

## Antioxidant and Antipyretic Activities of *Adansonia Digitata* (African Baobab) Fruit, Leaf And Bark Extracts

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### ABSTRACT

The study was conducted to evaluate the antioxidant and antipyretic activity of *Adansonia digitata* (African Baobab) fruit, leaf and bark extracts. Antioxidant activity of plant part extracts were determined by free radical Diphenylpicrylhydrazyl (DPPH) assay while the antipyretic activity was assessed using experimental animals. Antioxidant activity of leaf extract showed a value of  $13.40 \pm 0.77$ , bark extract  $29.23 \pm 1.69$  while fruit extract gave a value of  $39.21 \pm 2.26$ . For the Antipyretic activity results, the average temperature of Albino Wister rats was  $21.65 \pm 0.96$  °C before fever inducement and  $30.64 \pm 1.37$  °C after inducement. Following the administration of the leaf extract (400 mg/kg and 800 mg/kg), bark extract (400 mg/kg and 800 mg/kg) and fruit extract (400 mg/kg and 800 mg/kg), the body temperature of the albino rats fell to  $25.96 \pm 1.16$  °C vs.  $25.28 \pm 1.13$  °C,  $26.06 \pm 1.17$  °C vs.  $25.02 \pm 1.12$  °C, and  $25.78 \pm 1.15$  °C vs.  $24.30 \pm 1.09$  °C respectively. The results showed that the fruit extract has a higher antioxidant and antipyretic activity than bark and leaf extracts.

**Keywords:** *Adansonia digitata*, African Baobab, Antipyretic, Antioxidant.

### INTRODUCTION

In recent years, there has been growing interest in alternative therapies and the therapeutic use of natural products, especially those derived from plants [1, 2, 3]. *Adansonia digitata* called the baobab tree in both English and French is very characteristic of the Sahelian region and belongs to the Malvaceae family [4]. The plant is a very massive tree with a very large trunk (up to 10m in diameter) which can grow up to 25m in height and may live for hundreds of years. The plant is widespread throughout the hot and drier regions of tropical Africa [5].

Baobab tree has multi-purpose uses, and every part of the plant is reported to be useful [6, 7]. The leaves, for instance, are used to make soup. Seeds are used as a thickening agent in soups, but they can be fermented and used as a flavouring agent, or roasted and eaten as snacks, while the bark is used in making ropes [8]. The different parts of the plant provide food, shelter, clothing and medicine as well as material for hunting and fishing [9, 10]. Baobab tree provides income and employment to rural and urban households. For instance, about 92,445 tons of baobab leaves were produced in Burkina Faso in 1990, corresponding to a value of US\$18.1 million [11]. Previously published biochemical analyses revealed that the leaves, the seeds and the pulp from baobab are rich in nutrients [12, 13, 14, 15, 16].

Studies have shown that the pulp could be used to treat 'sickle cell anaemia', as it showed considerable 'anti-sickling' activity. It is also reported that some soluble dietary fibers in the pulp have prebiotic effects and stimulate the growth and metabolic activity of beneficial organisms. Baobab pulp is used internally with buttermilk in cases of diarrhea and dysentery in Indian medicine system [17]. *Adansonia digitata* has numerous medicinal and non-medicinal uses. This research is to determine the antioxidant and antipyretic properties of African Baobab (*Adansonia digitata*) fruit, leaf, and bark. This research is justified by its potential

to increase the economic importance of this tree which is common in the northern part of Nigeria in general and Kano State in particular.

All data generated from the research was subjected to statistical analysis using SPSS (Statistical Package for the Social Sciences) software. All statistical analysis will be performed by one-way analysis of variance (ANOVA) followed by Dunnett's *t*-test for multiple comparisons. The difference will be considered significant at  $p < 0.005$ .

## MATERIALS AND METHODS

### Sample Collection

The fruits, leaf, and root bark of *Adansonia digitata* was obtained from the tree. Their identity was verified by the staff of Botany Department, Bayero University Kano.

Wistar rats of either sex were obtained from the Laboratory Animal house, Faculty of Medicine, Bayero University, Kano. The animals were kept under controlled environmental conditions: day light (10-12 h), temperature (25-28 °C) and humidity (50-55 %). The animals were fed on rat-dietary cubes and water.

### Preparation of Plant Extract

To prepare 50% ethanolic extract of *Adansonia digitata*, 50 g powder of each plant leaf, bark and fruit was extracted with 200ml of distilled water and 200 ml of absolute alcohol (v/v) in a Soxhlet apparatus for 24 hours (8 hours per day for 3 days). The extract was filtered and the filtrate was evaporated to dryness at low temperature under reduced pressure. The use of 50% ethanolic extract thus obtained was approximately 7.0 g for leaf, fruit and bark.

### Antioxidant Activity

The percentage of antioxidant activity (AA%) of each substance was assessed by DPPH free radical assay. The measurement of the DPPH radical scavenging activity was performed according to methodology described by Brand-Williams *et al.* [18]. The changes in color (from deep violet to light yellow) will be read [absorbance (abs)] at 517 nm after 100 min of reaction using a UV-VIS spectrophotometer (du 800; Beckman coulter, Fullerton, ca, USA). The mixture of ethanol (3.3 mL) and sample (0.5 mL) serve as blank. The control solution will be prepared by mixing ethanol (3.5 mL) and DPPH radical solution (0.3 mL). The scavenging activity percentage (AA %) was determined according to [19].

### Experimental Animals

An albino rat of both sexes (100-140g) was used for this study. They were housed in polypropylene cages under standard laboratory conditions (12h light/12 h darkness). The animals were given standard diet and water throughout the experimental period. The animals were then divided as follows in – number of rats per group.

Group1:	Control
Group 2:	Standard drug (50mg/kg Aspirin)
Group 3:	Dose 1 Leaf (400mg/kg) of Extract (ethanolic) of <i>Adansonia digitata</i>
Group 4:	Dose 2 Leaf (800mg/kg) of Extract (ethanolic) of <i>Adansonia digitata</i>
Group 5:	Dose 1 Bark (400mg/kg) of Extract (ethanolic) of <i>Adansonia digitata</i>

Group 6: Dose 2 Bark (800mg/kg) of Extract (ethanolic) of *Adansonia digitata*

Group 7: Dose 1 Fruit (400mg/kg) of Extract (ethanolic) of *Adansonia digitata*

Group 8: Dose 2 Fruit (800mg/kg) of Extract (ethanolic) of *Adansonia digitata*

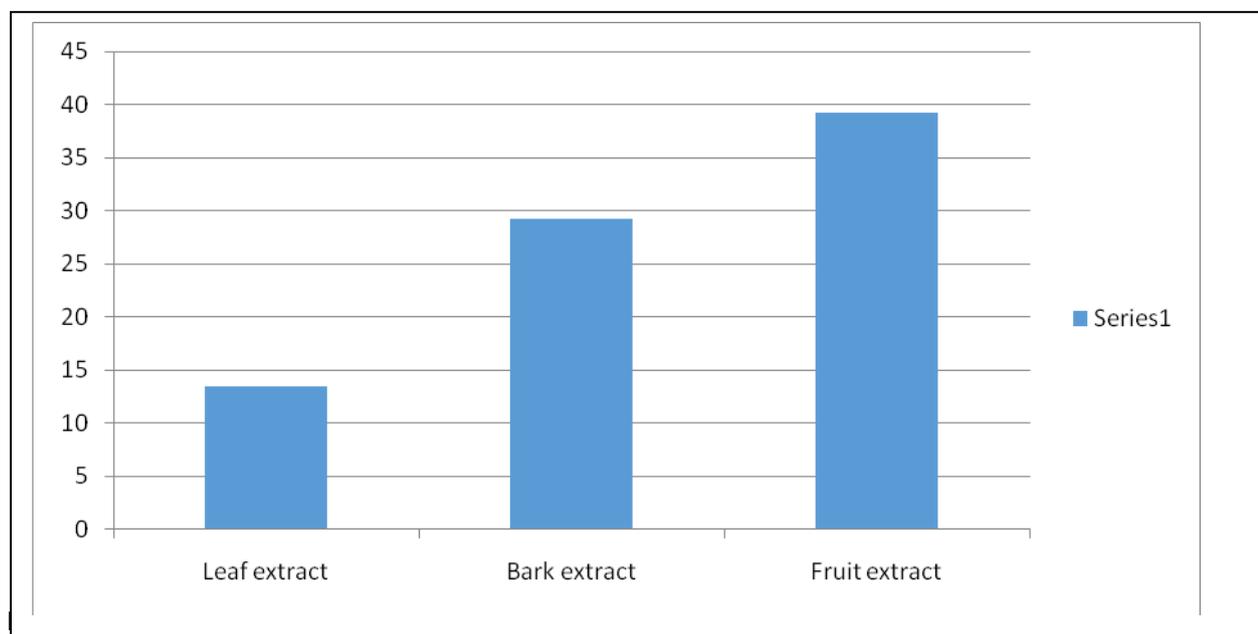
### Antipyretic Effect

Forty rats were divided into 8 groups, each of 5, and were made hyper-thermic by subcutaneous injection of a 12 % yeast suspension (1 ml/kg) as described by Tcoti-*no et al.* [20] after 15 h. The temperature of each rat was recorded. The first group was kept as a non – treated control, while the second group was orally administered Aspirin (standard) at the dose of 50 mg/kg. Groups 3 and 4 were orally given the extract in doses of 400 and 800 mg/kg this was done with all the part of tree used as indicated above, respectively. The rectal temperature of each rat was recorded hourly for 3 h.

### RESULTS AND DISCUSSION:

Part of <i>Adansonia digitata</i> (Baobab)	DPPH
Leaf extract	13.40±0.77
Bark extract	29.23±1.69
Fruit extract	39.21±2.26

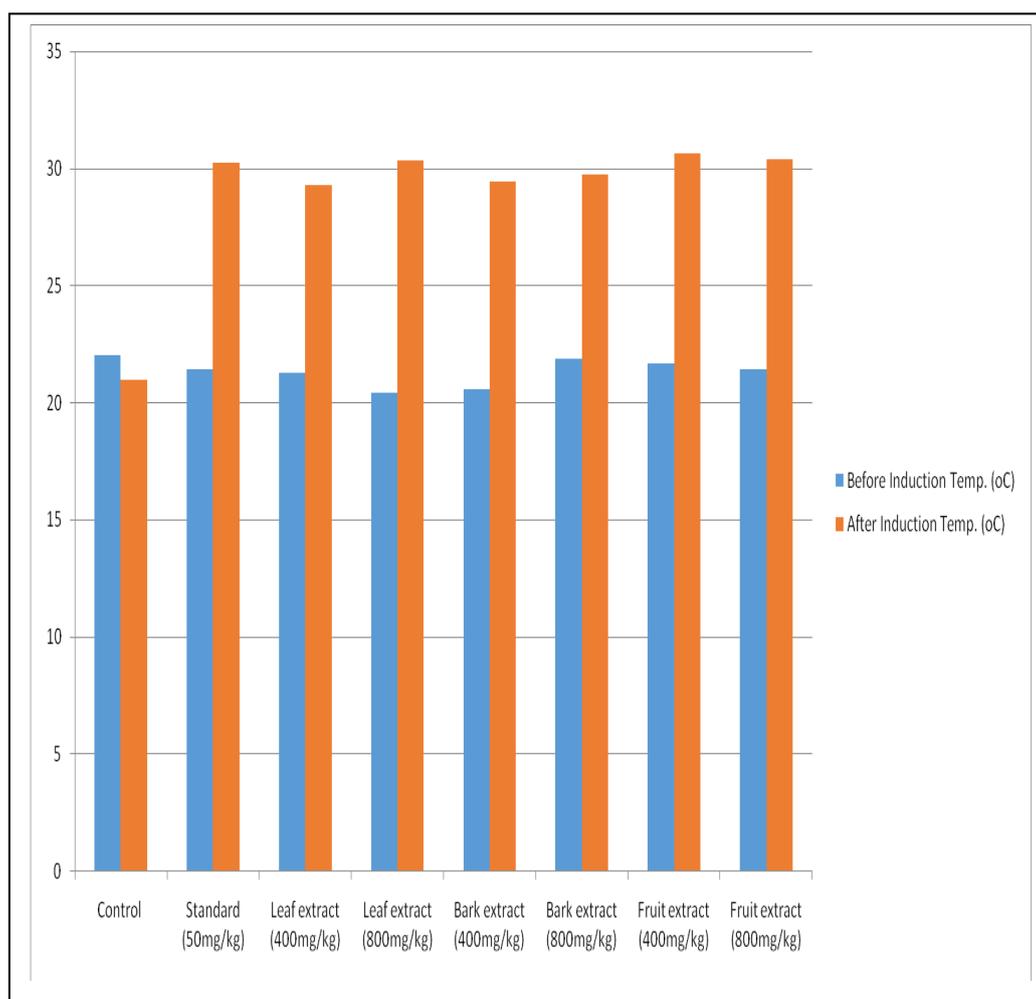
**All the results are expressed as mean ± SEM (Standard Error of mean) for three (3) replicates. Means are significantly different from each other at  $P < 0.05$ .**



**Antipyretic Activity:****Table 2: Temperature before and after induction of fever**

Group	Before Induction Temp. (°C)	After Induction Temp. (°C)
Group 1: Control	22.02±0.98	20.97±0.94
Group 2: Standard (50mg/kg)	21.43±0.96	30.23±1.35
Group 3: Leaf extract (400mg/kg)	21.25±0.95	29.30±1.31
Group 4: Leaf extract (800mg/kg)	20.42±0.91	30.34±1.36
Group 5: Bark extract (400mg/kg)	20.55±0.92	29.41±1.32
Group 6: Bark extract (800mg/kg)	21.85±0.98	29.71±1.33
Group 7: Fruit extract (400mg/kg)	21.65±0.96	30.64±1.37
Group 8: Fruit extract (800mg/kg)	21.43±0.96	30.41±1.36

**All the results are expressed as mean ± SEM (Standard Error of mean) for three (3) replicates. Means are significantly different from each other at  $P < 0.05$ .**

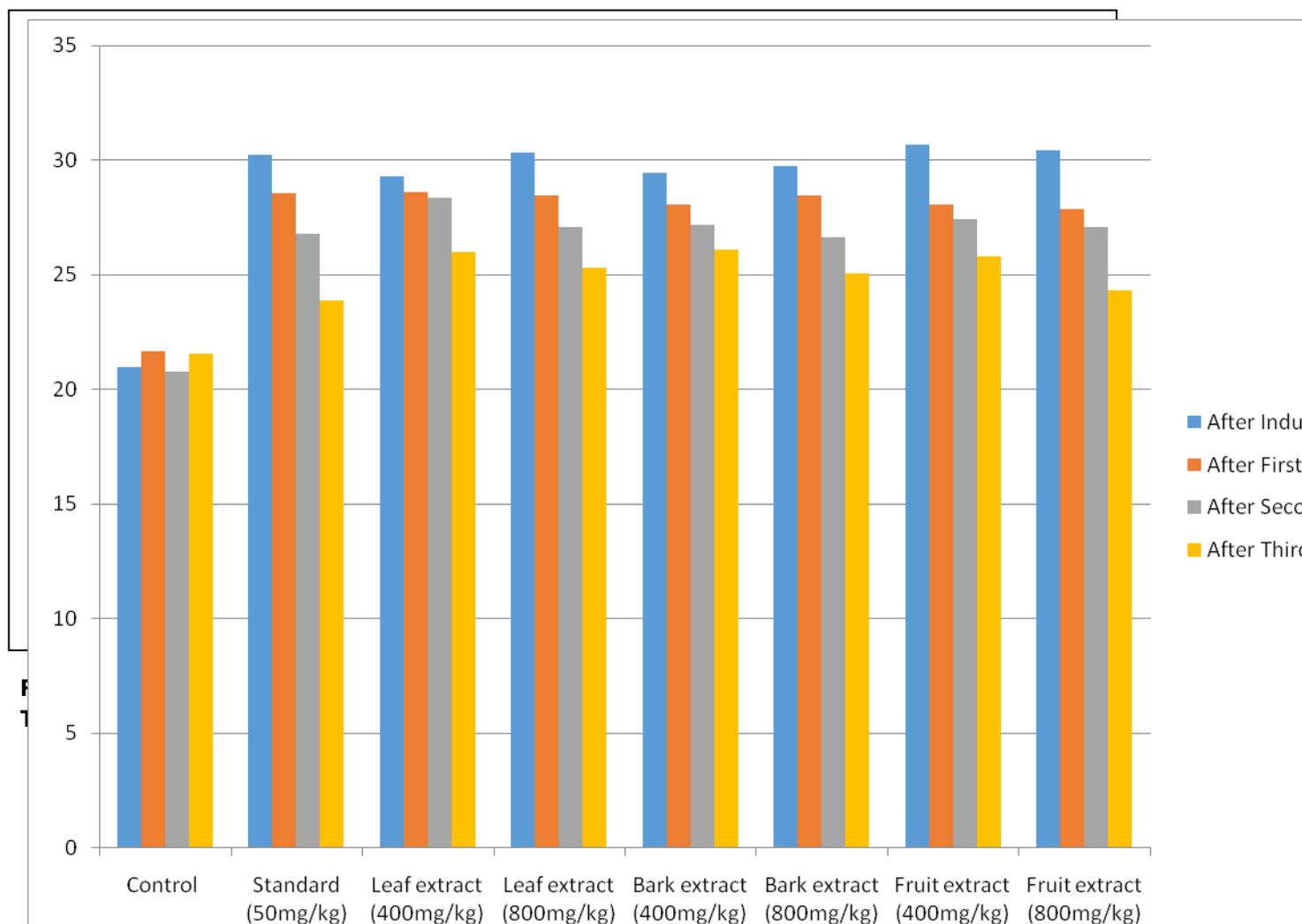


**Figure 2: Chart Showing Temperature Change Before and After Induction of Fever to Rats  
Temperatures of after 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Hours of Treatment**

**Table 3: Temperatures after the first three hours of Treatment**

Group	After Hour Treatment Temp. (°C)	First of Hour Treatment Temp. (°C)	Second of Hour Treatment Temp. (°C)	Third of Hour Treatment Temp. (°C)
Group 1: Control	21.65±0.97	20.76±0.95	21.55±0.96	
Group 2: Standard (50mg/kg)	28.52±1.28	26.75±1.20	23.85±1.07	
Group 3: Leaf extract (400mg/kg)	28.61±1.28	28.36±1.27	25.96±1.16	
Group 4: Leaf extract (800mg/kg)	28.46±1.27	27.04±1.21	25.28±1.13	
Group 5: Bark extract (400mg/kg)	28.05±1.25	27.18±1.22	26.06±1.17	
Group 6: Bark extract (800mg/kg)	28.44±1.27	26.62±1.19	25.02±1.12	
Group 7: Fruit extract (400mg/kg)	28.05±1.25	27.41±1.23	25.78±1.15	
Group 8: Fruit extract (800mg/kg)	27.86±1.25	27.05±1.21	24.30±1.09	

**All the results are expressed as mean ± SEM (Standard Error of mean) for three (3) replicates. Means are significantly different from each other at P<0.05).**



## Discussion

The results of the antioxidant activity as shown in table 1 shows that the fruit of *Adansonia digitata* (Baobab) has the highest antioxidant activity than the bark and the leaf with  $39.21 \pm 2.26$  the next to this is the bark with  $29.21 \pm 1.69$  and leaf showed an antioxidant activity of  $13.40 \pm 0.77$ . This is in conformity with the result obtained by Kaur and Kapoor [21], they evaluated the Antioxidants content in various fruits and vegetables and in their results *Adansonia digitata* (Baobab) fruit has an antioxidant of  $40.23 \pm 2.50$ . Most of the bioactive compounds are stored in fruit of the *Adansonia digitata* (Baobab) which is the reason for its high antioxidant activity than the bark and leaf. Vertuani [22] also conducted a research on the Antioxidant capacity of *Adansonia digitata* fruit pulp and leaves reported that the leaves have an antioxidant value of  $15.01 \pm 0.89$ .

The antipyretic activity of the tree parts (leaf, bark and fruit) conducted also showed a remarkable temperature increase among the rats induced with fever (Yeast suspension). The antipyretic activity also shown that the fruit has the highest value with  $24.30 \pm 1.09^\circ\text{C}$  after the third hour of treatment at a dose of 800mg/kg and  $25.78 \pm 1.15^\circ\text{C}$  at the dose of 400mg/kg, this values when compared with the control group (i.e. rats that were not induced with fever) which gave a temperature of  $21.55 \pm 0.96^\circ\text{C}$  and the temperature after induction which is  $30.41 \pm 1.36^\circ\text{C}$  it is observed that the fruit showed a very good temperature correction from 30.41 to  $24.30^\circ\text{C}$ .

The antipyretic activity of the bark also showed a remarkable temperature correction with values of  $25.02 \pm 1.12^\circ\text{C}$  after the third hour of treatment at a dose of 800mg/kg and  $26.06 \pm 1.17^\circ\text{C}$  at a dose of 400mg/kg. When this values are compared with the temperature of the control and the result after induction of the rats with fever which are  $20.55 \pm 0.92^\circ\text{C}$  and  $29.71 \pm 1.33^\circ\text{C}$  respectively, it is clearly seen that the bark of baobab at a dose of 800 mg/kg was able to reduce the temperature from 29.71 to  $25.02^\circ\text{C}$  which is also a very good temperature correction.

Leave extract gave the temperature correction of  $25.28 \pm 1.13^\circ\text{C}$  at a dose of 800 mg/kg and  $25.96 \pm 1.16^\circ\text{C}$  at a dose of 400 mg/kg which is almost the same thing with that of the bark, although researches have shown that the bark has high temperature correction than the leaf. The result of this research showed that the difference between the bark and leaf was just  $0.26^\circ\text{C}$ . This indicate that the leave also has the potential of being use to cure fever.

## Conclusion

In view of the ever increasing importance of health promotion and of the benefits, related to the use of antioxidant rich preparations and finding an alternative treatment for fever, this research work was under taken. The present work was to determine the antioxidant and antipyretic capacity of *Adansonia Digitata* (Baobab) leaves, bark, and fruit. The research results reveals that the fruit of the tree has more potential to be use as an alternative cure for fever as it shows a temperature correction of  $24.30 \pm 1.09$  at a dose of 800mg/kg from a temperature of  $29.71 \pm 1.33$  after third hour of treatment. This result when compared to that of the standard which gave a temperature of  $23.85 \pm 1.07$  reveals that that the difference between the standard drug and the extract of the fruit is not wide even though they were not administered at the same dose. This result when compared with that of bark and leaf which gave a value of  $25.02 \pm 1.12$  and  $25.28 \pm 1.13$ . It can be concluded that all the three parts of the tree may have an antioxidant and antipyretic property. This investigation, until all the active components of this plant will be clearly established, was conducted as an initial step to elucidate the therapeutic and nutraceutical potential of *Adansonia digitata* plant products. The research is recommending that *Adansonia digitata* (Baobab) leaf, bark and fruit should be taken because of its high antioxidant and antipyretic potentials.

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