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Estimation of protein and amino acid content of *Adansonia digitata* and *Bombax ceiba*

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Abstract

Medicinal plants are used by people for a long time to cure various diseases. The plants *Adansonia digitata* and *Bombax ceiba* belonging to the family Bombacaceae were selected for the present study. Estimation of protein and total amino acid content of leaf, stem, and bark of these plants was estimated in different seasons. The protein content of *Adansonia digitata* showed increasing order bark < stem < leaves and that of *Bombax ceiba* was stem < bark < leaf in increasing order. The range of amino acid content for both plants *Adansonia digitata* and *Bombax ceiba* was in the increasing order bark < stem < leaf.

Keywords Medicinal plants, *Adansonia digitata*, *Bombax ceiba*, protein, an amino acid

Introduction

The traditional use of medicinal plants as a drug is known to us since ancient times. Most of the world's population depends on the plant due to its medicinal value and scarcity (Tagboto S, 2001 & Hudaib M et al, 2008). Nowadays medicinal plants are used as drugs and increase demand and popularity, as many people are shifting from modern drugs to traditional ones. The number of various modern drugs have been identified and isolated from natural sources.

Adansonia digitata L. and *Bombax ceiba* L. belong to family Bombacaceae. Bombacaceae is a small family of flowering plants, contains about 28 genera and 200 species (Joly, 1991). *Adansonia digitata* has multi-purpose uses and all part of the plant is reported to be useful (Igboeli et al., 1997; Gebauer et al., 2002). The plant parts are used to cure various diseases such as diarrhea, malaria, and microbial infections (Kamatou et al, 2011).

Bombax ceiba is a lofty deciduous tree also known as Red Silk Cotton tree, Shalmali, Semal, Katesavar, etc is well distributed in temperate and tropical Asia, Africa, and Australia (Vartika Jain, 2014). It is an important tree to cure several diseases. According to Ayurveda, it has stimulant, astringent, hemostatic, aphrodisiac, diuretic, antidiarrheal, cardiogenic, emetic, demulcent, anti dysenteric, and antipyretic properties

(Williamson, 2002 & Singh M.P, 2006). It is extensively utilized by tribal folk and mostly all parts of the plant are used Medicinally and have ethnobotanical significance (Xavier et.al, 2012).

Both plants are having a variety of phytochemical compounds present in their different parts viz. leaves, stem, bark, fruit, flowers, seeds, etc. (John Refaat et al, 2013). Leaves stem and bark of *Adansonia digitata* L. and *Bombax ceiba* L were selected for the quantitative estimation of proteins and total amino acids.

Materials and Methods

Collection of plant material: leaves, stem, and bark of *Adansonia digitata* and *Bombax ceiba* were collected in summer, monsoon, and winter seasons for continuous two years. The collected plant material was clean and washed to remove any soil particles and dried in shade before grinding into a powder. The powdered plant material was stored in airtight containers for further use.

Quantitative estimation of protein: The proteins were quantitatively estimated by the method of Lowry et al (1951).

1 gm of plant material was homogenized with 10 ml of 80% ethanol. This was centrifuged at 5000 rpm for 5 minutes and the supernatant was discarded. To this residue, 10 ml of 5% Trichloroacetic acid was added. It was then incubated at 80°C for 20 minutes and centrifuged later. The supernatant was discarded, and the residue was washed with 10 ml distilled water. It was again centrifuged, and the supernatant was discarded. 10 ml of Lowry A solution (2% Na₂CO₃ in 0.1 N NaOH) was added to the residue and it was incubated for an hour at 30° C. After one hour it was centrifuged; the residue was discarded, and the supernatant was collected. The final volume of the supernatant was measured, and it served as a sample for protein estimation. 1 ml aliquot of sample was taken and mixed with 5ml of Lowry C solution. It was then incubated for 10 minutes. To this 1ml of Folin-Ciocalteu reagent was added and the contents were mixed. The color intensity was measured in a spectrophotometer at 660 nm. BSA was used as standard.

Quantitative estimation of total amino acids: The estimation of total amino acid was adapted by Krishnamurthy et al (1989) method. 500 mg plant material was grounded in mortar and pestle with few drops of cold 80% ethanol. Then 2.5 ml of distilled water and 10 ml of boiling 80% ethanol were added to it. The extract was centrifuged for 15 minutes at 10,000 rpm. The residue was discarded. The supernatant was collected, and the total volume was made 15 ml with distilled water. 1ml of the sample was taken in a test tube and 3ml alcoholic ninhydrin (400 mg ninhydrin in 100 ml ethanol) was added to it. The test tube was kept at 60°C for 20 minutes. The test tubes were cooled and 1ml 50% ethanol was added. The optical density was read at 420 nm in the spectrophotometer. Glycine was used as standard.

Results and Discussion

The protein content of *Adansonia digitata* leaf was higher (89.295 mg/g dry wt.) in the summer season over monsoon (34.74 mg/g dry wt.) and winter season (47.925 mg/g dry wt.). The range of protein content leaves for *Adansonia digitata* was noted to be from 34.74 mg/g dry wt. to 89.295 mg/g dry wt. The range of protein content of stem of *Adansonia digitata* was noted from 16.515 mg/g dry wt. to 24.479 mg/g dry wt. , with the highest being in the monsoon (24.479 mg/g dry wt.). The bark of *Adansonia digitata* exhibited higher protein content in the winter season (21.518 mg/g dry wt.) over summer (14.233 mg/g dry wt.) and monsoon (10.441 mg/g dry wt.). The range of protein content of bark of *Adansonia digitata* was found between 10.441 mg/g dry wt. to 21.518 mg/g dry wt. The protein content of *Adansonia digitata* showed increasing order bark < stem< leaves (Table 1 and Fig.1).

The protein content of *Bombax ceiba* leaves and stem was the highest in summer season 106.289 mg/g dry wt. The range of protein content was from 8.289 mg/g dry wt. to 22.697 mg/g dry wt. In the case of bark, the winter season contained higher amounts of protein i.e., 26.265 mg/g dry wt. The range of protein content in the bark was between 12.57 mg/g dry wt. and 41.22 mg/ g dry wt. The overall range of protein content

of *Bombax ceiba* in increasing order was stem< bark<leaf. (Table 1 and Fig.1)

Table 1. Protein content of various parts of *Adansonia digitata* and *Bombax ceiba* (mean values of two years)

Sr. No.	Plant Part	Season	Protein (mg/g dry wt.)	
			<i>Adansonia digitata</i>	<i>Bombax ceiba</i>
1	Leaves	Summer	89.295	106.289
		Monsoon	34.74	42.177
		Winter	47.925	63.44
2	Stem	Summer	19.388	22.697
		Monsoon	24.479	8.289
		Winter	16.515	11.47
3	Bark	Summer	14.233	12.57
		Monsoon	10.441	26.265
		Winter	21.518	41.22

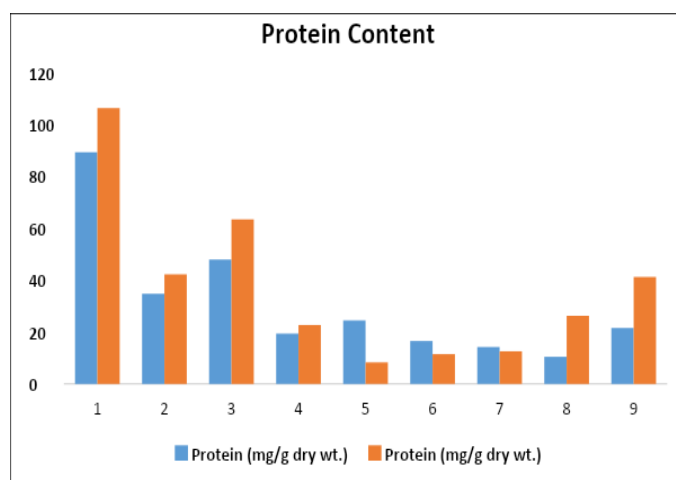


Fig.1 Protein content of various parts of *Adansonia digitata* and *Bombax ceiba* (mean values of two years)

The amino acid content of leaves of *Adansonia digitata* , as well as *Bombax ceiba*, was higher in the winter season; 7.986 mg/g dry wt. and 7.751 mg/g dry wt. respectively. The range of amino acid content in leaves of *Adansonia digitata* was between 7.531 mg/g dry wt. and 7.986 mg /g dry wt. The range of amino acid content of leaves of *Bombax ceiba* was between 3.888 mg/g dry wt. and 7.751 mg/g dry wt. The amino acid content of the stem of *Adansonia digitata*, exhibited the highest value of 8.697 mg/g dry wt., whereas in the case of *Bombax ceiba* monsoon season showed a higher value of 4.853 mg/g dry wt. The range of stem amino acid content was between 0.763 mg/g dry wt. and 8.697 mg/g dry wt. for *Adansonia digitata* and between 2.433 mg/g dry wt. and 4.853 mg/g dry wt. for *Bombax ceiba*. In the case of bark both plants exhibited higher values in monsoon season with 2.807 mg/g dry wt. for *Adansonia digitata* and 2.942 mg/g dry wt. for *Bombax ceiba*. The range of amino acid content for both plants *Adansonia digitata* and *Bombax ceiba* was in the increasing order bark< stem< leaf. (Table 2 and Fig. 2).

Table 2 Amino acid content of various parts of *Adansonia digitata* and *Bombax ceiba* (mean values of two years)

Sr. No.	Plant Part	Season	Amino acid (mg/g dry wt.)	
			<i>Adansonia digitata</i>	<i>Bombax ceiba</i>
1	Leaves	Summer	7.531	7.567
		Monsoon	7.543	3.888
		Winter	7.986	7.751
2	Stem	Summer	0.763	2.433
		Monsoon	6.329	4.853
		Winter	8.697	3.302
3	Bark	Summer	0.96	1.955
		Monsoon	2.807	2.942
		Winter	2.273	1.584

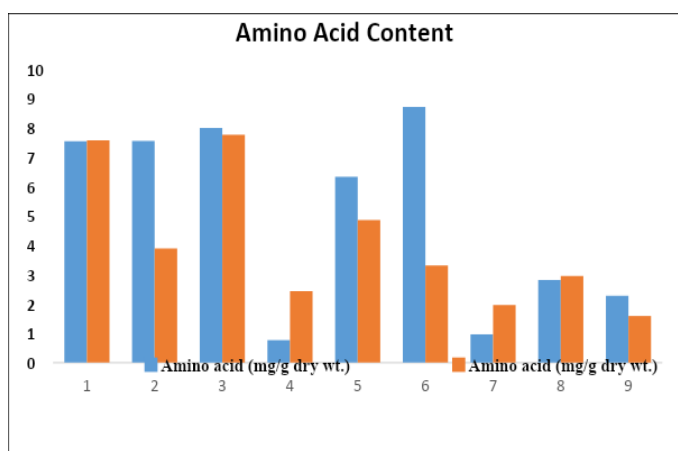


Fig.2 Amino acid content of various parts of *Adansonia digitata* and *Bombax ceiba* (mean values of two years)

Conflict of Interest

The author hereby declares no conflict of interest.

Consent for publication

The author declares that the work has consent for publication.

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