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Effects of Xylopia Aethiopica Leaf Extract on The Renal Function, Liver Enzymes and Antioxidants Status of Albino Rats

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Abstract

To determine effects of Xylopia aethiopica leaf extract on urea, creatinine, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Vitamin C and Vitamin E levels of albino rats. Thirty-five albino rats were randomly divided into five groups with seven rats in each group (n=7); Control (C) received normal feed only. Group 1: was administered with Xylopia aethiopica leaf extract 100 mg/kg, Group 2: Xylopia aethiopica extract 150 mg/kg, Group3: Xylopia aethiopica leaf extract 200 mg/kg. Group 4: received Xylopia aethiopica leaf extract 250 mg/kg. This lasted for 28 days. Group 3 and 4 showed significantly decreased urea (18.88±0.23mg/dl, 18.04± 0.56mg/dl,) creatinine (0.55±0.03mg/dl, 0.49±0.03mg/dl) AST (18.19±0.33iu/l, 18.05±0.32iu/l) and ALT (13.72±0.23iu/l, 13.58± 0.66iu/l) when compared with the control (urea 21.4±1.36mg/dl, Creatinine 0.73±0.06iu/l, AST 18.61±0.33, ALT 14.14±0.28) respectively at $p < 0.05$. While Group 3 and 4 showed significantly increased vit C and E levels when compared with the control at $p < 0.05$. Xylopia aethiopica leaf extract has an antioxidant effect as well hepatoprotective and renal protective effect.

Keywords: *Xylopia aethiopica, leaf extract, renal function, liver enzymes, antioxidants*

Introduction

Medicinal plants have been known to reveal different positive effects in animals, especially humans [1]. Most spices are used for the management or treatment of some diseased conditions in herbal medicine. Some of the spices include the leaf of Xylopia aethiopica (X. aethiopica) [2]. Xylopia aethiopica belongs to the Annonaceae family. It is referred to as negro pepper, African pepper, Guinea pepper and spice tree. It is an evergreen plant growing up to 15-30 m high [3]. It is a native to the low land rain forests and moist fringe forests in the savanna zones and coastal regions of Africa. It has been found to grow in forest zones and mainly along rivers and in arid areas.

Xylopia aethiopica is claimed it to be useful as abortifacients, menstrual disorder, ecbolics as well as in the treatment of diarrhea, dysentery by Folklore medicine. Equally, it has potency for treatment of stomach disorder, naso-pharyngeal infections, arthritis, rheumatism and infections [4].

In Nigeria, it is referred as “Uda” in Igbo, “Erunje” in Yoruba and “Kimba” in Hausa. The colour of the matured fruit usually changes from green to brownish-black after drying [5]. They are also used in preparation of hot soup usually given to nursing mothers postpartum [6].

In some quarters, it has been known to have antipyretic, purgative, analgesic and anti-helminthic anti-inflammatory effect, while some reported that the extracts are useful in bronchitis, oedema and dysentery [7].

The extract of X. aethiopica contains some constituents that could synergistically improve other food materials that are used in nutrition and appreciable level of certain mineral that supports the catalysis of some enzymes and maintenance of homeostasis and immune function [8].

X. aethiopica-treated rats showed that these spices have hypo-kalaemic, hypolipidaemic and no or low

hepatotoxic effects. It is important that the biochemical effects of these plant materials be investigated to ascertain their likely effects on its consumers [9]. Hence, there is a need to investigate the biochemical effects of extracts of X. aethiopica on liver and kidney of male albino rat. In nutrition, X. aethiopica is commonly used as spices. As a result of their vast use in nutrition and traditional medicine, [5] there is need to investigate their effects in this study. This will enable the consumers note the possible effects on liver and kidney.

Therefore, the present study was conducted in order to determine effects of Xylopia aethiopica extract on kidney, liver and antioxidant levels of albino rats.

Material and Methods

Plant material and extraction

The Xylopia Aethiopica were bought from Ekenuwa market. It was identified and confirmed in the Department of Plant Biology and Biotechnology of Imo State University Owerri. They were washed, sundried and ground into powder for use. The dried Xylopia Aethiopica were milled to get a coarse powder used for the extraction. The powder was macerated in a 400 g percolator with 250 mL of distilled water. The mixture was allowed to stand for 48 hours after it was filtered. The filtrate was then placed in an oven to evaporate and the solid residue was referred to as extract. The appropriate concentrations of the extract were made in distilled water for the experiment. Hence, the following concentrations i.e., 100mg 150 mg, 200mg and 250mg were prepared

Experimental design

The albino rats weighing (180-300 g) obtained from the Animal House of Imo State University were used in this investigation. The animals were kept in cages in a room and maintained at room temperature with a 12-hours light dark cycle for one week to acclimatize. The animals were randomly assigned to five experimental groups with six rats in each group.

Thirty-five albino rats were randomly divided into five groups (n=6); Control (C) received normal feed only. Group 1 was administered with Xylopia Aethiopica 100 mg/kg BW, Group 2: Xylopia Aethiopica 150 mg/kg BW, Group 3: Xylopia Aethiopica 200 mg/kg BW. Group 4: received 250mg/BW Xylopia Aethiopica. In all groups, the extract was administered through oral route. This treatment was performed by oral compulsion. All animal were allowed free access to food and water throughout the experiment.

This lasted for 28 days. The blood samples were collected and the level of urea, creatinine, AST, ALT Vitamin C and E were then measured

Blood collection

The animals were anaesthetized with chloroform vapour, quickly brought out of the jar and sacrificed. Whole blood was collected by cardiac puncture from each animal into clean dry test tubes. The blood in the clean dry test tubes was allowed to stand for about 15minutes to clot and further spun in a Westerfuge centrifuge (Model 1384) at 10000 g for 5 minutes, serum was separated from the clot with Pasteur pipette into sterile sample tubes for the estimation urea, creatinine, AST, ALT Vitamin C and E

Determination of urea, creatinine, AST, ALT Vitamin C and E level were determined using standard method [10, 11, 12,13]

Statistical analysis

The results were expressed as mean+ standard deviation. The statistical evaluation of data was performed by using student T-test

Results

Table 1: Effect of liver enzymes (AST and ALT) on albino rats administered with different doses of extract of Xylopia aethiopica

Groups	AST (iu/L)	ALT (iu/L)
Control	18.61±0.33	14.14±0.28
Group 1	18.47±0.54	14.00±0.29
Group 2	18.33±0.33	13.86±0.42
Group 3	18.19±0.33	13.72±0.23*
Group 4	18.05±0.32	13.58± 0.66*

*Significantly different from control at P<0.05

Table 2: Effect of renal function test (urea and creatinine) on albino rats administered with different doses of extract of Xylopia aethiopica

Groups	Creatinine (mg/dl)	Urea(mg/dl)
Control	0.73±0.06	21. 4±1.36
Group 1	0.63±0.02	20.56±0.49
Group 2	0.61±0.02	19.72±0.73
Group 3	0.55±0.03	18.88±0.23*
Group 4	0.49±0.03*	18.04± 0.56*

*Significantly different from control at P<0.05

Table 3: Effect of antioxidants (vitamin C and vitamin E) on albino rats administered with different doses of extract of Xylopia aethiopica

Groups	vitamin C (mg/dl)	vitamin E (mg/dl)
Control	0.91±0.01	1. 44±0.02
Group 1	0.93±0.02	1.45±0.02
Group 2	0.94±0.01	1.47±0.01
Group 3	0.94±0.02	1.47±0.04
Group 4	0.99±0.02*	1.51± 0.02*

*Significantly different from control at P<0.05

Table 4: Effect of weight on albino rats administered with different doses of extract of Xylopia aethiopica

Groups	Weight (mg)	Weight (mg)
Control	181.861±0.05	184.44±0.19
Group 1	181.443±0.05	186.00±0.33
Group 2	183.70±1.03	190.36±0.35*
Group 3	182.82±0.034	188.00±0.66*
Group 4	180.93±0.28	193.39± 0.44*

*Significantly different from control at P<0.05

Discussion

In this study, it was observed that the levels of liver enzymes AST, ALT and ALP were decreased in the albino rats administered with different doses of extracts of X. aethiopica [7]

Serum aminotransferase activities are sensitive indicators of parenchymal liver damage. Administration of the X. aethiopica extracts lead to significantly decreased ALT and AST activities in the treated groups that received 250mg/kg body weight. This may probably indicate hepato-protective effect of the plant extract. The decrease in AST activities in the treated groups, resulting from the extracts, is also indicative of the possible protective effect of the plant on the liver. The hepato-protective effect of the plant is also supported with results from our previous studies with normal experimental rabbits given aqueous or ethanol extracts of Xylopia aethiopica [9]

This indicates probably that extract of X. aethiopica may have the ability to protect the liver. This result is in line with the report of Nnodim et al. [14]. Indeed, the extracts may contain chemical constituents that may possess hepato-protective properties. The administration of extract of X. aethiopica never cause any elevation in the level of the liver enzymes. Hence, indicating no possible infiltration of the liver tissues. In other words, supporting no malfunctioning cell membrane of the organs, and no cellular leakage of the enzymes into the blood. It is possible that medicinal effects of extract of X. aethiopica is highly within the period studied [15].

In the same vein, the level of serum urea and creatinine significantly decreased in the group that were administered with 250mg/body weight of the extract of X aethiopica. Though, the decrease was dose dependent. This probably suggests that X. aethiopica administration might have renal protective effect. This is in line with the work of [16] in which the protection of kidney was observed. Urea is which is more concerned in the urinary concentrating mechanism of mammals and also contributes to the osmolarity gradient in renal tissue in all states of water balance Creatinine which is a waste product of muscle cell metabolism is excreted by the kidneys into the urine. Its concentration is usually measured to assess the functional status of the kidney, with elevations indicating kidney problems. As compared to the control, there was significant difference in creatinine concentrations in group 3 and group 4 given the extract of Xylopia aethiopica [17].

The concentration of vitamin c and vitamin E in the experimental albino rats when compared to the control group increased significantly in the group administered with 250mg per body weight extract of X. aethiopica. This result probably showed extract of X. aethiopica may encourage antioxidant effect. This result also showed that consumption of the plant materials in nutrition may aid the fight against free radicals [7].

The liver and kidneys work in synergy to maintain homeostasis in the body. This ensures the good excretion of waste materials and reabsorption of some useful materials by the kidneys. Indeed, if creatinine and urea are retained in the blood, it will indicate a likely malfunction of the kidneys [15]. The results of this study showed that creatinine was not in any way retained in the albino rats administered extract of X. aethiopica, when compared with the control group. This showed the constituents of extract of X. aethiopica may possess renal protectivity [17].

Conclusion

The results of this study suggest that the extracts of X aethiopica have no apparent damaging effect on the liver and kidneys of the albino rats. The extract X aethiopica at doses of 100 mg/kg BW, 150 mg/kg BW, 200 mg/kg BW and 250 mg/kg BW has antioxidant effects in preventing increased free radicals. A dose of 250 mg/kg BW is the most effective as a means of forestalling an increase in kidney and liver damage.

References

1. Adefegha, S. A., & Oboh, G. (2012). Effect of diets supplemented with Ethiopian pepper [Xylopia aethiopica (Dun.) A. Rich (Annonaceae)] and Ashanti pepper [Piper guineense Schumach. et Thonn (Piperaceae)] on some biochemical parameters in normal rats. Asian Pacific Journal of Tropical Biomedicine, 2(2), S558-S566.
2. Woode, E., Ameyaw, E. O., Boakye-Gyasi, E., & Abotsi, W. K. (2012). Analgesic effects of an ethanol extract of the fruits of Xylopia aethiopica (Dunal) A. Rich (Annonaceae) and the major constituent, xylopic acid in murine

models. Journal of pharmacy & bioallied sciences, 4(4), 291.

3. Abd-Algader, N. N., El-Kamali, H. H., Ramadan, M. M., Ghanem, K. Z., & Farrag, A. H. (2013). Xylopia aethiopica volatile compounds protect against panadol-induced hepatic and renal toxicity in male rats. World Appl. Sci. J, 27(1), 10-22.
4. Ayoola, G. A., Coker, H. A., Adesegun, S. A., Adepoju-Bello, A. A., Obaweya, K., Ezennia, E. C., & Atangbayila, T. O. (2008). Phytochemical screening and antioxidant activities of some selected medicinal plants used for malaria therapy in Southwestern Nigeria. Tropical journal of pharmaceutical research, 7(3), 1019-1024.
5. Keita, B., Sidibé, L., Figueredo, G., & Chalchat, J. C. (2003). Chemical composition of the essential oil of Xylopia aethiopica (Dunal) A. ch. from Mali. Journal of Essential oil research, 15(4), 267-269.
6. Obodo BN, Iweka FK, Obhakan JO, Oyadonghan GP, Agbo GE, (2013). The effect of Xylopia Aethiopica on body weight and growth performance. Int J Herbs Pharm Res 2: 14-19.
7. Aguoru, C. U., Pilla, C., & Olasan, J. O. (2016). Phytochemical screening of Xylopia aethiopica with emphasis on its medicinally active principles. Journal of Medicinal Plants Research, 10(22), 306-309.
8. Chike CP, Adienbo OM. (2010), The effect aqueous extract of Xylopia Aethiopica on some biochemical profile of male guinea pigs. Afr J Appl Zool Environ Biol 12: 72-75.
9. Chris-Ozoko, L. E., Ekundina, V., & Winiki, C. (2015). Histomorphological Effects of Xylopia aethiopica on the Liver and Kidney of Albino Wistar Rats. Histomorphological Effects of Xylopia aethiopica on the Liver and Kidney of Albino Wistar Rats, 3(2A), 1-5.
10. Ochei J and Kolhatkar, A., (2007), Medical Laboratory Science Theory and Practice; Tata MC.
11. Desai, I. D. (1984). [16] Vitamin E analysis methods for animal tissues. In Methods in enzymology (Vol. 105, pp. 138-147). Academic press.
12. Reitman, S. and Frankel S. (1953). Transaminasses. American Journal Clinical Pathology 28-34.
13. Tietz W. (1984). Ascorbic Acid in: Fundamental of Clinical Chemistry WB. Sander Compnay Britain 422- 429.
14. Johnkennedy, N., Adamma, E., Austin, A., & Chukwunyere, N. E. (2011). Influence of Xylopia aethiopica fruits on some hematological and biochemical profile. American J Med Sci, 4, 191-6.
15. Gad, A. S., & Sayd, A. F. (2015). Antioxidant properties of rosemary and its potential uses as natural antioxidant in dairy products—A review. Food and Nutrition Sciences, 6(01), 179.
16. Kaefer, C. M., & Milner, J. A. (2008). The role of herbs and spices in cancer prevention. The Journal of nutritional biochemistry, 19(6), 347-361.
17. Mauro, P., Renze,R., and Wouter (2007). Enzymes in Tietz text book of clinical chemistry and Molecular diagnostics. 74: 663 – 671.
18. Eze, K.N. (2012). Effect of Uda Extract of Xylopia Aethiopica on Albino rats. American Journal of Medicine and Medical Science. 2(1):12-15.