ISRG Journal of Multidisciplinary Studies (ISRGJMS)

ISRG PUBLISHERS
Abbreviated Key Title: isrg j. multidiscip. Stud.
ISSN: 2584-0452 (Online)
Journal homepage: https://isrgpublishers.com/isrgjms/
Volume – III, Issue - VII (July) 2025
Frequency: Monthly

STUDY ON PANCREATIC ACTIVITY OF WISTAR ALBINO RATS EXPOSED TO *COSTUS AFER* STEM EXTRACTS

Oforibika George Adieboye[1*], Collins Obia[2]

[1, 2] Department of Science Laboratory Technology Captain Elechi Amadi Polytechnic Rumuola, Port Harcourt.

| **Received:** 06.07.2025 | **Accepted:** 14.07.2025 | **Published:** 24.07.2025

***Corresponding author:** Oforibika George Adieboye
Department of Science Laboratory Technology Captain Elechi Amadi Polytechnic Rumuola, Port Harcourt.

Abstract

Worsening economic times has led to a surge in the use of different parts of medicinal plants in the treatment of various chronic diseases including diabetes mellitus.

Objective: *Evaluate the histolopathological effects of oral administration of aqueous stem extracts of Costus afer stem on the pancreatic tissue.*

Methods: *Twenty-four wistar albino rats weighing between 132g and 160g were used in this study. Group A served as control and these rats were treated with distilled water. Rats in the groups B, C, and D were treated with 3 different doses of the sample (500mg, 1,000mg and 1500mg/KgBW) respectively. Samples were administered once daily for 14, 28 and 42 days consecutively. Animals were sacrificed 24 hours after the last treatment*

Results: *Results obtained showed that there was distorted pancreatic histoarchitecture at all doses and durations of exposure.*

Conclusion: *Crude stem juice of Costus afer had deletrious effects on the pancreas and such care shoulod be taken in using it amongst the diabetic and general population.*

Keywords: *Costus afer aqueous stem extract pancreas diabetes mellitus*

DOI: 10.5281/zenodo.16409121

INTRODUCTION

Costus afer is a monocot, creeping rhizome usually about four metres in height, found in the Forest belt of Tropical africa. There are over 70 species found in Tropical Africa, Tropical America and South-East Asia (1, 2). It has a long and varied history of use both as a medicinal plant, for crafts and for religious purposes amongst various indigenous tribes in Africa (3).

Amongst the Ahoada tribe in Nigeria it is used as a cane to whip witches and remove evil spirits that possess humans. The Bayelsa and Edo States of Nigeria use it as a wrapping material for foods (4). Most tribes use the parts including leaf, stem and rhizomes to treat malaria, diabetes, arthritis, wounds, stomach problems, measles amongst others (5,6). It's also believed to scare away evil doers when used in fencing houses. Its parts are rich in carbohydrates, fat, ash, vitamins B, C and E and fibre (7). Phytochemistry of its parts show alkaloids, phenols, saponins, tannins and glycosides are present (8).

The exhaustion of insulin in the pancreas is important in the pathogenesis of diabetes. The pancreas plays a role in both exocrine (needed for digestion) and endocrine (needed to ensure glucose utilization) physiologies of the human body. The antidiabetic claims of this multipurpose tradomedicinal plants led the researchers to investigating the effect of this stem extracts on the pancreas of wistar albino rats,

MATERIALS AND METHOD

Plant collection and identification: *Costus afer* stems were purchased from Isiokpo market in Ikwerre Local Government Area of Rivers State. The plant specimen was confirmed by Mr Ezekiel, a Botanist at the Department of Science Laboratory Technology, Captain Elechi Amadi Polytechnic, Port Harcourt Rivers State.

Sample preparation: The stem were weighed (500g), thoroughly washed with distilled water and crushed with a blender at room temperature. Extraction was done by maceration with distilled water and finally converted to powder form at 40^0C in a hot air oven. Powder was stored at -20^0C for future use.

Specimen (animal) used for the experiment: Twenty-four (24) albino rats were purchased from animal house of the Department of Biochemistry, University of Port Harcourt, Choba Park. The animals were fed with rat pellets, water and libitum.

Chemicals and reagents: All chemicals and reagents used in this study were obtained from Randox Laboratories UK.

Preparation of Drug solution for administration: 500mg, 1000mg and 1,500mg of the preparation was given to the rats each day corresponding to their respective groups.

Experimental procedure: A total twenty-four (24) albino rats of weight range (132-160g/BW) were randomly divided into four groups labelled A, B, C and D where group A served as control and rats (n=3rats/dose) were treated with distilled water. Rats in groups B, C and D (n = 3 rats/dose) were orally treated with 3 different doses of the stem extract 500mg, 1000mg and 1500mg for 14, 28 and 42 days respectively. Animals were sacrificed twenty-four (24) hours after last treatment.

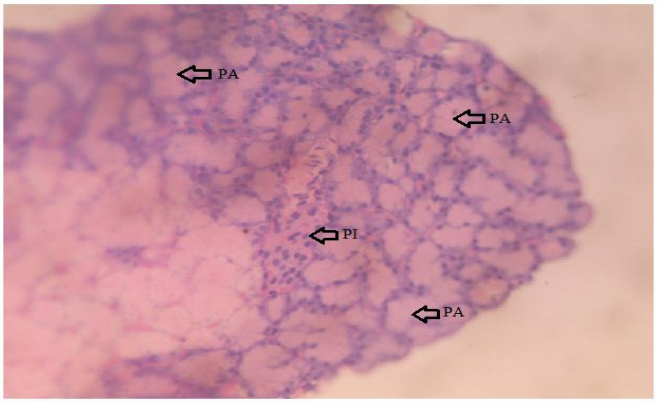
Organ collection:. The animal was dissected and only the pancreas was collected for pathological studies.

Histological procedures and analysis: The pancreas was cut on slabs about 0.5cm thick and fixed in 10% normal saline for a day after which they were transferred to 70% alcohol for dehydration. The tissues were passed through 90% alcohol and chloroform for different durations before they were transferred into two changes of molten paraffin wax for 20mins each in an oven at 57%. Several sections of the 5µm thick were obtained from a solid block of tissue and were stained with hematoxylin and eosin staining after which they were passed through a mixture of equal concentration of xylene and alcohols, following clearance of xylene, the tissues were oven dried. Photomicrographs were taken with a JVC colour video digital camera (JVC China) mounted on an Olympus light microscope (Olympus UK Ltd Essex, UK) to demonstrate cytoarchitecture of the pancreas.

RESULT AND DISCUSSION

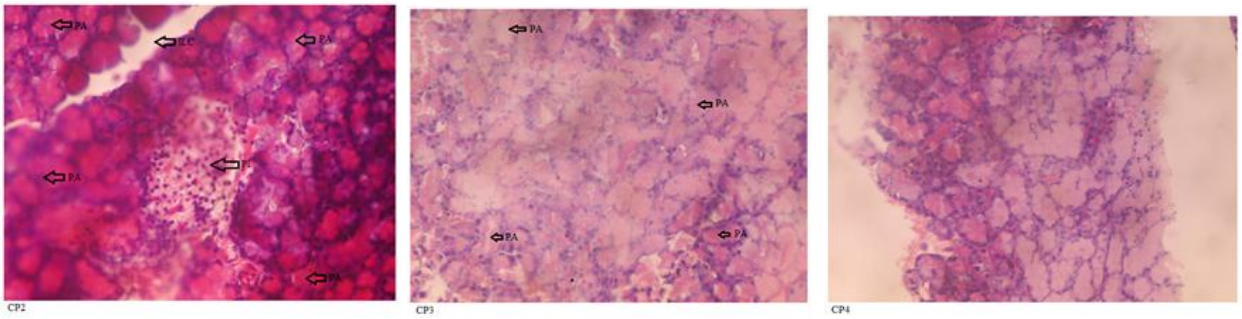
Histology

Fig1: control



Slide CP1 (control)- showing normal pancreatic histology with pancreatic islets containing alpha, beta and delta cells. Pancreatic acini also seen.

Fig2: 14 days

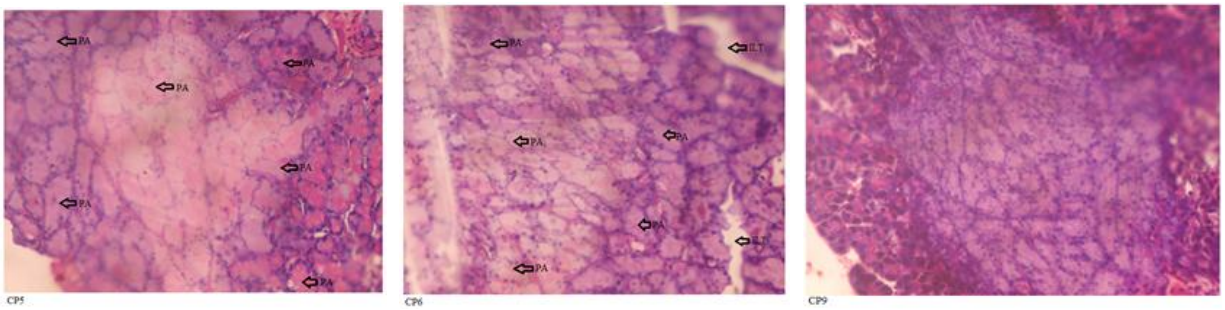


Slides CP2(500mg/kgbw)- showing pancreatic iclet that is twice the size of control(CP1), with numerous cells.

Slide CP3 (1000mg/kgbw) and Slide CP4 (1500mg/kgbw)- pancreatic islets not visible, may have been destroyed.

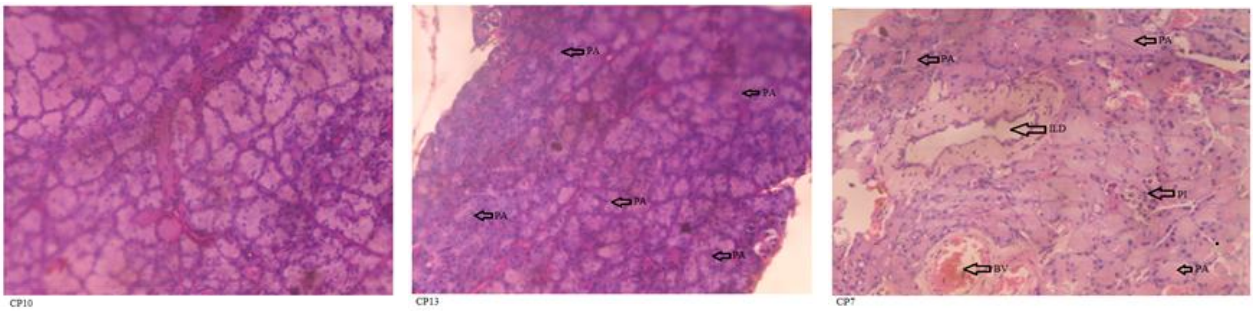
DOI: 10.5281/zenodo.16409121

Fig3: 28 days



Slide CP5 (500mg/kgbw), Slide CP6 (1000mg/kgbw) and Slide CP9 (1500mg/kgbw)- showing absent pancreatic islets and interlobular connective tissue.

Fig4: 42 days



Slide CP10 (500mg/kgbw) and Slide CP13 (1000mg/kgbw)- showing absent pancreatic islets. Slide CP7 (1500mg/kgbw)- showing atrophic pancreatic islet with few alpha, delta and beta cells and congested blood vessels.

Our study showed normal pancreatic histology with the control group but varying degrees of pancreatic damage in all treatment groups irrespective of dose and duration. The damages ranged from hypercellularity and hypertrophy of cells, congested blood vessels, absent pancreatic acini and reduction in the size and amounts of cells where atrophic pancreatic acini were seen. This is not supported by the studies done (9) on *Costus afer* leaves and (10) on *Costus afer* stems. Both studies showed biochemical and cytology evidence of protection of the pancreas against injury in alloxan exposed rats.

Ezejiofor et al., (14) showed that aqueous leaf extracts of *Costus afer* reversed pancreatic injury in rats earlier exposed to alloxan. It also caused a more significant reduction in glucose levels in the diabetes-induced rat group exposed to it as compared to those exposed to the oral hypoglycemic agent (OHA), glibenclamide. Uwah et al., (12) also showed a reduction in glucose levels in both the diabetic and non-diabetic rats populations exposed to the *Costus afer* stem extracts. Although there was significant difference in the diabetic group. Agu et al (13) also had significant, dose dependent and better glycemic control in diabetes-induced rats exposed to *Costus afer* and snail slime extract.

Histology done in the studies above showed evidence of repopulation and regeneration of pancreatic islet cells with continuous exposure to *Costus afer* plant parts. Histology done in this study showed the opposite results at all doses and all durations of exposure. Boison et al., (4) in their review stated that evidence suggests that *costus afer* extract inhibits alpha-glucosidase and alpha-amylase enzymes activities in the pancreas. It has also been reported that Diosgenin and Aferosides A,B,and C amongst other constituents in the stems and roots are responsible for the suspected anti-diabetic activity (14-16). This was not seen in this study.

CONCLUSION

Evidence from this study does not support the role of *Costus afer* stem extracts as being antidiabetic or protective to the pancreas. We recommend that further and more recent research should be done to confirm and rule out inconsistencies and to isolate the constituents said to have antidiabetic activity for further scientific processing. *Costus afer* use in the general public is only recommended at very low dosages and for less than 14 days at a time.

REFERENCES

1. Anyasor G., Onajobi F., Osilesi O., and Adebawo O. “Hexane fraction of Costus afer Ker Gawl leaf inhibited mitochondrial permeability transition, F1F0 ATPase and scavenged nitric oxide and hydrogen peroxide (957.1),” Journal of Investigational Biochemistry, vol. 3, no. 2, p. 79, 2014.
2. Anyasor G., Obukohwo E., and Adenike O., “Bioactive compounds in Costus afer Ker Gawl leaves and stem fractions protect against calcium ion-induced mitochondrial membrane permeability transition,” American Journal of Research in Medical Sciences, vol. 1, no. 1, pp. 21–26, 2017.
3. Don-lawson, C.,Oforibika, G.A. and Okah, R. (2022) He-patic Impact of Mandragora officinarumLeaf Extract on Wistar Albino Rats. Amer-ican Journal of Analytical Chemistry, 13,531-537.https://doi.org/10.4236/ajac.2022.1312035
4. Boison D., Adinortey C.A., Babanyinah G.K., Quasie O., Agbeko R., Wiabo-Asabil G.K. and Adinorte M.B.. Costus afer: A Systematic Review of Evidence-Based Data in support of Its Medicinal Relevance Hindawi Scientifica Volume 2019, Article ID 3732687, 10 pages https://doi.org/10.1155/2019/3732687

DOI: 10.5281/zenodo.16409121

5. Anyanwu O.B., Orish N.C., Ezejiofor N.A., Nwaogazie I.L., Akaranta O., Orisakwe E.O. (2021) Multi-organ protective effect of Costus afer on low concentration toxic metal mixture in albino rats Int J Physiol Pathophysiol Pharmacol 2021;13(2):52-68 www.ijppp.org /ISSN:1944-8171/IJPPP0121459 PMCID: PMC8166809 PMID: 34093966

6. Ezejiofor A.N., Orish C.N., and Orisakwe O.E. (2013) Effect of aqueous leaves extract of Costus aferKer Gawl (Zingiberaceae) on the liver andkidney of male albino Wistar rat . Anc Sci Life. 2013 Jul-Sep; 33(1): 4–9.doi: 10.4103/0257-7941.134554PMCID: PMC4140021

7. Idowu R.A. and Chetty N. (2021) Radioprotective potential of Costus afer against the radiationinduced hematological and histopathological damage in mice. Radiat Oncol J 2021;39(1):61-71 https://doi.org/10.3857/roj.2021.00017 pISSN 2234-1900 · eISSN 2234-3156

8. Izah S. C., Etim N. G., Ilerhunmwuwa I. A., Ibibo T. B., Udumo J. J. , (2019). Activities of express extracts of costus afer Ker–Gawl. [Family COSTACEAE] against selected bacterial isolates, Int. j. pharm. phytopharm. res. 9(4), pp. 39-44.

9. Ezejiofor A.N, Orish C.N. and Orisakwe O.E. (2015) "Morphological changes in the pancreas and glucose reduction of the aqueous extract of Costus afer leaf on alloxan-induced diabetic rats," Journal of Basic and Clinical Physiology and Pharmacology, vol. 26, no. 6, pp. 595–601, 2015.

10. Ezejiofor A.N, Igweze Z.N., Udowelle N.A., and Orisakwe O.E. (2017)"Histopathological and biochemical assessments of Costus afer stem on alloxan-induced diabetic rats," Journal of Basic and Clinical Physiology and Pharmacology, vol. 28, no. 4, pp. 383–391, 2017.

11. Ezejiofor A.N, Orish C.N. and Orisakwe O.E. (2014) "Cytological and biochemical studies during the progression of alloxan-induced diabetes and possible protection of an aqueous leaf extract of Costus afer," Chinese Journal of Natural Medicines, vol. 12, no. 10, pp. 745–752, 2014.

12. Uwah A.F., Ewere E.G. and Ndem I.J. (2015) Hypoglycaemic and Haematologic Effects of Crude Stem Juice of Costus Afer on AlloxanInduced Diabetic Wistar Rats. American Journal of Ethnomedicine, 2015, Vol. 2, No. 4 ISSN: 2348-9502

13. Agu O.M., Tsware J.B, Sunday A. O., Onwuka J.C., Anthony J.H. (2018). Investigatory Study of Long Term Doses of Costus afer, Snail Slime, and Their Combination with a Standard Pharmaceutical Drug on Blood Glucose Level of Alloxan Induced Swiss Albino Rat. Open Journal of Medicinal Chemistry > Vol.8 No.1, March 2018

14. Anyiam C. Chioma, Anyiam C. Albert and Anozie J. Kenechukwu (2020)Chemical Profile of the Stem Extract of Costus afer(Bush Cane) from Imo State in NigeriaAsian Journal of Research in Biochemistry7(4): 113-123, 2020; Article no.AJRB.62994ISSN: 2582-0516

15. Divengi J.N., Idrissa A.Z. , Kabasele M.D., Mbuyi L.P., Walle I.S., Lesse M.V., Kiala I.K., Nzinga S.P., Bongo M.R, Ntezolo Z.J., Mukeba B.F., Longo M.B., Mutwale P.K., Mesia K.G. and Tona L.G. (2022) Costus afer Ker Gawl (Costaceae): A Review on Its Medicinal uses with Focus on Potential Anti-Inflammatory Effect. Journal of Pharmaceutical Research International 34(41A): 6-23, 2022; Article no.JPRI.87850ISSN: 2456-9119.

16. Nwauche, K., Anacletus, F., & Ighorodje-Monago, C. (2018). Assessment of Fatty Acid, Proximate and Quantitative Phytochemical Compositions of Matured Stem of Costus afer (Bush Cane). Journal of Drug Delivery and Therapeutics, 8(6), 217-224. https://doi.org/10.22270/jddt.v8i6.2057

DOI: 10.5281/zenodo.16409121