ISSN: 2536-7153 SJMLS

Sokoto Journal of Medical Laboratory Science 2024; 9(3): 57 - 65

SJMLS - 9(3) - 006

Effect of Dissostis Rotundofolia Stem Extract Consumption on Some Biochemical Parameters and Hepato- Renal Organs in Healthy Albino Rats.

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https://dx.doi.org/10.4314/sokjmls.v9i3.6

Abstract

This study explored the potential health benefits of *Dissotis rotundofolia*, a plant widely used in traditional African medicine. It is a common plant that has been reported to have a variety of ethno-medical uses in tropical Africa. The aim of this research work was to ascertain the effect of aqueous methanoic stem extracts of *Dissotis rotundofolia* on plasma triglycerides, glucose, plasma sodium concentration, aspartate aminotransferase, plasma cholesterol concentration, and glutamate pyruvate transaminase and their histomorphological changes in normal adult albino rats and to evaluate changes that depict architectural variations in their kidneys and liver sinusoids. Twenty-four (24) healthy albino rats aged six to seven weeks old with an average weight of 190 g were used for this study. They were obtained locally from the animal house of the Department of Pharmacology, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria. The rats were randomly divided into two groups, group 1 and group 2, of 12 rats. They were kept in standard cages and fed with distilled water and growers mash (Guinea Food Nigeria) for 2 weeks to acclimate to the new environment. After acclimatization for a period of two weeks, they were fasted overnight. Group 1, which served as the normal control, received distilled water, while the test groups received an aqueous leaf and stem extract of *Dissotis rotundofolia* at 2 ml/kg body weight. The results obtained from the experiment for glucose and triglyceride are presented statistically. We observed that there were improvements in liver and kidney function, as evidenced by reduced levels of aspartate aminotransferase and glutamate pyruvate transaminase. These findings suggest that *Dissotis rotundofolia* extracts may be a useful adjunctive treatment for managing diabetic conditions.

Introduction

Dissotis rotundofolia, commonly known as "pink lady," is a tropical African medicinal plant that is widely used in Tanzania (Kideghesho *et al., 2020*), Cameroon (Fokunang *et al*., 2011), Liberia (Saha *et al*., 2023), Nigeria (Iwueke, 2020), and Ghana (Bekoe *et al*., 2020). There have been reports of its folkloric use in traditional herbal medicine systems. It is a common plant that has been reported to have a variety of ethno-medical uses, particularly in treating gastrointestinal disorders, which is significant given the high prevalence of peptic ulcers in Nigeria, with about 300,000 cases reported annually (WHO, 2019). The plant contains bioactive compounds that contribute to its medicinal properties and is used in various forms as a food component (Yu *et al*., 2021). However, conventional treatments for peptic ulcers often have significant side effects, such as erectile dysfunction, diarrhoea, and hypergastrinaemia (Djanaev *et al*., 2023), highlighting the need for alternative therapies like those derived from *Dissotis rotundofolia*. *Dissotis rotundofolia* is a multipurpose perennial herb that grows from seeds and stolons. It has prostate-like or ascending stems that can reach a height of 40 cm. The leaves have three nerves, are oblong to oval-lanceolate or suborbicular, 1.5–7.0 cm long, 0.8–4.0 cm wide, and have ciliate to slightly crenate margins, an acute tip, a truncate base to short-attenuate base, and petioles that are 0.5–2.5 cm long. (Abere *et al*., 2010). The leaves are arranged opposite each other and are commonly ovate or ovate-lanceolate measuring about 1.5 – 6 cm in length and 1 – 2.5 cm

wide (Singh 2013), with petioles as long as 1.5 cm (Wunnenberg *et al*., 2021). Triacyl glycerides (TG), also known as triacylglycerol, are esters derived from glycerol and fatty acids (tri- + glyceride) Pundir & Narang (2013). They are primary components of body fat and are crucial in the bidirectional transfer of glucose and fat in the bloodstream (Malik *et al*., 2023). Glucose, a simple sugar essential for energy production, is regulated in the blood by insulin, with imbalances leading to diabetes mellitus (Alshammari *et al.*, 2022). Hyperglycaemia and hypoglycaemia are terms used to describe consistently high and low glucose levels, respectively. Diabetes mellitus, the most common condition associated with improper blood sugar management, may be indicated by a high fasting glucose level. Sodium is an essential element for cellular function and osmoregulation, and its levels must be maintained within a narrow range to prevent conditions like hypernatremia and hyponatremia (Meneses-Sagrero *et al*., 2022). Cholesterol is a steroid lipid with the formula C27H46O, found in the cell membranes of all body tissues, and transported in the blood plasma, of all animals. Even while cholesterol is necessary for the body in many ways, having too much of it in the blood can be harmful (Upadhyay, 2023). When blood cholesterol reaches high levels, it can build up on artery walls, increasing the risk of blood clots, heart attack, and stroke. Enzymes such as Glutamate Pyruvate Transaminase (GPT) and Aspartate Aminotransferase (AST) are crucial biomarkers for liver and heart health, with elevated levels indicating tissue damage (Seth *et al., 2021*). *Dissotis rotundofolia* is rich in C-glycosyl flavones, namely, vitexin, isovitexin, orientin, and isoorientin which have demonstrated pharmacological effects such as anti-diarrhea effects, antimicrobial, and anti-trypanosomiasis (Adinortey *et al*., 2020). This research aims to ascertain the effect of aqueous and methanoic leaves and stem extracts of *Dissotis rotundofolia* on various biochemical parameters in normal adult albino rats. The study will assess changes in plasma triglycerides, glucose, plasma sodium concentration, aspartate aminotransferase, plasma cholesterol concentration, and glutamate pyruvate transaminase along with structural variations in the liver and kidneys to evaluate changes that depict architectural variations in their kidneys and liver sinusoids.

Materials and Method:

Equipment/Apparatus.

Centrifuge (model no; A C. 2304); Visible spectrophotometer (S23A Gulfex Medical and Scientific, England. Volt: Freq: 50Hz, 40W, NO: 23A); Electronic thermostatically controlled water bath (Model HH. W21. Cr4II 2004, 11, power a.c. 220v, 50Hz, 825W, temperature range 37-100°C, variation $\pm$ 0.5°C, No GCO43078) and weighing balance 770-15, Germany.

Chemical Reagents

All chemical Reagents used were of analytical grade, Manufactured by Randox Laboratories Limited, England, and were obtained from a commercial supplier, Effective Medical Laboratories, Island, Lagos state, Nigeria.

Experimental Animals

Twenty-four (24) healthy female albino rats aged six to seven weeks old with an average weight of 190g were used for this study. They were obtained locally from the Animal House of the Department of Pharmacology, Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria. The rats were randomly divided into two groups, group 1 and group 2 of 12 rats. They were kept in standard cages and fed with distilled water and growers mash (Guinea food Nigeria) for 2 weeks to acclimatize to the new environment. After acclimatization for a period of two weeks they fasted overnight, group 1 which served as normal control received distilled water while the test groups received aqueous leaf and stem extract of *Dissotis rotundofolia* at 2ml/kg body weight.

Feed

The rats were fed with pelleted growers' mash twice daily (morning and evening)

Source of Sample (*Dissotis rotundofolia*) Stem

The *Dissotis rotundofolia* was collected from the environment of the College of Health Science, Niger Delta University, Bayelsa State, Nigeria.

Preparation/Treatment of Sample

Dissotis rotundofolia stems were cut into pieces with the aid of a knife and sun-dried. When properly dried, the sample was ground into a powder with the aid of an electric blender. With the aid of a standard weighing balance, 240g of

samples were macerated in 2400ml of distilled water (1g/10ml) and stirred periodically for about 3 days. The macerated samples were filtered with a sieve to eliminate particles after 72 hours. The filtrates collected were then concentrated in a water bath to yield thick brown viscous pastes.

Administration of Aqueous Stem Extract
Aqueous stem extract of *Dissotis rotundofolia* was administered to the experimental rats orally twice a day (morning and evening) throughout the duration of the experiment (28 days) with the aid of gavage, at the dose of 2ml/kg body weight.

Experimental Design
The healthy albino rats after acclimatization of two weeks were randomly put into two groups of twelve (12) rats each as follows.

Group 1 (control): received pelleted grower mash and distilled water throughout the experiment (28 days)
Group 2 (test): administered aqueous stem extract of *Dissotis rotundofolia* orally (twice daily) and had access to pelleted grower mash and distilled water throughout the experiment (28 days)

Weight of Animals
The weights of animals were measured at the commencement of the experiment and subsequently every week throughout the duration of the experiment

Collection of Blood Samples and Organs
The tail of the restrained rat was cleansed with a ball of cotton wool soaked in methylated spirit. A little Vaseline was then smeared on the tail to reduce friction while massaging to redness. Gentle massage towards the tip of the tail continued until the tip became red; a sign of blood accumulation. The red tip of the tail was then slightly and carefully incised with a new and sterilized blade and further massaged gently as the blood trickled into immobilized universal sample tubes without anti-coagulant (for glucose and triglyceride assay). Cotton wool soaked in methylated spirit was again used to cleanse the incised area of the tail. After 5 minutes serum was decanted from the universal sample tubes kept on the side bench under room temperature (28 C) and used for all biochemical analyses carried out immediately.

Assays of Biochemical Parameters
The glucose and triglyceride assay were done in agreement with the procedure described by Randox Laboratories Ltd, United Kingdom. Below is the biochemical assay used in carrying out the research work.

Glucose Assay
Principle: It is based on the oxidation of glucose-by-glucose oxidation (GOD) to gluconic acid and hydrogen peroxide. The formed hydrogen peroxide (H2O2) is detected by a chromogenic oxygen acceptor, phenolaminophenazone in the presence of peroxidize (POD) and phenol
Glucose + O2 + H2O GOD H2O2 + gluconic acid.
H2O2 + phenol 4-AP POD Quinone + 4H2O

The intensity of the color formed is proportional to the glucose concentration in the sample.

Procedure:
The reagents and samples were brought to room temperature. 1000µl of reagent and 10µl of plasma sample were added into eight test tubes (the plasma was not added into the standard and reagent blank test tubes, only the reagent), Then 10µl of standard (cal) was added into the standard test tubes and 10µl of distilled water into the reagent blank test tube using a micropipette and mixed thoroughly. They were incubated at 37°C for 10 minutes. The absorbance (Abs) values of the samples and standard were read at 546nm against the reagent blank with the aid of a spectrophotometer. The absorbance (Abs) of the sample was read against a reagent blank.

Calculations
The Glucose concentration was calculated as:
mg/dl =Absorbance sample/Absorbance Standard x Standard glucose conc. (mg/dl)

Triglyceride Assay
Principle:
The method is based on the enzymatic hydrolysis of serum or plasma triglyceride to glycerol and free fatty acids (FFA) by lipoprotein lipase (LPL). Glycerol is phosphorylated by adenosine triphosphate (ATP). In the presence of glycerol kinase (GK) to form glycerol-3-phosphate (G-3-

P) and adenosine diphosphate (ADP). Glecrol is oxidized by glycerophosphate oxidase (GPO) to form dihydroxyacetone phosphate (DHAP) and hydrogen peroxide.

A red chromogen quinone imine is produced by the perioxidase (POD) catalyzed coupling of 4-aminoaphenazone (4-AA) and chlorophenol with hydrogen peroxide (H2O2) where colour integrity proportional to the concentration of triglyceride in the sample.

Triglycerides + 3H2O LPL Glycerol + 3FFA
Glycerol + ATP GK Glycerol-3-P + ADP
Glycerol-3-P + O2 GPO DHA + H2O2
4-AA + 4 Phenol H2O2 Quinoneimine + H2O

Procedure:
The reagents and samples were brought to room temperature. 1000µl of reagent and 10µl of plasma was transferred into 8 test tubes (the plasma is not added into the standard and reagent blank test tubes, only the reagent), then 10µl of standard (cal) into the standard test tubes and 10µl of distilled water into the reagent blank test tube using a micropipette and mixed thoroughly, incubated at 37°C for 10 minutes. The absorbance (A) value of the samples and standard were read at 546nm against the reagent blank with the aid of a spectrophotometer

Calculations
The triglyceride concentration was calculated as: mg/dl =Absorbance of sample/ Absorbance of Standard x A Standard triglyceride conc. (mg/dl)

Result
The result obtained from the experiment for glucose and triglyceride is presented statistically in Tables 1 to 6 as shown below. Tables 1 and 5 show the mean plasma glucose concentration. Tables 2 and 4 show the mean plasma triglyceride concentration in rats after 28 days of administration of sample. Tables 3 and 6 show the mean weight of the rat periodically taken. The result obtained from the experiment shows that glucose increased while triglyceride decreased.

Table 1: Mean plasma Glucose Concentration (mg/dl) of normal rats administered aqueous stem extract of *Dissotis rotundofolia.*

Day	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Control	1.20±1.48	1.01±0.09	1.18±0.07	0.87±0.07	0.91±0.22	0.70±0.47	0.63±0.11
Test	1.44±0.70	1.11±0.10	1.29±0.20	0.92±0.04	1.13±0.05	0.98±0.18	1.13±0.11

Each value represents the mean standard deviation. Statistical significance occurred at $p<0.05$

Table 2: Mean Plasma triglyceride concentration (mg/dl) of normal rats administered aqueous stem extract of *Dissotis rotundofolia.*

Day	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Control	1.20±0.28	1.01±0.09	1.18±0.07	1.18±0.26	1.00±0.13	0.58±0.03	0.44±0.24
Test	1.44±0.70	1.11±0.10	1.29±0.20	1.30±0.10	0.95±0.07	0.75±0.21	0.20±0.10

Each value represents the mean standard deviation. Statistical significance occurred at $p<0.05$

Table 3: The mean weight of normal rats administered aqueous stem extract of *Dissotis rotundofolia.*

Days	Day0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Control	180.3	191.4	197.5	200.1	200.9	202.0	203.4
Test	180.5	176.9	167.1	165.7	156.3	149.7	146.3

Each value represents the mean weight (in grams) of the rats used for the experimental procedure.

Table 4: Mean plasma concentration of triglyceride (mg/dl) in normal albino rats administered aqueous leaf extract of *Dissotis rotundofolia*.

Groups/ Days	*Day 0*	*Day 1*	*Day 6*	*Day 12*	*Day 18*	*Day 24*	*Day 28*
Control	573.00±255.236	73.67±27.163	273.33±115.632	387.33±178.655	178.00±3.786	466.67±80.683	137.83±23.786
Test	630.00±180.290	146.67±53.778	638.00±42.142	485.00±34.664	160.33±23.140	359.00±251.407	118.33±25.912

Values are represented as MEAN ± SE of duplicate determinations. Mean with the same superscript letters are not statistically different at 95% confidence limit ($p<0.05$) one-way analysis of variance (ANOVA) ± Tukey-Kramer multi-comparison test.

Table 5: Mean plasma concentration of glucose(mg/dl) in normal albino rats administered aqueous leaf extract of *Dissotis rotundofolia*.

Groups/ Days	*Day 0*	*Day 1*	*Day 6*	*Day 12*	*Day 18*	*Day 24*	*Day 28*
Control	126.33±11.020	134.67±11.050	152.67±13.776	127.00±26.52	46.33±4.631	283.00±49.813	142.33±16.895
Test	123.33±6.642	133.00±12.166	175.67±17.072	143.67±14.881	59.00±1.528	157.67±60.212	164.00±4.619

Values are represented as MEAN ± SE of duplicate determinations. Mean with the same superscript letters are not statistically different at 95% confidence limit ($p<0.05$) one-way analysis of variance (ANOVA) ± Tukey-Kramer multi-comparison test.

Table 6: **Mean weight of rats administered aqueous leaf extract of *Dissotis rotundofolia***

Groups/Days	*Basal*	*Day 0*	*Day 1*	*Day 6*	*Day 12*	*Day 18*	*Day 24*	*Day 28*
Control	180	180	180	200	200	193	200	193
Test	193	193	193	173	173	160	146	146

Histological Findings and Explanations of Rats Administered With Aqueous Stem Extract of *Dissotis Rotundofolia* (Day 0, 1, 6, 12, 18, 24 and 28)

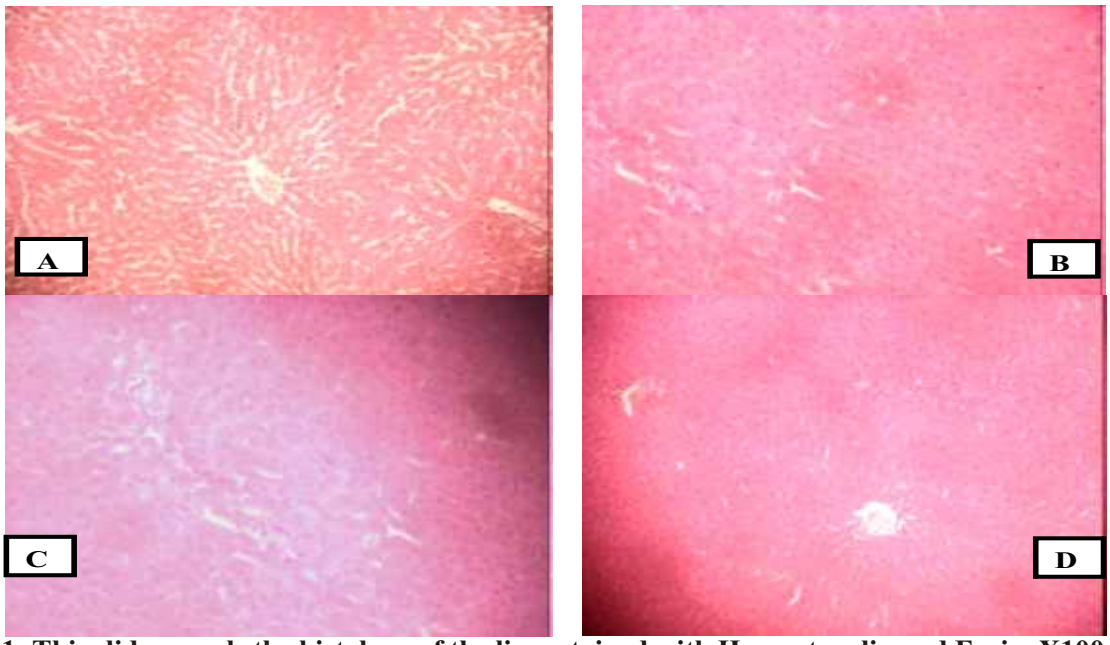

Figure 1: This slide reveals the histology of the liver stained with Haematoxylin and Eosin, X100 Slide A (Control) shows normal hepatic stroma with Hepatocytes, Sinusoid, and central vein. B, C and D are similar to the control. No significant changes were observed.

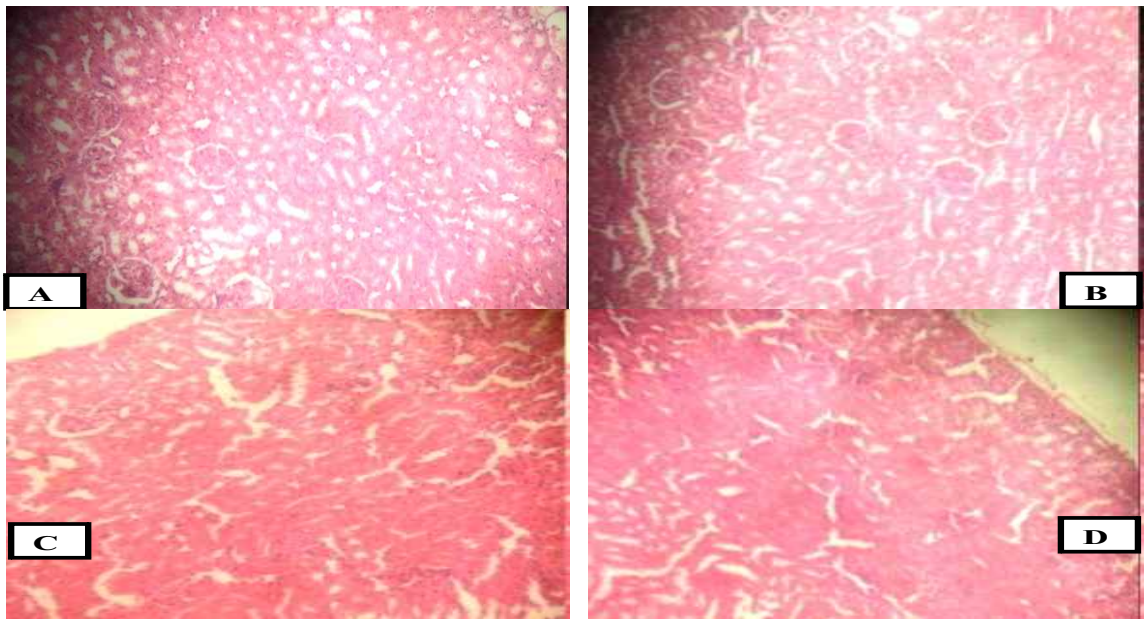

Figure 2: Slides show the histology of the Kidney stained with Haematoxylin and Eosin, X100
Slide A (Control) shows normal kidney stroma with Bowman's capsule with glomerulus (renal corpuscle) and renal tubules. B is similar to the control while C and D have fewer renal corpuscles in their cortex.

Histological Findings and Explanations of Rats Administered With Aqueous Leave Extract of *Dissotis Rotundofolia* (Day 0, 1, 6, 12, 18, 24 And 28)

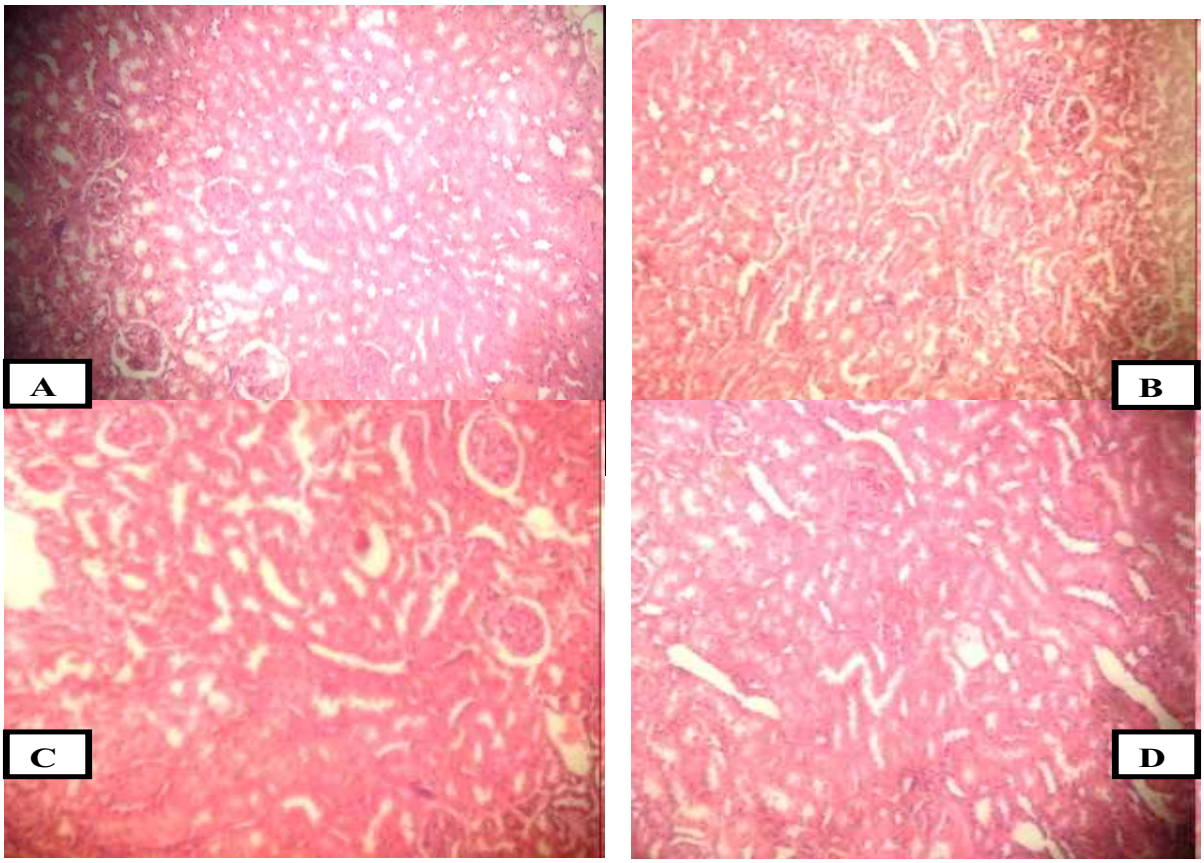

Figure 3: Shows the histology of the Kidney stained with Haematoxylin and Eosin, X100
Slides A (control), B, C, and D show normal kidney stroma with Bowman's capsule with glomerulus (renal corpuscle) and renal tubules

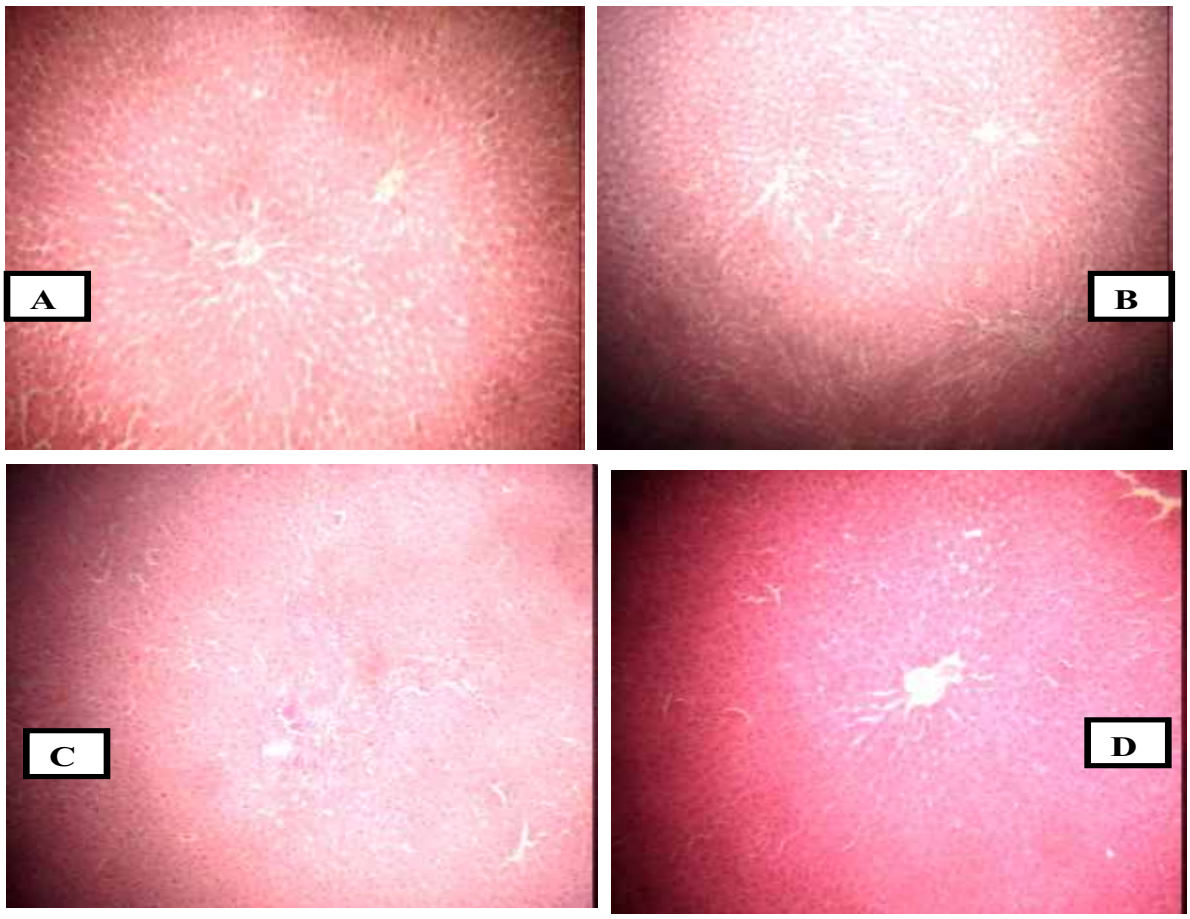

Figure 4: Shows the histology of the liver stained with Haematoxylin and Eosin, X100
Slide A (Control) shows normal hepatic stroma with Hepatocytes, Sinusoid, and central vein. B, C, and D are similar to the control

Discussion

The hypoglycaemic potentials of medical plants have been documented (Mohammed*, et al*., 2023). The result of this study confirms the earlier report on the hypoglycaemic effect of the leaf extract of *Dissotis rotundofolia* in rabbits. Although several biologically active constituents were reported present in the extract. The prompt and remarkable reduction in both plasma glucose and triglyceride points to a mechanism of action different from that of sulphonylureas and unrelated to insulin secretion from pancreatic β-cells. It is now widely believed that an important signal for insulin secretion maybe the link between glucose and lipid metabolism; and long-term exposure of islet cells to high levels of fatty acids may result in β-cell dysfunction (lipotoxicity), and diminished glucose-stimulated insulin secretion (Guo *et al., 2023*). It has been established that hyperlipidemia does not only increase the risk of ischaemic heart disease (HD) in diabetic patients but also may impair glycaemic control, accelerates the progression of renal insufficiency, and increases mortality (Akbar, 2020). In this study, *D. rotundifolia* evinced a potent lowering of plasma triglyceride levels in both normoglycemic and diabetic rats. Adequate treatment of diabetes dyslipidemia through diet is critical in reducing risk and complications, and the role of medicinal plants in the treatment of diabetes is emerging. A high fiber content that reduces insulin secretion was used in the management of hyperlipidaemia in diabetic patients (Wolever, 2023). Furthermore, the effectiveness of the leaf extract of *Trigonella foenum, L, hymenocardia acids*, and *Munaya koenigii* as a cholesterol and triglyceride lowering agent has been reported (Devi and Raju 2020). The leaves were reported to contain soluble fibers, which decrease triglyceride absorptions and bile acids reabsorption by disrupting the intraluminal formation of micelles (Devi and Raju 2020). When compared to the aqueous leaf extract of

Dissotis rotundofolia, similar mechanisms of action are suspected due to its high fiber content. *D. rotundifolia* has been shown in this study to decrease weight gain in rats. Although the mechanism of weight reduction was not explored, it may be related to its lipid-lowering effect. The ability of the extract to reduce both plasma triglyceride and glucose concentrations is remarkable. Continual administration of aqueous leaf extract of *Dissotis rotundofolia* may cause a significant decrease in mean Plasma triglyceride and glucose levels. Studies have shown also that type 1 diabetics who consumed aqueous leaf extract of *Dissotis routundifolia* have lower blood glucose levels and type 2 diabetics may have improved blood sugar, lipids, and insulin levels. Furthermore, compared to the control group, the Wistar albino rats treated with all dose levels of *Dissotis rotundofolia* leaf extract did not show signs of aggressiveness, vomiting, respiratory distress, salivation, and sedation. No mortality was recorded at all dose levels (2ml/kg body weight) of *Dissotis rotundofolia* leaf extract over the 24-h period. Daily observation over the 28 days post-treatment did not reveal evidence of latent *Dissotis rotundofolia* leaf extract-related toxicities. Histological tests have shown that aqueous leaf extract of *Dissotis rotundofolia* did not have any adverse effect on the liver and kidney of the rats while administration of aqueous stem extract of *Dissotis rotundofolia* demonstrated a significant increase in plasma glucose concentration ($P<0.05$). Aqueous stem extract of *Dissotis rotundofolia* demonstrated a statistically significant decrease in triglyceride concentrations in normal rats ($P<0.05$), loss of appetite and general body weakness were observed in the rats, and this led to a decrease in their body weight. The extract may not be advisable for diabetic patients as a study reveals daily consumption of stem extract of *Dissotis rotundofolia* is harmful for diabetic patients.

D. rotundifolia is very abundant and relatively cheap. This experiment may justify the use of this extract in the treatment of various diseases such as rheumatism, dysentery, venereal diseases, and stomach ailments and is also recommended as dietary inclusion for diabetics.

Conclusion

The aqueous leaf extract of *Dissotis rotundofolia* has been found to be of clinical value in lowering mean plasma triglyceride and glucose concentrations if it could be translatable to human clinical studies, though this effect is marginal which may be due to the duration of administration. Studies have also revealed that aqueous leaf extract of *Dissotis rotundofolia* contains alkaloids, Flavonoids, phenols and polyphenols, tannins, and saponins. phenols and polyphenols are strong antioxidants that prevent oxidative damage to biomolecules such as DNA, lipids, and proteins which play a role in chronic diseases such as cancer and cardiovascular diseases. Flavonoids contain biological and pharmacological activities such as anti-allergic, anti-inflammatory, antioxidant, and antimicrobial activities. Tannin has antimicrobial activities. Saponin bind to bile salt (Aja *et al.,* 2015). The significant reduction in both plasma triglyceride and glucose concentrations observed in this study may help in alleviating some of the complications associated with diabetic conditions.

Conflict of Interest: There is no conflict of interest in whatsoever form.

Reference

Abere, T. A., Okoto, P. E., & Agoreyo, F. O. (2010). Antidiarrhoea and toxicological evaluation of the leaf extract of Dissotis rotundofolia Triana (Melastomataceae.

Adinortey, M. B., Ansah, C., Aboagye, B., Sarfo, J. K., Martey, O., & Nyarko, A. K. (2020). Flavonoid-Rich Extract of Dissotis rotundofolia Whole Plant Protects against Ethanol-Induced Gastric Mucosal Damage. Biochemistry Research International; 2020(1): 7656127.

Aja, P. M., Alum, E. U., Ezeani, N. N., Ibiam, U. A., & Egwu, C. (2015). Comparative phytochemical evaluation of Dissotis rotundofolia root and leaf. Global Veterinaria; 14(3): 418-424.

Akbar, S. (2020). Handbook of 200 medicinal plants: a comprehensive review of their traditional medical uses and scientific justifications.

Alshammari, M. K., Ghazwani, J. A., Alsharari, F. O., Alotaibi, S. S., Alotaibi, R. M., Alsayahani, A. A., ... & Arshad, M. F. (2022). An update on microneedles in insulin delivery: quality attributes, clinical status and challenges for clinical translation. Journal of Drug Delivery

Science and Technology; 75: 103668.
Bekoe, E. O., Agyare, C., Boakye, Y. D., Baiden, B. M., Asase, A., Sarkodie, J., ... & Nyarko, A. (2020). Ethnomedicinal survey and mutagenic studies of plants used in Accra metropolis, Ghana. Journal of Ethnopharmacology; 248: 112309.
Devi, P., & Raju, B. (2020). Synthesis of Different Dipeptides From 4-Hydroxy Isoleucine and Evaluation of Their Anti-Diabetic Activity.
Djanaev, G. Y., Kh, K., Askarov, O. O., & Sultanov, S. A. (2023). Pharmacotherapy of Gastropathy (Literature Review). Texas Journal of Medical Science; 17: 67-76.
Fokunang, C. N., Ndikum, V., Tabi, O. Y., Jiofack, R. B., Ngameni, B., Guedje, N. M., Tembe-Fokunang, E. A., Tomkins, P., Barkwan, S., Kechia, F., & Asongalem, E. (2011). Traditional medicine: Past, present and future research and development prospects and integration in the National Health System of Cameroon.
Guo, H., Guo, D., An, M., Zhang, R., Wang, C., & He, J. (2023). Angiotensin-(1-7) Improves Islet β-cell Dedifferentiation by Activating PI3K/Akt/FoxO1 Pathway. Protein and Peptide Letters; 30(12): 1009-1019.
Iwueke, V. A., & Chukwu, C. E. (2020). Ethnotherapeutic profile of medicinal plants used during postnatal recovery (postpartum) in South Eastern Nigeria: a review. Archives of Current Research International; 20(5): 31-41.
Kideghesho, J. R., Mseja, G. A., Nyakunga, O. C., & Dulle, H. I. (2020). Conservation of large mammals in the face of increasing human population and urbanization in Tanzania. Protected Areas in Northern Tanzania: Local Communities, Land Use Change, and Management Challenges: 157-179.
Malik, D., Narayanasamy, N., Pratyusha, V. A., Thakur, J., & Sinha, N. (2022). Textbook of Nutritional Biochemistry. Springer Nature Singapore.
Meneses-Sagrero, S. E., Rascón-Valenzuela, L. A., García-Ramos, J. C., Vilegas, W., Arvizu-Flores, A. A., Sotelo-Mundo, R. R., & Robles-Zepeda, R. E. (2022). Calotropin and corotoxigenin 3-O-glucopyranoside from the desert milkweed Asclepias subulata inhibit the Na+/K+-ATPase activity.
Mohammed, A. (2023). Hypoglycemic potential of African medicinal plants in diabetic and non-diabetic human subjects: a review. Clinical Complementary Medicine and Pharmacology; 3(2): 100081.
Piero, M. N., Njagi, J. M., Kibiti, C. M., Ngeranwa, J. N., Njagi, E. M., & Miriti, P. M. (2012). The role of vitamins and mineral elements in management of type 2 diabetes mellitus.
Pundir, C. S., & Narang, J. (2013). Determination of triglycerides with special emphasis on biosensors. International Journal of Biological Macromolecules; 61: 379-389.
Saha, N. C., Ghosh, D., & Singh, A. (2023). Nutritional and Medicinal Uses of Baobab Tree. About the Editor: Dr. Debabrata Das, 229.
Seth, E., Ahsan, A. U., Bamrara, P., Kaushal, S., Sharma, V. L., & Chopra, M. (2021). Cytoprotective and antioxidant potential of Aegle marmelos on cadmium-induced hepato-renal toxicity: an in vivo study. Biologia; 76(6): 1859-1872.
Singh, D. (2013) Morpho-Taxonomic Studies in The Flora of Wamakko Local Government Area, Sokoto State, Nigeria.
Upadhyay, R.K. (2023). High Cholesterol Disorders, Myocardial Infarction and Its Therapeutics. World Journal of Cardiovascular Diseases; 13(8): 433-469.
Wolever, T.M. (2023). Total fibre vs types and sources of fibre in subjects with and without diabetes: role of molecular weight and viscosity. Bioactive Carbohydrates and Dietary Fibre; 29: 100349.
Wunnenberg, J., Rjosk, A., Neinhuis, C., & Lautenschläger, T. (2021). Strengthening structures in the petiole–lamina junction of peltate leaves. Biomimetics; 6(2): 25.
Yu, M., Gouvinhas, I., Rocha, J., & Barros, A. I. (2021). Phytochemical and antioxidant analysis of medicinal and food plants towards bioactive food and pharmaceutical resources. Scientific Reports; 11(1): 10041.

Citation: Ilegbedion Ikhide Godwin, Egoro Tombra Emmanuel, Beredugo Sylvanus, Chukwuedo Judith Nkechi. Effect of *Dissostis Rotundofolia* Stem Extract Consumption on Some Biochemical Parameters and Hepato- Renal Organs in Healthy Albino Rats. ***Sokoto Journal of Medical Laboratory Science*; 9(3): 57 – 65.** https://dx.doi.org/10.4314/sokjmls.v9i3.6