ISSN: 2536-7153 SJMLS

Sokoto Journal of Medical Laboratory Science 2024; 9(3): 107 - 112

SJMLS - 9(3) - 011

Investigating the effects of Lonchocarpus Cyanencens Aqueous Leaf Extracts on the Histology of the Cardiovascular System in Normal Albino Wistar Rats

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Abstract

The shrub tree Lonchocarpus cyanescens is one of the herbal remedies traditionally used in Nigeria to promote human health. In the western part of the nation Nigeria, it is used to treat diabetes mellitus. Investigating the histomorphological activities of an aqueous extract of Lonchocarpus cyanescens leaf on the cardiovascular status of normal Wistar albino rats was the purpose of this investigation. Thirty-five rats in all were split up into seven groups of five rats each: Group A was designated as the control group. Group B was given an aqueous extract of L. Cyanencens containing 200 mg/kg, Group C was given 500 mg/kg, Group D was given 1000 mg/kg, Group E was given 2000 mg/kg, Group F and H were given 3500 mg/kg and 5000 mg/kg of the extract, respectively. The rats had 42 days of therapy before being cervically dislocated while sedated with ether. The rat's heart was quickly removed, preserved for 72 hours in 10% buffered formalin, and then histologically processed and stained with eosin and hematoxylin. According to histological findings, all treated groups experienced mild vascular events with intact interstitial spaces and myocardial bundle arrangement in the cardiovascular system as a result of graded doses of Lonchocarpus cyanescens aqueous extracts. These extracts also activated the heart's local immune system, causing endothelial cell activation and lymphocytosis (induction fraction). A more intense action was elicited by the lower doses, peaking at 1000 mg/kg. But there were no harmful consequences, affirming the safety of the extract and its potential for treatment of cardiovascular diseases.

Keywords: Lonchocarpus cyanescens" Wistar" histomorphology" Heart" Dosage

Introduction

There is a long history of using plants and plant extracts for medical purposes. As compared to conventional medication. This approach has less adverse effects, which has led to its encouragement recently (Ajiboye *et al.,* 2019). Plants are a source of numerous strong and potent medications that are utilized medicinally in many countries. Researchers are very interested in screening the therapeutic potential of medicinal plants. Secondary metabolites are the active ingredients in many medications that are found in plants. Folk medicine used medicinal plants and herbs to treat a wide range of diseases and infections. Currently, a wide range of medicinal plant products with biologically active ingredients are sold on the market, including medications and cosmetics (Abu *et al.,* 2015). Because medications produced from plants have been shown to be safe and free of side effects, there has been a slow but steady resurgence of interest in the use of aromatic and medicinal plants in both industrialized and developing nations in recent years.

However, some phytochemicals have been reported to be toxic to humans due to their ability to cause cellular damage via oxidative stress (Adebiyi and Abata, 2013). It has become necessary, therefore, to strike a balance between the effectiveness of medicinal plants and their relative safety.

West African wild indigo, or Lonchocarpus cyanescens, is a medicinal plant that is used

locally to treat a range of ailments when combined with other recipes. The names "Elu" in Yoruba, "anunu" in Ibo, "talaki" in Hausa, "suru" in Tiv, and "ebelu" in Edo are for Lonchocarpus cyanescens. The shrub can reach a height of 5 m and a thickness of 50 cm; it is found in fringe, deciduous, and savannah forests (Ogungbaro, 2010). The plant is used in traditional medicine; Lonchocarpus cyanescens's bioactivity effects have been shown to be anti-inflammatory, anti-arthritic, anti-diabetic, and ulcer-relieving. According to Manoj and Aquad (2003), it also possesses antiviral, antifungal, anti-protozoal, and antibacterial activity. The presence of reducing sugars, flavonoids, tannins, saponins, and cardiac glycosides in plant leaves has been demonstrated (Iyoha and Onoagbe, 2016). It is important to keep in mind that although Lonchocarpus cyanescens is well renowned for its exceptional therapeutic properties, there is not enough information available regarding its safety, efficacy, and other interactions and contraindications. This is the justification for the study, which centers on the heart. Similarly, an acute toxicity assessment and biochemical data by Iyoha *et al. (*2023) showed that the plant is practically non-toxic. The nutritional and antidiabetic properties have well been documented (Amu *et al.,* 2019). This study was conducted to ascertain the effects of an aqueous extract of L. cyanenscens leaves on the histomorphology of cardiovascular status in normal Wistar albino rats. Nevertheless, there are few or no scientific evidence to support its influence on the histomorphology of cardiovascular status in rats.

Materials And Methods

Collection of Plant Materials

Lonchocarpus cyanescens (Anunu) leaves used in this research work were freshly obtained from Abavo in Ika South, L.G.A. Delta State Nigeria and were botanically identified and authenticated in the Department of Plant Biology and Biotechnology, University of Benin, Benin City, Nigeria. A herbarium specimen with voucher number UBHf0291 was deposited at the herbarium of the University of Benin.

Extraction of Plant Materials

After being cleaned with clean water, the gathered plant samples were left to dry for seven (7) days at room temperature. Using an electric blender, the dried plant samples were ground into a powder, which was subsequently utilized to make the extract.

Preparation of Plant Extracts

After 100g of each powdered leaf were weighed using an electrical weighing balance into a sterilized conical flask, 500ml of distilled water was added, the flask was shaken, the top was covered with aluminum foil, and it was left at room temperature for 48 hours. A clean, fine-pored cloth was then used to filter the extract. After that, the extracts were concentrated in a crucible using a water bath that was heated to 45 °C. The weight of concentrated extract was taken and then stored in air-tight sample bottle in refrigerator till it is time to be used.

Experimental animals: Thirty-five adult Wistar rats were used as experimental subjects in this study. The rats were divided into seven (7) groups of five (5) animals each at random. They were between 180 and 200 grams in weight at the beginning of the trial. The animals were purchased and put in standard cages at the University of Benin's Department of Anatomy's Animal House, where they were cleaned and sanitized. The rats were allowed to acclimate for two (2) weeks prior to the start of treatment. For the course of the experiment, all animals were given food (livestock's growers marsh made by Top Feed limited, Sapele, Delta State, Nigeria) and water ad libitum.

Groups' dosage

GROUP A Received 1 ml distilled water only
GROUP B were given 200 mg/kg of extract L. cyanescens
GROUP C Received 500 mg/kg of extract L. cyanescens
GROUP D Received 1000 mg/kg of extract L. Cyanescens
GROUP E Received 2000 mg/kg of extract L. Cyanescens
GROUP F Received 3500 mg/kg of extract L.Cyanescens
GROUP G Received 5000mg/kg of extract L. Cyanescens

Tissue collection, processing and staining: After being exposed to the extract for 42 days, the animals were slaughtered via cervical dislocation while sedated with ether. The rat's heart was quickly removed. The heart tissues underwent a 72-hour fixation in 10% buffered formalin prior to histological processing and staining with hematoxylin and eosin. Tissues were stained using approved techniques (Drury *et al.,* 1976).

Photomicrography: The heart's H&E-stained slides were viewed by a histopathologist using a Leica DM750 research microscope with a Leica CC50 digital camera connected. Digital photos of the tissues were taken at x400 magnifications.

Results

Plate 1: Heart of Control Rat composed of bundles of myocardial fibres A, interstitial space B and cardiac vessel C (H&E x 400)

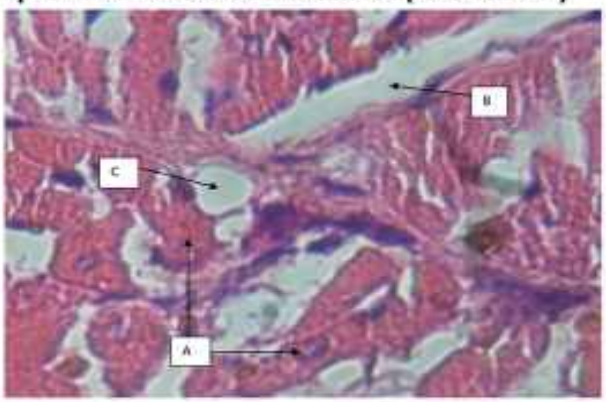


Plate 2: Heart of Rat given 200mg/kg of L. cyanescens (aqueous extract) showing mild interstitial congestion A (H&E x 400)

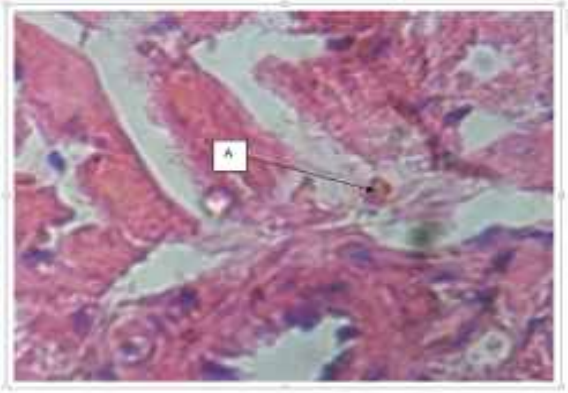


Plate 3: Heart of rat given 500mg/kg L. cyanescens (aqueous extract) showing mild interstitial congestion A (H&E x 400)

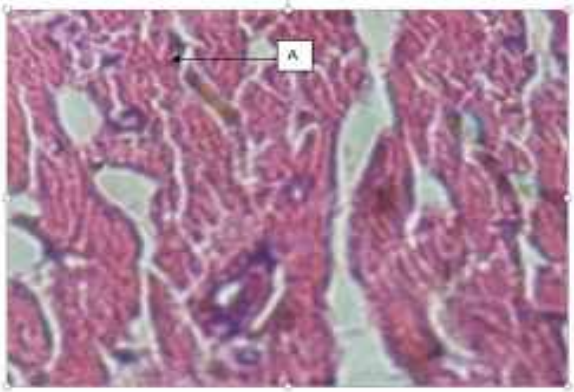


Plate 4: Heart of rat given 1000mg/kg aqueous extract of L. Cyanescens showing mild interstitial congestion A (H&E x 400)

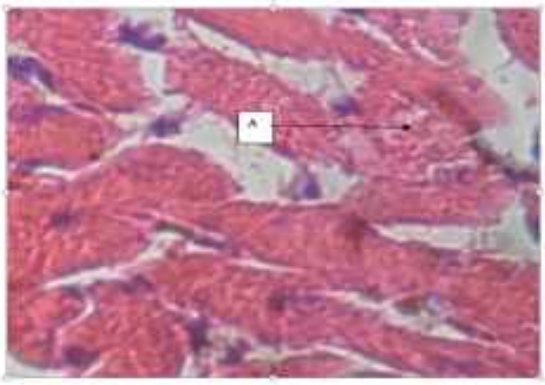


Plate 5: Heart of rat given 2000mg/kg aqueous extract of L. cyanescens showing mild vascular dilatation A (H&E x 400)

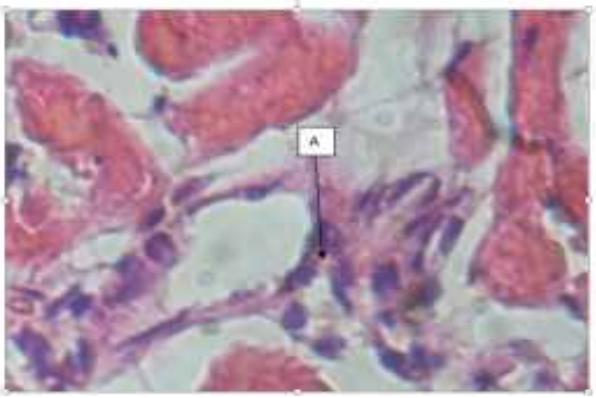


Plate 6: Heart of rat given 3,500mg/kg aqueous extract of L. cyanescens showing mild coronary vascular dilatation and congestion A (H&E x 400)

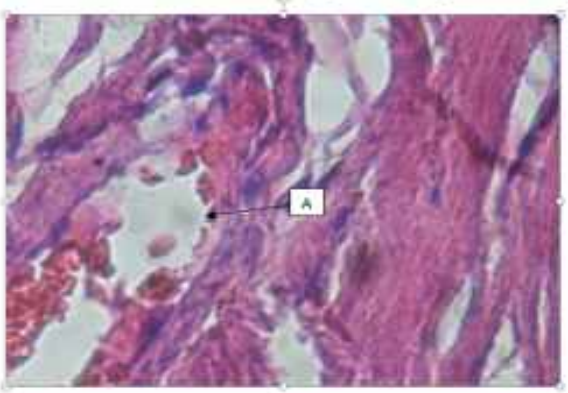


Plate 7: Heart of rat given 5000mg/kg aqueous extract of L. cyanescens showing mild coronary vascular dilatation and congestion A (H&E x 400)

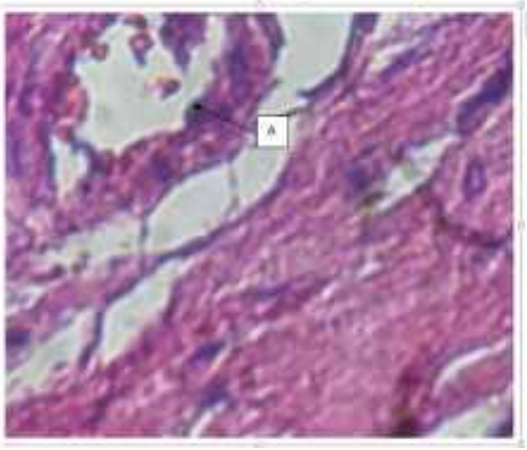
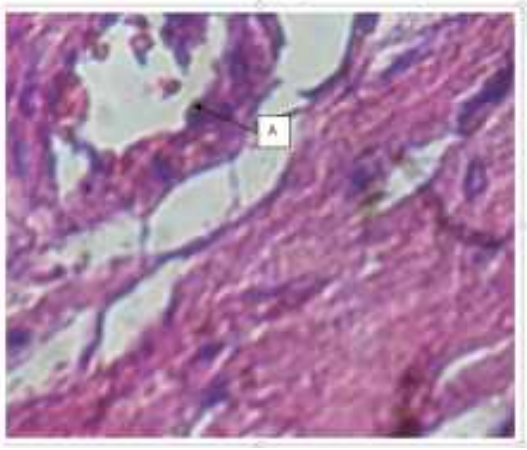


Plate 7: Heart of rat given 5000mg/kg aqueous extract of L. cyanescens showing mild coronary vascular dilatation and congestion A (H&E x 400)



The H&E reaction results showed that minor coronary and vascular congestions occurred with increasing doses of Lonchocarpus cyanescens extract (plate 2-7). All of the groups receiving Lonchocarpus cyanescens treatment had well-organized interstitial spaces and cardiac bundle configurations, as seen in our micrographs.

Discussion

Lenchocarpus cyanescens is used medicinally all over the world. Many ailments can be treated medicinally with the help of the plant's stem and leaves. Every part of the plant has a number of ethnomedical uses for both people and animals. According to Agbo and Obi (2007), medicinal plants are believed to be a substantial source of new compounds with potential medical applications. Nevertheless, research on the phytochemical components of the plant extract also showed that the antibacterial properties of the extract leaves are enhanced by the presence of bioactive components such as sugars, tannins, ascorbic acid, saponins, resins, alkaloids, and flavonoids. When comparing the animals treated with Lonchocarpus cyanescens extract to the control, histopathological analysis of the cardiovascular system showed mild to moderate alterations, notably at higher doses (Figures 2-7). All of the animals that received L. cyanescens treatment at body weights ranging from 200 to 5000 mg/kg showed modest vascular and interstitial congestion along with undistorted cardiac bundle fibers.

In 200mg/kg body weight and 500mg/kg body weight concentration, it can be seen that there were mild interstitial congestions and mild coronary distortion suggesting that Lonchocarpus cyanescens at different doses shown no deleterious effect on the myocardium of the rats. This findings are in agreement with (Iyaha and Onoagbe, 2023) whose results indicated that 200mg/kg and 500mg/kg of extracts of L. cyanescens can maintain the oxidative status, cannot induce lipid peroxidation in normal rats and is therefore safe for the treatment of various ailments. Similar findings were also seen in the results reported by Omonkhua and Onoagbe (2012) where the roots of Urena lobeta, the bark of Irvingia gabonensis and the leaf of Carica papaya did not have any deleterious effect on oxidative status and lipid peroxidation in normal rats. The dosage at 1000mg/kg, 2000mg/kg body weight of the extract shown similar potency affirming the safety activity of the extract. It revealed mild interstitial and vascular congestion, no myocardial degeneration. This implies that although administration at lower dosages will be preferred, particularly on a long-term use, the aqueous leaf extract may be safer at all tested doses. This is consistent with other research that found no overt adverse responses in either the acute or sub-acute phases. Its antioxidant qualities might potentially play a role in maintaining the cardiovascular system. According to Ahmad *et al*. (2019), flavonoids, which are naturally occurring antioxidants, are

crucial for eliminating free radicals and averting degenerative illnesses including cardiovascular disease. Ascorbic acid, or vitamin C, is one of the additional chemicals found in L. cyanescens that has been linked to cardiovascular illness. In order to prevent endothelial dysfunction, which is one of the factors that causes atherosclerosis, vitamin C has the ability to improve endothelial vasodilation (Airaodion *et al.,* 2019).

Mild coronary vasodilation seen in figure 5 and figure 6 (3500mg/kg and 5000mg/kg body weight) respectively affirms the extract hypolipidemic properties and its potencies to prevent atherosclerosis. The histological plates (plate 2-6) showed similar histological appearances connoting the extract at different doses is not deleterious to the cardiovascular system. This findings may be in consonant with Amu *et al*. (2019) who noted that reduction in both cholesterol, triglycerides and LDL-Cholesterol in treated diabetic groups suggests that the extracts of L. cyanescens possibly produced effects due to the presence of phytoconstituents like tannin, saponin and other phytoconstituents which possibly decreased absorption of dietary cholesterol.

Conclusion

Histological results according to revealed that graded doses of aqueous extracts of *Lonchocarpus cyanescens* induced mild vascular events in the cardiovascular system, as well as activating the local immune system of the heart viz: lymphocytosis (induction fraction) and endothelial cell activation. The lower doses induced a more intense activity with the peak being at 1000mg/kg. However, there were no toxicity effects.

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Citation: Onyeije Benson Peter, Innih Silvanus Orlu. Investigating the effects of Lonchocarpus Cyanencens Aqueous Leaf Extracts on the Histology of the Cardiovascular System in Normal Albino Wistar Rats. ***Sokoto Journal of Medical Laboratory Science*; 9(3): 107 – 112.** https://dx.doi.org/10.4314/sokjmls.v9i3.11