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Research Article

### Quantification of vitamin C in leaves and fruit pulp of *Adansonia digitata* L.

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**Abstract:** The species of *Adansonia digitata* L. (Bombacaceae) is an endangered medicinally important forest tree. It is known as *Kalpavriksha* as all the parts of the tree such as leaves, seeds, flowers, fruit pulp, bark and roots are used in the preparation of food products, medicines, fuel, timber and fodder. The leaves and fruit pulp of *A. digitata* are known to be rich in many mineral nutrients such as calcium, iron, vitamin A and C. The aim of the present investigation was to estimate the amount of vitamin C in leaves and fruit pulp of *A. digitata* and also to compare their percentage with fruits of orange and lemon. The results revealed that the fruit pulp was found to possess more amount of vitamin C than in leaves of *A. digitata* and Orange but less than the Lemon fruit.

**Keywords:** *A. digitata*, leaves, fruit pulp, Vitamin C and DCIP.

#### INTRODUCTION

The species of *Adansonia digitata* L. (Bombacaceae) is a globally endangered medicinally important deciduous forest tree commonly known as “*Baobab*”. The plant prefers dry conditions, well-drained soil, and tolerates fierce sun. It possesses a massive trunk of immense girth which resembles an elephant with smooth bark and humanoid branches with leaves. The tree bears white, pendulous flowers and velvety, elongated fruits. These fruits contain a powdery pulp with many small, dark brown seeds embedded in it, each about 1 cm long and wide.

This tree mainly valued for its nutritional factors, as all the parts of the tree are edible such as fruits, flowers, leaves, shoots and roots. The leaves can be used either fresh or dried powder as a functional ingredient (thickener) of soups and sauces<sup>1-3</sup>. The fruits contain a white, acidic tasting nutritious flesh used to make refreshing drinks and ice-creams, or used to adulterate and curdle milk. The seeds are rich in protein<sup>4-6</sup> and yield edible and pleasant tasting oil, and oil extraction results in an oil meal<sup>7</sup>. The bark is used for fiber, firewood and roots yield a useful red dye and fruit pulp is burnt to deter insects troublesome to livestock and the ashes from fruit shells bark and seeds are rich in K and also used as fertilizers<sup>1,9</sup>. Roots, bark, leaves, fruits and seeds are used medicinally for an enormous range of ailments, among the more common of which are iron deficiency, digestive system disorders, infections and skin disorders in both human as well as in veterinary treatments as they are found to be rich in bioactive compounds<sup>9,10</sup>.

The baobab fruit is composed of an outer shell (epicarp) (45%), fruit pulp (15%) and seeds (40%). The woody epicarp or pod contains the internal fruit pulp (endocarp) which is split in small floury, dehydrated and powdery slides that enclose multiple seeds and filaments, the red fibres that subdivide the pulp in segment. The pulp is an ingredient in cool/hot drinks, in different kinds of ice products<sup>11,12</sup>. Fruit pulp is important in local diets as a seasoning component and appetizer. When the pulp is soaked in water, it produces a milky solution, which can be consumed as a milk substitute. The fruit pulp is acidic and this is due to the presence of organic acids including citric, tartaric, malic, succinic as well as ascorbic acid. When eaten raw, the pulp is a rich source of calcium and vitamins B and C. It contains sugars but no starch, and is rich in pectin. Baobab pulp is recommended daily intake (RDI) for vitamin C for children and pregnant women<sup>13</sup>.

In general, vitamin C is involved in the formation of fundamental intercellular collagen, in body structures and particularly in the formation of bones and teeth. It enhances the absorption of iron from plant foods. It is essential in the healing of bone fractures and plays an important role in maintaining proper immune function, as an antioxidant it can block the damage caused by free radicals produced in a body due to metabolic activities.

According to literature survey the leaves and fruit pulp of *A. digitata* are known to be rich in many mineral nutrients such as calcium, iron, and vitamin A and C. Thus, the determination of vitamin C content is an important because of its medicinal as well as nutritional value in the species. The aim of the present investigation was to estimate the amount of vitamin C in leaves and fruit pulp of *A. digitata*, and also quantifying the vitamin C content in Lemon and Orange fruits.

## MATERIALS AND METHODS

**Collection of Plant material:** The leaves, fruits of *A. digitata* were collected from DKW College for Women, Nellore District, Andhra Pradesh, India which were dried under shade for 45 days. The dried leaves were made into fine powder using an electronic blender then sieved using a muslin cloth and stored in air tight container for future use. The hard fruit wall was broken to collect the fruit pulp found to be a white powdery substance attached to the seeds. The fresh fruits of Lemon and Orange were purchased from local market of Waranagal, Telangana State, India. The leaf and fruit pulp of *A. digitata* and fruits of lemon and orange were tested for the quantity of vitamin C using DCIP through the method<sup>14</sup> with slight modifications.

*Preparation of reagents*

**2, 6-Dichloroindophenol Solution (0.025 % of DCIP):** The DCIPI solution is prepared by dissolving 50 mg of 2, 6-dichloroindophenol and 42 mg of NaHCO<sub>3</sub> (Sodium bicarbonate) in few ml of distilled water and then diluted to the 200ml with the same.

**Metaphosphoric acid (5%MPA):** 5.0 mg of MPA was dissolved in 8.0 ml Glacial acetic acid then diluted to 100 ml with distilled water.

**Procedure:** 100 gm of each of plant material was homogenized individually by adding 5% MPA then filtered and supernatants were collected separately. To 1.0 ml of the each sample solution, 9.0 ml of the 5% MPA was added and titrated against DCIP until a permanent (lasting more than 30 sec) light red or pink color appears. The volume of DCIP needed to oxidize all of the ascorbic acid recorded carefully; the experiment was repeated with different test samples separately to get concurrent readings. Then 1.0 ml of standard ascorbic acid (1 mg/1ml) and 9.0 ml of 5% MPA were taken into a beaker and titrated against DCPIP and final volume for its oxidation was recorded.

**Data Analysis:** Data pertaining to the volume of DCIP utilized for the oxidization of ascorbic acid of both leaf and fruit pulp of *A. digitata* and lemon and orange fruits was recorded and the procedure on six additional samples of standard ascorbic acid was repeated. The percentage of vitamin C present in different samples of plant material was calculated by using the following formula:

$$\text{Amount of vitamin C (\%)} = L \times S \times D/A \times 100/W$$

Where,

L= volume of 2, 6 DCPIP utilized in sample titration

S= mg of Ascorbic acid reacting with 1 ml of 2, 6 DCIP

D= total volume of the extract in ml

A= volume of the sample extract taken for titration (1ml)

**Table1:** Showing the percentage of vitamin C in different parts of *A. digitata* and other fruits

S. No.	Name of the Sample	% of vitamin C
1	Ascorbic acid	24.75
2	Lemon	88.0
3	Orange	27.5
4	Fruit pulp of <i>A. digitata</i>	82.5
5	Leaf of <i>A. digitata</i>	55.0

## RESULTS AND DISCUSSION

In the present investigation the quantity of vitamin C present in leaf and fruit pulp of *A. digitata* and in Lemon and Orange fruits was assayed (Table. 1). The leaf and fruit pulp of *A. digitata* found to possess 55% and 82.5 % respectively. The amount of vitamin C in leaves and fruit pulp of *A. digitata* is found to be more than orange (27.5%) and less than lemon (88%).

In general, vitamins play an important role in bodily functions such as metabolism, immunity and digestion, among which vitamin c, which is water soluble is needed for the normal growth and development, maintenance of healthy gums, improvement in the absorption of iron from the diet, metabolism of bile acids, hormones, neurotransmitters, and also in control of high blood pressure. It acts as a powerful antioxidant and neutralizes the harmful free radicals thus aids in neutralizing toxins and able to prevent the formation of potential carcinogenic substances<sup>15-17</sup>.

Supplements of vitamin C such as ascorbic acid, sodium ascorbate, or calcium ascorbate are made from unnatural ingredients and chemicals and are not efficient in their action and found to be detrimental, whereas natural supplements are synthesized from their natural plant-based sources and are found to be effective than synthetic ones and safe.

Thus, at this juncture our results in the present investigation becomes important as the fruit pulp and leaves of *A. digitata* are found to be rich in vitamin c content and can directly be included in regular diet to compensate the necessity of vitamin C in maintaining the proper health.

## CONCLUSION

In conclusion, the present investigation reports that the leaves and fruit pulp of *A. digitata* are rich in vitamin c hence may be included in diet due to its role in the developmental as well as metabolic activities in human body.

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