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The Effect of Methanol Extract of Talinum Triangulare (Water Leaf) on the Hematology and Some Liver Parameters of Experimental Rats

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Abstract: The percentage yield of *Talinum triangulare* was found to be 4.84%. The preliminary phytochemical screening of plant extract revealed the presence of alkaloids and flavonoids in larger amounts while saponins, tannins, resins, steroids and glycosides were in lower amounts. The administration of methanol extract of *Talinum triangulare* at 100, 200 and 400/kg b.w had no effect on the level of alanine amino transferase and alkaline phosphatase ($p>0.05$), but the administration of extract at these doses gave significant increase ($p<0.05$) in the levels of serum aspartate amino transferase and RBC but significant decrease ($p<0.05$) were recorded in PCV and bilirubin. There was a significant increase ($p<0.05$) in the AST levels at 100mg/kg dose and this could have been due to the physiological conditions of animal because AST is also found in other organs of the body such as the heart, but at 200 and 400 mg/kg there was a decrease in AST when compared to the one at 100mg/kg. There was significant decrease in the PCV level of the rats. For the bilirubin concentration there was a significant decrease ($p<0.05$) between the control and the test groups. At 200mg/kg, the extract gave the lowest serum total bilirubin concentration. The RBC concentration was significantly increased when compared to the control and the highest RBC level was obtained at 200mg/kg. This shows that *T. triangulare* leaf could be used for treatment of disease conditions such as anaemia and could also be used by pregnant women and growing children to boost their blood level. The clearance of bilirubin from blood shows that the plant could help red cells stay longer and be used by the body. Since these vegetables are readily available almost everywhere, it means they are used by almost everyone including those in remote areas and so they have access to a lot of health benefits that is provided by this plant.

Key words: Liver markers · Talinum triangulare · Hematological parameters · Phytochemical analysis and Blood

INTRODUCTION

Vegetables are those herbaceous plants whose part or parts are eaten as supporting food or main dish. It may be aromatic, bitter or tasteless [1]. Nigeria is endowed with varieties of traditional vegetables and different types are consumed by different ethnic groups for different reasons. They are important constituent of the human diet supplying the body with minerals, vitamins and certain hormone precursors, in addition to protein and energy.

Several vegetable species abound in Nigeria and most West African countries where they are used partly as condiments or spices in human diets or as supplementary feeds to livestock such as rabbits, poultry, swine and cattle [2]. These vegetables are harvested at all stages of growth and fed either as processed, semi-processed or fresh to man while they are usually offered fresh to livestock. Lack of information on the specific nutrients and phytochemicals in a large number of the native vegetable species with which Nigeria is richly endowed is partly responsible for their under-exploitation especially in areas beyond the traditional localities where they are found and consumed [3].

Since immense benefits have been derived by man from using medicinal herbs in management of health because they are relatively safer, more affordable and sometimes offer better therapeutic value than synthetic drugs, the increasing discovery of more medicinal plants has necessitated increased scientific scrutiny of their

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bioactivity in order to provide data that will help physicians and patients make wise decisions before using them [4]. The liver which is one of the most vital organs in the body, if not the most important, controls so many vital processes in the body and must be well taken care of to ensure adequate functioning. The liver marker enzymes which are used to show how well the liver works are important enzymes needed for its function. Malfunction of the liver could lead to increased production of these enzymes and some liver parameters, like bilirubin in the blood leading to a lot of chronic diseases.

Diseases of the liver are among the most important causes of death and disability in many countries throughout the World [5]. Gilbert diseases, jaundice and other related liver diseases could arise as a result of high level of bilirubin, the marker enzymes of the liver and this could be as a result of liver malfunction.

Statistics from the Centers for Disease Control and Prevention (CDC) rank mortality related to chronic liver disease and cirrhosis as the 12th most common cause of death in adults in the U.S. Using a modified definition that includes diseases such as viral hepatitis, liver cancer and obesity-related fatty liver disease (liver diseases), several mechanisms for the development of liver disease in CHF (chronic heart failure) have been proposed and include increased alkaline phosphatase, alanine amino tranferase, aspartate amino transferase and bilirubin production, inflammation, etc.[6].

Liver disease causes approximately 2% of all deaths. Nevertheless, research finds that when otherwise healthy people drink large amounts of alcohol, AST and ALT levels in the blood increase [7].Of the two enzymes, ALT is the more specific measure of alcohol-induced liver injury because it is found predominantly in the liver, whereas AST is found in several organs, including the liver, heart, muscle, kidney and brain. Very high levels of these enzymes (e.g., 500 units per liter) may indicate alcoholic liver disease. Clinicians often use patient's ratio of AST to ALT to confirm an impression of liver diseases in genera l[7].

Since it is established that most of the causes of these liver diseases result in elevated levels of these marker enzymes and of liver parameters such as bilirubin, these enzymes and parameters then serve as a useful tool for the diagnosis of liver diseases.

To this effect, the effect of methanol extract of *Talinum triangulare* on the liver and blood was studied. It is hoped that this study will give new insight into the use of the plant as a potential drug for the cure of liver diseases.

Fig. 1: Picture of Talinum triangulare (water leaf)
Source: [10]

Talinum triangulare, commonly known as water leaf, belongs to the plant family *Portulaceae*. It is a short-lived perennial herb, growing to 30-60cm in height. The leaf is greenish in colour with succulent and alternate leaf arrangement. *Talinum triangulare* is a cosmopolitan weed common throughout the humid tropics. It is a non-conventional vegetable crop which originated from tropical Africa and is widely grown in West Africa, Asia and South America [8].

Talinum triangulare is a perennial plant that can form dense colonies in shallow water or moist soils and can grow to 3 feet in height. Leaves are oval to lance-like (1 to 2 inches long by 1/2 to 1 inch wide), on a short petiole usually with a 1/2 inch long spine or thorn in the leaf axis. Flowers are blue in one sided or coiled clusters. *Talinum triangulare* (water leaf) is a herbaceous perennial, succulent and glabrous plant widely grown in tropical regions as a leaf vegetable [9]. It is a short duration crop which is due for harvest between 35-45 days after planting [10]. It is consumed as a vegetable and constituent of a sauce in Nigeria. Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. Waterleaf has no direct food value for wildlife.

The aim of this study was to investigate the effect of methanolic extract of *Talinum triangulare* on the liver and hematological parameters of experimental rats.

The Specific Objectives Include:

- To monitor the changes in total serum alanine amino transferase level
- To monitor the changes in total serum aspartate amino transferase level

- To monitor the changes in total serum alkaline phosphatase level
- To monitor the changes in total serum bilirubin level
- To monitor the changes in the PCV blood level
- To monitor the changes in the RBC blood level.

MATERIALS AND METHODS

Material

Plant Materials: Fresh leaves of water leaf (*Talinum triangulare*) were bought from hawkers in a common market (Abakpa) in Abakaliki, Ebonyi State of Nigeria.

Animals: Twenty five (25) adult albino rats of both sexes weighing between 117 - 200 g were purchased and housed at the Departmental Animal House. The animals were acclimatized for at least one week and with adequate rat feed and clean water were regularly given to them orally.

Chemicals/Reagents: The chemicals and reagents used were bought from scientific shops in Nsukka and were of analytical grade, while some others were obtained from the Laboratory of the Department of Biochemistry, University of Nigeria Nsukka. Some of the chemicals used for this analysis include:

Chemicals	Manufacturer:
Methanol	British drug house
Acetone	Sigma, London
Aluminium chloride	BDH, England
Bismuth carbonate	BDH, England
Chloroform	Sigma, London
Carbon tetrachloride	Cartivalue
Disodium hydrogen phosphate	Merck Darmstadt Germany
Distilled water	STC, UNN
Sodium chloride	May and Baker
AST reagents	Randox
ALT reagent	Randox
Bilirubin reagent	Randox
ALP reagent	Randox
Fehlings solution A and B	Teco USA
Ferric chloride	Merck Darmstadt Germany
Ethyl acetate	BDH England
Ferrous sulphate	BDH England
Glacial acetic acid	Sigma, London
Hydrochloric acid	BDH England
Iodine crystal	Merck Darmstadt Germany
Lead acetate	BDH England
Million's reagent	BDH England
Mercuric chloride	Sigma, London
Naphthylene diamine dihydrochloride	BDH England
Olive oil	Goya Nigeria
Picric acid	Lab tech Chemicals London
Potassium dihydrogen sulphate	BDH England
Potassium iodide	East Angelis
Potassium sulphate	May & Baker England
Potassium hydroxide	May & Baker England
Potassium chloride	Merck Darmstadt Germany
Phosphoric acid	Sigma, London
Saponin	Lab tech chemicals London
Sodium tungstate	BDH England
Sulphuric acid	BDH England
Tannic acid	Sigma, London
Trichloroacetic acid	BDH England
Naphthol	Sigma, London

INSTRUMENTS/EQUIPMENT	
Weighing balance	Metler HAS
Volumetric flasks	Pyrex England
RefrigeratorHaier	Thermocool
Dissecting set	Gold cross
Oral intubation tube	Pyrex England
PCV tubes	Pyrex England
PCV reader	Pyrex England
Test tubes	Pyrex,England
Measuring cylinder	Pyrex, England
Syringes	Lifescan
Spectrophotometer	Spectronic 20D
Centrifuge	Pac Pacific Cages
Dissecting set	Gold cross
Filter paper	Whatman
Glass funnels	Kimax
Micropipette	Perfect
Mortar	Life scan
Pasteur pipette	Pyrex, England
Separating funnel	Pyrex, England
Spatula	Pyrex, England
Colorimeter	EI scientific co. India
Sunction pump	Gallenkanp
Syringes	Mono-ject China
Beaker	Pyrex England
Test tube	Pyrex England
Water bath	Gallenkamp
Weighing balance	Metler HAS
pH meter	Ecosan
Micro haematocrit reader	London
Triple beam balance	(MB 2610) London
Harvard trip balance 2kg-5ib capacity	Harvard

Preparation of Reagents for Phytochemical Analysis:

5% (w/v) Ferric Chloride Solution: A weighed sample ferric chloride 5.0g) was dissolved in 100ml of distilled water.

Ammonium Solution: 187.5ml of the stock concentrated ammonium solution was diluted in 31.25ml of distilled water and then made up to 500ml with distilled water.

45% (v/v) Ethanol: 45ml of absolute ethanol was mixed with 55ml of distilled water.

Aluminium Chloride Solution: 0.5g of aluminium chloride was dissolved in 100ml of distilled water.

Dilute Sulphuric Acid: 10.9ml of concentrated sulphuric acid was mixed with 5ml of distilled water and made up to 100ml.

Lead Sub Acetate Solution: 45ml of 15% lead acetate (i.e. 15.0g of lead acetate in 100ml of distilled water) was dissolved in 20ml of absolute ethanol and 35ml of distilled water.

Wagner's Reagent: A weighed sample of iodine crystals (2.0g) and potassium iodide (3.0g) were dissolved in 100ml of distilled water.

Mayer's Reagent: A weighed sample of mercuric chloride (13.5g) was dissolved in 50ml of distilled water. Also, 5.0g of potassium iodide was dissolved in 20ml of distilled water. The two solutions were mixed and the volume made up to 100ml with distilled water.

Dragendorff's Reagent: A weighed sample of bismuth carbonate (0.85g) was dissolved in 100ml of glacial acetic acid and 40ml of distilled water to give solution A. Another solution called solution B was prepared by dissolving 8.0g of potassium iodide in 20ml of distilled water. Both solutions were mixed to give a stock solution.

Molisch Reagent: A weighed sample of α-naphthol (1.0g) was dissolved in 100ml of absolute ethanol.

2% (v/v) Hydrochloric Acid: 2.0ml of concentrated hydrochloric acid was diluted with some distilled water and made up to 100ml.

1% (w/v) Picric Acid:A weighed sample of picric acid (1.0g) was dissolved in 100ml of distilled water.

MATERIASLS AND METHODS

The phytochemical analysis of the plant was carried out on fresh samples according to the method of [11] to identify its active constituents of *Talinum triangulare*..

Test For Alkaloids: In a test tube, 0.2g of the sample was boiled with 5ml of 2% HCl on a steam bath. The mixture was filtered and 1ml portion of the filtrate was treated with 2 drops of the following reagents

- Dragendorff's reagent: A red precipitate indicates the presence of alkaloids.
- Mayer's reagent: A creamy-white precipitate indicates the presence of alkaloids.
- Wagner's reagent: A reddish-brown precipitate indicates the presence of alkaloids.
- Picric acid (1%): A yellow precipitate indicates the presence of alkaloids.

Test For Flavonoids: In a test tube, 0.2g of the sample was heated with 10ml ethyl acetate in boiling water for 3 minutes. The mixture was filtered off and the filtrate was used for the following tests.

- Ammonium test: A quantity, 4ml of the filtrate was shaken with 1ml of dilute ammonium solution. The layers were allowed to separate. A yellow precipitate observed at the ammonium layer indicates the presence of flavonoids.
- Aluminium chloride test: A quantity, 4ml of the filtrate was shaken with 1ml of 1% aluminium chloride solution and observed for light yellow colouration. A yellow precipitate indicates the presence of flavonoids.

Test For Glycosides: In a test tube 2.0g of the sample was mixed with 30ml of distilled water and heated in a water bath for 5minutes. The mixture was filtered and the filtrate used for the following tests.

- A quantity, 5ml of the filtrate was added to 0.3ml of Fehling's solutions A and B until it turned alkaline (tested with litmus paper) and heated on a water bath for 2 minutes. A brick-red precipitate indicates the presence of glycosides.
- Using 15ml of sulphuric acid instead of distilled water, the above process was repeated and a brick-red precipitate formed indicates the presence of glycosides.

Test For Proteins: In a test tube, 5ml of distilled water was added to 0.1g of the sample. The mixture was left to stand for 3 hours and then filtered off. To 2ml portion of the filtrate was added 0.1ml of Millon's reagent. The mixture was shaken and kept for observation. A yellow precipitate indicates the presence of proteins.

Test For Carbohydrates: In a test tube, 0.1g of the sample was shaken vigorously with water and filtered. To the aqueous filtrate was added few drops of Molisch reagent followed by vigorous shaking again. Then, 1ml of concentrated sulphuric acid was carefully added down the side of the test tube to form a layer below the aqueous solution. A brown ring at the interface indicates the presence of carbohydrates.

Test For Reducing Sugars: In a test tube, 0.1g of the sample was shaken vigorously with 5ml of distilled water and filtered. To the filtrate was added equal volumes of

Fehling's solutions A and B and shaken vigorously. A brick-red precipitate indicates the presence of reducing sugars.

Test For Saponins: In a test tube, 0.1g of the sample was boiled with 5ml of distilled water for 5 minutes. The mixture was filtered while still hot. The filtrate was used for the following tests.

- Emulsion test: A quantity, 1ml of the filtrate was added to two drops of olive oil. The mixture was shaken and observed for the formation of emulsion.
- Frothing test: A quantity, 1ml of the filtrate was diluted with 4ml of distilled water. The mixture was shaken vigorously and then observed on standing for a stable froth.

Test For Tannins: In a test tube, 2g of the sample was boiled with 5ml of 45% ethanol for 5 minutes. The mixture was cooled and then filtered and the filtrate was treated with the following solutions.

- Lead sub acetate solution: To 1ml of the filtrate was added 3 drops of lead sub acetate solution. A gelatinous precipitate indicates the presence of tannins.
- Bromine water: To 1ml of the filtrate was added 0.5ml of bromine water and then observed for a pale brown precipitate.
- Ferric chloride solution: a quantity, 1ml of the filtrate was diluted with distilled water and then 2 drops of ferric chloride solution was added. A transient greenish to black colour indicates the presence of tannins.

Test For Oils: In a test tube, 0.1g of the sample was pressed between filter papers and the papers observed. Translucency of the filter paper indicates the presence of oils.

Test For Resins:

- Precipitate test: A quantity, 0.2g of the sample was extracted with 15ml of 96% ethanol. The alcoholic extract was poured into 20ml of distilled water in a beaker. A precipitate occurring indicates the presence of resins.
- (ii) Color test: A quantity, 0.12g of the sample was extracted with chloroform and the extract concentrated to dryness. The residue was redissolved in 3ml of acetone and 3ml of concentrated HCl added. This mixture was heated in a water bath for 30minutes. A pink color which changes to magenta formed indicates the presence of resins.

Test For Terpenoids and Steroids: About 9ml of ethanol was added to 1g of the sample and refluxed for a few minutes and filtered. The filtrate was concentrated to 2.5ml on a boiling water bath and 5ml of hot water was added.

The mixture was allowed to stand for 1hour and the waxy matter filtered off. The filtrate was extracted with 2.5ml of chloroform using a separating funnel. To 0.5ml of the chloroform extract in a test tube was carefully added 1ml of concentrated sulphuric acid to form a lower layer. A reddish-brown interface shows the presence of steroids.

Another 0.5ml of the chloroform extract was evaporated to dryness on a water bath and heated with 3ml of concentrated sulphuric acid for 10minutes on water. A grey colour indicates the presence of terpenoids.

Preparation of Normal Saline: Sodium chloride (0.9g) was weighed into a caliberated flask and made up to 100ml of distilled water.

Preparation of Plant Extract: The fresh leaves of *Talinum triangulare* were air dried under atmospheric temperature for over two weeks and was pounded to powder with mortar and pestle. 500g of the pulverized leaves was subjected to cold maceration in 1400ml methanol for fourty eight hours. The filtrate was concentrated in a water bath for solvent elimination; the residue was reconstituted in distilled water and stored in a refrigerator until when needed.

Estimation of Percentage Yield of Extract: After evaporating the solvent (methanol), the extract was obtained in the slurry form. The extract was weighed with an electronic weighing balance and the weight recorded. The extract was re-dissolved in distilled water. 1 ml of the solution was added to an empty evaporating dish with known weight and was evaporated to dryness. The weight of the extract and the evaporating dish was also determined. The actual weight of the extract in ml of the extract 1mlof the solution was obtained by subtracting the weight of the empty evaporating dish from the weight of the evaporating dish containing the extract. The weight of the entire extract contained in the 50ml solution was also calculated.

The percentage yield was calculated as shown below:

$$\text{Percentage yield} = \frac{\text{Weight (g) of extract}}{\text{Weight (g) of pulverized leaves}} \times 100$$

Experimental Design: The twenty five rats were randomly divided into four (4) different groups as follows:

Group 1: Normal control rats and were given 0.5ml of normal saline orally.

Group 2: Received 100 mg/kg body weight of *Talinum triangulare* extract orally.

Group3: Received 200mg/kg body weight of the *Talinum triangulare* extract orally.

Group 4: Received 400 mg/kg body weight of the *Talinum triangulare* extract orally

Biochemical and Haematological Assay: The parameters were measured spectrophotometrically, using enzymatic colorimetric assay kits (Random, UK) as follows:

Assay for Serum Bilirubin:
Principle: Van den bergh reaction has been used for many years to determine the bilirubin in the serum. This involves treating the serum with diazotized sulphanilic acid to form the azobilirubin complex. The conjugated bilirubin reacts directly with the diazo reagent while the unconjugated (indirect) bilirubin reacts with the diazo reagent only in the presence of an accelerator such as caffeine-benzoate reagent and takes about ten minutes for the color development. The azobilirubin is purple in the medium and is converted to blue color by addition of alkaline tartarate solution.

Method: Set up a test tube and add 0.2ml of serum, 0.8ml of distilled water and 0.5ml of diazo reagent. Leave for 10mins for color development. Add 0.1ml of ascorbic acid, 2.0 ml of caffeine reagent and 1.5 ml of alkaline tartarate solution. The absorbance was read at 600nm within 30 minutes

Assay for Serum Alanine Amino Transferase Enzyme:
Principle: ALT is measured by monitoring the concentration of pyruvate hydrazone formed with 2, 4-dinitrophenylhydrazine. The colour intensity is measured against the blank at 540nm.

Method: The blank and sample test tubes were set up in duplicates. 0.1ml of serum was pipetted into the sample tubes. To these were added 0.5ml buffer solution containing phosphate buffer, L-alanine and α-oxoglutarate. The mixtures were thoroughly mixed and incubated for exactly 30 minutes at 37 °C ml and pH 7.4. 0.5ml of reagent containing 2, 4-dinitrophenylhydrazine was later added to both tubes while 0.1ml of sample was added to sample blank tube. The tubes were mixed thoroughly and incubated for exactly 20 minutes at 25 ° C.5.0ml of sodium hydroxide solution was then added to each tube and mixed. The absorbance was read against the blank after 5 minutes at 540nm.

Assay for Serum Aspartate Amino Transferase Enzyme:
Principle: AST or SGOT is measured by monitoring the concentration of oxaloacetate hydrazone formed with 2, 4-dinitrophenylhydrazine. The colour intensity is measured against the blank at 546nm.

Method: The blank and sample test tubes were set up in duplicates. 0.1ml of serum was pipetted into the sample tubes. 0.5ml of Reagent 1 was pipette into both sample and blank tubes. The mixtures were thoroughly mixed and incubated for exactly 30 minutes at 37°C ml and pH 7.4. 0.5ml of Reagent 2 containing 2, 4-dinitrophenylhydrazine was added into all the test tubes followed by 0.1ml of sample into the blank tubes. The tubes were mixed thoroughly and incubated for exactly 20 minutes at 25 ° C.5.0ml of sodium hydroxide solution was then added to each tube and mixed. The absorbance was read against the blank after 5 minutes at 546nm.

Determination of Serum Alkaline Phosphatase Enzyme:
Principle: The principle of this method is based on the reaction involving serum alkaline phosphatase and a colourless substrate of phenolphthalein monophosphate, giving rise to phosphoric acid and phenolphthalein which at alkaline pH values, turn pink that can be determined spectrophotometrically.

P-nitrophenylphosphate

$+ H_20 \rightarrow ALP \rightarrow PO_4^{2-} +$ P-nitrophenol (pink at pH=9.8)

Method: The blank and sample test tubes were set up in duplicates. 0.05ml of sample was pipette into the sample test tubes. 0.05ml of distilled water was pipetted into the blank tube. 3.0ml of substrate was pipette into each tube

respectively, which was then mixed and the initial absorbance taken at 405nm. The stop watch was started and the absorbance of the sample and the blank read again three more times at one minute intervals.

Calculation: alkaline phosphatase activity was calculated as follows:

$$\text{Activity of ALP (in U/L)} = \frac{\text{Absorbance of sample}}{\text{Absorbance of standard}} \times 100$$

Determination of Packed Cell Volume

Principle: When whole blood sample is subjected to a centrifugal force for maximum RBC packing, the space occupied by the RBCs is measured and expressed as percentage of the whole blood volume.

Method: Using microhaematocrit method, a well-mixed anticoagulated whole blood was allowed to enter capillary haematocrit tubes until they are approximately 2/3 filled with blood. Blood filling was done for each tube. One end of each tube was sealed with plastic seal and placed in the medial grooves of the centrifuge, head exactly opposite each other, with the sealed end away from the centre of the centrifuge. All tubes were spun for five minutes at 1000 rpm. The tubes were removed as soon as the centrifuge had stopped spinning.

Calculation: PCV was obtained for each tube using microhaematocrit-reader by measuring the height of the RBC column and expressing this as a ratio of the height of the total blood column.

$$\text{PCV (\%)} = \frac{\text{Height of cell column}}{\text{Height of total blood column}} \times 100$$

Determination of Red Blood Cells counts (RBCs)

Principle: When whole blood was diluted with an isotonic fluid, it prevents lysis and facilitates counting of the red cells. Some isotonic solutions in use include Hayem's solution, Gower's solution or 0.85% NaCl solutions.

Method: This was done using standard method as described in [13]. The blood sample was diluted in the ratio of 1:20 with 10%$NaCO_3$. The diluted sample was loaded into the Neubaer counting chamber with the aid of a Pasteur pipette. The RBC was counted from appropriate squares on the chamber under an electronic microscope.

Calculation:

The RBCs (in mm^3)

= cells counted × correction for volume × correction for dilution

= RBC counted in 5 small squares × 200 × 1.0/0.2 (or 50) n

= Number of RBC counted in five squares $\times 10^4$

\Statistical Analysis: Values obtained from liver function assay were expressed as mean ± SEM. The data obtained were statistically analyzed using one-way analysis of variance (ANOVA) with Turkey's multiple comparison, post hoc tests to compare the level of significance between control and experimental groups. The value of $p<0.05$ were considered as significant.

Percentage Yield of Methanol Extract:

Qualitative Phytochemical Analysis of *Talinum Triangulare:*

Effect of Methanol Extract of *Talinum Triangulare* on the Total Serum Alanine Amino Transferase Enzyme Concentration of Experimental Rats: After daily oral administration of *Talinum triangulare* extract (100,200and 400 mg/k.gb.w) for two weeks, there was no significant ($p>0.05$) difference in the total serum alanine amino transferase enzyme concentration of the test groups compared to the control. There was no significant ($p>0.05$) difference at varying doses of the extract. This is shown in Figure 2 below:

Effect of *Talinum Triangulare* on the Serum Aspartate Amino Transferase Enzyme Concentration of Experimental Rats: After a daily oral administration of *Talinum triangulare* (100,200,300/kg b.w) for two weeks, there was a significant ($p<0.05$) increase in the serum aspartate amino transferase enzyme concentration between the test groups and the control group. There was also a significant ($p<0.05$) decrease at varying doses of the extract. This is shown in Figure 3:

Effects of *Talinum Triangulare* Extract on the Serum Alkaline Phosphatase Enzyme Concentration of Experimental Rats: After a daily oral administration of *Talinum triangulare* (100,200,300/kgb.w) for two weeks, there was no significant ($p>0.05$) difference in the serum alkaline phosphatase enzyme concentration between the test groups and the control group. There was also no significant ($p>0.05$) difference at varying doses of the extract. This is shown in Figure 4:

Table 1: The percentage yield of methanol extract of the leaves of *Talinum triangulare* is shown:

Extract (g)	Percentage (%)
24.2 from 500g of pulverized leaves	4.84

The percentage yield of the extract was found to be 4.84%.

$$\text{Percentage yield}=\frac{24.2}{500}\times 100 = 4.84$$

Table 2: The result of the phytochemical composition of the leaves of *Talinum triangulare*

Component	Relative Abundance
1.Flavonoids	+++
2.Alkaloids	++
3.Glycosides	++
4.Reducing sugars	+
5.Saponins	+
6.Proteins	+++
7.Carbohydrates	+++
8.Fats and Oil	+
9.Tannins	+
10.Steroids	++
11.Resins	+++
12.Terpenoids	+++
13.Acidic compounds	-

Key - Not detected + Present in little amount ++ Moderately present +++ Present in large amount

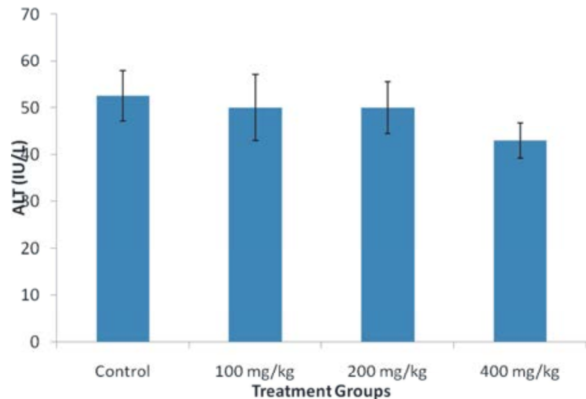

Fig. 2: Effect of *Talinum triangulare* on serum alanine amino transferase level of albino rats

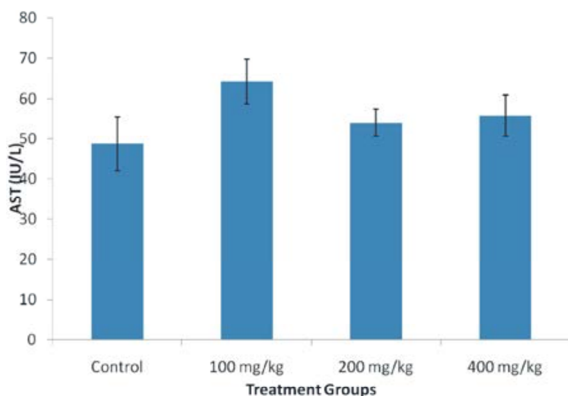

Fig. 3: Effect of *Talinum triangulare* on serum aspartate amino transferase level of albino rats

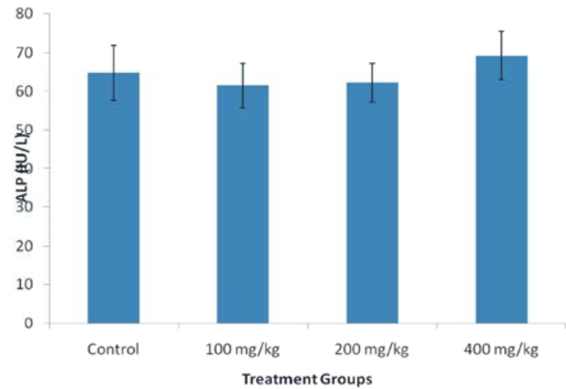

Fig. 4: Effect of *Talinum triangulare* on serum alkaline phosphatase level of albino rats

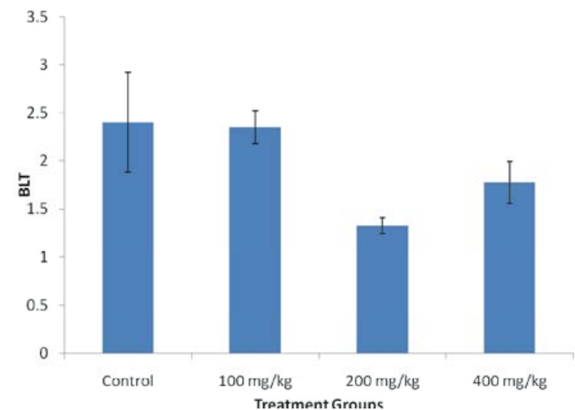

Fig. 5: Effect of *Talinum triangulare* on serum bilirubin level of albino rats

Effect of *Talinum Triangulare* Extract on the Serum Total Bilirubin Concentration of Experimental Rats: After a daily oral administration of *Talinum triangulare* (100,200,400/k.gb.w) for two weeks, there was a significant ($p<0.05$) decrease in the serum total bilirubin concentration between the test groups and the control group. There was also significant ($p<0.05$) difference at varying doses of the extract. The extract dose of 200mg/kg gave the lowest serum total bilirubin concentration. This is shown in Figure 5:

Effect of *Talinum Triangulare* Extract on the Serum Rbc Concentration of Experimental Rats: After a daily oral administration of *Talinum triangulare* (100,200,400/kgb.w) for two weeks, there was a significant ($p<0.05$) increase in the serum RBC between the test groups and the control group. There was a significant ($p>0.05$) difference at varying doses of the extract. The extract of 200mg/kg gave the highest RBC level. This is shown in Figure 6:

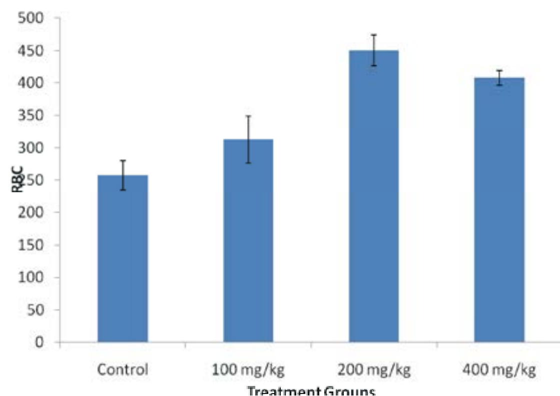

Fig. 6: Effect of Talinum triangulare on RBC level of albino rats

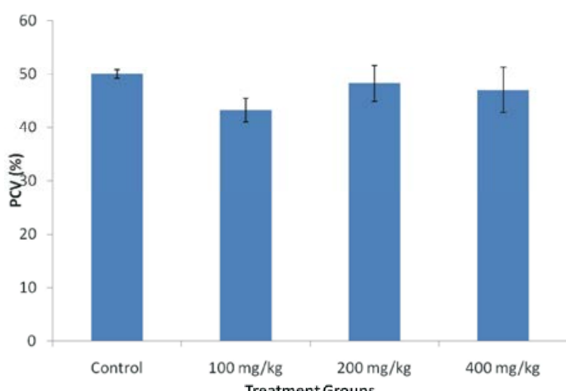

Fig. 7: Effect of Talinum triangulare on PCV level of albino rats.

Effect of *Talinum Triangulare* Extract on the Serum PCV Concentration of Experimental Rats: After a daily oral administration of *Talinum triangulare* (100,200, 400/kgb.w) for two weeks, there was a significant ($p<0.05$) decrease in the serum total PCV between the test groups and the control group. There was also no significant difference ($p<0.05$) at varying doses of the extract. This is shown in Fig 7:

Discussion, Conclusion and Suggestions for Further Study Discussions: The phytochemicals, haematological properties as well as the effect of methanol extract of the leaves of *Talinum triangulare* on liver parameters and liver marker enzymes was investigated in this study.

From the studies, the percentage yield of the extract was found to be 4.84%. The preliminary phytochemical screening of the plant extract revealed the presence of alkaloids and flavonoids in larger amounts while the saponins, tannins, resins, steroids and glycosides were in lower amounts as shown in (Table 2). This is an indication that the plant possesses some possible antioxidant activities which when properly harnessed could be used in the treatment and management of some diseases [13]. With the presence of these phytochemicals in the vegetable, it could therefore be used in the management of some diseases. This plant contained high amount of flavonoids. Flavonoids have been known to reduce oxidative stress and are used in the treatment of cardiovascular diseases [14]. The presence of alkaloid in plants contributes to the medical significance of *T. triangulare.* Alkaloids have been used as the stimulant of Central nervous system, in topical anaesthetic in opthamology, powerful pain relivers, anti puretic action, among other uses [15]. Tannins posseses antinutritional effects, this is due to their ability to reduce the palatability of food by complexing with protein making nutrients unavailable to the body. However, the value of tannins from this study was found to be low and did compare favorably with the work done by [16].

The administration of the methanol extract of *Talinum triangulare* at 100, 200 and 400/kg b.w had no effect on the level of alanine amino transferase and alkaline phosphatase ($p>0.05$), but the administration of the extract at these doses gave significant increase ($p<0.05$) in the levels of serum aspartate amino transferase and RBC but significant decrease ($p<0.05$) in PCV and bilirubin. This result is in a ccordance with the work of [17]. There was significant increase ($p<0.05$) in the AST levels at 100mg/kg dose and this could have been due to the physiological conditions of the animal because AST is also found in other organs of the body such as the heart, but at 200 and 400 mg/kg there was a decrease in AST when compared to the one at 100mg/kg. There was significant decrease in the PCV level of the rats. For the bilirubin concentration there was a significant decrease ($p<0.05$) between the control and the test groups. At 200mg/kg, the extract gave the lowest serum total bilirubin concentration. The RBC concentration was significantly increased when compared to the control and the highest RBC level was obtained at 200mg/kg. This shows that *T. triangulare* leaf could be used for treatment of disease conditions such as anaemia and could also be used by pregnant women and growing children to boost their blood level. The clearance of bilirubin from the blood shows that the plant could help the red cells stay longer and be used by the body. Since these vegetables are readily available almost everywhere, it means they are used by almost everyone including those in remote areas and so they have access to a lot of health benefits that is provided by this plant.

CONCLUSION

The results of the phytochemistry indicate that the leaves contain an appreciable amount of bioactive components. From the liver function enzyme activity test, it was revealed that a dose dependent suppression of oxidative damage in the liver cells was obtained following the administration of methanol extracts of *T. triangulare* ($P<0.05$). There were reductions in the serum hepatic marker enzymes, suggesting an overall protection of the hepatocyte. When this vegetable is consumed by humans and animals, it will contribute to the maintenance of the overall health of human and animal.

It can therefore be concluded that *T. triangulare* leaves could contribute significantly to the health management of man and should be recommended in our daily nutritional need.

Suggestions for Further Research: The effects of *Talinum triangulare* on liver function enzymes of rats have shown that the leaves of the plant have a promising role in the treatment of liver diseases by reducing the concentration of the enzymes in the blood. Further research should be done on the assay for the presence of antioxidant enzymes such as peroxidase, catalase and superoxide dismutase in *Talinum triangulare*. This will raise the prospects of exploiting the findings of this study towards the manufacture of potent life-saving drugs.

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