

EVALUATION OF NEPHROTOXIC EFFECT OF BAUHINIA MONANDRA ON THE KIDNEY OF ALLOXAN INDUCED DIABETIC RATS

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ABSTRACT

Objective

This study was carried out to evaluate the nephrotoxic effect of *Bauhinia monandra* leaf extract on some Wistar rats.

Materials and Methods

Twenty rats were randomly divided into 4 groups of 5 each. The first group was the control and was fed with normal rat diet. The 2nd group received alloxan and *B. monandra* extract 1g/kg, i.p. The 3rd group received alloxan and *B. monandra* extract 2g/kg, i.p., while the 4th group received alloxan and *B. monandra* extract 4g/kg, i.p. The extract was given once daily for eight days and the rats were sacrificed after fasting for 16hr. Blood samples were then taken for biochemical analysis.

Results

Rats that received up to 4g/kg i.p. *B. monandra* extract had normal sodium, potassium, chloride and bicarbonate but urea and creatinine levels were high in the group administered with 2g/kg of the extract and increased significantly in the group administered with 4g/kg of the extract. Excessive administration of *B. monandra* extract above 2g/kg can be toxic to the kidney.

Conclusion

B. monandra causes elevation of certain biochemical parameters as such, it will be necessary to augment this medicinal plant with substances that can balance any elevated parameter and such a substance should not interfere with the function of the plant or alter the normal physiology of the body.

Keywords: *Bauhinia monandra*, kidney, medicinal plants, alloxan, diabetes

1. INTRODUCTION

Bauhinia monandra (Kurz), (family: Caesalpinaceae) is an ornamental tree commonly found in West Africa and India^[1] It is traditionally used for the treatment of diabetes in Nigeria, Brazil^[2], and Asia^[3]. It has also been used for post natal haemorrhage^[4]. Haemagglutinating, trypsin inhibiting and low disaccharidase activities for the seed extract have been reported^[5, 6]. *Bauhinia monandra* is a spreading tree with large leaves, pink and white flowers with one large anther which is elongated and sharply pointed, very persistent pods which split open by explosive mechanism^[7]. *Bauhinia monandra* which is commonly known as “cow’s foot”, Orchid tree, St. Thomas tree, Napoleon’s plume, Flamboyant, Mariposa and Pink butterfly. In Yoruba tribe of South Western Nigeria, it is known as “abafe”^[2]. Studies on the chemical composition of the leaves have led to the isolation of Quercetin-3-O-rutinoside and Quercetin^[8] and β -Carotene^[2]. Not much information is known about their possible toxic side-effect; hence the aim of this study was to determine the nephrotoxic effect of *B. monandra* leaf extract on Wistar rats.

2. MATERIALS AND METHODS

Plant extraction

The fresh leaves of *B. monandra* were collected from Wilberforce Island, Bayelsa State, Nigeria, rinsed in water, dried in an oven at 50°C and milled to a near fine power. The powered plant material was weighed and extracted at room temperature with 3000ml of 80% ethanol. The yield was also weighed according to the method of Alade et al.,^[9]

Treatment of animals

Twenty adult male albino rats weighing 225 \pm 25g were used for the experiment. They were housed in the Laboratory at 27 \pm 2°C, relative humidity 50 \pm 15% and normal photo period (12h dark/12h light). The rats were

grouped into 4 of 5 each and were supplied with standard pellet food with tap water. All rats received human care according to the criteria outlined in the "Guide for care and use of laboratory animals" prepared by the National Academy of Science and published by The National Institutes of Health.

Induction of diabetes in rats

After acclimatization, diabetes was induced by a single intraperitoneal injection of 150 mg/kg alloxan (Sigma, St. Louis, MO, USA) dissolved in sterile 0.9% saline. Rats were made to fast prior to alloxan administration. After 72 h, blood samples were collected from the tail vein of the animals for evaluation of glucose levels by using a glucometer. Animals with glucose levels above 196 mg/dL (11.1mmol/L) were used for this study, i.e., those presenting glucose levels below 196 mg/dL, were excluded from this study^[10].

Experimental design

The rats were randomly divided into 4 groups of 5 each and tested as follows: - Group A- Control (deionized water), Group B – Diabetic + *B. monandra* extract (1g/kg, i.p), Group C – Diabetic + *B. monandra* extract (2g/kg, i.p) and Group D – Diabetic + *B. monandra* extract (4g/kg, i.p). The extract was given once a day for eight days. At the end of the treatment, all the rats were sacrificed after fasting for 16hr. Blood was taken for biochemical analysis.

Biochemical analysis

Blood was obtained from the rats through cardiac puncture and allowed to clot. Serum samples were extracted by centrifuging the clotted blood at 3000g for 10min. The serum samples were analyzed for Na⁺, K⁺, Cl⁻ and HCO₃⁻ using automated Medical analyzer. Urea and creatinine were also analyzed using Berthelot reaction. Creatinine clearance was also determined by standard method.

Statistical Analysis

Values were represented as mean ± SD. Data were analyzed using one-way analysis of variance (ANOVA) and group means were compared using the Tukey-Kramer Multiple Comparisms Test using GraphPad InStat® software. P values < 0.05 were considered significant.

3. RESULTS

The results of the biochemical parameters of the kidney of alloxan induced diabetic rats administered with *B. monandra* are shown in tables 1 and 2. Urea was slightly higher in all the treatment groups when compared with the control, but it was not significant (p< 0.05, 0.01 and 0.001). This also applies to sodium, chloride and bicarbonate. Potassium decreased showing significant difference (p< 0.05, 0.01 and 0.001) in the group administered with 1g/kg of the extract and increased showing significant difference in the group administered with 4g/kg of the extract.

Table 1: Analysis of renal function in rats administered with *Bauhinia monandra*

Parameters (mmol/L)	Control	1g/kg	2 g/kg	4 g/kg
Urea	5.7±0.2	7.1±0.3	8.9±1.9	7.6±0.6
Creatinine	108±5.4	77±2.5***	116±6.0	165±51***

Each value represents the mean ± standard deviation (n = 5), values are statistically different from control at p< 0.05*, 0.01** and 0.001*** one-way analysis of variance (ANOVA) + Tukey –Kramer Multiple Comparison Test.

Table 2: Analysis of serum electrolytes in rats administered with *Bauhinia monandra*

Parameters (mmol/L)	Control	1g/kg	2 g/kg	4 g/kg
Na ⁺	123± 3.6	124±8.7	130±3.8	136±3.0
K ⁺	7.6± 0.5	6.9±0.2	6.8±1.2	7.3±1.0
Cl ⁻	93± 1.5	94±3.5	102±5.7*	105±2.4
HCO ₃ ⁻	15±2.5	18±4.7	20±6.3	21±1.1

Each value represents the mean \pm standard deviation (n = 5), values are statistically different from control at $p < 0.05^*$, 0.01^{**} and 0.001^{***} one-way analysis of variance (ANOVA) + Tukey –Kramer Multiple Comparison Test.

4. DISCUSSION AND CONCLUSION

Medicinal plants are important sources of drugs for the treatment of several ailments. The plants can be used alone or combined with other plants^[11]. The use of plant to treat illnesses is found throughout human culture^[12]. Globally, plant extracts are employed for their antibacterial^[13], antimalarial^[11], antifungal and antiviral activities. They are also useful in the treatment of tumours, asthma, inflammation, hypotension and coronary vasodilatory conditions^[14], cough, dysentery, boils and sores^[15] etc. It is known that more than 400,000 species of tropical flowering plants have medicinal properties and this has made traditional medicine cheaper than modern medicine. However, excessive intakes of these plants have severe unpleasant consequences, some of them resulting into complications and subsequent death of the patient. Severity of over dosage depends on the nature of the plant and the part of the plant used for treatment of the disease. Not much has been done to evaluate the harmful effects of these plants. The present study evaluated the nephrotoxicity of *Bauhinia monandra* leaf extract on alloxan induced diabetic rats. The plant is traditionally used for the treatment of diabetes in Nigeria and Brazil^[2]. When taken up to 4g/kg, there was slight elevation of serum urea and bicarbonate but with normal sodium, potassium and chloride. There was also an increase in creatinine level. Serum urea and creatinine elevation are evidence of acute kidney dysfunction^[16]. The result of this work suggests that *Bauhinia monandra* leaf extract in alloxan induced diabetes may have little nephrotoxic components when given up to 2g/kg i.p., This was deduced from the fact the creatinine level was elevated significantly at a higher dose. *B. monandra*, which has the ability to reduce blood sugar level in diabetic rats^[10], may not be absolutely friendly with the kidney at high doses. Therefore, *B. monandra* should be taken with substances that can balance any elevated parameter and such a substance should not interfere with the blood sugar lowering ability of *B. monandra*.

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