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# Anticonvulsant Activity of Methanol Stem Bark Extract of *Adansonia digitata* L. (Malvaceae) in Rats

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## Abstract

Epilepsy is amongst the oldest and most recognizable health problem and disabilities that afflicts almost fifty (50) million individuals across the world. Discrimination and social stigma are largely associated with epilepsy over decades. This research investigated the Anticonvulsant effects of methanol stem bark extract of *Adansonia digitata* in wistar rats following Pentylenetetrazole (PTZ) induced convulsion. Phytoconstituents and median Lethal Dose (LD50) values of the extract were also determined using standard methods. The Phytochemical screening revealed the presence of bioactive plant secondary metabolite such as alkaloids, flavonoids, glycosides, saponins and tannins while the acute toxicity studies revealed the LD50 values of approximately 5000 mg/kg body weight. The extract was able to significantly and dose dependently increased the onset of seizure and reduced seizure latency at the doses of 750 mg/kg and 1500 mg/kg body weight when compared to normal saline treated group. In this study, methanol stem bark extract of *Adansonia digitata* was found to contain phytochemicals which may be responsible for the observed anticonvulsant activity, supporting the traditional use of this plant in the treatment of epilepsy, However, the current study did not identify the active agent/s mediating the antiepileptic property of this plant and the mechanism through which the effect was exerted. Therefore further research is required.

**Keywords: Epilepsy; *Adansonia digitata*; Pentylenetetrazole; Phytochemistry; LD50**

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## Introduction

Epilepsy is the most prevalent neurological disorder affecting nearly fifty (50) million people worldwide. Epilepsy is characterized by uncontrolled discharge of neurons in the brain [1]. Children under the age of seven (7) and adults above fifty five (55) years are at the highest risk to have epilepsy. Approximately 5% of the world population does experience epilepsy in their lifetime [2]. Antiepileptic drugs are those agents that effectively control seizures in nearly 70% to 80% of subjects, but their use is largely affected due to the serious side effects such as trauma, tumors and cerebral infarction [1]. Medicinal plants remain the integral source of novel chemical substances with potential pharmacological activities [3]. Majority of medicinal plants used for the treatment of epilepsy in various folkloric systems have proven effective in the treatment of epilepsy when evaluated in the modern science [4]. *Adansonia digitata* (*malvaceae*) is the most widespread of the Adansonia species that is native to the African continent especially in Nigeria where it is cultivated for its medicinal values. This plant has been used ethno-medicinally for the treatment of various psychiatric disorders including epilepsy [5]. Adansonia digitata has been scientifically evaluated to have numerous pharmacological actions including antibacterial [6] anti-inflammatory, analgesic [7] and antidotal actions [8] amongst others. *Adansonia digitata* also known as "Baobab" tree in English, "Kuka" in Hausa and "Gangu" in Yoruba.

## Materials and Methods

### Material

Water bath, spatula, weighing balance, beaker, Whitman's filter paper, stainless steel tray and distilled water.

### Drugs and chemicals

Sodium valproate (Sanofi Aventis), methanol (Sigma chemical co. St Louis USA), Pentylenetetrazole (Sigma chemical co. St Louis USA) and distilled water. Other chemicals used

**Table 1:** Phytochemical constituents of *Adansonia digitata* stem bark extract.

| Phytochemical constituents. | Inference |
|---|---|
| Alkaloids | + |
| Flavonoids | + |
| Glycosides | + |
| Saponins | + |

(+) = Positive (-) = negative

include ferric chloride, dragendorff's reagent, wagner reagent, sulphuric acid, Sodium hydroxide and hydrochloric acid.

### Animals

Wister rats of either sex (180 g to 200 g) were procured from animal facility of the department of Pharmacology, Bauchi state University Gadau. All animals were housed and allowed to acclimatize for seven days with free access to food and water and maintained under standard laboratory conditions in accordance with national academy of science, guides for the care and use of laboratory animals [9,10].

### Extract preparation

Methanol stem bark extract was prepared from a freshly collected stem bark of Adansonia digitata. The collected plant material was allowed to dry under shade with adequate ventilation. The dried plant material was grounded to fine powder using wooden pestle and mortar. 300 grams of the powder was weighed and subjected to maceration using 400 ml of 95% v/v methanol with occasional stirring and agitation for three (3) days. The filtrate was then filtered using Whatman filter paper No:1 The filtrate was evaporated under reduced pressure using hot air ovum at 45°C and the content was air dried. The dried extract was then coded AME (Adansonia digitata methanol stem bark extract).

The percentage yield was calculated as = X/Y × 100; where X is the weight of dried concentrated extract, while Y is the starting material.

### Phytochemical analysis

The AME was screened for the presence of flavonoids, phytosterols, Amino acids, fatty acids, alkaloids saponins and glycosides using the method described by [11].

### Median lethal dose (LD50) determination

The acute toxicity of AME was determined using Lorke's method (1983). Rats of both sex were randomly divided into three groups, n=3 (A, B and C). The animals were weighed and labeled and then treated respectively with the extract at doses of 10 mg/kg, 100 mg/kg and 1000 mg/kg body weight intraperitoneally. The animals were then observed for signs of toxicity and mortality within 24 h. In the second phase, another three groups of one rat each were administered doses of 1600 mg/kg, 2900 mg/kg and 5000 mg/kg body weight of the extract. They were observed for signs of toxicity and mortality for another twenty four (24) h. The LD50 was then calculated as the product of the square root of the lowest dose that produced mortality and the highest dose for which the animal survived.

### Anticonvulsant screening

Anticonvulsant activity of the extract was evaluated using Pentylenetetrazole (PTZ) induced convulsion model. Rats were randomly divided into five groups (n=5). Group one served as control received normal saline 1 ml/kg, intraperitonial (i.p.) Groups 2, 3 and 4 received 1500 mg/kg, 750 mg/kg and 375 mg/kg body weight of the extract (AME) while group 5 was given sodium valproate 200 mg/kg body weight, intraperitoneal. Thirty (30) min later, each rat from the respective groups received a convulsive dose of pentylenetetrazole (80 mg/kg). In each case, onset of seizure and latency as well as percentage protection from seizure was observed and recorded. Increased in the onset of seizure by the extract and ability of the extract to protect animal from seizure was considered anticonvulsant effect.

## Results

Adansonia digitata stem bark extract was found to be dark brown with the percentage yield of 20.12% w/w.

### Phytochemical constituents of *Adansonia digitata* stem bark extract

The phytochemical screening of *Adansonia digitata* stem bark extract revealed the presence of alkaloids, flavonoids, glycosides, saponins and tannins (Table 1).

### Median lethal dose (LD50) values of methanol stem bark extract of Adansonia digitata

The intraperitoneal median lethal dose of the methanol stem bark extract was found to be 5000 mg/kg.

### Effect of stem bark of Adansonia digitata methanol extract on Pentylenetetrazole (PTZ) induced convulsion using rats

The methanol extract of Adansonia digitata stem bark extract was able to significantly and dose dependently increased onset of seizure and reduced seizure latency at the doses of 750 mg/kg and 1500 mg/kg body weight when compared to normal saline treated group. At the dose of 375 mg/kg, there was no significant statistical increase in the mean onset of seizure as compared to control group. The extract at all the tested doses exhibited better percentage protection when compared to normal saline treated group (Table 2).

## Discussion

In this study, *Adansonia digitata* stem bark extract was found to contain bioactive components such as alkaloids, flavonoids, glycosides and tannins which agree with several literature reports in which similar constituents were detected [2]. Flavonoids, phytosterols, phenolic compounds, amino acids, tannins and fatty acid are reported to have effects on many central nervous system disorders

**Table 2:** Effects of *Adansonia digitata* stem bark extract on Pentylenetetrazole induced convulsion.

| Treatment (mg/kg) | Mean onset of seizure (sec) | Mean seizure (sec) | Percentage Protection (%) |
|---|---|---|---|
| N/S (1ml/kg) | 8.5 ± 6.7. | 18.5 ± 2.9 | 0% |
| AME (1500) | 23.8 ± 2.1*. | 7.0 ± 0.5*. | 50% |
| AME (750) | 21.8 ± 2.8*. | 8.3 ± 0.2*. | 25% |
| AME (375) | 19.8 ± 4.2. | 9.3 ± 2.0*. | 0% |
| SV (200) | 21.8 ± 4.1*. | 5.5 ±1.8*. | 100% |

Expressed as mean ± SEM, n=5, p<0.05, N/S: Normal Saline; AME: *Adansonia digitata* methanol stem bark extract, SV: Sodium Valproate, *: Significant difference when compared to control group

including seizure [2]. The result of our acute toxicity studies revealed the LD50 values of 5000 mg/kg body weight suggested that the extract is relatively less toxic, and thus, worthy for practical purposes.

The significant increase in the onset of seizure by the extract at the doses of 750 mg/kg and 1500 mg/kg body weight when compared to control suggested anticonvulsant like effect. Significant reduction in the mean seizure latency when compared to control at all the doses tested also indicates anticonvulsant like action. The better percentage protection exhibited by this extract also indicates anticonvulsant like activity. The pattern of activity observed with our extract was similar to that of sodium valparoate (used as standard in this study), thus, the observed activity with our extract could be due to modulation of GABA ergic system, however further study is recommended to explore the exact mechanism of anticonvulsant action of this extract.

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