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EVALUATING THE CHEMICAL ANALYSIS PROFILE OF SOME LESSER KNOWN EDIBLE FRUITS

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Abstract:

Fruit samples of Solanum trilobatum (L.), Mukia maderaspatana (Linn) M.Roem, Murraya koengii (L.)Spreng, Pithecellobium dulce (Roxb.)Benth were analyzed with view to evaluating their level of nutrients, minerals, vitamins and anti nutrients. The nutrients compositions of the fruits showed that the amount of carbohydrate ranged between 3.00 and 35.00 g/100g; Protein, 1.25 – 7.23g/100g; Moisture, 71.56 – 81.6 %; ash, 12.5 -19 %; fiber, 3.3 -7.41 g/100g. Concentration of sodium, phosphorous, calcium and iron were highest in M. maderaspatana fruits; S.trilobatum fruits contain highest amount of magnesium while calcium content was highest in Murraya koengii. Highest amount of potassium were present in P.dulce fruits. Highest amount of vitamin B1 and vitamin B2 were present in Pithecellobium dulce fruits. Vitamin C was ranged between 0.01 – 0.63mg/100g. The results of anti nutrients factor showed that the phenol content ranged between 0.35 – 1.3 g/100g.Tannins ranged from 0.27 - 1.20 g/100g. The fruits with low level of anti nutrients, high elemental composition, protein, carbohydrates and vitamins could serve as supplementary sources of essential nutrient to man and livestock. The selected lesser know edible fruits are recommended for commercial-scale production for the pharmaceutical industry to overcome medicinal crises as they are potential medicinal sources and its contain moderate nutrient profiles.

Keywords: *Lesser known edible fruits, nutrients, minerals, vitamins, anti nutrients.*

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INTRODUCTION:

Man needs an appreciate amount of nutrients in their diet to perform various body function and to lead a healthy life. In human nutrition, fruits play an important role for balanced diet. Fruits are the cheapest source of natural nutritive foods which help in building resistance against diseases [1]. The diet of many rural and urban dwellers is deficient in protein and high in carbohydrates, the implication is high incidence of malnutrition and increase dietary disease, a situation in which children and especially pregnant and lactating women are most vulnerable [2]. A number of fruits used in the traditional medical system of remedies in India. They have been shown to possess immune stimulating activity acting at different levels of the immune system. Life on earth is threatened by various chronic diseases such as cancer, strokes, cardiovascular diseases and so on. There is need to exploit nature's best and endowed weapons as fruits in combating these threatening diseases. Many plant foods are rich in health-promoting components including vitamins, minerals and other bioactive factors and have low fat and high fiber contents [3]. Many reports on fiber fruits indicate that they could be good sources of nutrient for both man and livestock [4]. The present study analyzed the some lesser known edible fruits for their proximate composition, mineral elements, and vitamins and anti nutrients like tannins and phenols.

MATERIALS AND METHODS:

Collection and Preparation of Fruits Material

The *Solanum trilobatum, Mukia maderaspatana* , *Murraya koengii* and *Pithecellobium 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, mineral elements, vitamins and anti nutrients analysis during the period of the research.

PROXIMATE ANALYSIS

Moisture content

2g of each sample was taken in a flat –bottom disc and kept overnight in an air oven at 100- 110^0 C and weighed. The loss in weight regarded as a moisture content.

Total ash

About 5g of powdered fruits was accurately weighed and taken separately in silica crucible, which was previously ignited and weighed. The powder was spread as a fine layer on the bottom of crucible. The powder was incinerated gradually by increasing temperature to make it dull red hot until free from carbon. The crucible was cooled and weighed. The procedure was repeated to get constant weight. The percentage of total ash was calculated with reference to air dried powder.

Extraction and estimation of total soluble carbohydrates

Extraction

200 mg sample dried fruits powder was suspended in 1:5(w/v) hot 70% ethanol and extracted for 10 minutes. The pellet was re-extracted twice with equal volumes of 70% of ethanol. The ethanol extracts were clarified by centrifugation, pooled and concentrated to 1-2 ml evaporations in vacuum. The concentrated ethanol extracts was diluted to 50 ml with distilled water.

Estimation

The total soluble carbohydrate from dried tubers powder were extracted and estimated by the anthrone reagent method of [5] using glucose as a standard at 660 nm using a spectrometer. The average values were expressed on percentage on dry weight basis.

Extraction and estimation of total proteins

Extraction

200mg sample of dried fruits powder were taken and was suspended in 1:5% (W/V) phosphate buffer. The extract was removed by centrifugation at 3000 rpm for 10 minutes. The pellet was washed with phosphate buffer twice and the defatted meal was washed with 100 ml of cold 10% trichloro acetic acid (TCA) and centrifuged at 3000 rpm for 15 minutes. The procedure was repeated, the resulting TCA-washed pellet was suspended in NaOH solution.

Estimation

The proteins separated were estimated following the method of [6] after TCA precipitation, as described earlier. The values were expressed as percentage on dry weight basis.

MINERAL ELEMENTS ANALYSIS

Determination of mineral elements

Finely ground (5 g) of samples 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 were 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.

Determination of Vitamins

Vitamins analysis was carried out using the methods [7].

ANTINUTRITIONAL FACTORS

Extraction of Tannins and Total Free Phenols

One gram of air dried fruits powders were taken in 100ml flasks, separately to which was added 50 ml of samples 1 % HCl in methanol. The samples were shaken on reciprocating shaker for 24 hours at room temperature. The contents were centrifuged for 5 min. The supernatants were collected separately.

Determination of Tannins

Tannins content were carried out by using the methods [8].

Determination of Phenols

Phenols content were carried out by using the methods [9].

Statistical analysis

Descriptive statistics were performed by using Microsoft Excel 2007 to calculate mean and standard errors for proximate, mineral elements, vitamins and anti nutrients of fruit samples.

RESULT AND DISCUSSION:

Table 1 reveals the proximate composition of some lesser known edible fruits. Among these fruits, Moisture content was ranged from 71.56 % (*Pithecellobium dulce*) to 81.6 % (*Mukia maderspatana*). In this study, the moisture content of *M. maderaspatana* fruits was similar to commercial fruit like mango ripe (81%), mulberries (80.37 %)[10] and wild edible fruits such as *Hippophae rhamnoides* (80.50 %)[11]. Moisture content of fruits is an index of water activity that indicates the stability and susceptibility to microbial contamination [12]. Based on this, fruit of *M.maderaspatana* had very high moisture, thus potentially having a short life that could promote microbial growth.

The ash content is high in *Mukia maderspatana* (19%) followed by *Solanum trilobatum (*18.6 %) fruits. The percentage ash of the fruit samples gives an idea about the inorganic content of the samples from where the mineral content could be obtained. Samples with high percentages of ash contents are expected to have high concentrations of various mineral elements, which are expected to speed up metabolic processes and improve growth and development.

Carbohydrates were ranged from 3.00 g/100g (*Mukia maderspantana*) to 35.7 g/100g (*Murraya koengii*). The carbohydrate content in *Murraya koengii* fruits 35.7 g/100g was lower than the fig and mulberries [10].

Protein variation is between 1.25 to 7.23 g/100g. The highest amount of protein was found in the *Murraya koengii* fruits (7.23g/100g) while the lowest was found in the *Mukia maderspatana* (1.25g/100g). The *Murraya koengii* fruits contain high protein content than the edible part of sunberry (2.7%) and Dabai fruit (3.8%) [13].

The crude fiber ranged between 3.3g/100g for *S.trilobatum* to 7.1g/100g for *M.koengii* fruits. Fiber helps in the maintenance of human health and has been known to reduce cholesterol level in the body.

MINERAL COMPOSITION

The concentrations of different mineral elements in the lesser know edible fruit samples were reported in Table 2. Sodium content was ranged from 28 mg/100g (*Solanum trilobatum*) to 164.28 mg/100g (*Mukia maderspatana*). The (Na/K) ratio for *Mukia maderaspatana* is 0.8 which implies that the fruits have better potential for managing high blood pressure. Similarly in cucurbitaceous family, *Telfaria occidentalis* control the blood pressure [14]. Sodium and Potassium acts as electrolytes and are involved in ion and extracellular fluid. Sodium plays an important role as electrolyte, regulates the osmotic pressure, transmits nerve impulse, relaxes muscles and maintains a proper water balance within the body [15]. Potassium ranged from 0.73 mg/100g (*S.trilobatum*) to 285. 9mg/100g (*P.dulce*). Potassium regulates the volume of blood and maintains the balance of fluid, transmits nerve impulse, controls heart action and metabolism of carbohydrate and protein.

Among the lesser known fruits, highest amount of phosphorous was found to be present in the *M.maderaspatana* (512.7 mg/100g) and lowest in *S.trilobatum* (0.02mg/100g) [14]. Nwogwugwu *et al*., 2016 reported the phosphorous content of *Telfaria occidentalis* fruits 5.27 mg/100g lower than the *Mukia maderaspatana* fruits. The phosphorous intake helps in bone growth, proper kidney function and cell growth. It also plays a role in maintaining the body's acid alkaline balance [16].

Highest concentration of magnesium was present in the *Solanum trilobatum* fruits (194 mg/100g) and lowest in *P.dulce* (55.1mg/100g). Mg plays a major role in relaxing muscles along the airway to the lung thus allowing asthma patients to breathe easier. High magnesium content in *S.tilobatum* fruits was recommended for asthma patients. The daily value for Mg is 400mg. It 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 [17].

The iron content was maximum in *Mukia maderaspatana* (6.86mg/100g) followed by *Murraya koengii* (3.25mg/100g). However the values are much higher when compared to most of the popular fruits like apple (0.66mg/100g), cashenut (5.81 mg/100g), mango (1.30mg/100g) and papaya (0.50mg/100g). Iron is said to be an important element in the diet of pregnant women, nursing mothers, infants convulsing patients and elderly to prevent anaemia and other related diseases [18].

Calcium was ranged from 38.7 to 326.5 mg/100g. *Mukia maderaspatana* fruits contain the lowest calcium content (38.7 mg/100g) while highest calcium content in *Murraya koengii* fruits. The calcium content of *Murrya koengii* leaves 1228mg/100g [19]. However the *M.koengii* fruit contain low amount of calcium compared to their leaves. The calcium content of some commercial fruits like Almond (230mg/100g), apple (10mg/100g), cashewnut (50mg/100g), mango (14mg/100g) and papaya (17mg/100g), however the calcium content is higher in *M.koengii* fruits. Calcium regulates many cellular processes and is essential for structural maintenance of body [20].

Zinc content is maximum in *M.maderaspatana* (0.05mg/100g), *M.koengii* (0.05 mg/100g) followed by *P.dulce* (0.037 mg/100g). The zinc content of these fruits is higher than the Lichi fruit (0.027mg/100g). Zinc is said to be an essential trace element for protein and nucleic acid synthesis and normal body development. It plays a central role in growth and development, vital during periods of rapid growth such as infancy, adolescence and during recovery from illness.

Vitamins

Among the different vitamins quantified, vitamin B1 was found to be high in *Pithecellobium dulce* (6.73 mg/100g), low in *Mukia maderspantana* and Murraya *koengii* fruits (0.01mg/100g). Vitamin B2 was ranged from 0.01 mg/100g (*Murraya koengii* and *Mukia maderaspatana*) to 3.53 mg/100g (*Pithecellobium dulce*). *Tetrapleura tetraptera* fruits contain vitamin B1 (0.04mg/100g) and vitamin B2 (0.03 mg/100g) [21]. *Pithcellobium dulce* fruit contain higher amount of vitamin B1 and vitamin B2 than the *Tetrapleura tetraptera* fruits. Vitamin B1 (Thiamine) is part of an enzyme needed for energy metabolism and important in nerves functioning. It helps to break down carbohydrate, fat and alcohol. Vitamin B2 (Riboflavin) is needed for energy metabolism, important for normal vision and skin health.

The highest content of vitamin C was present in *P.dulce* fruits (1.83 mg/100g) where lower content in *M.koengii* (0.01mg/100g) and *M.maderspantana* (0.01mg/100g) fruits. *Dacrodes edulis* fruits contain Vitamin C (0.02mg/100g) which is lower than *P.dulce* fruits [22]. Vitamin C is a highly effective antioxidant such as vitamin E. Small amount of vitamin C can protect indispensable molecule in the body.

ANTINUTRIENTS

Phenols were ranged from 0.29 g/100g (*Mukia maderaspatana*) to 1.31g/100g (*Pithecellobium dulce*). Same species of *Pithecellobium dulce* fruits from Mexican origin [23] the variation in low phenol content compared with the study report. This may due to the different environmental conditions and analytical methods.

Tannins were found to be present in higher quantity of *Pithecellobium dulce* (1.20 g/100g) and lower in *Mukia maderaspatana* (0.27g/100g). Tannin in fruits imports an astringent taste, reduce food intake and inhibit the activities of digestive enzymes [24].

Table 1: Proximate composition of lesser known edible fruits

Parameter (g/100g)	*Solanum trilobatum*	*Mukia maderaspatana*	*Murraya koengii*	*Pithecellobium dulce*
Moisture %	**80 ± 0.56**	**81.60 ± 0.57**	75.5 ± 0.23	71.56 ± 0.47
Ash%	18.6 ± 0.12	**19 ± 0.45**	14.7 ± 0.32	12.5 ± 0.36
Carbohydrate	25 ± 0.78	3.00 ±0.14	**35.7 ± 0.18**	23.57 ± 0.22
Protein	5.5 ± 0.89	1.25± 0.28	**7.23 ± 0.12**	2.83 ± 0.17
Fiber	3.3 ± 0.55	3.4 ± 0.45	**7.1 ± 0.23**	5.4 ± 0.23

Table 2: Mineral composition (mg/100g) of lesser known edible fruits

Minerals	*Solanum trilobatum*	*Mukia maderaspatana*	*Murraya koengii*	*Pithecellobium dulce*
Sodium	28 ± 0.06	**164.28 ± 0.02**	37.1 ± 0.23	50.92 ± 0.33
Potassium	0.73 ± 0.04	192.83 ± 0.04	150.2 ± 0.89	**285.9 ± 0.42**
Phosphorous	0.02 ± 0.01	**512.17 ± 0. 12**	460 ± 0.45	458.8 ± 0.31
Magnesium	**194 ± 0.05**	180.2 ± 0.21	155.9 ± 0.29	55.1 ± 0.45
Calcium	60 ± 0.03	38.7 ± 0.21	**326.5 ± 0.55**	66.8 ± 0.34
Iron	0.34 ± 0.08	**6.86 ± 0.31**	3.52 ± 0.65	1.78 ± 0.21
Zinc	0.00 ± 0.12	**0.05 ± 0.54**	**0.05 ±0.36**	0.037 ± 0.13

Table 3: Vitamins composition (mg/100g) of lesser known edible fruits

Fruits	Vitamin B1	Vitamin B2	Vitamin C
Solanum trilobatum	3.56 ± 0.23	2.08 ± 0.15	0.53 ± 0.36
Mukia maderspatana	0.01 ± 0.41	0.01 ± 0.26	0.01 ± 0.21
Murraya koengii	0.01 ± 0.32	0.01 ± 0.12	0.01 ± 0.41
Pithecellobium dulce	**6.73 ± 0.16**	**3.53 ± 0.16**	**0.63 ± 0.32**

Table 4: Antinutrients content of lesser known edible fruits

Fruits	Phenols (g/100g)	Tannins (g/100g)
Solanum trilobatum	0.35 ± 0.29	0.55 ±0.18
Mukia maderspatana	0.29 ± 0.12	0.55 ± 0.13
Murraya koengii	0.79 ± 0.24	**1.20 ± 0.26**
Pithcellobium dulce	**1.31 ± 0.27**	0.27 ± 0.24

CONCLUSION:

The lesser known edible fruits were *Solanum trilobatum,Mukia maderaspatana,Murraya koengii* and *Pithecellobium dulce* fruits were studied for nutritional, minerals, vitamins and anti nutrients. The findings showed that these edible fruits are promising sources of essential micronutrients, macronutrients vitamins and the low level of anti nutrients. Further research should therefore be conducted on these fruits and the results of such studies should be disseminated to the public. This will ensure dietary diversity and pharmaceutical security in different parts of the world.

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REFERENCES:

1.Ravindran C, Senthil Kumar B and Murthy BNS. Medicinal Plants. Therapeutic properties of fruits. *Agro bios Newsletter*, 2004; 1(9): 50-52.

2.Sadik N. Population growth and the food crisis. Nutr. Agric.1991; 1:,3-6.

3.Fleuret A. The role of wild foliage plants in the diet. A case study from Lushuto, Tanzania.*Ecol. Food Nutr.* 1979;8:87-93.

4.Adekunle V A J and Ogerinde O V . Food Potentials of some indigenous wild fruit in lowland rainforests ecosystem of South West Nigeria. *J. Food Technol*.2004; 2: 125-130.

5.Yemm EW and Wills EW . The estimation of carbohydrate in plant extracts by anthrone . *Biochem J*. 1954; 57(3): 508–514.

6.Lowry OH, Rosenbrough NJ and Farr A. Randall RJ (1951). Protein measurement with the Folinphenol reagent. J Biol Chem 1951;193:265-75

7.AOAC. Official Methods of Analysis. 15th Edn., Association of Official Analytical Chemists, Washington D.C. 1990.
8.Burns RE. Methods for estimation of tannins in grain sorghum. *Agron. J*. 1971; 63:511 – 512.
9.Bray HG and Thorne WV. Analysis of phenolic compounds. Meth. *Biochem.Anal*.1954;1:27 - 52.
10. Sadia Haleema, Mushtaq A, Shazia S, Ahmad Zuhairi A, Lee KT, Muhammad Z and Asghari B. Nutrient and mineral assessment of edible wild fig and mulberry fruits. *Fruits,*2014; 69:159–166.
11.Tapan Seal. Nutritional composition of wild ediblefruits in meghalaya state of Indian and their ethnobotanical importance. *Research Journal of Botany* 2011;6: 58 -67.
12. Edem C A and Miranda I D. Chemical evaluation of proximate composition, ascorbic acid and anti-nutrients content of African star apple (*Chroysophyllum africanum*) fruit, *Int. J. Res. Rev. App. Sci.* 2011; 9: 146–149.
13. Patel P R, Gol N B, Rao T V R. Physiochemical changes in sunberry (*Physalis minima* L.) fruit during growth and ripening, *Fruits* 2011; 66: 37–46.
14. Nwogwugwu NU, Abu GO and Akaranta O. Chemical composition of Calabash (*Cresenti cujeta*) and fluted pumpkin (*Telfaria occidentalis* Hook.F) pulp and their potential for use in the industry. *Archives of applied science research* 2016; 8 (8):24 – 30.
15. Soetan KO, Olaiya C O and Oyewole O E. The importance of mineral elements for humans, domestic animals and plants – A review *Afr. J. Food Sci.*, 2010; 4(5): 220 -222
16. Fallon S and Enig MG 2001. Nourishing Traditions: The cookbook that challenges politically correct nutrition and the diet (Dictocrats), 2001, 40 -45.
17. Bello M O, Falade O S, Adewusi S R A, Olawore N O. Studies on the chemical compositions and anti-nutrients of some lesser known Nigerian Fruits. *African Journal of Biotechnology* 2008; 7: 3972 – 3979.
18. Oluyemi EA, Akinlua AA, Adenuga AA, Adebayo MB. Mineral Contents of some commonly consumed Nigerian foods. Sci. Focus. 2006; 11(1): 153-157.
19. Idoka O, Emmnuel SA, Aguzue O C, Akanji F T, Thomas S A, OSugwu I. Phytochemical screening proximate analysis and mineral composition of some leafy vegetables consumed in nigeria. *International journal of advanced chemistry* 2014; 2 (2): 175 – 177.
20. Friday ET, James O, Olusegun O and Gabriel A. Int. J. Plant Physiol. Biochem., 2011;3:99
21. Akintola O O, Bodede A I and Ogunbanjo O R. Nutritional and medicinal importance of *Tetrapleura tetraptera* fruits (aridan). *African Journal of Science and Research* 2015; (4)6: 33-38.
22. Duru Majesty, Amadi Chioma, Ugbogu Amadike, Eze Adindu and Amadi Benjamin. Phytochemical, vitamin and proximate composition of *Dacryodes edulis* fruit at different stages of maturation. *Asian Journal of Plant Science and Research* 2012; 2 (4): 437-441.
23. Juan Fernando Pio L, Sylvia P D, Julio M A, Gabriela L A and Francisco D V. Nutritional and nutraceutical characteristics of white and red *Pithecellobium dulce* (Roxb.) Benth fruits. *Fruits* 2013;68 (5):397
24. Carnovale E, Marletta L, Marconi E, Brosio E. Nutritional and hydration properties in cowpea.(In Ng NQ, Monti LM (Eds.), Cowpea genetic resources, IITA, Ibadan) 1991; 111-118.