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Full-Length Research Paper

Determination of phytochemicals, proximate and vitamin C content of *Carica papaya* fruit peel

Yanah, Y. M.[1]*, Mbongo, A. N. L.[3], Nwaogu, J.,[1] Elinge, C. M.[2], Yahaya, Y[2]., Haruna, Y.,[2] Mujitaba, N. [1], and Naima, M. S. [1]

[1]Department of Biochemistry, Kebbi State University of Science and Technology, Aliero, Kebbi State Nigeria.
[2]Department of Pure and Applied Chemistry, Kebbi State University of Science and Technology, Aliero, Kebbi State Nigeria.
[3]Department of Biochemistry and Molecular Biology, Faculty of Science, University of Buea Cameroon.
*Corresponding Author E-mail: yaksyanah@gmail.com; ykb_musa@yahoo.com

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ABSTRACT: *Carica papaya* commonly known as pawpaw is an edible fruit with many nutritional values known throughout the world. Apart from its rich vitamins and mineral content, some part of the plant has been known to have medicinal value. Fresh ripe pawpaw (*Carica papaya*) fruits were purchase from Birnin Kebbi main market in Kebbi state, Nigeria. The pawpaw fruits were washed, peeled and air-dried for fourteen (14) days at room temperature after which it was blended using mortar and pestle to homogenous state before analysis. The Phytochemical screening tested positive for flavonoids, tannins, alkaloids, Cardiac glycosides, Saponins glycosides phenols, and glycosides while saponin and steroid were not detected. The proximate analysis of pawpaw (*Carica papaya*) showed that *Carica papaya* had a moisture content of 12.68%, the protein content of 8.280%, fibre content of 3.35%, ash content 4.83% and carbohydrate contents 68.777%. The result of the ascorbic acid (vitamin c) content shows that *Carica papaya* has a high vitamin C content of 28.35mg. It is therefore established that *Carica papaya* can serve as an important source of good nutrition as well as vitamins.

Keywords: Phytochemicals, Vitamin C, Proximate, Carica papaya

INTRODUCTION

The plant *Carica papaya* is grown for its edible nature mainly for human consumption. Ripe *papaya* fruits are usually consumed fresh and unripe or green fruits as a vegetable (Danbaba *et al*., 2012). Papaya has found so many industrial and medicinal uses. Several proteins and alkaloids have been produced from its leaves and some part of its fruit with far-reaching relevance in medicine and industry (Kruger *et al*., 1991). The proteolytic enzyme, papain has been found on the latex of unripe papaya fruits. It is a proteolytic enzyme that is widely used in the pharmaceutical, food, and beverage industry (Archbold *et al*., 2008). It has also been reported to be utilized in the manufacture of soap and cosmetics (Monteiro *et al*., 2019). Pawpaw is among the cheap and highly nutritional fruit that is cultivated and consumed in Nigeria and some part of the world. However, in recent times the demand for fruits is very high while on the other hand supply of the said fruits is inadequate to meet up with demands due to different factors such as road network, flooding, and drought which affect production and transportation which leads to variation in the availability of the fruit (Abah *et al*., 2018).

Carica papaya latex (CP latex) is rich in enzymes with high potential values. Enzymes that are present in latex

mostly are four types namely cysteine, endopeptidases, papain, glycyl endopeptidase (Azarkan *et al*., 2003). Recently there is a newly discovered enzyme which is Carica papaya latex lipase (CPL). Proteinases from papaya (Carica papaya) are well known and known as proteolytic enzymes. These proteolytic enzymes are present in fresh latex from fruit, stems, petioles, and leaves. Studies have found that data on the composition of enzymes from the latex of the different parts are not the same (Edioga *et al*., 2005). Proteolytic enzymes have found a variety of applications in scientific research, medicinal and pharmaceutical companies, and food industries. This article is therefore aimed at assessing the concentration of ascorbic acid (Vitamin C), and proximate composition of pawpaw fruit. *Papaya* is being used as food and also in traditional medicine practice. The stem and back are used in making rope. Green papaya fruit and its latex are rich in papain, a protease used for softening meat (Soforow, 1993).

MATERIALS AND METHODS

Materials used for the experiment are; Weighing balance, desiccator, funnel, filter paper (Whatman No.1), hot plate, measuring cylinder, beaker, burettes, conical flask, retort stand, mortar and pestle, pipette, reagent bottle, spatula, volumetric flask, cotton wool, the crucible, and clamps.

Sample collection

The ripe pawpaw (*Carica papaya*) fruit (5) was purchase from Birnin Kebbi main market Kebbi state, Nigeria, and was identified as the fruit at the Department of plant and biotechnology.

Sample preparation

The sample was washed with clean tap water and then peeled with a knife to separate the main fruit from the peel. The pawpaw peel was then cut into pieces and air-dried for two (2) weeks at room temperature after which it was blended using mortar and pestle to a homogenous state and stored in the laboratory before use.

Phytochemical screening

Phytochemical screening was carried out on the sample using standard methods described by Soforow, (1993), Edioga *et al*. (2005), and Usman *et al*. (2009), and each of the tests was qualitatively expressed as negative (–ve) or positive (+ve). The positive sign indicates present or detected while the negative sign connotes absent or not detected.

Test for alkaloids

($1cm^3$) pawpaw sample was treated with a few drops of Hager's reagent; the second part ($1.0cm^{3)}$ was treated with Wagner's reagent. Turbidity or precipitate with either of these reagents was taken as evidence for the presence of alkaloids.

Test for tannins

(0.5g) of the extract was boiled in 20 ml of distilled water in a test tube and then filtered. A few drops of 0.1% $FeCl_3$ were added and observed. a brownish-green or a blue-black coloration indicates the presence of tannins.

Test for saponins

2g of the sample + 20ml of distilled were boiled in a water bath and filtered. 10ml of the filtrate was mixed with distilled water 5ml in a test tube and shaken vigorously to have a stable froth which persists. Drops of olive oil were added to the froth and shaken vigorously. The formation of emulsion indicates the presence of saponins.

Test for flavonoids

A (5ml) of ammonia (NH_3) was added to extract followed by the addition of concentrated sulphuric acid H_2SO_4. A yellow color observed in the mixture gives a positive test for flavonoids.

Test for terpenoids

5ml of the extract was combined with $CHCl_3$ 2ml in a test tube. Conc. H_2SO_4 (3ml) was gradually joined to the mixture to form a layer. A reddish-brown interface formed confirms the presence of terpenoids.

Test for cardiac glycosides

5 ml sample was treated with 2ml of glacial acetic acid (CH_3CO_2H) carrying 1 drop of $FeCl_3$ solution. This was followed by the careful addition of 1ml of concentrated sulphuric acid. A brown ring interface indicates a positive test. A violet ring might also be observed below the formed ring, while in the acetic acid layer, a greenish ring was formed just gradually throughout the thin layer.

Proximate analysis

Determination of moisture content

Principle

The fresh samples were weighed 5g each into beakers and placed in an oven for about six (6) hours at a temperature of 100ºC. The weight was taken after drying. The loss in weight was expressed as a percentage of the

initial weight, thus the difference in weight indicates the amount of water contained in the samples.

$$\%\text{Moisture}=\frac{\text{loss in weight on drying}}{\text{Initial sample weight}}x100 \quad (1)$$

Determination of ash content

A clean and dried crucible was weighed (W1). The pawpaw sample 5g sample was poured into the crucible and measured as (W2). The sample was placed in the furnace at 550ºC. Then the ash was covered with petri-dish and placed in desiccators and measured to have (W3). The percentage ash content was calculated using equation 2.

$$\text{ash} = \frac{\text{weight of ash}}{\text{weight of sample}} \text{ X } 100$$
$$= \frac{W3-W1}{W2-W1} \text{ X } 100 \quad 2$$

Where

W_1 = initial weight of the dish without sample grams.
W_2 = initial weight of dish with sample (in grams)
W_3 =final weight of dish with sample.

Determination of crude protein

(0.15g) of extract was weighed and conveyed into kjeldhal digestion flask. Catalyst (0.8g) and concentrated sulphuric acid H_2SO_4 2ml each were carefully added into the digestion flask. The blended mixture in the digestion flask was subjected to heating for 1 hour until a clear solution was obtained. The digest was cooled and made alkaline by adding 40% NaOH (15cm^3) then conveyed into a steam out apparatus using minimal volume of water. The ammonia NH_3 steam distilled into 2% boric acid (10cm^3) containing 5 drop of methyl red indicator for about 15 minutes. The distilled NH_3 was then titrated with hydrochloric acid (0.02M). The protein content was calculated using equation 3.

$$\% \text{ protein} = \frac{Pg}{\text{Weight of sample used}} X\ 100 \quad (3)$$

Pg = N x F

Where;
Pg = crude protein content
F = specific factor (6.25)

Determination of crude fat

A 3g extract was weighed (W_1) into a fat-free filter paper which was folded and a small portion of cotton wool placed over it. This was correctly joined with a thread at different ends and weighed (W_2), it is then gradually placed in a thimble, and cotton wool is used to cover it. After the addition of about 300cm^3 of petroleum ether, it took about 3 hours on the heating mantle and ensuring there is a continuous flow of water in the condenser. The extract was later detached, dried, and placed in an oven at 80ºC until persistent weights were obtained (W_3). The crude fat content was calculated using equation (4).

$$\% \text{ crude lipid (fat)} = \frac{W2-W3}{W1} X\ 100 \quad (4)$$

Where;
W1 = weight of extract (gram)
W2 = weight of extract + filter paper (before extraction)
W3 = weight of extract + filter paper (after extraction).

Determination of crude fibre

Extract 3g was weighed into the extraction system and extracted three times with light petroleum ether by stirring, settling and draining. The dried sample was conveyed into a dried 100cm^3 conical flask. **[**200ml of 0.1275M sulphuric acid (80cm^3)**]** measured at standard temperature and boiled. It was boiled for about 30 minutes, while the volume is maintained. The flask was revolved in few minutes in order to combine the contents and separate particles from the side. Buchner funnel was fastened to a punctured plate and to the funnel a filter paper was positioned to wrap the openings on the plate. The mixture was poured at once into a prepared funnel.

The funnel was then adjusted to achieve filtration within 10 minutes and the insoluble matter washed by boiling it severally until it is free of acid. After which it was moved back to the conical flask containing 200ml of 0.313M NaOH (80cm^3) measured at normal temperature and boiled. The resulting mixture was further boiled for about 30 min and allowed to stand for 1 minute before being filtered. The undissolved materials were moved to the filter paper by boiling, before being washed with 1% HCL and further washed again by boiling until it is free of acid. The mixture was then treated twice with ethanol and three times with ether while the undissolved matter was further transferred to a dry measured crucible and dried at 100ºC to obtain a constant weight containing the crucible with its content before it is placed on a heating mantle in a fume cupboard to eliminate organic matter. After which it was moved to a muffle furnace at 550ºC for about 3 hours. Then the ash content was computed by weighing after cooling.

The crude fiber content was calculated using equation (5)

$$\% \text{ crude fibre} = \frac{W1-W2}{W3} X\ 100 \quad (5)$$

Where;
W1 = weight of extract + filter paper
W2 = weight of W1 after it was ashed
W3 = weight of extract used (3g).

Determination of total carbohydrate

To establish the crude carbohydrate content of the extract, the percentages of the remaining constituents were added and subtracted from 100%. The value gotten from this, gives the crude carbohydrate content of the extract. The carbohydrate content was calculated using equation 6.

% carbohydrate = 100 – (% Moisture + % Ash + % Fiber + % Protein + % Fat) (6).

Ascorbic acid determination

The method used for the determination of the concentration of ascorbic acid used was that of oxidation Reduction (Redox) titration using iodine solution. 100g of the powdered pawpaw sample was dissolved into distilled water solution and made up to 100ml in a volumetric flask. 20ml aliquot of the sample solutions was pipette into a 25ml conical flask and 150ml of distilled water and 1ml of starch indicator was added to the sample solution. The sample was titrated with 5.0cm iodine solution. The end point of the titration was identified as the first permanent trace of a dark blue-black colour due to the starch-iodine complex. The titrations were repeated with further aliquots of the sample solution until the final titre values were obtained.

Statistical analysis

The result obtained is expressed as ± (SEM). The data obtained was analyzed using the one way analysis of variance (ANOVA) using software program SPSS version 20 and the value ($P < 0.05$) was considered a level of significance.

RESULTS AND DISCUSSION

The results of these findings showed that all the phytochemical constituents tested are present except saponin and steroid. The phytochemicals detected are flavonoids, tannins, alkaloids, Cardiac glycosides, Saponins glycosides phenols and glycosides as displayed in (Table 1).

Table 1. Phytochemical constituents of Pawpaw *(Carica Papaya* fruit peel).

Phytochemicals	Ethanolic extract
Tannins	+
Saponins	−−
Flavonoids	+
Cardiac glycosides	+
Alkaloids	+
Saponins glycosides	+
Steroids	−−
Phenols	+

+ indicate presence,
- indicates not detected

The results obtained revealed that cardiac glycosides are moderately present in the pawpaw sample. Mostly cardiac glycosides are said to be relatively toxic and can have pharmacological activity particularly in the heart(2). The result also revealed the presence of flavonoids. Flavonoids are group of naturally occurring phenols that have medicinal use. They are also known to have anti-inflammatory and anti-allergic properties for hampering the excess production of gastric mucosa (Kumar *et al*., 2013). The presence of phenols was also detected. Phenols are compounds with a hydroxyl group directly linked to benzene ring. They are structurally similar to alcohol but are greatly stronger acids that help in contracting the blood capillaries and also prevent certain hemorrhages (Zaruwa *et al*., 2016).

The proximate composition of the paw paw peel extract (*Carica papaya*) as presented in (Table 2) showed the moisture content to be 12.68%. Papaya was found to have 8.280% Protein is an essential component of diet which primarily functions in building the body as well as repair and replacement of worm out tissues (Zaruwa *et al*., 2016). The fibre content of papaya found was 3.35%, foods rich in fibre expands the inner wall of the colon, this makes the transit of waste easier, thus making it an essential anti-constipation and also lessens the tendency of developing bowel related diseases (Kumar *et al*., 2013). *Papaya* shows (4.83%) amount of ash. The lipid content of pawpaw detected is 2.083%, it is considered healthy when consumed moderately (Kumar *et al*., 2013). The carbohydrate contents of the fruit were 68.777%, this indicate that the fruit can be regarded as a good source of vitality in the case of malnutrition. When carbohydrate is sufficient in food it prevents the unwarranted utilization of protein and allows it to be channeled for body building processes (Kumar *et al*., 2013).

The result of the ascorbic acid (vitamin C) content of

Table 2. Proximate composition of *Carica papaya.*

Nutrients	% Composition
Moisture	12.68±0.023
Lipid	2.083±0.18
Fibre	3.35±0.158
Ash content	4.83±0.107
Protein	8.280±0.03
Carbohydrate	68.777±0.32

Table 3. Ascorbic Acid content of *Carica papaya*

Vitamin C (mg/100g)	Mean ±SD
Vitamin C	28.35±0.023

Data are mean ± standard deviation of three replicate determinations.

pawpaw (*carica papaya*) as shown in (Table 3) indicates a considerable amount of vitamin C with a record value of 28.35mg. Severe insufficiency of vitamin C results in scurvy, whereas deficient vitamin C uptake makes one prone to infections such as loss of teeth, dry mouth, eyes and insomnia (Leblanc et al., 2002). Vitamin C can also have a pro-oxidant ability or behavior, particularly in the existence of transition metals, such as iron and copper, starting different dangerous radical reactions (Salmon *et al*., 2004. Vitamin C can be a strong, effective, and inexpensive antioxidant agent and at the same time, behave as a radical promoter.

Conclusion

In conclusion, *carica papaya* is an edible fruit that can be used to treat vitamin related deficiency in humans. This is owing to the nutritional importance as detected in the fruit and also the vitamin C content that was found. It can therefore serves as a very important source of vitamins. The secondary metabolites detected indicate that *Carica papaya* can be useful in human diet and is relatively safe for consumption.

Recommendation

More investigation can be conducted on the fruit using different sample from different location so as to know or determine the effect of soil on the nutritional composition of carica papaya which will also shed more light on the double functions of vitamin C.

REFERENCES

Abah R, Tolough G, Ochoga MO, Tolough GI, Michael A, Ikuren I(2018). Article no.JAMMR.40055 Reviewers: (1) Arushi Agarwal, Sanjay Gandhi Memorial Hospital, India. (2) Radoslava Vazharova. J Adv Med Med Res. 2018; 25(11):1–7.

Archbold S, Sach T, O'neill C, Lutman M, Gregory S (2008). Outcomes from cochlear implantation for child and family: parental perspectives. Deaf Educ Int [Internet]. 2008 Sep 1 [cited 2020 Apr 9];10(3):120–42.

Azarkan M, El Moussaoui A, Van Wuytswinkel D, Dehon G, Looze Y (2003). Fractionation and purification of the enzymes stored in the latex of Carica papaya. Vol. 790, Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences. Elsevier; 2003. p. 229–38.

between the C-terminal domain of RNA polymerase II and the negative regulator SIN1. Cell [Internet]. 1991 Mar 22 [cited 2020 Apr 9];64(6):1135–43. Available from: http://www.ncbi.nlm.nih.gov/pubmed/2004420

Danbaba N, Anounye JC, Gana AS, Abo ME, Ukwungwu MN, Maji AT (2012). Physical and Pasting Properties of 'Ofada' Rice (Oryza sativa L.) Varieties. Niger Food J. 2012 Jan 1; 30(1):18–25.

Edioga HO, Okwu DE, Mbaebie BO (2005). Phytochemical constituents of some Nigerian medicinal plants. African J Biotechnol. 2005 Aug 19; 4(7):685–8.

Kruger W, Peterson CL, Herskowitz I (1991). A functional interaction

Kumar S, Mishra A, Pandey AK (2013). Antioxidant mediated protective effect of Parthenium hysterophorus against oxidative damage using in vitro models. BMC Complement Altern Med. 2013 May 30;13.

Leblanc SJ, Duffield TF, Leslie KE, Bateman KG, Keefe GP, Walton JS, (2002). The effect of treatment of clinical endometritis on reproductive performance in dairy cows. J Dairy Sci [Internet]. 2002 Sep [cited 2020 Apr 9]; 85(9):2237–49.

Monteiro F, Sebastiana M, Duarte B, Malhó R, Caçador I, Matos AR (2019). The leaf lipid composition of ectomycorrhizal oak plants shows a drought-tolerance signature. Plant Physiol Biochem. 2019 Nov 1;144:157–65.

Salmon P, Sephton S, Weissbecker I, Hoover K, Ulmer C, Studts JL (2004). Mindfulness meditation in clinical practice. Cogn Behav Pract. 2004 Sep 1;11(4):434–46.

Soforow A (1993). Medicinal Plants and Traditional Medicine in Africa. Spectrum Books Ltd., Ibadan, 191-289.

Usman A, Abdulrahman FI, Usman A (2009). Qualitative phytochemical screening and in vitro antimicrobial effects of methanol stem bark extract of Ficus thonningii (Moraceae). African J Tradit Complement Altern Med. 2009;6(3):289–95.

Zaruwa MZ, Ibok NI, Ibok IU, Onyenonachi EC, Danchal C, Ahmed AG (2016). Effects of Sterculia setigera Del. Stem Bark Extract on Hematological and Biochemical Parameters of Wistar Rats. Biochem Insights. 2016 Jan 11;9:BCI.S36143.