

## PHYTOCHEMICAL AND NUTRIENT EVALUATION OF *CARICA PAPAYA* (PAWPAW) LEAVES.

\*P.B. Ayoola & A. Adeyeye

Department of Science Laboratory Technology, Ladoko Akintola University of Technology, P.M.B. 4000,  
Ogbomosho, Oyo State, Nigeria.

\*Email: [pbayoola@yahoo.com](mailto:pbayoola@yahoo.com)

### ABSTRACT

Three samples of *Carica papaya* leaves (Green, Yellow and Brown) were collected randomly from Ogbomosho town, Oyo state, Nigeria and analyzed for the phytochemical composition, vitamins and mineral constituents. Phytochemical screening revealed the presence of bioactive compound saponins, cardiac glycoside alkaloids and absence of tannins in the three samples.

Results showed that the plant leaves contained the vitamins, (mg/100g), thiamine (B<sub>1</sub>): green leaves 0.94, yellow leaves 0.41, brown leaves 0.52; riboflavin (B<sub>2</sub>): green leaves 0.13, yellow leaves 0.04, brown leaves 0.06; ascorbic acid (C): green leaves 16.29, yellow green 9.62, brown leaves 11.26. Mineral analysis showed highest values (mg/kg) of Ca, 8612.50; Mg, 67.75; Na, 1782.00; K, 2889.00; Mn, 9.50 in the green leaves, and Fe, 147.50 in yellow leaves as compared to other elements examined. Thus green pawpaw leaf gave a source of essential nutrients while yellow pawpaw was a source of iron. Therefore pawpaw leaves can be manipulated in the herbal treatment of various diseases and as a potential source of useful elements for drugs formulation.

**Keywords:** *Carica papaya* leaves, minerals, vitamins, phytochemicals, therapeutic properties.

### 1. INTRODUCTION

*Carica papaya* Linnaeus, (pawpaw), belongs to the family of Caricaceae. Papaya is not a tree but an herbaceous succulent plants that possess self supporting stems. (Dick Gross, 2003). Papaya is a large perennial herb with a rapid growth rate. The plants are usually short-lived, but can produce fruit for more than 20 years. The papaya has a rather complicated means of reproduction. The plants are male, hermaphrodite, or female (Bruce and Peter, 2008). The male trees are uncommon, but sometimes occur when homeowners collect their own seeds. Hermaphrodite trees (flowers with male and female parts) are the commercial standard, producing a pear shaped fruit. These plants are self pollinated (Jari, 2009).

*Carica papaya* plants produce natural compounds (annonaceous acetogenins) in leaf bark and twig tissues that possess both highly anti-tumour and pesticidal properties. It was suggested that a potentially lucrative industry based simply on production of plant biomass could develop for production of anti-cancer drugs, pending Food and Drug Agency approval, and natural (botanical) pesticides (Mc Langhlin, 1992). The high level of natural self-defence compounds in the tree makes it highly resistant to insect and disease infestation (Peter, 1991).

*Carica papaya* L. leaf tea or extract has a reputation as a tumour-destroying agent. (Walter Last, 2008)

The papaya fruit, as well as all other parts of the plant, contain a milky juice in which an active principle known as papain is present. Aside from its value as a remedy in dyspepsia and kindred ailments, it has been utilized for the clarification of beer. The juice has been in use on meat to make it tender, (Wilson, 1994).

The seed is used for intestinal worms when chewed. The root is chewed and the juice swallowed for cough, bronchitis, and other respiratory diseases. The unripe fruit is used as a remedy for ulcer and impotence, (Elizabeth, 1994).

Fresh, green pawpaw leaf is an antiseptic, whilst the brown, dried pawpaw leaf is the best as a tonic and blood purifier. (Atta, 1999). Chewing the seeds of ripe pawpaw fruit also helps to clear nasal congestion, (Elizabeth, 1994). The green unripe pawpaw has a therapeutic value due to its antiseptic quality. It cleans the intestines from bacteria, more so that (only a healthy intestine is able to absorb vitamin and minerals, especially vitamin B<sub>12</sub>). The tea, prepared with the green papaya leaf, promotes digestion and aids the in treatment of ailments such as chronic indigestion, overweight and obesity, arteriosclerosis, high blood pressure and weakening of the heart (Mantok, 2005).

The objective of this study is to compare the phytochemical and nutrient contents of different coloured *Carica papaya* leaves from the same plant as a basis to advising the traditional medicine practitioners, herb users, herb sellers, health institutions and farmers on the health and economic importance of *Carica papaya* leaves.

## 2. MATERIALS AND METHODS

### Source of plant materials

The plant materials which include fresh green pawpaw leaves, fresh yellow pawpaw leaves and dry brown pawpaw leaves (the ones that fell on the ground) were obtained randomly from the Ladoko Akintola University of Technology, research farm land, Ogbomoso, Oyo State, Nigeria.

### Sample preparation

The leaves were washed, cut into small pieces and sun dried for five days. The samples were ground into powder and stored each in an air tight bottle prior to use for analysis.

### Phytochemical analysis.

The analysis for tannin, saponins, cardiac glycosides and alkaloids were carried out according to standard methods, (Sofowara, 1993; AOAC 1980).

### Mineral analysis

Minerals were determined by digesting the ash with 3M Hydrochloric acid using the atomic absorption spectrophotometer for Calcium, Magnesium, Manganese and Iron and the flame photometer for potassium and sodium (Egan, Kirk & Sawyer, 1981).

### Vitamin analysis

The composition of the water-insoluble vitamins, riboflavin and thiamine, were determined by the method of Scalar (2000), while ascorbic acid content was determined by the method of AOAC, (1980)

## 3. RESULTS AND DISCUSSION

The Phytochemical analysis of the leaves (Table 1) showed that the leaves contained saponins, cardiac glycosides, and alkaloids. Tannin was absent in the leaves. The presence of saponins supports the fact that pawpaw leaf has cytotoxic effects such as permealization of the intestine as saponins are cytotoxic, (Okwu & Okwu, 2004). It also gives the leaves the bitter taste. Saponin has relationship with sex hormones like oxytocin. Oxytocin is a sex hormone involved in controlling the onset of labour in women and the subsequent release of milk (Okwu and Okwu, 2004). Another important action of saponins is their expectorant action through the stimulation of a reflex of the upper digestive tract (David, 1983). Alkaloids are the most efficient therapeutically significant plant substance. Pure isolated alkaloids and the synthetic derivatives are used as basic medicinal agents because of their analgesic, antispasmodic and bacterial properties (Stray, 1998). They show marked physiological effects when administered to animals. The presence of alkaloids in the leaves shows that these plants can be an effective anti-malaria, since alkaloids consist of quinine, which is an anti-malaria (Robinson, 1985). The cardiac glycosides, therapeutically have the ability to increase the force and power of the heart-beat without increasing the amount of oxygen needed by the heart muscle. They can thus increase the efficiency of the heart and at the same time steady excess heart beats without strain to the organ (David, 1983). Deficiency of ascorbic acid is associated with pains in the joint and defect in skeletal calcification, anaemia, manifestation of scurvy haemorrhage from mucous membrane of the mouth and gastrointestinal tract (Hunt et al. 1980). This function of ascorbic acid accounts for its demand for normal wound healing. There is also an interesting ability of ascorbic acid as an antioxidant, to prevent or at least minimize the formation of carcinogenic substances from dietary material (Hunt et al, 1980). As a result of the presence of ascorbic acid in *carica papaya* leaves, the plant can be used in herbal medicine for the treatment of common cold and other diseases like prostate cancer (Okwu and Okwu, 2004; Okwu and Ekekes 2003). Other vitamins though in trace amount are essential for body metabolism (Njoku & Akumefula, 2007).

Table 1: Phytochemical Screening of pawpaw leaves

Constituents	Bioassay		
	Green leaf	Yellow leaf	Brown leaf
Saponins	+	+	+
Tannins	-	-	-
Cardiac glycoside	+	+	+
Alkaloid	+	+	+

+ Represent presents, - No activity; Results are means of three determinations.

Table 2: Mineral Composition of the pawpaw leaves on dry weight basis (mg/kg)

Mineral	Green leaf	Yellow leaf	Brown leaf
Ca	8612.50	3762.50	4362.50
Mg	67.75	28.55	35.35
Na	1782.00	567.00	324.00
K	2889.00	819.00	468.00
Fe	90.50	147.50	79.50
Mn	9.50	5.00	4.50

Results are means of three determinations.

Table 3: Vitamin Compositions of the pawpaw leaves on a dry basis (mg/100g)

Vitamin	Green leaf	Yellow leaf	Brown leaf
Ascorbic Acid	16.29	9.62	11.26
Thiamine	0.94	0.41	0.52
Riboflavin	0.13	0.04	0.06

Results are means of three determinations.

In table 2, the result of the mineral composition clearly showed that *Carica papaya* leaves contain rich source of mineral elements. This result becomes so important when the usefulness of such minerals like Ca, Mg, Na, K, Fe and Mn in the *Carica papaya* leaves indicates the usefulness of the leaves in the coagulation of blood, the proper functioning of the heart and nervous system and the normal contraction of muscles. Magnesium, assist in the assimilation of phosphorus. Lack of magnesium can be responsible for tetany, tuberculosis, diabetes, cancer and all nervous diseases (Claude and Paule,1979). Maybe this is the reason why pawpaw leaves especially the green ones are being employed in the treatment of the above listed diseases (Atta, 1999). Potassium is necessary for muscular weakness which is associated with malaria, and also slows down sclerosis of the vascular system. It contributes to the fight against bacteria and cleanses the digestive system. Sodium takes part in the metabolism of water, promotes digestion, assimilation, osmosis, cleanses the digestive system, combats stomach acidity and alkalize the blood (Claude and Paule ,1979). This is the reason behind the brown pawpaw leaf being used as a cleanser in herbal remedy (Atta, 1999). The presence of Iron signifies that the leaves can be used against anaemia, tuberculosis and disorder of growth. (Claude and Paule, 1979). Iron is an energizer but excess can cause fatigue but we hardly have excess if taken from natural source (Gbolahan, 2001).

Manganese, according to Claude and Paule (1979) is necessary for the functioning of the pituitary gland, the pineal gland and the brain. It promotes hepato-renal function, combat anaemia and it is also essential for growth. Since these leaves contain these elements in different concentrations, the quantity and the type of leaf to be taken will depend on the therapeutic need of the individual and they can also be combined for an effective result in such cases as diabetes, cancer, fibroid and tuberculosis. The yellow leaf is equally used as anti-anaemic agent while the brown leaf is used as a body cleanser, (Atta, 1990).

#### 4. CONCLUSION

This study has shown the phytochemicals, vitamins and minerals composition of green, yellow and brown *Carica papaya* leaves. This partly shows the use of this plant in herbal medicine, as a rich source of phytochemicals, coupled with the presence of the essential vitamins and minerals. *Carica papaya* leaves can be seen as a potential source of useful food and drug items. The presence of alkaloids in them explains the reason why it is being effectively used as an anti-malaria agent. The yellow *Carica papaya* leaf is equally used as anti- anaemic agent while the brown leaf is used as a body cleanser (Atta, 1999).

#### 5. REFERENCES.

- AOAC, (1980). Official methods of analysis. 13<sup>th</sup> Ed. Washington D.C.
- Atta, K. Bonsu (1999). "The Power of Garlic". Cardiovascular disease prevention Association, Buea, Cameroon. p.72.
- Bruce, S. and Peter, C. A. (2008). Handbook of environmental physiology of fruit crops. 1<sup>st</sup> Ed. p.217.
- Claude, B. and Paule, S. (1979). The manual of natural living. 1<sup>st</sup> Ed. Biddles Ltd, pp.98-101.
- David, H. (1983). The new holistic herbal. 3<sup>rd</sup> Ed. Findhorn press, U.S.A. pp: 241.
- Desmond, R. Layne (1995)".Pawpaw": New crop factsheet. Department of Horticulture, Poole Agriculture Centre, Clemson University, Clemson, Sc. 29634-0375.

- Dick Gross (2003). "Papaya": A tantalising taste of the Tropics. Maricopa County Master Gardener Volunteer information, University of Arizona Cooperative Extension. [www.papaya.maricopa-hort@ag.arizo.edu](http://www.papaya.maricopa-hort@ag.arizo.edu).
- Egan, H., Kirk, R.S., & Sawyer, R., (1981). *Pearsons chemical analysis of foods*. 8<sup>th</sup> Ed. Churchill Livingstone, N. Y.
- Elizabeth Kafaru, (1994). *Immense help from nature's workshop*. 1<sup>st</sup> Ed. Elikaf Health Services Ltd. Ikeja, Lagos. Pp:207-209.
- Gbolahan, D. (2001). Lesson note on medical importance of trace elements. Centre for Natural Health Studies, Surulere, Lagos, Nigeria..
- Hunt, S., Goff, J. L., and Holbrook, J. (1980). *Nutrition Principles and Chemical Practices*. John Wiley and Sons, New York, pp: 49-52.
- Jari, S. (2009). Papayas are yummy easy to grow. University of Hawaii- Manoa College of Tropical Agric. & Human Resources.
- Mantok, C. (2005). Multiple Usage of Green Papaya in Healing at Tao Garden. Tao Garden Health spa & Resort. Thailand. [www.tao-garden.com](http://www.tao-garden.com)
- McLanghlin, J. L., Ratanyake, S. Rupprecht, J. K. and, Potter, W. M. (1992). Evaluation of various parts of the pawpaw tree, *Asimina triloba* (Annonaceae), as commercial source of the pesticidal annonaceous acetogenins. *J. Econ. Entomol.* 85: 2353-2356.
- Njoku, P. C., and Akumefula M. I., (2007). Phytochemical and nutrient evaluation of *Spondias mombin* leaves. *Pak. J. Nutr.* 6(6): 613-615.
- Okwu, D. E. and Ekeke, O. (2003). Phytochemical screening and mineral composition of chewing sticks in South Eastern Nigeria, *Global. J. Pure Appl. Sci.*, 9: 235-238.
- Okwu, D. E, and Okwu, M.E., (2004). Chemical composition of *Spondia mombin* plants. *J. Sustain Agric. Environ.* 6: 140-147.
- Peter, R. N. (1991). Pawpaw (*Asimina*). In: J. N. Moore and J. R. Ballington (eds). *Genetic resources of temperate fruit and nut trees*. *Acta Hort.* 290:567-600.
- Robinson, T., (1985). *The organic constituents of higher plants. "Their Chemistry and Interrelationships*. 3<sup>rd</sup> Ed. Corcleus Press. North Amherst mass. 6: 430-435.
- Scalar, (2000). In: *Segregated flow analyzer for analytical process Laboratories Netherland*, pp:45,55 and 61.
- Sofowara, A., (1993). *Medicinal plants and traditional medicine in Africa*, Spectrum Books, Nigeria. 2<sup>nd</sup> Ed. Pp: 10-158.
- Stray, F., (1998). *The natural guide to medicinal herbs and plants*. Tiger Books International, London, pp: 12-16.
- Walter Last (2008). *Cancer remedies*. [www.health-science-spirit.com/cancer6-remedies](http://www.health-science-spirit.com/cancer6-remedies).
- Wilson Popenoe, (1974). "Papaya"- *Manual of tropical and subtropical fruits*. Hafner Press. Facsimile of the 1920 Ed. Pp: 225-240.