QUANTIFICATION OF PIGMENTS, VITAMINS AND MINERALS IN PITHCELLOBIUM DULCE (ROXB) BENTH FRUIT

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Abstract: Edible wild plants are nature's gift to mankind. Considering the growing need to identify alternative bio-nutritional sources, some underutilized species of *P. dulce*. The plants are traditionally reported to be abortifacient, anodyne, astringent, larvicidal, convulsions, dysentery, dyspepsia, earache, leprosy, peptic ulcers, sores, toothache, and venereal disease. The study aimed to determine the pigments, vitamins and mineral composition of *Pithcellobium dulce* fruits to explore its uses as a source of nutrients. The *Pithcellobium dulce* fruits contain anthocyanin (6.23%), beta carotenoid (0.047mg/ml), vitamin B1 (6.73 mg/100g), vitamin B2 (3.56 mg/100g) and vitamin C (0.634 mg/100g). The highest levels of phosphorous (458.8 mg/100g), Potassium (285.9 mg/100g), Mg(66.8mg/100g), Ca (55.1mg/100g), Na (50.92mg/100g) and the basic detect level of iron and zinc. According to the results, *Pithcellobium dulce* fruit is recommended for commercial-scale production for the pharmaceutical industry to overcome medicinal crises as they are potential medicinal sources and it's contain high nutrient profiles.

Keywords: *Pithcellobium Dulce,* Minerals, Vitamins , Pigments.

Introduction: Increasing interest in nutrition, fitness and beauty consciousness has enhanced concerns over a healthy diet. Nowadays, food scientists have collaborated with nutrition researchers to develop plant-based functional foods to promote healthy eating habits. In food research, carotenoids and anthocyanin from fruits have attracted great attention for their functional properties, health benefits and prevention of several major chronic diseases (Cooper 2004; Young *et al*., 2008;Shahidi 2009). Fruits are a good source of essential mineral elements that are necessary for multiple physiological and metabolic reactions involved in maintaining good health (Goldman *et al.,* 1999). They are comparatively in low amount in fruits but play an important role in human. Trace elements do not provide any calorie but they play an important role in the metabolic regulation of the human body. Increased fruit consumption can improve mineral regulation and reduce cardiovascular diseases and certain cancer risks (Ismail *et al.,* 2011). Vitamins are a broad group of organic compounds that are minor, but essential, constituents of food required for normal growth, self-maintenance classified in two main groups – water-soluble and fat-soluble vitamins. Among the B group of water-soluble vitamins, both Thiamine (B1) and riboflavin (B2) and are important. They play different specific and vital functions in metabolism, and their lack or excess produces specific diseases.

Pithecellobium dulce is commonly known as monkey pod in the United States of America.
P. dulce has many traditional uses, such as medical, food, animal feed and timber. *Pithecellobium dulce* leaves contain compounds with potential for diabetes treatment, whereas seeds have protease inhibitors and saponins with anti-inflammatory properties. It is reported to be abortifacient, anodyne, astringent, larvicidal, guamachil is a folk remedy for convulsions, dysentery, dyspepsia, earache, leprosy, peptic ulcers, sores, toothache and venereal disease.

Material and Methods: ***Collection And Preparation Of Plant Material:*** The *Pithcellobium dulce* fruits were collected from Coimbatore district, Tamil Nadu state, India. The fruits were cut into pieces and air-dried. The dried samples were pounded into powder using mortar and pestle. The powder obtained was kept in the laboratory and used for proximate and mineral elements analysis during the period of the research.

Determination of Beta Carotene Content: Beta carotene content was determined using spectrophotometric method described (Kirk and Sawyer 1991). Each sample was weighed (2g) into a flat bottom reflux. Distilled water (10ml) was added and shaken carefully to form a paste; 25ml of alcoholic KOH solution was added and a reflux condenser attached. The mixture was heated in boiling water bath for one hour with frequent shaking, cooled rapidly and 30 ml of distilled water was added. The hydrolyzed product obtained was transferred into a separator funnel and the solution was extracted three times with 20 ml of ether; 20g of anhydrous Na_2SO_4 was added to the extract to remove any traces of water. The mixture was then filtered into a 100 ml volumetric flask and made up to mark with ether. A standard solution of β-carotene of range 0-50µg/ml was dissolved in 100ml of ether. The gradients of different standard solutions were determined with reference to their absorbance from which the average gradient was taken to calculate β-carotene in µg/100g. Absorbance of sample and standards was read on a spectrophotometer (Metrohn Spectronic 21D Models) at a wavelength of 328nm. Calculations to determine actual beta carotene content was done using the formula.

$$\text{Beta carotene} = \frac{\text{Absorbance of sample X Dilution Factor X Gradient Factor}}{\text{Weight of Sample}}$$

Determination of Anthocyanin Content: Take different aliquots of the sample (1.2 to 2 ml) and make up the volume in all the tubes to 3 ml with water. Add 0.5 ml of folin ciocalteau reagent and after 3 minutes , add 2 ml of 20% Na2CO3 solution and mix thoroughly heat the tubes for 1 minute in a boiling water bath and read the colour at 650 nm against a reagent blank. Prepare a standard curve using different concentration of catechol.

Determine the total anthocyanin content using the pH differential method. Take 1.0 mL aliquot of the mulberry solution and place it in to a 25 mL volumetric flask .Dilute to volume with pH buffer (Disslove 1.49 g KCl in to 100mL deionized water. Carefully pour 1.7 mL conc HClin to100 mL deionized water for 0.2 N, Mix 25mL of the KCl solution with 67mL of the 0.2 N HCl solution. Adjust pH 1.0 + 0.1 if necessary) and mix. Zero spectrophotometer with distilled water sample turbidity(haze) is corrected for by measuring the absorbance 700nm. Measure the absorbance of the pH 1.0and pH 4.5 sample prepartion is 510 nm.dilute sample further if absorbance is greater than 1.0AU. Calculate the difference in absorbance between the two samples using the following equation. Absorbance = (A510nm pH 1.0 – A700nm pH1.0) – (A510nm pH 4.5 – A700nm pH4.5).

Determination of Vitamins: Vitamins analyses were carried out using the methods (AOAC 1990).

Determination of Mineral Elements: Finely ground (5 g) of sample was oven dried at 60°C and was weighed into crucible. The sample was ignited into a muffle furnace for 6-8 hours at a temperature between 450°C and not exceeding 500°C, a grayish white ash was obtained. The sample was cooled on asbestos sheet and 5 cm3 1N HNO3 solutions was added to it. It was evaporated to dryness on a steam bath or a hot plate at a low heat of 400°C for 15 min. until a perfectly white or grayish white ash is obtained. The sample was later cooled on asbestos sheet and 10 cm^3 1N HCl was added and the solution filtered into 50 cm3 volumetric flask. The crucible and filter paper were washed with additional 10cm3 portion of 0.1N HCl three times to make up to the volume with 0.1N HCl solution. The filtrate was stored for Na, P, K, Ca, Mg, Fe and Zn determination using Atomic Absorption Spectrophotometer (AOAC 1990).

Statistical Analysis: Descriptive statistics were performed by using Microsoft Excel 2007 to calculate mean and standard errors for mineral contents of fruit sample.

Result and Discussion: ***Anthocyanin:*** *Pithcellobium dulce* fruit contain anthocyanin (6.23 %). Anthocyanins correspond to a class of an important antioxidants,are common in plants and foods. Recently, many researchers have been reported on the biosynthetic pathway and there function in plant as well in human body.

Beta Carotene: *Pithcellobium dulce* fruit contain 0.047mg/ml beta carotenoid. Beta carotenoid have been credited with other beneficial effects to human health enhancement of the immune response and reduction of the risk of degenerative diseases such as cancer, cardiovascular diseases, cataract and muscular degeneration. The RDA requirement for Beta carotene for a normal healthy, active adult man and non-pregnant woman is 0.3mg/day and 0.27mg/day respectively

Mineral Composition: Minerals play several important roles in human physiology and biochemistry as co-factors for enzymes, and are related to energetic efficiency, fertility, mental stability and immunity (Mayer 1997). The results regarding the mineral and trace elements level in the *Pithcellobium dulce* studied shows that high amount of phosphorous (458.8 mg/100gm) but in the same species of *Pithcellobium* found low content(16.34 mg/100g) of phosphorous in mexico origin (Juan et al.,2013). Phosphorus is needed for bone growth, kidney function and cell growth. It also plays a role in maintaining the body acid alkaline balance.

Similarly calcium is a major component of bone and assists in tooth development (Brody 1994). In our finding, the calcium was reported in 55.1 mg/100g. The calcium level of some commercial fruit Apple 10mg/100g, Lichi 10mg/100g, mango 10mg/100g and papaya 17mg/100g (Gopalan *et al.,* 2004).The recommended daily calcium intake for adult range from 1000 mg to 1500 mg. It is also recommended to take supplements with food to aid in absorption

P.dulce fruit contain magnesium (66.8mg/100g). Adepoju.,2009 analysed the mineral composition from three fruits such as *Sponias mombim ,Diallum guineese* and *Mordii whytii* in Nigeria. In all three fruits magnesium was higher and *S. mombin* fruit contains the higher value of magnesium (465.0 ± 21.21mg/100g). Magnesium plays fundamental roles in most reactions involving phosphate transfer, believed to be essential in the structural stability of nucleic acid and intestinal absorption while deficiency of magnesium in man is responsible for severe diarrhoea, migraines, hyper-tension, cardiomyopathy, arteriosclerosis and stroke (Bello *et al.,* 2008).

Sodium has the highest concentration of 50.92mg/100g in *Pithcellobium dulce* (table 2) but it is higher than the same species found in the mexica origin (Juan *et al.,* 2013). Sodium is important for fluid distribution, blood pressure, cellular work and electrical activity.

Potassium is essential for the ability of skeletal and smooth muscles to contract. Because of this, an adequate intake of potassium is important for regular digestive and muscular functioning. The quantity of potassium in *P.dulce* (285.9 mg/100g). Apple 75 mg/100gm, Lichi 159mg/100g, mango 205mg/100g lower than the *P.dulce* (285.9mg/100g) (Gopalan *et al.,* 2004).

Iron (Fe) content was (1.78mg/100g) in *P.dulce* fruit. An adequate level of Fe is required for haemoglobin formation in blood, while excessive intake can result in hemochromatosis. Iron containing enzymes and proteins participate in many oxidation and in transport.

Vitamins: Table 2 showed the determination of vitamins of *P.dulce* fruits. Among the vitamins, vitamin B1 found to be higher amount (8.569 mg/100g) followed by the vitamin B2 (4.67 mg/100g). vitamin B1 is necessary for carbohydrate use as an energy source, as well as for amino acid metabolism (Rakesh *et al*., 2012). vitamin B1 deficiency and diabetes mellitus have been shown to be related, since up to 76% of type I diabetics and 75% of type 2 diabetics have low plasma thiamine levels. vitamin B2 is required for the formation of red blood cells and antibodies and benefits vision, healthy skin, nails and hair. It also aids growth and reproduction and helps in stressful situations.

Table 1: Beta Carotene Contentc of *Pithcellobium Dulce* Fruits

Fruit	**Beta carotene** (mg/ml)
Pithcellobium dulce	0.047

Table 2: Anthocyanin content of *Pithcellobium Dulce* Fruits

Fruit	**Anthocyanin (%)**
Pithcellobium dulce	6.23 %

Table 3: Vitamins of *Pithcellobium Dulce* Fruits

VITAMINS	***Pithcellobium dulce***
Vitamin B1 (Thiamine)	8.569 mg/100g
Vitamin B2 (Riboflavin)	4.67 mg/100g
Vitamin C (Ascorbic acid)	0.5 mg/100g

Table 4: Mineral Composition (mg/100g) of *Pithcellobium Dulce* Fruits

Fruit	Na	K	P	Ca	Mg	Fe	Zn
Pithcellobium dulce	50.92	285.9	458.8	55.1	66.8	1.78	0.037

Conclusion: Our study revealed that essential pigments, vitamins and mineral elements are needed for growth, production of bones, teeth, hair, blood, nerves, skin, enzymes and hormones. The healthy function of nervous transmission, blood circulation, fluid regulation, cellular integrity, energy production and muscle contraction are influenced by essential elements and too little of any essential element can lead to deficiency disease and too much of it any can be toxic.

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