

## NATURAL DRUGS

PHARMACOGNOSY AND HYPOTENSIVE EVALUATION  
OF *FICUS EXASPERATA* VAHL (*MORACEAE*) LEAF

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**Abstract:** There is already a literature report on the anti-ulcer effect of water extract of *Ficus exasperata*. Some communities in Edo and Delta States of Nigeria use the decoction of the leaf as hypotensive crude drug. Verification of this claim and also the microscopy and other pharmacognostic parameters which can be used to establish the identity of the leaf were carried out. The microscopy of the leaf powder revealed the presence of straight walled epidermal cells, cone or nail shaped trichomes or epidermal hairs, clustered or prismatic calcium oxalate crystals of varying dimensions. The percentage weight loss on drying was  $9.84 \pm 0.08$  whereas water and alcohol extractive values were  $5.29 \pm 0.07$  and  $2.21 \pm 0.11$ , respectively. The ash value was  $30.68 \pm 0.44$  whereas the acid insoluble ash and water soluble ash values were  $17.87 \pm 0.37$  and  $16.73 \pm 0.13$ , respectively. Preliminary phytochemistry of leaf showed that it contains tannins, flavonoids and saponins with no traces of alkaloids or anthraquinones. The water extract showed a dose related reduction in mean arterial blood pressure. At 10 mg/kg, a reduction of  $16.6 \pm 1.1$  mmHg was observed, whereas at 30 mg/kg, a fall in mean arterial pressure of  $38.3 \pm 0.6$  mmHg was obtained. The hypotensive effect of the extract was significantly reduced with a prior administration of 2.5 mg of either atropine or chlorpheniramine. This suggests the probable stimulation of muscarinic receptors in the heart or release of histamine into the circulatory system thereby causing the initial fall in blood pressure.

**Keywords:** *Ficus exasperata*, pharmacognostic parameters, hypotensive effects.

Hypertension is a major risk factor for the development of stroke, congestive heart failure, coronary heart disease, peripheral vascular disease and renal failure (1). It is one of the major causes of sudden death in the society. In the past 2 or 3 decades, deaths from stroke have decreased by 59% due to increased use of synthetic antihypertensive drugs (2). Despite the efficacy of orthodox drugs, the use of herbs to reduce high blood pressure is still common among rural dwellers probably due to inherent side effects, high costs and unavailability of synthetic hypotensive drugs when required. One of such herbs used in some parts of Edo and Delta States is *Ficus exasperata* whose leaf extract is reportedly taken orally after decoction or maceration (personal communication) by hypertensive patients. Although there are various traditionally claimed uses of the leaf in different parts of Africa, very few of such claims have been scientifically investigated and documented. For instance, a decoction of the leaf has been established to exhibit significant reduction in intestinal motility in addition to its anti-ulcer activity with no sign of toxicity (3).

In order to add to the established or proven potency of this plant, this work was carried out to examine the effect of its leaf extract on blood pressure. Attempts were also made to determine standard pharmacognostic parameters that can be used to establish the identity of the leaf in powder form.

## EXPERIMENTAL

## Materials and methods

## Collection of plant material

The leaf samples of *F. exasperata* were collected in Benin in April, 2002 and identified by Mr. Abubakar, Department of Pharmacognosy, Faculty of Pharmacy, at University of Benin, Benin City.

## Preparation of plant material

The leaves were air-dried at room temperature followed by pulverization to powder form using an electric machine.

## Determination of pharmacognostic parameters

Microscopic examination of the powdered samples was carried out using Abbe type camera

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Lucida (at a magnification of 180×) while the quantitative parameters were determined using standard methods in African and British Pharmacopoeias (4, 5).

#### Preliminary phytochemical tests

Tests for the presence of alkaloids, saponins, anthraquinones, tannins and flavonoids were also carried out using standard procedures (6).

#### Preparation of extract

500 g of the powdered leaf was macerated for 24 h with distilled water. After filtration and concentration of the filtrate *in vacuo*, the extract obtained was kept in a refrigerator until required.

#### Drugs and chemicals

These include Atropine (Wuxi-China), Chlorpheniramine (Epil-pharm), Pentobarbitone Sodium (Poulenc Pharmaceuticals).

#### Preparation of animals for determination of blood pressure determination

Rabbits weighing 1.8-2.6 kg were purchased and maintained in the Department of Pharmacology and Toxicology Animal House with normal rabbit pellets (Livestock feeds) and water *ad libitum* till required. The animals were injected with 60 mg/mL of pentobarbitone sodium as anesthetic agent at a dose of 40 mg/kg i.p. The marginal ear vein was cannulated for administration of the extract and drugs. The carotid artery was cannulated and connected via a Bentley physiological pressure transducer to a twin channel Ugo Basile (Gemini 7070) recorder for recording blood pressure and heart rate.

#### Determination of the probable mechanism of action of the extract

The effects of atropine and chlorpheniramine on the hypotensive effects of the water extract was tested at 2.5 mg each followed by administration of the extract at 10, 20 and 30 mg/kg. The mean arterial blood pressure was calculated using the formula: Diastolic pressure + 1/3 (systolic-diastolic) and

where applicable, the statistical analysis was carried out using ANOVA.

## RESULTS

### Microscopy

Microscopy of the leaf powder revealed the presence of polygonal, straight-walled epidermal cells ( $38.6 \pm 0.5 \mu\text{m}$  long and  $20.83 \pm 0.4 \mu\text{m}$  wide), nail or cone shaped trichomes or epidermal hairs with prisms of calcium oxalate crystals. The xylem fibers contain clusters of calcium oxalate crystals whereas the xylem vessels were annular in shape. The abrasive nature of the leaf surface of the medicinal plant was observed to be due to the deposition of numerous clustered-shaped calcium oxalate crystals.

### Quantitative parameters

Table 1 shows the various values obtained from the determination of quantitative parameters.

### Phytochemical reports

Preliminary photochemical tests carried out on the powdered leaf showed the presence of flavonoids, saponins and tannins, with no traces of alkaloids or anthraquinones.

The hypotensive effects of the water extract of *Ficus exasperata* was observed to be dose related affecting both systolic and diastolic blood pressures. At a dose of 5 mg/kg, no appreciable effect on the blood pressure was observed, whereas at a dose of 10 mg/kg, the mean arterial blood pressure was reduced by  $16.6 \pm 1.1 \text{ mmHg}$  followed by an initial arrhythmia and latter stabilization of the heart rate.

Table 1. Values for quantitative parameters determined for leaf powdered sample of *Ficus exasperata*

Quantitative parameters	Values obtained (%)
Weight loss on drying	$9.84 \pm 0.08$
Alcohol extractive value	$2.21 \pm 0.11$
Water extractive value	$5.29 \pm 0.07$
Total ash value	$30.68 \pm 0.44$
Acid insoluble ash value	$17.87 \pm 0.37$
Water soluble ash value	$16.73 \pm 0.13$

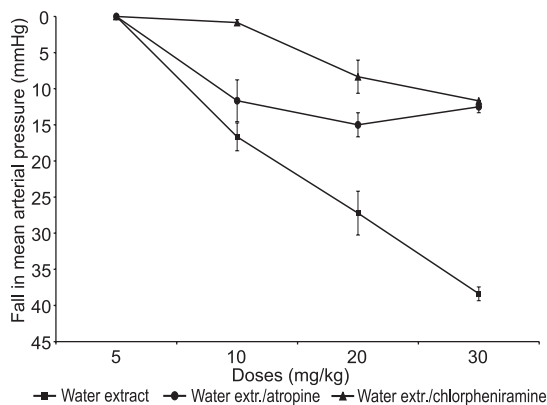


Figure 1. Dose-dependent hypotensive effect of the water extract of *Ficus exasperata* leaf on the blood pressure of normotensive rabbit.

The hypotensive effect of the extract was significantly affected by the prior administration of the atropine or chlorpheniramine.

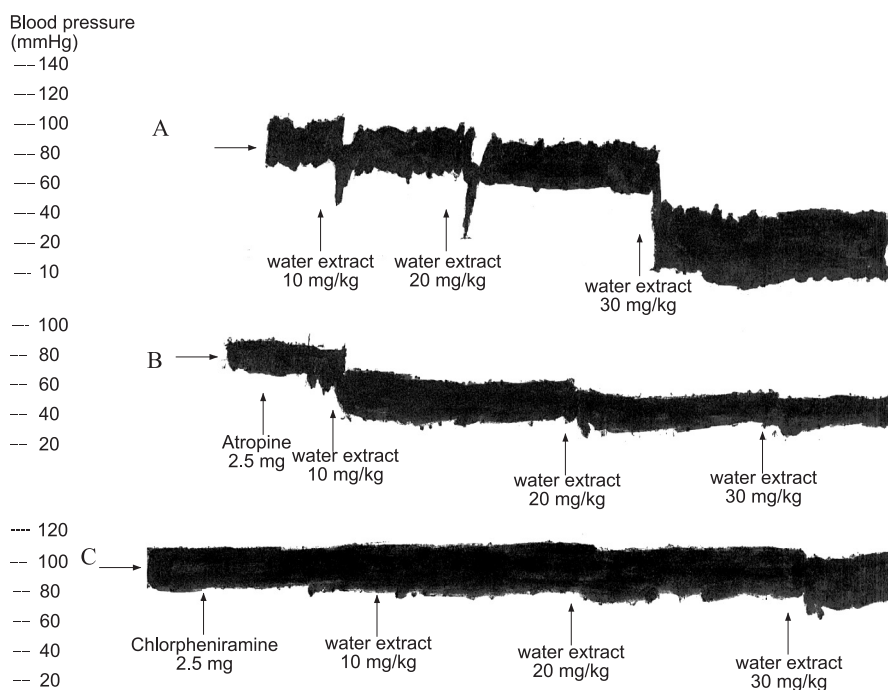


Figure 2. Effects of atropine and chlorpheniramine on the hypotensive effect of water extract of *F. exasperata* leaf. (A) Hypotensive effects of the water extract. (B) Partial inhibitory effect of atropine (2.5 mg) on the hypotensive effects of the water extract. (C). Inhibitory effect of chlorpheniramine (2.5 mg) on the hypotensive effects of the water extract.

The mean arterial pressure dropped by  $27.2 \pm 2.1$  and  $38.3 \pm 0.6$  mmHg after administration of 20 and 30 mg/kg of the extract, respectively. Atropine 2.5 mg and chlorpheniramine 2.5 mg significantly ( $p < 0.05$ ) reduced the hypotensive effects of the extract at the tested doses. For instance, the fall in mean arterial pressure observed after administration of 30 mg/kg of the extract was reduced to  $12.5 \pm 0.6$  mmHg and  $11.7 \pm 0.0$  mmHg with prior separate administration of 2.5 mg atropine and 2.5 mg and chlorpheniramine, respectively (Figures 1 and 2).

## DISCUSSION

Microscopic analyses and qualitative parameters are carried out on plant samples in order to establish appropriate data that can be used in identifying crude drugs particularly those supplied in powder form. They are standard pharmacognostic parameters that can be used to differentiate closely related plant species or varieties with similar constituents or pharmacological activities. The percentage weight loss on drying, which is an indication of the moisture content of the material, is important in determining the probable rate at which a drug can undergo deterioration due to fungal attack or enzymatic activities. Such enzymatic activities may lead

to degradation of the secondary metabolites responsible for the observed pharmacological activity or lead to conversion of the constituents to less potent ones. This value of  $9.8 \pm 0.8\%$  obtained for the leaves of *F. exasperata* is within the acceptable limit. Also, the high total ash value of  $30.9 \pm 0.4$  observed for the leaf indicated the high concentration of calcium oxalate crystals particularly on the epidermal layers. This relationship between the total ash and the calcium oxalate crystals had been reported for the rhizome of *Rheum palmatum* (6).

The results obtained on the effects of the leaf extract on blood pressure showed the potency of *F. exasperata* leaf as a hypotensive drug plant. The effects were observed to be sustained although with an initial arrhythmic action. The fact that the hypotensive effect of the leaf extract was reduced separately after administration of either atropine or chlorpheniramine indicated the probable involvement of muscarinic receptor-mediated vasodilatation as well as histamine release into the circulatory system. It is also possible that the extract causes stimulation of the muscarinic receptors in the heart which resulted in the initial fall in cardiac output and hence low blood pressure or that it stimulates the release of histamine which, when released into the circulatory system, produces a fall in blood pressure

through a fall in peripheral resistance. The probable effect of the extract on the stimulation of muscarinic receptors or histamine release was significantly reduced after the administration of either atropine or chlorpheniramine.

In related works, the hypotensive effect of the aqueous leaf extract of *Musanga cecropioides* was significantly reduced by atropine (7, 8), whereas the hypotensive of the stem bark was not affected by prior administration of the drug which implied that it was not associated with the stimulation of muscarinic receptors or the release of histamine although the plant is also in *Moraceae* family (9). More work is being carried out to ascertain the nature of the constituent(s) responsible for the observed hypotensive effects of *Ficus exasperata*.

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