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Effect of *Xylopia aethiopica, Fiscus mucuso* and *Anthocleista vogelli* Extracts on Some Biochemical Parameters Following Ethanol-induced Toxicity

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Authors' contributions

This work was carried out in collaboration between all authors. Author AOA designed the study and wrote the protocol. Author REO did the biochemical analyses in this study. Author DAO co-designed the research, literature searches and statistical analysis. Author OAK participated in the animal care and Laboratory work. Author KDSB participated in the Laboratory work and final draft of the manuscript. Author JBF coordinated the laboratory procedures. All authors read and approved the final manuscript

Original Research Article

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ABSTRACT

The objective of the study was to comparatively verify the effects of aqueous extracts of three plants on some biochemical parameters following ethanol administration with a view to ascertaining the role of the extracts in ameliorating ethanol toxicity.
A total of forty rats were divided into eight groups (n=5). Group A were control rats;

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Group B were administered with absolute ethanol; Group C were ethanol administered rats treated with *Xylopia aethiopica*; Groups D were ethanol administered rats treated with *Fiscus mucuso,* Group E were ethanol administered rats treated with *Anthocleista vogelli*; Group F were normal rats administered orally with *Xylopia aethiopica*; Group G were normal rats administered orally with *Fiscus mucuso*; Group H were normal rats administered orally with *Anthocleista vogelli*. At the end of the experimental period, the animals were sacrificed and serum was obtained for total protein, uric acid, creatinin, urea, aspartate aminotrasferase (AST) and alanine aminotransferase (ALT) analysis using respective research kits.

The result showed that *Xylopia aethiopica* had protective effect on the kidney as compared with *Fiscus mucuso* and *Anthocleista vogelli* treated rats. Also, The AST and ALT was lowered with the beginning of *Xylopia aethiopia* treatment. The total protein, creatinin and urea were slightly ($p>0.05$) affected with ethanol, an effect which was normalized with the beginning of extract treatment.

It can be concluded that *Xylopia aethiopica* had a better reno-protective and hepatoprotective effect than *Anthocleista vogelli* and *Fiscus mucuso* extract as evident in its ameliorative role on the biochemical profiles.

Keywords: Ethanol; Xylopia aethiopica; Fiscus mucuso; Anthocleista vogelli.

1. INTRODUCTION

Natural compounds have been adopted as protective and therapeutic agents against various toxicities caused by necrotizing agents such as ethanol. Some of the extracts of plants are very beneficial due to the antioxidant properties; others have cytotoxic effects [1]. Although there is gradual decline in the use of medicinal plants due to the introduction of modern synthetic medicine, information has it that traditional medicine still accounts for about 80% of the health needs of the rural populace in most regions of Africa. Despite the huge benefits attached to medicinal herbs, it is not recommended to use it without adequate knowledge of its toxicity, dosage and purity.

Xylopia aethiopica, Fiscus mucuso and *Anthocleista vogelli* are among the many medicinal plants valued in many countries of Africa.

Xylopia aethiopica is predominant in West African and commonly referred to as “pepper tree”, “African guinea pepper” or “Ethiopian pepper” [2]. It is wide spread in tropical Africa, Zambia, Mozam-bique and Nigeria [3]. Investigations have shown that owing to its antiseptic and antioxidant properties, the aqueous extract is usually administered after child birth [3-5]. *X. aethiopica* is also well known for its anti-hypertensive and diuretic effects [3].

The genus *Ficus* is made up of about 1000 species across tropical and warm temperate regions with greatest diversity in Asia, Malesia and tropical South America. The tree is large and up to 21 m in height. In Latin, ficus means fig, which is derived from the Persian ‘fica’. The common name for *Ficus mucuso* is fig. It is a semi-deciduous spreading savannah tree with greenish flowers. The seeds are very tiny and numerous [6]. Because of the high nutritive value, apes [7,8] and indeed humans [9] depends so much on *Ficus* as part of their diet.

The antioxidant status and beneficial effects of *Ficus* have been documented [6,10].

Anthocleista vogelli is predominantly found in swampy areas, river banks and Raphia grooves [11,12]. It is about 20m in height. It is a medicinal plant that is widely used in West Africa [11,12]. It is used to manage constipation and also regulate menstruation. It acts as a strong purgative and diuretic. In some countries such as Sierra Leone, it is used in the treatment of jaundice and hepatitis [11]. In Nigeria and Congo, the back and seed of this promising plant is used in the treatment of ovarian problem, bronchitis, hernia and fever. *Anthocleista vogelli* contains compound such as 1,7-dihydroxy-3,8-dimathoxy-xanthrone and 1,8-dihydroxy-3,7-dimathoxy-xanthrone. These compounds are responsible for is anti-malaria and anti-ulcer potential.

Antioxidants occur naturally in some plants which constitute part of human daily diet [6]. The intakes of such nutritious plants display antioxidant properties which mop up free radicals thus preventing oxidative stress and maintaining good health. The most common antioxidants present in diets are vitamin E, vitamin C and carotenoids. Other non-nutrient food substances, including, phenolic and polyphenolic compounds also exhibit antioxidant properties [6,13]. Based on the documented antioxidant evidences and nutritive value of these three plants, it becomes very important and necessary to evaluate their basic role against ethanol toxicity.

The present study was thus initiated to comparatively evaluate the effects of three aqueous extracts of *Xylopia aethiopica, Fiscus mucuso* and *Anthocleista vogelli* on some biochemical parameters following ethanol administration with a view to ascertaining their effect in ameliorating ethanol toxicity.

2. MATERIALS AND METHODS

2.1 Plant Materials

The fresh fruit of *Xylopia aethiopica* and leaves of *Fiscus mucuso and Anthocleista vogelli* were procured from the central market in Ile-Ife, Osun State, Nigeria. They were authenticated by comparison with the existing specimen deposited in the Department of Botany, Faculty of Science, Obafemi Awolowo University, Ile-Ife, Nigeria.

2.2 Preparation of Extract

The fresh fruit of *Xylopia aethiopica,* leaves of *Fiscus mucuso and Anthocleista vogelli* were air dried and powdered using a grinding and crushing machine (Daiki Rita Kogyo Co Ltd, Japan). The powders were extracted in cold water with intermittent shaking for 48 hours. The aqueous filtrate was concentrated in vacuum rotary evaporator (Buchi Ratavapour R110, Schweiz). The fruit of *Xylopia aethiopica* and leaves of *Fiscus mucuso and Anthocleista vogelli* yielded 18.39g (5.93%), 19.75g (5.34%) and 51.39g (3.06%) respectively.

2.3 Animals

Forty adult wistar rats were procured and acclimatized for two weeks in the Animal Holdings of the College of Health Sciences Obafemi Awolowo University, Ile Ife. Animals were allowed free access to rat chow (Caps feeds, Nigeria) and water *ad libitum* throughout the study. All the animals were treated according to the recommendations of National Academy of Sciences and published by the National Institutes of Health, USA [14].

2.4 Experimental Design

The forty wistar rats were randomly divided into eight groups (n=5).

GROUP A: Control (administered with normal saline)
GROUP B: Absolute ethanol (1ml/kg b.w)
GROUP C: Absolute ethanol (1ml/kg b.w) + *Xylopia aethiopica*
GROUP D: Absolute ethanol (1ml/kg b.w) + *Fiscus mucuso*
GROUP E: Absolute ethanol (1ml/kg b.w) + *Anthocleista vogelli*
GROUP F: *Xylopia aethiopica*
GROUP G: *Fiscus mucuso*
GROUP H: *Anthocleista vogelli*

Extracts were dissolved in normal saline solution and administered orally at a dose of 200mg/kg to animals in groups C-H for twenty one days. The extract was administered 24hrs after 1ml/kg b.w of absolute ethanol was administered orally to animals in groups C-E [15].

At the end of the experiment, the animals were sacrificed. Before the sacrifice, blood samples were collected via cardiac puncture after the animals were placed under slight anesthesia. Serums obtained were assayed for total protein, uric acid, creatinin, urea, aspartate aminotrasferase (AST) and alanine aminotransferase (ALT) using respective diagnostic kits. All biochemical analyses were carried out in the Department of Biochemistry, Obafemi Awolowo University, Nigeria.

2.5 Statistical Analysis

One-way analysis of variance (ANOVA) using SPSS version 17.0 (SPSS, Cary, NC, USA) was used to compare the means of the groups. P value <0.05 was considered as significant.

3. RESULTS

In this study, uric acid levels were decreased in the serum of ethanol administered rats. Following the treatment with *Xylopia aethiopica* and *Anthocleista vogelli* (Group C and E), there was a significant ($p<0.05$) increase in the uric acid concentration (Table 1). Also, groups treated with *Xylopia aethiopica* and *Anthocleista vogelli* only (group F and H) presented similar increase ($p<0.05$) in uric acid concentration. There was a concomitant decrease in the uric acid concentration of *Fiscus mucuso* treated groups (group D and G) when compared with the control and ethanol treated groups. A significant ($p<0.05$) increase in AST and a non significant increase in ALT in the ethanol administered group was observed. The AST was lowered with the beginning of treatment with *Xylopia aethiopica, Fiscus mucuso* and *Anthocleista vogelli* while only *Xylopia aethiopica* had a non significant decrease on the ALT when compared with the ethanol treated group. The total protein and urea concentrations in all the groups were only slightly affected in the ethanol administered group; an effect which was normalized in the extract treated groups. The creatinine concentrations in all the groups were not significantly affected by the ethanol administration thus; there were no significant changes across the groups (Table 1).

Table 1. Showing the effects of *Xylopia aethiopica*, *Fiscus mucuso* and *Anthocleista vogelli* on some serum enzymes following ethanol administration

Groups	Total Protein (mg/dl)	Uric Acid (mg/dl)	Creatinin (mg/dl)	Urea (mg/dl)	AST (U/L)	ALT (U/L)
Group A	0.66±0.033^{a}	35.61±2.08^{ab}	1.68±0.33^{a}	37.46±0.66^{bc}	37.25±12.95^{ab}	10.80±0.80^{a}
Group B	0.62±0.035^{a}	31.82±5.60^{ab}	1.94±0.13^{a}	37.50±0.28^{bc}	53.00±11.93^{b}	12.33±2.02^{a}
Group C	0.65±0.012^{a}	58.15±1.16^{c}	1.79±0.12^{a}	36.20±1.15^{bc}	19.00±1.15^{a}	11.00±1.16^{a}
Group D	0.66±0.015^{a}	28.76±1.32^{a}	1.50±0.01^{a}	35.55±0.02^{b}	25.00±3.46^{a}	16.00±2.30^{ab}
Group E	0.78±0.011^{a}	68.28±1.19^{c}	1.70±0.12^{a}	32.80±1.16^{a}	36.00±1.16^{ab}	13.00±1.15^{a}
Group F	0.66±0.043^{a}	62.18±11.99^{c}	1.82±0.09^{a}	36.22±0.69^{bc}	30.50±3.27^{ab}	14.75±1.31^{ab}
Group G	0.71±0.022^{ab}	29.35±4.16^{a}	1.70±0.04^{a}	36.06±0.62^{bc}	24.60±5.60^{a}	13.20±2.65^{a}
Group H	0.78±0.025^{b}	51.95±11.01^{bc}	2.07±0.09^{a}	39.05±1.58^{c}	36.66±7.75^{ab}	19.50±1.04^{ab}

Values are given as Mean ± SEM. Letters a, b, c, ab and bc within a column signifies that means with different letters differs significantly at $p < 0.05$ while means with the same letters does not differ significantly at $p < 0.05$ (using one way ANOVA with Duncan multiple range test)

4. DISCUSSION

Ethanol toxicity has been a point of reference in biomedical researches due to its basic role in eliciting oxidative stress which is capable of causing serious harm if left unchecked. Oxidative stress occurs in cells as result of cascade of reactions such as lipid peroxidation produced by oxidants [16]. Lipid peroxidation is elicited by many environmental factors such as infections, toxins and ethanol. Even though biochemical determination of lipid peroxidation status was not performed in this study, evidence from previous researches has linked ethanol toxicity to lipid peroxidation [17,18].

In this study, uric acid levels were decreased in the serum of ethanol fed rats as compared to the control. However, this decrease was not significant. This may either be due to the inhibition of nucleotide (adenine nucleotide) turnover or alteration in the catabolism of purines. It is also possible that the uric acid may have been utilized in scavenging free radicals produced as a result of ethanol intoxication. Free radicals such as superoxide anion and hydroxyl radical are unstable [6,19]. For instance, superoxide anion interacts with nitric oxide to form reactive peroxynitrite while hydroxyl radical react rapidly with most biological molecules [19]. The increase in the uric acid concentration of the group treated with *Xylopia aethiopica* and *Anthocleista vogelli* after ethanol toxicity (Group C and E) and also in the group administered with *Xylopia aethiopica* and *Anthocleista vogelli* only (group F and G) is likely due to the antioxidant properties of these plants. Investigations have shown that *Xylopia aethiopica* possesses antioxidant properties [5]. A study of Adefegha and Oboh [20] about the effects of diets supplemented with *Xylopia aethiopica* and *Piper guineense* on some biochemical parameters in normal rats revealed that the flavonoid content of *Xylopia aethiopica* was significantly higher than *Piper guineense*.

There was no change in the uric acid concentration of *Fiscus mucuso* fed groups (group D and G), an indication of its poor protective role. In this study, there was no significant effect of ethanol administration on ALT even though AST was significantly increased. AST and ALT are liver enzymes that are expected to increase in response to liver damage. There is a possibility that the body adjusted itself to the systemic presence of ethanol by producing endogenous antioxidants to mop up the elicited free radical thus protecting the liver from excessive damage. Recent studies have shown that in the event of toxicity, the body is capable of adjusting itself to cope so long the threshold of intoxication is not exceeded [21]. The failure to obtain the threshold of intoxication in the ethanol fed group may be due to the duration of ethanol administration which may not be long enough to result in excessive liver damage. Vasconcelos et al. [22] in a related study reported that daily administration of ethanol for 7 days produced no effects on ALT and AST levels which later increased significantly with a prolonged treatment for 14 days. This may probably be responsible for the non significant difference in the total protein, urea and creatinine concentrations in all the groups.

It is therefore suggestive that body adaptability due to short duration of ethanol administration rather than antioxidants properties of *Anthocleista vogelli* and *Fiscus mucuso* was responsible for the non significant changes in the AST, ALT, total protein, urea and creatinine concentrations in the ethanol fed group. The fact that creatinine concentration was not affected may be an indication that the kidney function was not hindered.

5. CONCLUSION

It can therefore be concluded that Xylopia aethiopica had a better reno- and hepato-protective effect than *Anthocleista vogelli* and *Fiscus mucuso* extracts as evident in its ameliorative role on the biochemical profiles.

CONSENT

Not applicable.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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