



Research Article

Nutrient Composition of Carica Papaya Leaves Extracts

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Abstract

Background of Study: Consuming diets rich in fruits and vegetables were associated with the prevention and treatment of at least four of the leading causes of death in the developing countries. Vegetables are excellent sources of complex carbohydrates, dietary fibre, and several vitamins, minerals and photochemical which have a unique protective effect on health.

Objectives: This study investigated the nutrient composition of Carica papaya leaves extract.

Methods: Sample of the Carica papaya leaves were collected from Amoke lane, University of Nigeria Nsukka . The samples were processed into extract using a standard procedure; the extracts of the three samples were subjected to proximate, micronutrients and phytochemical analysis using standard methods. Data obtained were presented as means and standard deviations, and analysed using Analysis of variance (ANOVA) to separate means and Duncan's multiple range test was used to compare means, Significant was determined at (p<0.05).

Results: The findings of this study revealed moisture (57.01%), fat (2.01%), ash (2.18%), protein (6.50%), crude fibre (3.10%) and carbohydrate (29.20%). Vitamins C (68.59 mg/100g), Beta carotene (303.55 mg/100g), B1 (199.31 mg/100g), B2 (295.63 mg/100g) and vitamin E (39.78 mg/100g).

Minerals- phosphorus (1971.17 mg/100g), sodium (30.42 mg/100g) and potassium (80.13 mg/100g), calcium (1086.53 mg/100g) and chromium (31.10 mg/100g). Phytochemicals-flavonoid 899.53 mg/100g, alkaloid 1569.13 mg/100g, saponin 898.07 mg/100g and tannin 310.50 mg/100g.

Conclusion: This study established that *Carica papaya* extracts are rich source of vitamins, minerals and phytochemicals and good source of proximate composition.

Keywords: *Carica papaya*; Nutrient composition

1. Introduction

Papaya is a palm-like, soft-stemmed, green tree. *Carica papaya*, is a native to the tropics of the Americas, but it is now being cultivated in the tropical and warm, semi-tropical zones around the world. Papaya also is the name for the large, juicy, melon-like, edible fruit of this tree, which has black seeds in the center and typically ranges in colour from amber to a yellow hue. Papaya is a powerhouse of nutrients and it is available throughout the year. It is a rich source of three powerful antioxidant (vitamin C, vitamin A and vitamin E), minerals (magnesium and potassium), B vitamin (pantothenic acid) folate and fiber. Papaya leaves have several vitamins and minerals in significant amounts, it is low in calories, and has an enzyme that is useful in tenderizing meat and for treatment of indigestion [1, 2]. The leaves have been researched for its medicinal uses and has been documented in literature for its use by natives of various parts of the world for its anti- inflammatory, antitumor, anti -diabetic effects among others. Recently the haemostatic property and beneficial effects of *Carica papaya* leaves in curing the dengue infected patients has been reported [3].

The leaves also contain active components such as papain ,chymopapain cystain, ascorbic acid, flavournoids, cynogenic glucosides that increases the total antioxidant power in blood and reduce lipid preoxidation level [4]. Papaya leaves also contains vitamins (vitamin A, and B vitamins most especially B₁₂), minerals (calcium, magnesium, sodium, potassium, manganese, iron), saponins cardiac glycosides and alkaloids respective which may play an important role in curing thrombocytopenia [5].

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As reported by ElMoussaoui, et al. [6], papaya leaves contain several and alkaloids with important pharmaceutical and industrial applications. The extract has anti-cancer, anti-oxidative, anti-inflammatory and anti-bacterial properties [7] and in addition to this, it has nephro-protective and hepato-protective activity against toxins, hypoglycaemic and hypolipemic effects. It also has anti-sickling properties in sickle cell disease [7]. The chemical content of papaya leaves makes it useful in the treatment of conditions like diabetes heart diseases stroke etc.

2. Materials and Method

2.1 Collection of sample

A sample of the Carica papaya leaves was collected from Amoke lane, University of Nigeria and was

identified at Department of Plant Science and Biotechnology, University of Nigeria, Nsukka.

2.2 Sample preparation

The samples of the leaves of papaya were sorted, washed and shade-dried for three (3) days and was subsequently ground to powder using household blender.

2.3 Sample extraction

Five hundred gram (500 g) of each of the blended leaves of papaya was macerated in 1.5 litres of methanol for 48 hours, the solution was filtered with Whatman no.-4 filter paper, then centrifuged and decanted to remove the remaining particles.

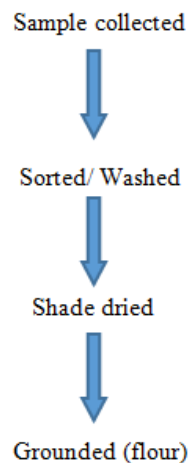


Figure 1: Flow chart showing the processing into leaves.

2.4 Nutrient analysis

The proximate composition of the extract made from carica papaya leaves was determined by using Association of Official Analytical Chemists (AOAC) [8] and the moisture, crude protein, crude fat, total ash, crude fibre and carbohydrate content were determined. Calcium, Copper, Iron, Zinc, Magnesium, Potassium, Phosphorus, Chromium and Manganese content of the

leave extract were determined using (AOAC) [9]. Vitamins E and C were determined using the institute of public analytes, (2005). Pro-vitamin A and thiamine content was determined using Harborne method as described by Pearson, [10]. Riboflavin, pyridoxine, cyanocobalamin contents was determined using atomic absorbance spectrophotometer [11].

2.5 Phytochemical analysis

Flavonoids was determination using the method described by Boham, et al. [12]. The Alkaloids were determined using Harborne method of (1973) while saponin was determination as described by Obdoni, et al. [13]. Tannin determination was done using the method of Fohn-Denis calorimeter as described by Kirk, et al. [14].

3. Results and Discussion

Table 1 presents the mean proximate composition of papaya leaf extracts. The result of the data analysis of the triplicate samples revealed that moisture and carbohydrate in the extract of papaya were 57.01% and 29.20% respectively. The mean value for protein was 6.50% while crude fibre was 3.10%. Other proximate parameters were 2.10% and 2.18% respectively for ash and fat. The proximate composition of the papaya leaves extract as shown in Table1.0 revealed that it is a source of carbohydrate (29.20%) and has been supported by OECD [15] which affirmed that the major nutritional component of papaya leave is carbohydrate. The high moisture (57.01%) is in conformity with United State Department of Agriculture’s [16] report, that moisture content of leaves is high and had mean value of 83%, this is however higher than the value

reported in this present study. Low protein was observed in the extract (6.50%), however it could be used to supplement other sources of protein to make up the 11 RDA for children above 6 months especially children that are prone to protein energy malnutrition. Crude fibre (3.10%) was observed in this study, the presence of crude fibre makes for good bowel movement as well as aid nutrient absorption [11]. Ash content was (2.18%), ash is an indication of mineral contents of foods [17] and hence the ash content of the extract has implication for mineral values. The fat concentration in the sample was 2.01% which is quite low and does not meet daily recommended allowance of fat, this may not be adequate for body needs, as a source of fatty acids which have been associated with wound healing [18] and immunity [19], it is still considered as very useful in this regard when added to other foods that has a better source of fat.

Table 2 presents the phytochemical composition of papaya extract. Alkaloid had (1569.13 mg/100g), Saponin recorded a mean content of 898.07 mg/100g and flavonoid (866.53 mg/100g). However, tannin had (310 mg/100g).

Proximate	Quantity
Moisture Content	57.01 ± 0.20
Protein	6.50 ± 0.30
Ash	2.18 ± 0.08
Fat	2.01 ± 0.04
Crude fibre	3.10 ± 0.06
Carbohydrate	29.20 ± 0.16

Mean ±S.D of the triplicate sample

Table 1: Proximate composition of papaya extract (%).

Phytochemical	Concentration
Flavonoid	866.53 ± 27.24
Alkaloid	1569.13 ± 92.58
Saponin	898.07 ± 20.67
Tannin	310.50 ± 11.51

Mean ± S.D of triplicate sample

Table 2: Phytochemical composition of papaya leave extracts (mg/100g).

The phytochemical analysis on Table 2 showed that the extracts contains alkaloid, saponin, flavonoid and tannin. Phytochemicals are bioactive, non-nutrient, naturally occurring plant compounds found in vegetables, fruits and spices. The result showed that the levels of tannin and saponin in the papaya extracts are 310.50 mg/100g and 898.07 mg/100g respectively. Tannins are known to exert anti-microbial activities by iron deprivation, hydrogen bonding or specific interactions with vital proteins such as enzymes in microbial cells [20]. They are also observed to have remarkable activity in cancer prevention. Li, et al. [21] showed tannins to be useful in the treatment of inflamed or ulcerated tissues. The presence of saponins supports the fact that pawpaw leaves extract has cytotoxic effects such as permealization of the intestine [22]. Flavonoids are capable of treating certain physiological disorder and diseases, they at times occurs as glycosides and contain several Phenolic hydroxyl groups on their ring structure. Some flavonoids are antioxidants and have been proved to exhibit a wide range of biological activities like antimicrobial, anti-inflammatory, antiangiogenic, antidiabetic, analgesic, anti-allergic, cytostatic and antioxidant properties [23].

Alkaloids, a secondary metabolite compound observed in the extract of papaya leaves have the biological property of toxicity against cells of foreign organisms.

Its activities have been widely studied for their potential use in the elimination and reduction of human cancer cell line [24]. Alkaloids is one of the largest groups of phytochemicals in plants, it has an amazing effects on humans and this has led to the development of powerful pain killer medications with Alkaloids as active ingredients [25]. In other words, the observed high alkaloid content could be responsible for their much-acclaimed medicinal values though the exact mode of action is poorly understood. Similarly, saponins are produced by plants as a defense mechanism to stop attacks by foreign pathogens, which makes them natural antibiotics [26]. They have also been demonstrated to have cholesterol lowering effects and the ability to kill or inhibit cancer cells [26-28].

Table 3 Presented the Vitamins and Minerals composition of papaya extract. Analysis of the vitamins revealed that beta-carotene in the papaya extract was (303.35 mg/100g), Vitamin B₂ (295.63 mg/100g). Vitamin B₁ recorded (199.31 mg/100g). Vitamin C and E levels were (68.59 and 39.78 mg/100g respectively). Mineral analysis revealed that phosphorus and calcium in papaya extract recorded (1971.17 and 1086.53 mg/100g respectively). In the same vein, potassium recorded (80.13%) while sodium and chromium were (30.42 and 31.10 mg/100g respectively).

Vitamins and Minerals	Concentration
Vitamin C (mg/100g)	68.59 ± 1.80
Beta Carotene (mg/100g)	303.55 ± 12.24
Vitamin B ₁ (mg/100g)	199.31 ± 5.04
Vitamin B ₂ (mg/100g)	295.63 ± 5.05
Vitamin E (mg/100g)	39.78 ± 2.81
Phosphorus(mg/100g)	1971.17 ± 80.28
Sodium (mg/100g)	30.42 ± 2.86
Potassium (mg/100g)	80.13 ± 3.95
Calcium (mg/100g)	1086.53 ± 96.72
Chromium(mg/100g)	31.10 ± 2.31

Mean ± S.D of triplicate samples

Table 3: Vitamin and Mineral composition of Papaya extract.

Minerals are essential for the proper functioning of tissues and act as second messengers in some biochemical cascade mechanisms [29]. Among the minerals embedded in the extracts are sodium (30.42 mg/100g), which was the least followed by chromium and potassium (31.10 mg/100g and 80.13 mg/100g) respectively. However, high content of phosphorus and calcium were observed (1971.17 and 1086.53 mg/100g). Shahid, et al. [30] reported 0.49 mg/100g of calcium in extract of *Zinger officinale* and 0.37 mg/100g of calcium in *Alpinia allughas* extracts which were both low when compared to this present study. Calcium content reported by Sajid, et al. [31] was 15.76 mg/100g which was also lower than the report of this finding. Presence of potassium in the extract is good, as potassium are known to help lower blood pressure [32] which is usually observed in most diabetic patients and it has important interrelationships in the control of arterial resistance [33]. When compared to ginger as reported by [31], potassium content of papaya leave is lower, ginger extract (410.91 mg/100g) compared to 80.13 mg/100g observed in this study.

Sodium and potassium also regulate the fluid balance of the body and hence, influence the cardiac output. Chromium is well known trace elements in diabetes as cofactors for insulin [34] while calcium and phosphorus are also essential for bone and teeth formation [22]. The importance of these elements cannot be overemphasized because they are required by many enzymes as cofactors to function effectively. Chromium functions as an insulin-performance enhancer. Insulin is a vital hormone that is used in the metabolism and storage of proteins, carbohydrates and fats. Chromium may also be directly involved in the process of metabolism. It stimulates fatty acid and cholesterol synthesis, which are important for brain function and other body processes. Chromium also aids in insulin action and glucose metabolism. Vitamins E and C were the least in the papaya leaves extract. Beta-carotene was the highest Vitamin in the extract and closely followed by Vitamin B₂ and B₁ respectively. Vitamins in food help to regulate body processes. B-group of vitamins, are particularly essential in carbohydrate, fat and protein metabolism. Thiamine (B₁) plays a central role in the generation of energy from carbohydrates, while riboflavin (B₂) is involved in the energy production for

the electron transport chain, the citric acid cycle, as well as the catabolism of fatty acids [35]. The Beta-carotene and Vitamin C are responsible for the papaya extracts antioxidant activity.

Nwofia, et al. [36] studied variability in proximate, mineral and vitamin contents of papaya leaves, fruit pulp and seeds and reported that the leaves had (31.68, 0.45, 0.14 and 656 mg/100g) for vitamin C, Vitamin B₁, Vitamin B₂, and beta carotene. It is worth noting that the result of this present finding is higher than all the vitamins reported by the above-named authors. The difference could be attributed to soil differences, method of laboratory investigation and form of the sample that was analyzed. Ayoola, et al. [37] aluated the phytochemical and nutrient content of papaya leaves of different colors and reported that the green leaves had 16.29 mg/100g, 0.94 mg/100g and 0.13 mg/100g of Vitamin C, Vitamin B₁ and Vitamin B₂. The report showed lower values when compared with this present study and the reasons stated earlier could be attributed to these differences.

4. Conclusion

The researcher has been able to establish through this research that papaya extract is a rich source of vitamins, minerals and phytochemicals and can be used as supplement for malnourished children and adults as well, taking into cognizance their importance in the metabolic processes in the body.

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