

**SPECTROSCOPIC DETERMINATION OF TOTAL PHENOL, FLAVONOID CONTENT AND ANTI-OXIDANT ACTIVITY IN DIFFERENT PARTS OF *Adansonia digitata* L.: AN IMPORTANT MEDICINAL TREE.**Singh Sugandha<sup>1\*</sup> and Rai Shashi<sup>2</sup><sup>1\*</sup>Department of Biotechnology, Sant Hirdaram Girls College, Bhopal (M.P) India.<sup>2</sup>Group Director, JSS & Shaheed Hemu Kalani Educational Society, Bhopal (M.P) India.**Corresponding Author: Dr. Sugandha Singh**

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**ABSTRACT**

*Adansonia digitata* L. (Bombacaceae) (baobab) is a remarkable key tree species known as Kalpavriksha in India and very few reports validate its presence in the country. Baobab is a multi-purpose tree which is revered for its medicinal and nutritional value. It offers protection, provides food, clothing, medicine as well as Raw materials for many useful items. The fruit pulp, seeds, leaves, flowers, roots, and bark are edible and have been studied for their useful properties including antimicrobial, anti-malarial, antiviral, anti-oxidant and anti-inflammatory activity. In the present study, Quantitative spectroscopic estimation for phenols, flavonoids and anti-oxidant activity in plant extracts (methanol & aqueous extracts of bark and fruit pulp) was carried out. It was observed that the phenolic content was found maximum in the methanol bark extracts i.e. 44.50 µg (GAE)/ml compared to the methanol fruit pulp extract 38.69 µg (GAE)/ml. Methanol fruit extract was found to have higher flavonoid content (50.32 µg/ml) followed by aqueous fruit having 39.32µg/ml. Fruit pulp extract in methanol showed maximum anti-oxidant capacity of 114.82 µg AAE/ml followed by aqueous fruit pulp extract (84.23µg AAE/ml). The present results re-confirm the fact that the plant is a storehouse of large number of economically important chemicals, which have applied value as pharmaceuticals, with enormous anti-microbial potential against selected microorganisms. Also, the sudden interest developed in rehabilitation of this species is due to its unparalleled medicinal properties and rich chemical composition.

**KEYWORDS:** Phenol content, flavonoid, *Adansonia digitata*, pharmaceutical, nutraceuticals, antimicrobial, anti-oxidant.

**INTRODUCTION**

*Adansonia digitata* L. (Bombacaceae) commonly known as Baobab<sup>[1]</sup> is a very unique tree species known for its elegance and its multiple utility. It is commonly found in the thorn woodlands of African savannahs and is a very long-lived tree with multipurpose uses.<sup>[2]</sup> Every part of the tree is reported to have numerous medicinal and non-medicinal uses.<sup>[3]</sup> The plant parts are used to treat various ailments such as diarrhoea, malaria and microbial infections.<sup>[4]</sup> It is also known as the dead-rat tree (from the appearance of the fruits), monkey-bread tree (the dry fruit as food for monkeys), upside-down tree (the bare branches looked like roots) and cream of tartar tree (the acidic taste of the fruits).<sup>[5]</sup>

The flora from Tikamgarh District in Bundelkhand Region has immense pharmaceutical and commercial potential. The various plant parts (e.g. leaves, bark and fruit pulp), have traditionally been used for immunostimulant, anti-inflammatory, analgesic, insect repellent and pesticidal properties, in the treatment of diarrhoea

and dysentery and have been evaluated as a substitute for imported western drugs.<sup>[6,7]</sup> Several compounds like terpenoids, steroids, vitamins, carbohydrates and lipids have been isolated from fruit pulp, seed oil and root isolates.<sup>[8]</sup> It was observed that every part of the tree is economically important in terms of pharmaceutical and nutraceutical indicators; still the tree has very limited distribution and far more limited occurrence.<sup>[9]</sup> It is unfortunate to record that the tree is an endangered species and very few efforts are being made all over the world for its regeneration. Today, the tree is not very widely distributed in the country including Madhya Pradesh where the presence of the tree is reported from Bhopal, Sagar and Dhar district.<sup>[10]</sup> The secondary metabolites can be easily drawn in the purest form by the cell and suspension culture technology. This will be an economically viable and commercially valuable approach for extracting high range pharmaceuticals in vitro. In the present work, an attempt has been made for determining the total phenol, flavonoid and antioxidant activity of stem bark and fruit pulp.

## MATERIAL AND METHODS

### Plant material

The plant material was collected, cleaned and air dried in shade for 20 days. The stem bark and fruit pulp samples were grinded to obtain a smooth powder. The grinded samples were weighed and 10 gram of the powdered samples were extracted with 100 ml of distilled water and methanol using a rotary shaker. The samples were filtered using sterile Whatman filter paper and the filtrate was concentrated 50°C under reduced pressure with Buchi Rotavapor for 2-6 hours to one-fifth of the original volume. The extraction was done three times for each plant material.

### Estimation of total phenol content

Total phenolics in methanolic bark and fruit pulp extracts were estimated by FCR method.<sup>[11]</sup> Standard curve was prepared using standard gallic acid at different concentrations of 20-100 µg/ml.

### Estimation of total flavonoid content

The total flavonoid content in the various plant extracts (methanol and aqueous extracts of bark and fruit pulp) was estimated using the vanillin assay.<sup>[12]</sup>

### Determination of the total anti-oxidant capacity

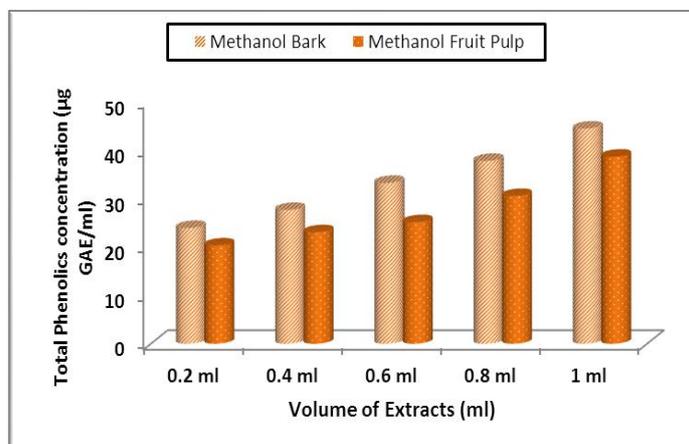
The total anti-oxidant capacity was measured by Phosphomolybdenum method.<sup>[13]</sup> Total phosphomolybdate reducing capacity was estimated using ascorbic acid as a standard.

## RESULTS AND DISCUSSION

Phenolic content was found maximum in the methanol bark extracts. The methanol bark extract had higher content that is 44.50 µg (GAE)/ml compared to the methanol fruit pulp extract 38.69 µg (GAE)/ml (table 1, figure 1). Even, 0.2 ml of the bark extracts showed high phenolic content. Phenolic compounds have been reported to serve as antioxidants, and exhibit a wide range spectrum of medicinal properties such as anti-cancer, anti-inflammatory and diabetes<sup>[14, 15]</sup>. In a separate investigation, another study<sup>[16]</sup> reported that total phenolic levels in fresh ripe fruits were significantly higher in the aqueous, methanol than in the aqueous, acetone extracts (4057.5 and 3518.3 mg GAE (gallic acid equivalents)/100 g of fruit for total phenolics, respectively).

**Table 1: Total phenolics content in methanolic bark and fruit extracts**

Extract	Total phenolics concentration (µg GAE/ml) ± SD				
	0.2 ml	0.4 ml	0.6 ml	0.8 ml	1 ml
<b>Methanol Bark</b>	23.94±0.51	27.66±0.10	33.26±0.17	37.81±0.28	44.50±0.17
<b>Methanol Fruit</b>	20.31±0.75	23.05±0.68	25.14±0.43	30.55±0.49	38.69±0.50



**Figure 1: Comparative chart showing total phenolic content per ml of methanol plant extracts**

The total flavonoid content of bark and fruit pulp extracts are presented in table 2.

**Table 2: Total flavonoid content in methanolic and aqueous plant extracts**

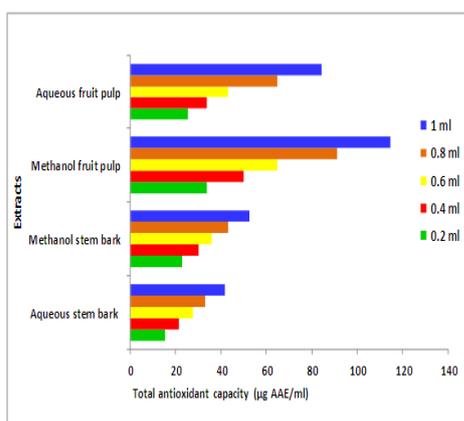
Extract	Concentration (µg/ml) Mean ± SD
Methanol bark	34.21±0.78
<b>Methanol fruit</b>	<b>50.32±0.51</b>
Aqueous bark	30.03±0.44
Aqueous fruit	39.32±0.72

Flavonoids are one of the most diverse natural compounds known to possess chemical and biological

activities like radical scavenging, antiallergenic, antiviral, anti-inflammatory etc.<sup>[17, 18]</sup> Methanol fruit

extract was found to have higher flavonoid content (50.32  $\mu\text{g/ml}$ ) followed by aqueous fruit having 39.32 $\mu\text{g/ml}$ . Overall, methanol extracts showed high amounts of flavonoids as compared to aqueous extracts. Our results are inconsistent with the studies of [19] where the total flavonoid content was found highest in methanolic stem bark extract.

The total phosphomolybdenum reducing capacity of the different extracts and a comparative analysis of the anti-oxidant capacity in different volumes of each extract is given in figure 2. Fruit pulp extract in methanol has maximum anti-oxidant capacity of 114.82  $\mu\text{g AAE/ml}$  followed by aqueous fruit pulp extract (84.23 $\mu\text{g AAE/ml}$ ). Methanol fruit pulp however was found to have the highest anti-oxidant capacity even at lower volume of the sample (33.87 $\mu\text{g AAE/ml}$ ) in 0.2 ml of the extract. The study of [20] showed that the antioxidant capacity of the hydrophilic extract of fruit pulp was higher (7.65 mg ascorbic acid equivalent/g) compared to the lipophilic extract of fruit pulp (3.32 mg ascorbic acid equivalent/g).



**Figure 2: Comparative analysis of total phosphomolybdenum reducing capacity per ml of extracts**

## CONCLUSION

The result of the present investigation reports the quantitative analysis of total phenolics, flavonoids and anti-oxidant capacity present in different parts of *A. digitata*. The chance to find bioactive compounds with antimicrobial activities becomes more apparent in the methanol bark and fruit pulp extracts. However, further investigations are required to isolate and characterize the active constituents and evaluate their therapeutic role.

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