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Biochemical and Histological Effects of *Eleophorbia drupifera* Leaf Extract in Wistar Albino Rats

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Abstract

Water extract of *Eleophorbia drupifera* Leaves was administered orally in graded doses of 10, 20, 30 and 40 mg/kg body weight of experimental animals for 2 weeks. The effect of the extract on some biochemical parameters and the histology of the liver and kidney tissues were evaluated in Albino Wistar rats. Serum glucose levels were significantly ($P < 0.05$) elevated. The cholesterol, triacylglycerol and ALT levels of the test groups demonstrated no significant change, but AST showed a significant decrease ($P < 0.05$) at 20, 30 and 40 mg/kg body weight. Computed AST/ALT ratio showed a decrease but no histopathological lesions were observed in either liver or kidney tissue. The results suggest that no adverse biochemical changes are associated with the use of the extract in phytotherapy. The extract may contain some hepatoprotective agent(s) and antihistopathologic agents.

Keywords: *Eleophorbia drupifera*, leave extract, biochemical parameters, histological changes.

Introduction

The tropical rain forest of West Africa, like most other forest regions of the world, is endowed with enormous natural resources, chiefly medicinal plants. Much has been documented on the medicinal values of some tropical forest plants (Dominguez et al., 1996; Ekpa, 1996; Udoh & Akpan, 1996; Udoh, 1998; Udosen & Ojong, 1998). Despite this, most of the existing plants are yet to be fully exploited for human benefit.

Eleophorbia drupifera (Thonn) Stapf is one of the medicinal plants used by traditional herbalists for the treatment of various ailments. It is a small perennial tree of about 2 m in height, which grows in tropical Africa. Literature available on the medical use of this plant is scanty but it is listed among the plants that heals (Ampofo, 1977). In Nigerian folk medicine, the leaves of *E. drupifera* are used as antihypertensive, anti-diuretic, skeletal muscle relaxant and antidiabetic agents. All parts of the plant, leaves, barks, roots and even the latex, are used medicinally for treatment of various ailments by traditional healers.

The phytochemical screening and chemical composition of the leaves have not been documented, but Eno and Itam (1996) reported the hypoglycemic effect of the leaves. Previous reports showed that the leaf is a more potent hypogylcemic agent compared with glibenclamide (at a dose of 20 mg/day) recommended for human diabetics (Thomas, 1986). Recently, work on crude water extract of *Eleophorbia drupifera* leaves indicated that the crude extract induced an increase in myometrial contractility which is considered to be due to the action on post-ganglionic autonomic nerve endings with acetylcholine release and stimulation of muscarinic receptors (Eno & Itam, 1998).

Despite the long use of *Eleophorbia drupifera* in herbal medicine and its efficacy in the treatment of various ailments, little is known about the possible side effects or alteration in some biochemical parameters associated with use. This information on the effect of *Eleophorbia drupifera* extract on some biochemical parameters and the histological architecture of the liver and kidney will add to the available literature on *E. drupifera*. This work was designed therefore to evaluate and report the effect of oral administration of *E. drupifera* extracts on some biochemical parameters and histology of the liver and kidney tissues of Albino Wistar rats.

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Materials and methods

Preparation of crude extract

Fresh leaves of *Eleophorbia drupifera* were collected from the University of Calabar Staff Quarters in Calabar, Nigeria in the month of October, 1998. The leaves were identified and authenticated by the Botanist in the Botanical Garden of the University of Calabar. A voucher specimen No. MIA 2000 was deposited in at the herbarium of the Botany Department, University of Calabar. Crude water extract of the leaves was prepared according to the method of Parry et al. (1987), using distilled water. The fresh leaves (50 g) were extracted to yield 1.88 ± 0.65 g of the solid matter. The extraction was carried out on each day of administration.

Animal treatments

Fifty male Albino rats of the Wistar strain, weighing 140–150 g, were obtained from the Biochemistry Departmental Animal house in the College of Medical Sciences, University of Calabar, Calabar. The animals were housed in a well ventilated experimental section of the animal house, at room temperature. The animals were fed normal rat chow (Pfizer Livestock Co. Ltd., Aba, Nigeria). Both the experimental and control animals had free access to both rat chow and drinking water during the experimental period. The animals were randomly allocated into 5 groups of 10 animals each. Group 1 animals served as the control and received normal saline (0.5 ml). In groups 2, 3, 4, and 5, animals were treated with graded oral doses of 0.2, 0.4, 0.6, 0.8 ml of the crude water extract corresponding to 10, 20, 30 and 40 mg/kg body weight of the animals. Administration of the extract was carried out daily for 14 days between the hours of 10–12 noon.

Preparation of serum, liver and kidney tissues

Twenty-four h after the last administration, the animals were anaesthetized under chloroform vapour and were dissected. Blood samples were collected by cardiac puncture, using sterile syringes with needles. Blood samples for glucose estimation were collected into oxalate/flouride tubes and blood for serum preparation was collected into sterile plain tubes without an anticoagulant. Serum samples were separated from the clot by centrifugation at 3,000 g for 5 min using bench top centrifuge (MSE Minor, England). Serum samples were separated into sterile plain tubes and both the serum and whole blood samples were stored in the refrigerator for analysis. All analyses on blood and serum samples were completed within 24 h of sample collection.

Liver and kidney tissues were removed from the animals and trimmed down to a size of 3 mm × 3 mm thick and fixed in buffered formalin solution ready for histological studies. The tissue slides were prepared in the Histology Laboratory, Anatomy Department, College of Medical Sciences, University of Calabar.

Analysis of fasting blood sugar on plasma was done using Randox glucose kit method. Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities were determined using Randox kits. Serum triglyceride (TG) and cholesterol were assayed by the enzymatic colorimetric methods using QCA triglyceride GPO reagents and QCA enzymatic cholesterol reagents, respectively. The absorbance of all the tests were determined using spectrophotometer (HAICH, DR 3000 Germany).

Statistical analysis of data employed the standard Student's *t*-test and $P < 0.05$ was regarded as significant.

Results

Effects of extract on biochemical parameters

The effect of the extract from leaves of *Eleophorbia drupifera* on biochemical parameters (AST, ALT, cholesterol, TG, glucose and computed AST/ALT ratio) are presented in Table 1. The results indicate a significant decrease in the AST activity at all doses of the extract relative to the control, but ALT activities in the treatment groups did not differ from those of the control. Computed AST/ALT ratios showed a decrease ranging from 2.639 to 1.633 in the treatment groups compared to the control value of 3.366. There were no significant changes in TG and total serum cholesterol levels of treated animals at all doses relative to the control. However, a significantly higher value of glucose ($P < 0.05$) of the treatment groups compared with the control was observed.

Table 1. AST, ALT, cholesterol, TG, glucose and AST/ALT levels of normal Wistar rats on oral administration of aqueous extract of *Eleophorbia drupifera*.

Group	Dose (mg/kg)	AST (U/L)	ALT (U/L)	Cholesterol (mmol/l)	TG (mmol/l)	Glucose (mmol/l)	AST/ALT
1	–	101.25 ± 15.32	30.0 ± 2.82	1.35 ± 0.18	0.82 ± 0.08	3.64 ± 0.18	3.37
2	10	97.0 ± 7.44	36.75 ± 4.27	1.32 ± 0.05	1.13 ± 0.13	4.36 ± 0.22	2.6
3	20	80.25 ± 9.42	30.75 ± 6.39	1.13 ± 0.00	0.77 ± 0.08	4.44 ± 0.72	2.8
4	30	81.00 ± 10.00	31.50 ± 3.69	1.24 ± 0.23	0.87 ± 0.08	4.37 ± 0.63	2.5
5	40	49.00 ± 13.73	30.00 ± 2.31	1.19 ± 0.11	0.840 ± 0.07	4.52 ± 0.29	1.6

Mean ± SD of 10 samples.

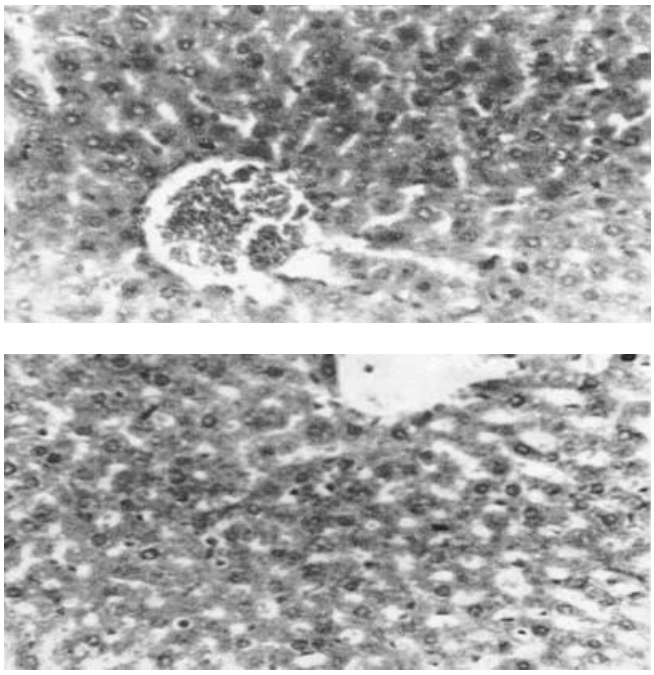

Figure 1 a. A typical liver section (mag × 100) of the treatment groups (2, 3, 4 and 5). There was no histopathologic alterations. b. Liver section (mag × 100) of the control group showing normal liver cell.

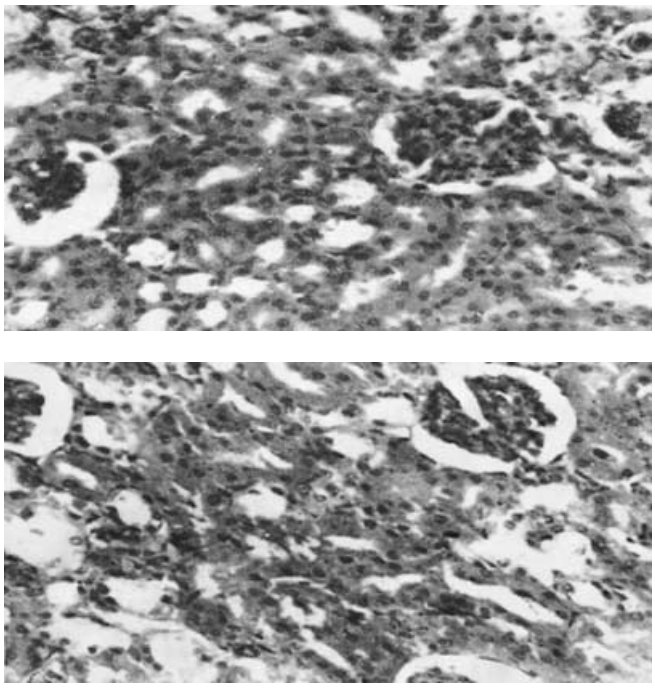

Figure 2 a. A typical Kidney section (mag × 100) of the treatment groups (2, 3, 4 and 5). There was no histopathologic alteration. b. Kidney section (mag × 100) of the control group showing normal kidney cell.

Effect of extract on histology of liver and kidney

Figure 1 shows the histology of the liver in treatment (a) compared with the control (b). Similarly, Figure 2 shows histology of the kidney tissue of the treatment (a) compared with the control (b).

There were no histological lesions in either the liver or kidney tissue of experimental animals as the cellular integrity and the cellular architecture were intact in both tissues, compared to their respective controls.

Discussion

This study was carried out to investigate the effect of oral administration of graded doses of *Eleophorbia drupifera* extract on some biochemical parameters and histology of the liver and kidney tissues of normal Albino Wistar rats.

The results of the study are summarised in Table 1. There were no significant differences in the TG and serum total cholesterol levels of the treated animals at all doses relative to the control. Similarly, there were no changes in the ALT activities of the treated groups compared with the control. AST activities showed a significant decrease at 20, 30, 40 mg/kg body weight doses of the extract ($P < 0.05$). This decrease in the serum AST level observed in this study indicates that the mitochondria of the liver cell may have been affected by the extract since AST is found in the mitochondria and cytoplasm and ALT in the cytoplasm. Computed AST/ALT ratio showed a decrease when compared with the control. The plasma glucose levels were significantly ($P < 0.05$) elevated in the treated groups compared with control. Histopathological investigation did not reveal any significant changes in both liver and kidney tissues of experimental rats.

The liver is the site of metabolism of xenobiotics. In heptatic damage, serum TG and cholesterol levels are raised as a result of decreased catabolic rate and there is some deposition of TG in the liver tissue (Muller et al., 1974; Aragno et al., 1992; Abdel-Baset et al., 1997). The cholesterol and TG levels of the experimental animals when compared with the control were not significantly different, suggesting that the catabolic rate of the experimental animals were not impaired by the administration of the crude extract. The possible explanation for the observed effect on serum cholesterol and triglyceride levels may be based on the fact that herbs are generally rich in vitamins. Vitamins such as vitamin C and E are good antioxidants capable of preventing lipid peroxidation in both plasma and tissues (Abdel-Baset et al., 1997). This may explain why there is no adverse alteration in the lipid levels of treated animals relative to the control.

Serum AST and ALT ratio has long been used as an index to monitor tissue pathology (Hacroft, 1987; Stroev & Makaraova, 1989; Eteng et al., 1998). A decrease in this ratio points to pathology involving the liver. There was a significant decrease which signaled possible liver pathology,

although no histopathological lesions were observed in both liver and kidney tissues.

Hypoglycemic effect of *Eleophorbia drupifera* leave extract on animals loaded with sucrose have been reported (Eno & Itam, 1996). It is interesting here to report that there was a significant ($P < 0.05$) increase in plasma glucose level of normal Albino Wistar rats. The increase was not dose dependent and we cannot compare this with the earlier reports of Eno and Itam (1996) because of differences in the experimental protocol and design.

Conclusion

We conclude from our study that *Eleophorbia drupifera* extracts did not induce adverse alterations in biochemical parameters such as serum AST, ALT, TG and total cholesterol, and no histopathological lesions have been observed in liver or kidney tissues of experimental animals. However, plasma glucose levels of normal non-diabetic rats were significantly increased relative to controls. In light of this finding on plasma glucose level, the mechanism of the previously reported hypoglycemic action in diabetic animals needs to be investigated. Work in this area is ongoing.

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