root of the plant, while the presence of its bioactive components in the root include saponins, alkaloids and resins (Innocent Imosemi 2020). The high alkaloid content of the root and their extracts are therefore used for controlling pest and rodents (Innocent Imosemi 2020).

2.1.4. NUTRITIONAL AND ANTI-NUTRITIONAL CONSTITUENTS OF TELFAIRIA OCCIDENTALIS ROOTS.

The older root of *Telfairia occidentalis* has the highest concentrations of calcium, magnesium, sodium, and potassium (Innocent Imosemi 2020). It has been reported that the roots contain significant levels of anti-nutrients, including oxalates, phytic acid, tannin, and saponin, which may pose a health risk to those who consume them (Innocent Imosemi 2020).

2.1.5. ETHNOMEDICINAL USES OF TELFAIRIA OCCIDENTALIS

In ethnobotany, Medicinal plants have been a significant source of medicine for thousands of years, and the World Health Organization (WHO) estimates that up to 80% of the world's population still primarily uses traditional medicine. The antioxidant qualities of their components have been linked to the role of medicinal plants in the prevention or control of disease. Telfairia occidentalis is widely used for its antidiabetic, antihypertensive, antioxidant, immunodulator, antibacterial, antihypercholesterolemic, antiparasitic, anti-inflammatory, and treatment of disorders related to the central nervous system, such as convulsions (Nwozo *et al.* Igbeneghu and Abdul (2014); Oyewole and Abalaka (2012)). Additionally, chemosuppressive qualities have reportedly been reported for its leaves (Igbeneghu and Abdul, 2014). water-based extract

of its leaves has been demonstrated to provide hepatoprotection against oxidative stress caused by garlic (Olorunfemi *et al*. Oboh *et al.*, 2005; Oboh, 2006. , 2006), but in rats with normoglycemic and alloxan-induced diabetes, both its aqueous and ethanolic extracts showed hypoglycemic qualities (Zhang, 2001; Zhang and Yao, 2002; Salman et al. 2008). Its protein content is extremely high in comparison to most vegetables (Ajibade. *et al.,* 2006; Aregheore, 2007).

Minerals, antioxidants, and vitamins like thiamine, riboflavin, nicotinamide, and ascorbic acid are abundant in the leaves of Telfairia occidentalis, according to Kayode and Kayode (2011). Young leaves of this plant are high in iron and magnesium (Akwaowo *et al.* , 2000) and because of its heamatinic qualities, it can be utilized to treat anemia (Ajibade *et al.* 2006; Eseyin and colleagues. 2014).

Despite enormous potential benefits, Ekanem *et al*. (2005) noted that its crude root extract is hepatotoxic and ought to be used extremely cautiously, both in colloquial language and in academic studies (Akubue *et al.* , 1980; Abiose, 1999; Ogbonnaya and Uadia, 2016), meaning that it is imperative to determine how the extraction solvent affects the toxicity of the material (Ekanem *et al*., 2009) An antibacterial agent could be made from the fluted pumpkin's root. Because it contains poisonous compounds, it can be used as an ordeal poison and a rodenticide (Ekanem *et al.,* 2009).

2.1.6. TOXICITY OF TELFAIRIA OCCIDENTALIS ROOT

According to Imosemi Innocent 2020, the use of medicinal plants to treat and manage diseases is on the rise in more than 70% of the world's population.

Agwu *et al.,* 2016 reported that the root extracts of Telfairia occidentalis was toxic to Clarias gariepinus fingerlings and the percentage mortality was concentration dependent. The highest mortality, 100% was observed in 75 mg/L treated group when compared to the other groups. They also reported that no literature is available on the toxicity of root of *Telfairia occidentalis* on Clarias gariepinus or other fish species. Aqueous extract of *Telfairia occidentalis* root is therefore toxic to Claria gariepinus and its cultivation close to banks of water utilized for Claria gariepinus aquaculture should be discouraged (Agwu *et al*., 2016).

The high concentration of alkaloids and saponins in the roots of *Telfairia occidentalis* has been shown to make them highly toxic to humans, even though they are not edible (Imosemi, Innocent 2020). According to Ajibesin *et al.* (2020), the root extract is used to manage pests and rodents and as an antibacterial agent (Oyewole *et al*., 2010). Aqueous extracts of the root have been shown to have a strong adverse effect on the stomach mucosa lining. Morcos et al. (2013) observed significant weight loss, decreased appetite and death in some rats. This may be due to the lethal effects of alkaloids and saponins as well as glycosides present in the

crude extract.

Saponins are relatively benign when taken orally. They are only slightly digested by the gastrointestinal tract. However, saponins have haemolytic properties. When injected into the bloodstream, saponins are highly toxic, particularly to cold blooded animals. Many saponins have been used as fish poison (Imosemi, 2020).

Ekanem *et al.* 2005 reported that the crude extract of the root of *Telfairia occidentalis* is hepatotoxic and should be used with great caution. Ekanem *et al.* 2010 also suggested that the root of *Telfairia occidentalis* may be nephrotoxic when administered intraperitoneally at doses of 0.38 mg/kg and 0.75 mg/kg but when administered orally at doses of 0.38 mg/kg and 0.75 mg/kg, ethanolic extract of the root may not be as toxic as claimed.

Results showed that the level of AST, ALT, ALP as well as LDL-cholesterol and HDL-cholesterol in the serum of group IV animals increased significantly relative to the control group. Antioxidant enzyme biomarkers such as catalase and superoxide dis- mutase as well as lipid peroxidation were significantly increased in the serum of group IV animals relative to the control. The study concluded that toxicity of root extract of Telfaria occidentalis is solvent-dependent (Ogunmoyole *et al.,* 2019).

2.2. LIVER HEALTH

The liver, which serves as a hub for nutrient metabolism and waste metabolite excretion, is the largest solid organ, largest gland, and one of the most important organs (Ozougwu and Eyo, 2014). The primary function of the Liver is to control flow and safety of substances which are absorbed from the digestive system before they are distributed to the systemic circulatory system (Allen. 2002).

2.2.1. Physiology of the Liver

The liver makes up about 2.5% of an adult's body weight and weighs about 1500g (Moore and Dalley, 2006). The normal liver crosses the midline in the direction of the left nipple and rests deep on the right side, between ribs 7 and 11 (Moore and Dalley, 2006). According to Allen, (2002), the four lobes of the liver are the right, left, caudate, and quadrate. The gallbladder is also evident anteriorly on the most inferior part of the right lobe. Many more intriguing structures can be seen on the posterior side (Allen, 2002).

2.2.2 FUNCTION OF THE LIVER

- **Bile Production**

Bile is a physiological aqueous solution produced and secreted by the liver. It consists mainly of bile salts, phospholipids, cholesterol, conjugated bilirubin, electrolytes, and water (Boyer, 2013). Initially, hepatocytes (Liver cells) produce bile by secreting conjugated bilirubin, bile salts, cholesterol, phospholipids, proteins, ions, and water into their canaliculi (thin tubules between adjacent hepatocytes that eventually join to form bile ducts) (Boyer, 2013). Bile salt-independent bile flow is encouraged by osmotically active solutes such glutathione and bicarbonate (Dosch *et al.*, 2019). The bile flow is enhanced by bombesin, vasoactive intestinal polypeptide, acetylcholine, and secretin, whereas it is inhibited by somatostatin, gastrin, insulin, and endothelin (Chiang and Ferrel, 2019).

Drug Metabolism

Drug metabolism is influenced by a number of variables, including age, gender, drug-drug interactions, diabetes, pregnancy, liver or kidney illness, inflammation, and heredity, to mention a few (Almazroo et al., 2017).

- **Bilirubin Metabolism**

Heme is broken down into biliverdin, which is then reduced to unconjugated bilirubin. The liver receives unconjugated bilirubin bound to albumin from the circulation.(O' Brien *et al.,* 2015). Some bilirubin is converted to urobilinogen or unconjugated bilirubin by gut bacteria for reabsorption to undergo enterohepatic circulation (Stec *et al.,* 2016)

2.2.3. Relative testing

In particular, elevated ALP signals damage to the lining of the biliary tract (Hoeskstra *et al.,* 2015).

Liver disease is a growing public health concern both globally and in many national populations. Some of the most common liver diseases include non-alcoholic fatty liver disease (NAFLD), viral hepatitis, cirrhosis, and liver cancer. Rates of liver disease are rising due to risk factors like obesity, diabetes, high cholesterol, chronic alcohol consumption, and exposure to environmental pollutants (Devarbhavi *et al*., 2023).

CHAPTER 3

MATERIALS AND METHODS

3.1. EQUIPMENTS AND REAGENTS

Plastic cages with wire gauze, sample bottles, 5ml syringes, cotton wool and disposable gloves, masking tape, Distilled water, chloroform, Surgical latex Gloves, Refrigerator, Dissecting set, Laboratory centrifuge, Orogastric tube, Oven, Electronic weighing scale, Universal bottles, Grower mash manufactured by Top feed and flour mill limited, were obtained from standard retailers/suppliers at Uselu Market, Benin City, Edo State.

3.2. PLANT MATERIALS

3.2.1. Collection and Identification

Telferia occidentalis root was collected in January 2024 within the premises of University of Benin from a farm at the Faculty of Agriculture in Ovia North East Local Government Area of Edo state, Nigeria. It was identified and authenticated as *Telferia occidentalis* at the Department of Plant Biology and Biotechnology, Faculty of Life Sciences, University of Benin, Benin City.

3.2.2. Preparation and extraction

The harvested *Telferia occidentalis* roots were washed and chopped into bits. They were then air dried for two (2) weeks after which they were then pulverized to fine powder using the British milling machine. 800grams of the fine powder was then macerated in a jar containing 1.5L of distilled water for 24 hours with constant shaking and stirring.

The contents of the jar were then filtered to separate the residue from the filtrate using Whatman No 1 filter paper,funnel and conical flask. The filtrate was then concentrated to paste using a water bath and crucible. The crude extract was then placed In a sample bottle and preserved in a refrigerator.

3.3. EXPERIMENTAL ANIMALS

Twenty (20) adult Wistar rats weighing between 160-200g were used for this experimental study. The animals were obtained and maintained in the Animal Holdings of the Department of Anatomy, School of Basic Medical Sciences, University of Benin, Benin City, Edo State, Nigeria. They were fed with standard rodent feeds and water ad libitum. The animals were housed under standard condition of temperature and relative humidity. The animals gained maximum acclimatization (2 weeks) before commencement of the experiment.

3.4. EXPERIMENTAL DESIGN AND ADMINISTRATION

Twenty (20) adult Wistar rats were randomly assigned into five (5) groups: A, B, C, D and E with 4 rats in each group. Group A served as control while groups B, C, and D served as treatment groups. The animals were cared for according to the guidelines of the National Institute of Health (NIH, USA) for the care and use of laboratory animals.

Group A	Control group
Group B	Rats received 100mg/kg body weight of Telferia occidentalis aqueous root extract
Group C	Rats received 500mg/kg body weight of Telferia occidentalis aqueous root extracdt
Group D	Rats received 1000mg/kg body weight of Telferia occidentalis aqueous root extract
Group E	Rats received 1500mg/kg body weight of Telferia occidentalis aqueous root extract

The aqueous extract of *Telferia occidentalis* was administered using an Orogastric tube in order to ensure accuracy in treatment. Treatment/Administration lasted for 2 weeks.

3.5. SACRIFICE AND BLOOD COLLECTION

Twenty-four hours after last administration, the animals were grossly observed for general physical characteristics. The animals were then anaesthetized with chloroform. Blood was collected via cardiac puncture using the 5ml syringes, into EDTA bottles and lithium-heparin bottles. An abdominal incision was made to expose the abdominal viscera. The Liver was harvested and immediately fixed in 10% formal-saline for histological analysis. The blood samples collected were taken to the Chemical Pathology Laboratory of the University of Benin Teaching Hospital (U.B.T.H.) for assay.

3.6. STATISTICAL ANALYSIS

Data gotten from the biochemical assay was subjected to statistical analysis using the SPSS 2021 Software. The Comparison within-groups was done using One-way analysis of variance (ANOVA). P-value greater than 0.05 ($P > 0.05$) considered statistically insignificant. Data was presented as mean ± standard error of mean (mean ± SEM) in tables and bar charts.

3.7 PRINCIPLE OF THE METHOD: LIVER FUNCTION

The blood samples collected were centrifuged at 3000 rev/min using a centrifuge for 10 min. Serum alanine aminotransaminase (ALT), aspartate aminotransaminase (AST), Alkaline Transferase, Bilirubin, albumin and globulin were assayed for spectrometrical analysis using ELITech Clinical systems.

- **Aspartate Aminotransaminase (AST) Assay –** IFCC Method without pyridoxal phosphate

  In the estimation of AST, serum is treated with L- aspartate and α-ketoglutarate leading to formation of oxaloacetate and L-glutamate. Oxaloacetate is treated with NADH forming L-malate.

- **Alkaline phosphatase (ALP) Assay -** Based on DGKC and SCE Method

  The estimation of ALT, serum is treated with p-Nitrophenylphosphate in the presence of Mg2+ and diethanolamine. This results in formation of inorganic phosphate and p-Nitrophenol. The absorbance of the initial yellow color due to the formation of p-Nitrophenol is measured using alkaline condition at 405nm.

- **Alanine aminotansferase (ALT) Assay-** In the estimate of ALT, serum is treated with L- alanine and α- ketoglutarate leading to formation of pyruvate and L- glutamate. Pyruvate is treated with NADH forming L-Lactate in the presence of Lactate dehydrogenase.
- **Total and conjugated Bilirubin Assay**- Based on Malloy- Evelyn modified Method: Sulphanic acid reacts with sodium nitrate to form diazotized Sulphanic acid. Then in the presence of an accelerator such as cetrimod, conjugated and unconjugated bilirubin is then reacted with diazotized Sulphanic acid to form uzobilirubin. I'm the absence of acceleration, only conjugated bilirubin will react. An increase absorbance at 546nm is proportional to bilirubin concentration.
- **Total protein:• Assay For Total protein :** In estimation of total proteins, using colorimetric method. The peptide bonds of proteins react with Cu2+, in alkaline solution to form a coloured complex with absorbance, proportional to the concentration of total proteins in the serum, measured at 550nm. The biuret reagent contains sodium potassium tartartate to complex cupric ions and maintain their solubility in alkaline solution.
- **Albumin:** In the estimation of Albumin, serum is treated with Bromocresol (BCG) green at PH of 4.2, leading to formation of

Albumin-BCG complex. The absorbance of the green colour formed is measured at 620nm.

CHAPTER 4

RESULTS

Data was presented as mean ± standard error of mean (mean ± SEM) in tables and graphs. Statistical analyses were carried out using SPSS version 2021 software. The Comparison within-groups was done using One-way analysis of variance (ANOVA). P-value greater than 0.05 (P > 0.05) was considered statistically not significant among the treatment groups compared to the control.

Table 4.1: Showing the mean values of various liver function parameters across all groups.

	Group 1 (Control)	**Group 2 (100mg/kg)**	**Group 3 (500mg/kg)**	**Group 4 (1000mg/kg)**	**Group 5 (1500mg/kg)**	**P-value**
	Mean±SE	Mean±SE	Mean±SE	Mean±SE	Mean±SE	
AST(µ/L)	461.25±97.57	412.5±18.39	342±54.74	333.5±52.06	307±65.76	P>0.05
AST(µ/L)	177.5±41.39	156.5±4.7	160±14.35	155±1.58	171.33±7.31	P>0.05
ALT(µ/L)	83.5±17.61	112.25±11.5	102±4.53	83±7.77	107.67±8.82	P>0.05
TB (Mg/dl)	0.28±0.05	0.28±0.05	0.25±0.03	0.28±0.02	0.23±0.03	P>0.05
CB (Mg/dl)	0.08±0.02	0.1±0.00	0.07±0.02	0.1±0	0.08±0.02	P>0.05
TP (g/dl)	7.38±0.28	7.15±0.09	7.15±0.25	7.08±0.25	7.67±0.09	P>0.05
ALB (g/dl)	3.68±0.06	3.65±0.05	3.45±0.12	3.53±0.05	3.77±0.13	P>0.05
GLO (g/dl)	3.7±0.23	3.5±0.07	3.7±0.18	3.3±0.19	3.57±0.28	P>0.05

P>0.05- means no significant difference among the treatment groups compared to the control

ALKALINE PHOSPHATASE

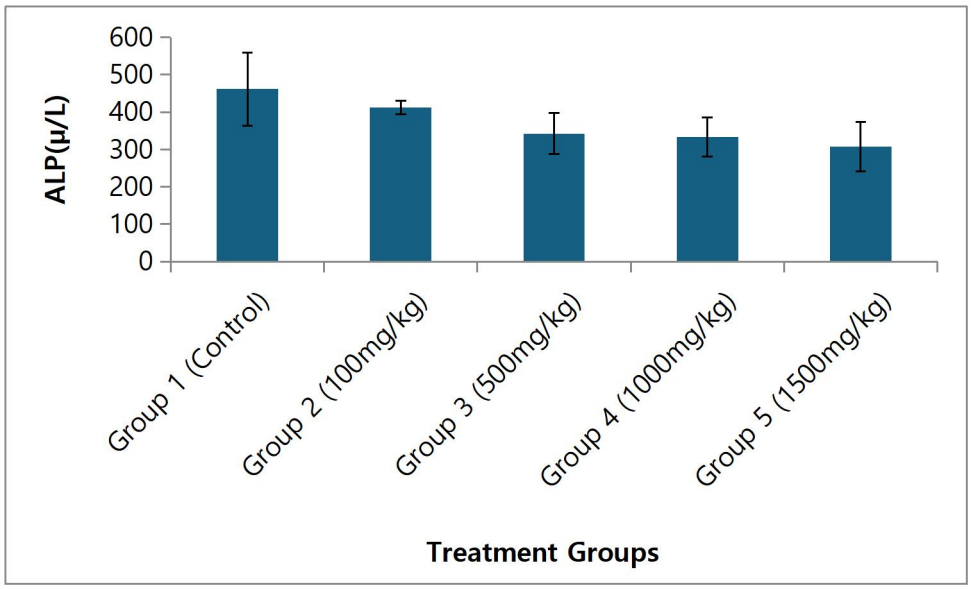

Fig. 4.1: *Chart showing levels of* ***alkaline phosphatase*** *across all groups*

There were no statistically significant differences (P>0.05) in alkaline phosphatase levels across the groups.

ASPARTATE AMINOTRANSFERASE

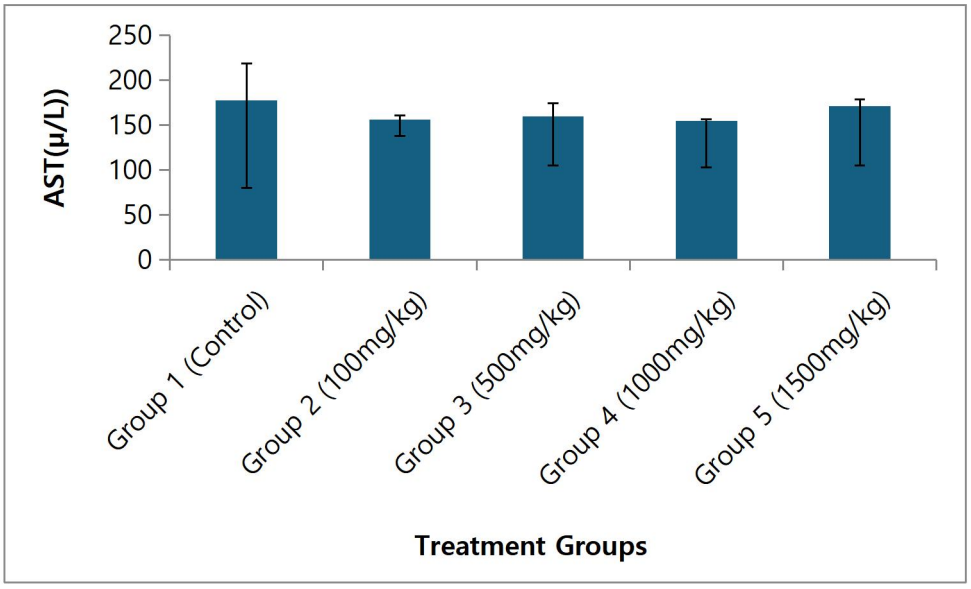

Fig. 4.2: Chart showing levels of ***aspartate aminotransferase*** *across all groups*

There were no statistically significant differences (P>0.05) in aspertate aminotransferase levels across the groups.

ALANINE TRANSFERASE

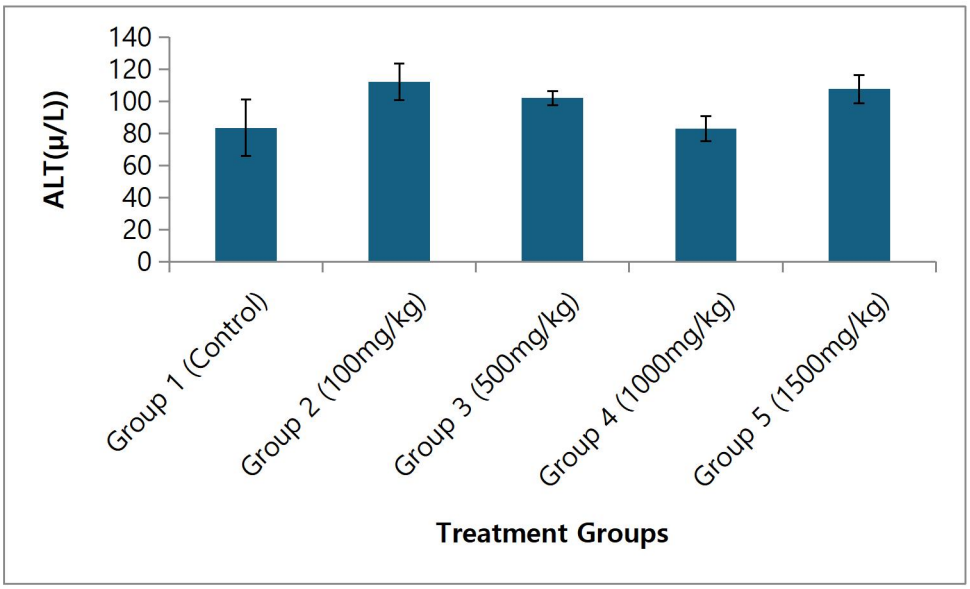

*Fig. 4.3: Chart showing levels of **alanine transferase** across all groups*

There were no statistically significant differences (P>0.05) in alanine transferase levels across the groups.

TOTAL BILIRUBIN

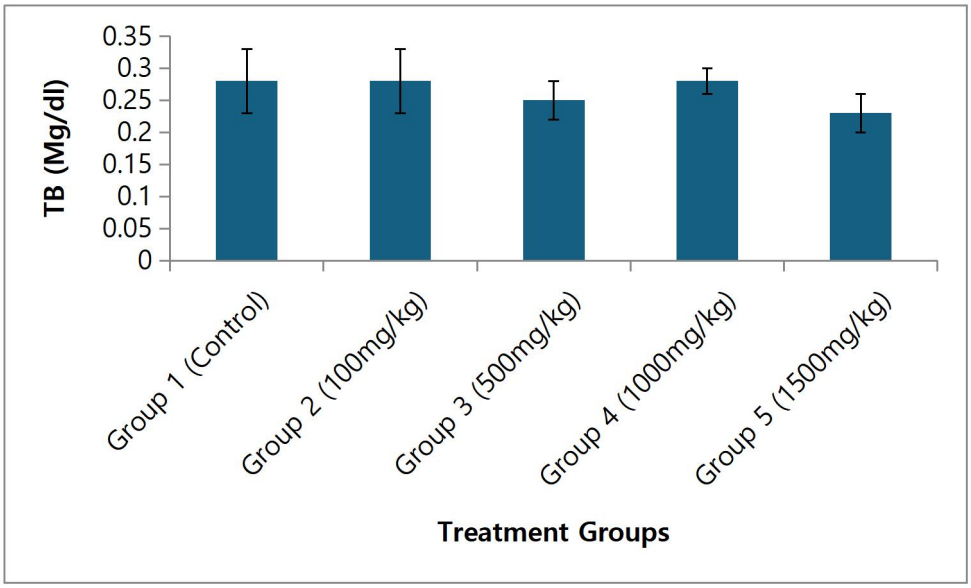

Fig. 4.4: Chart showing levels of Total bilirubin across all groups

There were no statistically significant differences (P>0.05) in Total bilirubin levels across the groups.

CONJUGATE BILIRUBIN

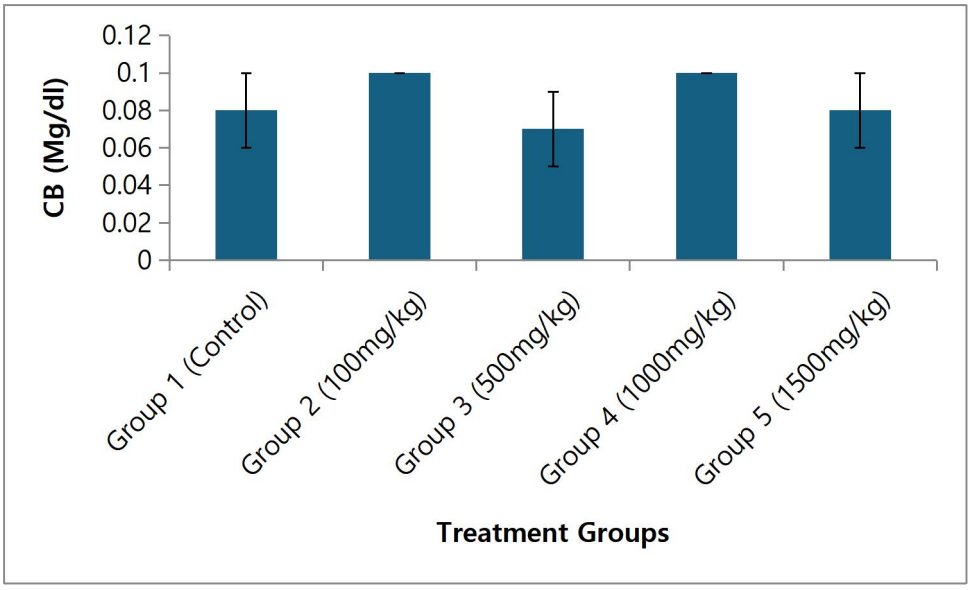

Fig. 4.5: C*hart showing levels of* ***conjugate bilirubin*** *across all groups*

There were no statistically significant differences (P>0.05) in conjugate bilirubin levels across the groups.

TOTAL PROTEIN

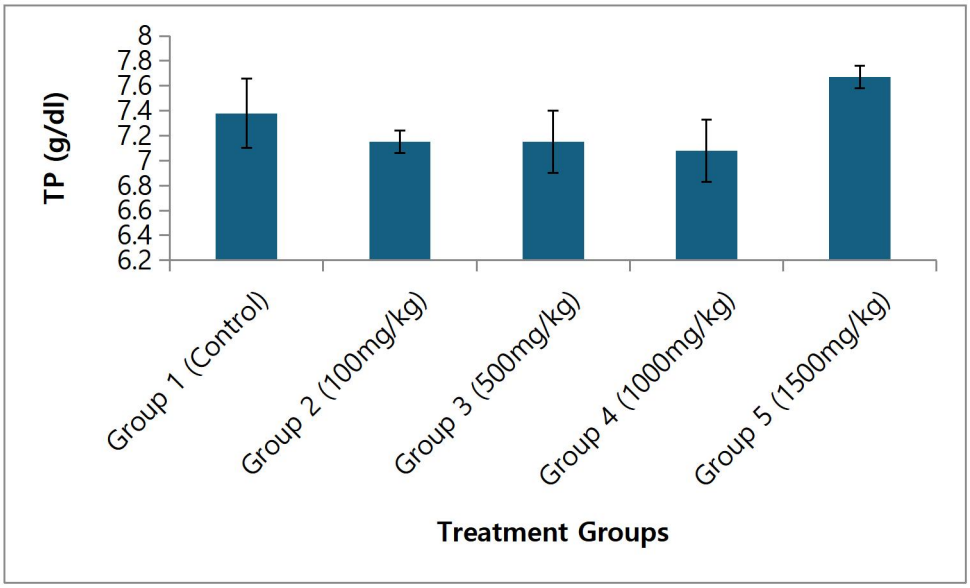

*Fig 4.6: Chart showing levels of **Total protein** across all groups*

There were no statistical significant difference (P>0.05) in total protein levels across the groups

ALBUMIN

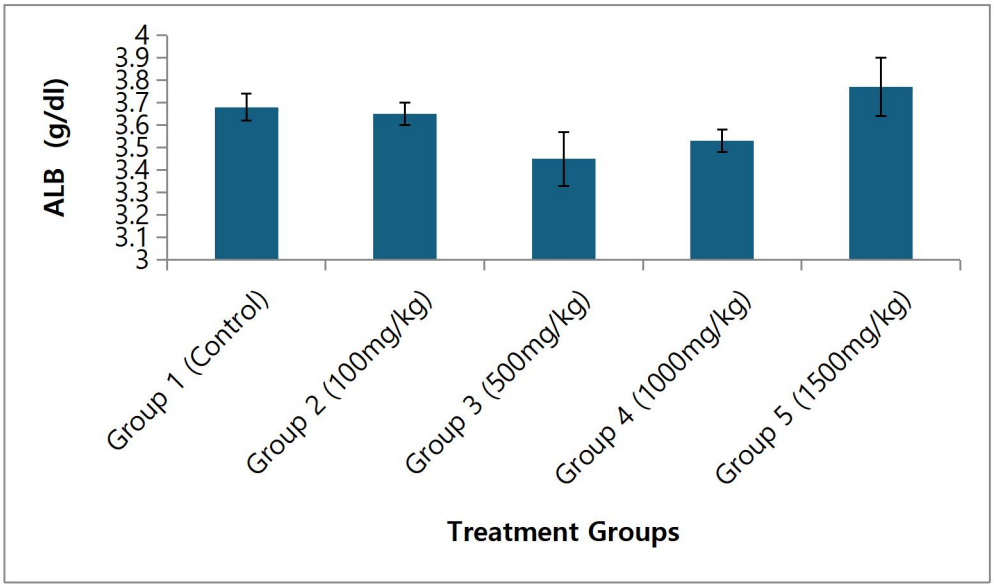

Fig 4.7: Chart showing levels of **Albumin** across all groups

There were no statistical significant difference (P>0.05) in total protein levels across the groups

GLOBULIN

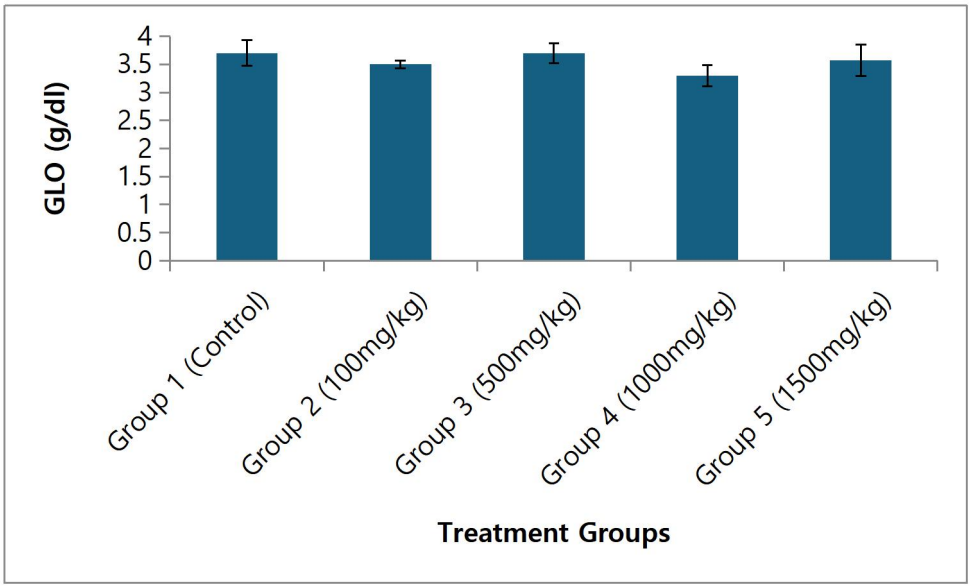

*Fig 4.8: Chart showing levels of **Globulin** across all groups*

There were no statistical significant difference (P>0.05) in Globulin levels across the groups

CHAPTER FIVE

DISCUSSION AND CONCLUSION

The liver is an important organ in the human body that is responsible for an array of functions such as metabolism, immunity, digestion, detoxification, vitamin storage among other functions (Kalra *et al.,* 2024).The activity of hepatocytes in a various metabolic activities including biotransformation and excretion of materials makes the liver more vulnerable and susceptible to toxicity from these agents (Gulati *et al.,* 2018; Obianime and Uchie, 2008). The present study evaluated the effect of aqueous root extract of Telfairia occidentalis on the liver.

In this study, there was no statistically significant difference ($P>0.05$) in the AST, ALT and ALP levels of the treated rats (Group 2,3,4 and 5) when compared to the control (Group 1) as well as in bilirubin and protein levels. This observation may infer that the plant extract did not induce hepatocellular damage in Wistar rats. According to report by Ogbonnaya and Uadia(2013),the serum ALT and AST activities were reduced significantly ($P<0.05$) by the root extract at the doses of 250mg/kg body weight and 750mg/kg. The reduction in activities of serum ALT and AST by root extract at the doses of 250mg/kg bw and 750mg/kg bw may be an indication that short term administration of increased dose of the root extract on ALT and AST activities as correlates

with a lower dose administration over a longer period.The insignificant effect of the root extract on these and other biochemical parameters suggests that the extract may not cause any liver or kidney dysfunction (Ogbonnaya and Uadia, 2014).

5.2 CONCLUSION AND RECOMMENDATION

In conclusion, this study revealed that administration of aqueous root extract of *Telfairia occidentalis* may not have a substantial effect on the liver function parameters evaluated in Wistar Albino rats at the dosages tested. However, it is important to interpret these findings cautiously and consider other factors that may influence liver function. Further studies including histopathological examination and longer term observations, may provide additional insights into the effects of *Telfairia occidentalis* root extract on liver health.

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