International Journal of Botany Studies
ISSN: 2455-541X; Impact Factor: RJIF 5.12
Received: 2-02-2021; Accepted: 11-03-2021: Published: 19-03-2021
www.botanyjournals.com
Volume 6; Issue 2; 2021; Page No. 227-231

An ethnobotanical importance and phytochemical analysis of *Carica papaya* l.

M Nafees Iqbal
Department of Botany, M.S.P. Arts, Science and K.P.T. Commerce College, Washim affiliated to SGB, Amravati University, Amravati, Manora, Maharashtra, India

Abstract
The qualitative and quantitative phytochemical studies were carried out in the solvents *viz*. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and fruit extract of *Carica papaya* L. shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in fruit of *Carica papaya* L. Total content of Alkaloid, flavonoids and phenols in the Methanol, 1.926, 0.434 and 1.641 µg/ml. respectively, in the Chloroform 1.554, 0.391 and 0.856 µg/ml. and followed by in the n-Butanol leaves extract of *Gloriosa superba* L. that was 2.045, 0.423 and 0.426 µg/ml.

Keywords: *carica papaya* l., qualitative, quantitative, phytochemicals, ethnobotanical importance etc

Introduction
Papaya (*Carica papaya* L.) belonging family *Caricaceae* and Genus *Carica* is a deliciously sweet tropical fruit with musky undertones and a distinctive pleasant aroma. It was first cultivated in Mexico several centuries ago but is currently being cultivated in most of the tropical countries.

Plant: It is a fast-growing arborescent herb, with short life; it has single straight or sometimes branched stem reaching 2-10 m height.
The stem is cylindrical spongy-fibrous, loose, hollow, gray or gray-brown colour, 10-30 cm diameter and toughened.

Leaves: The leaves are spirally arranged in a terminal cluster, simple, on petioles 30-70 cm long. The margins of the lobes are very variable, and range from entire to undulate to deeply lobed. The leaves are rounded in outline, 60-90 cm in diameter, bundled at the apex between stem and branches, long petioles; widely evident, 25-75 cm diameter, smooth, moderately palm shape with thick middle irradiant veins, the base is deeply string shape with over-imposed lobes; from 7-11 large lobed, each with a wide base or slightly constrained and sharp-pointed, and sharp apex. The bundle of leaves is dark green to yellow-green, bright, visibly marked by the off-white nerves embedded and reticulated veins; the underneath surface is pale green-yellow and opaque with visibly prominent vascular structures; the petioles are round and yellow-green, with sporadic purple or violet stains, fistulous form, fragile, 25-100 cm length and 0.5-1.5 cm thick. The lifespan of each leaf is 4 to 6 months.

Typical female flower
It is a rather large flower of conical shape when closed, when open, its five petals spread from the base. The ovary is large with circular and smooth or slightly undulated. Fruits produced by this flower are spherical or ovoid in shape. ternately arranged, Similar to the above when closed, but this type has five short anthers, which correspond in their orientation with the five petals that also spread from the base. The ovary has five deep longitudinal grooves that remain until maturity. Fruit develop a form from globular to egg-shaped.
***Fruit*:** An ovoid-oblong berry pyriform or almost cylindrical, large, fleshy, juicy, grooved along the upper longer side, green yellow to yellow or yellow-orange colour when ripen, single cell of orange or redish internal colour with many parietal seeds and a length of 10-25 cm or longer and 7-15 cm or more of diameter. Generally, the fruit is melon-like, oval to nearly round, somewhat pyriform, or elongated club-shaped, 15-50 cm long and 10-20 cm thick; weighing up to 9 kg. Semi-wild (naturalized) plants bear miniature fruits 2.5-15 cm long. The skin is waxy and thin but fairly tough. When the fruit is green and hard it is rich in white latex. As it ripens, it becomes light or deep-yellow externally and the thick wall of succulent flesh becomes aromatic, yellow, orange or various shades of salmon or red. It is then juicy, sweetish and somewhat like a cantaloupe in flavour; in some types quite musky. Attached lightly to the wall by soft, white, fibrous tissue, are usually numerous small, black, ovoid, corrugated, peppery seeds about 3/16 in (5 mm) long, each coated with a transparent
Total annual world production is estimated at 6 million tonnes of fruits. India leads the world in papaya production with an annual output of about 3 million tonnes. Other leading producers are Brazil, Mexico, Nigeria, Indonesia, China, Peru, Thailand and Philippines.
Everything in papaya plant such as roots, leaves, peel, latex, flower, fruit and seeds have their nutritional and medicinal significance.

Ethnobotanical Importance of *Carica papaya*
The nutrients and phytochemicals contained in papaya help in digestion, reduce inflammation, support the functioning of cardiovascular, immune and digestive systems and may also help in prevention of colon, lung and prostate cancers. Overall, the papaya can act as a detoxifier, activator of metabolism, rejuvenating the body and in the maintenance of body's homeostasis because it is rich in antioxidants, B vitamins, folate and pantothenic acid, and potassium and

magnesium as well as fiber. Because of its high vitamin A and carotenoids contents, it can help in preventing the cataract and age-related macular degeneration. Papaya pastes can be used externally as a treatment for skin wounds and burns. This paper discusses the nutritional and medicinal value of papaya (*Carica papaya* L.) and its relationship to human health.

Material and Methods

Collection of Plant

Collection of *Carica papaya* L. plant part were collected from Manora tehshil area, district, Washim, Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part fruit and leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of fruit and leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and n-butonol, 24 hrs at room temperature and shaking constant and then filter with Whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative and quantitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) [5] and Sofowara (2005).

According to Budhiraja, 2012, fruit and leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Carica papaya* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for Gallic tannins and green black for catecholic tannins.

Quantitative analysis of *Carica papaya* L. plant parts

Preparation of plant extracts for quantitative determination of alkaloids 5 gm of powdered plant material was taken into 20 ml of n-butanol and vigorously stirred. The content was transferred into a reagent bottle. The slurry was kept overnight at room temperature. Then it was centrifuged at 6000 rpm for 10 min and the supernatant was made up to 50 ml with n-butanol

Estimation of total alkaloids by titrimetric methods Plummer, 2013 and Debnath *et al.* 2015.

Obtained supernatant of the plant sample was used for the estimation of total alkaloids by titrimetric methods. 10 ml of the supernatant was taken into a100 ml separating funnel. 10 ml of 0.1 (N) HCl was added and shaken thoroughly for 2-3 min. This results in the solubility of alkaloids. The lower layer contains alkaloids neutralized with 0.1 (N) HCl and the upper layer contains n-butanol. 10 ml HCL portion was collected in a beaker and 2-3 drops methyl red was added to it, that turns the solution into slightly reddish colour. The contents of beaker were titrated against 0.1 (N) NaOH, till colour change changed from red to pale yellow. The neutralization point was determined. Same procedure was repeated triplicate. The total amount of alkaloids was calculated by considering the following equivalent:

1 ml 0.1N HCl ≡ 0.0162 g alkaloid

Estimation of Total Phenolic Content

Total phenol content of *Carica papaya* L. was assayed by modified Dewanto *et al.*, 2002 and Jothi *et al.*, 2019 procedure. The different concentrations of 10µg, 20µg, 40µg, 60µg, 80µg, and 100 µg were using an aliquot of diluted extract and added to 0.25mL of Folin Ciocalteu reagent. The elucidation was adjusted with distilled water to a final volume of 3mL and shaken thoroughly. The solution was incubated and kept in the dark placed and read at 760nm was read against prepared blank. The total phenol content of plant parts was expressed as milligrams of gallic

acid equivalents per gram of dry weight. The total sample was analyzed in three replicates.

Estimation Total Flavonoid Content

Total Flavonoid content in *Carica papaya* L. whole plant extract was analysed by the aluminum chloride colorimetric system M.M Mervat, *et al* 2009 and Jothi *et al*., 2019. 0.5ml of entire plant extract of at different concentrations like 10µg, 20µg, 40 µg, 60 µg, 80 µg, and 100 µg were taken and the final volume was made up to 3mL with methanol. After that, 0.1ml AlCl3 (10%), 0.1ml of potassium acetate and 2.8ml of distilled water were added continuously and test solution was vigorously shaken. After 30 minutes for the incubation periods, absorbance was recorded at 415 nm. The concentration of flavonoids in test samples was calculated and expressed as the equivalent of quercetin (QE) / g of sample. The entire sample was analysed in three replicates.

Fig 1: Papaya Plant

Fig 2: Papaya plant with Fruits

Fig 3: Dreied powder of papaya

Fig 4: Fruit dried powder

Fig 5: Dried Powder dissolved solvent

Fig 6: Extraction in Soxhlet apparatus

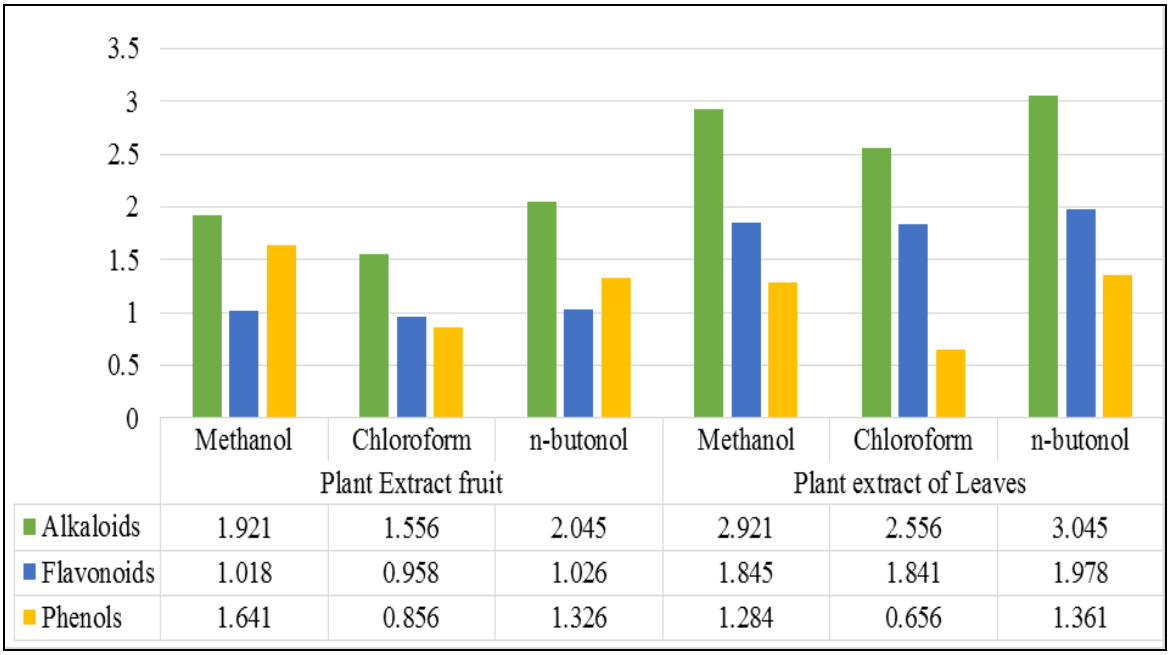
Results, Discussion and Conclusion

Table 1: Qualitative analysis of *Carica papaya* L. Fruit and leaves

Sr. No.	Phytochemical	Plant extract of leaves in			Plant extract of fruit in		
		Methanol	Chloroform	N-Butonol	Methanol	Chloroform	n-butonol
1.	Alkaloids	++	++	++	++	+	+

2.	Glycosides	++	+	++	+	+	+
3.	Terpenoids	+	++	+	+	+	+
4.	Steroids	++	+	++	++	+	+
5.	Flavonoids	++	++	++	++	+	+
6.	Saponins	++	++	++	+	++	++
7.	Phenols	++	+	++	++	+	-
8.	Tannins	++	++	++	-	+	-

Quantitative analysis of *Carica papaya* L. plant parts, (leaves and Fruit µg/ml)



	Plant Extract fruit			Plant extract of Leaves		
Alkaloids	1.921	1.556	2.045	2.921	2.556	3.045
Flavonoids	1.018	0.958	1.026	1.845	1.841	1.978
Phenols	1.641	0.856	1.326	1.284	0.656	1.361

Fig 7

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents *viz*. Methanol, Chloroform and n-Butanol. The Methanol, Chloroform and n-Butanol Leaves and fruit extract of *Carica papaya* L. shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but in fruit of *Carica papaya* L. high intensity of phytochemicals than that of leaves showed in table no.1 by twice and tannin absence in methanolic fruit and n-butanol extract of leaves. Also, the quantitative studies were carried out in the same solvent mentioned above, Alkaloid content in fruit of *Carica papaya* L. that was 2.921, 2.546 and 3.045 µg/ml respectively, and total flavonoids in fruit, 0.845, 0.641 and 0.978 µg/ml respectively and also followed by total content of phenols that was 1.284, 0.652 and 1.361 µg/ml.

Total content of Alkaloid, flavonoids and phenols in the Methanol, 1.926, 0.434 and 1.641 µg/ml. respectively, in the Chloroform 1.554, 0.391 and 0.856 µg/ml. and followed by in the n-Butanol leaves extract of *Gloriosa superba* L. that was 2.045, 0.423 and 0.426 µg/ml.

Discussion

Papaya is a small, frost-tender, succulent, broadleaved evergreen tree that bears papaya fruits throughout the year. Each tree typically has a single, unbranched, non-woody trunk bearing the scars of old leaf bases. The trunk is topped by an umbrella-like canopy of palmately lobed leaves. Large, fleshy, melon-like fruits (papayas) hang in clusters attached to the trunk top just under the leaf canopy. Papaya typically grows to 6 - 20' tall (container plants to 10' tall) and is most noted for its edible melon-like fruit. Papaya tree sometimes branches due to injury and it contains white latex in all parts. The stem is cylindrical, 10 - 30 cm in diameter, hollow with prominent leaf scars and spongy-fibrous tissue. It has an extensive rooting system (Orwa *et al*., 2009) [2]. Leaves spirally arranged, clustered near apex of the trunk; petiole up to 1 m long, hollow, greenish or purplish-green (Fig. 4); lamina orbicular, 25 - 75 cm in diameter, palmate, deeply 7- lobed, glabrous, prominently veined; lobes deeply and broadly toothed (Orwa *et al*., 2009) [2]. The species plants are typically dioecious (hermaphroditic), and maple trees are uncommon. Hermaphrodite trees (flowers with male and female parts) are the commercial standard, producing a pear-shaped fruit. These plants are self-pollinated (Jari, 2009). Flowers tiny, yellow, funnel-shaped, solitary or clustered in the leaf axils, of 3 types; female flowers 3 - 5 cm long, large functional pistil, no stamens, ovoid-shaped ovary; male flowers on long hanging panicles, with 10 stamens in 2 rows, gynoecium absent except for a pistil lode; hermaphrodite flowers larger than males, 5-carpellate ovary; occurrence depends on the season or age of the tree (Orwa *et al*., 2009) [9]. The female flowers give way to smooth-skinned green fruits that ripen to yellow-orange with a yellow to pinkish-orange flesh and central cavity of pea-sized black seeds. However, several distinct varieties of papaya have been mentioned (Richharia, 1957; Sen, 1939) [12], which vary in shape and size of fruits, height of plants, etc.

Papaya is considered one of the most important fruits because it is a rich source of antioxidant nutrients (e.g.,

carotenes, vitamin C, and flavonoids), the B vitamins (e.g., folate and pantothenic acid), minerals (e.g., potassium and magnesium), and fibre (EDI, 2012). Papaya plant is laticiferous as they contain specialized cells known as laticifers. The lactifiers secrete latex and are dispersed throughout most plant tissues. The papaya latex is well known for being a rich source of the four cysteine endopeptidases namely papain, chymopapain, glycyl endopeptidase and caricain (Azarkan *et al*., 2003) and the content of latex may vary in fruit, leaves and roots. As the papaya fruit ripen, the amount of laticifers cells that produces latex decreases (OECD, 2005). Therefore, ripe papaya contains less latex and other constituents. The richness of enzymes in papaya juice has been known since 1878 (Witmann, 1978). The most important enzyme papain was characterized in 1968 (Drenth *et al*., 1968). The enzymes chymopapain and papaya protease III were characterized in the 1980s of the last century (Jacquet *et al*., 1989; Zucker et al., 1985) [7] these two important compounds like papain and chymopapain are supposed to aid in digestion and therefore they are widely used to cure the digestive disorders. In addition, papain is used in meat tenderizing, pharmaceuticals, beauty products, and cosmetics (EDI, 2012). Besides, it has been used in brewing and wine making, and in the textile and tanning industries. It is also used to treat arthritis. It is important to note that the level and amount of the chemical compounds vary in the fruit, latex, leaves, and roots. The phytomedicine contents of the 100 gm of leaf, young fruit. In addition, plant parts from male and female trees differ in the quantity of the compounds. For example, phenolic compounds tend to be higher in male trees than female trees. The amount of fresh papaya latex and dry latex (crude papain) also vary with the gender and age of the tree. Female and hermaphrodite trees yield cruder papain than the male trees and the older fruit yields more than the younger fruit. However, the activity of the papain is higher in the extracts from the younger fruit than the older fruit. Cultivars also vary in the quantity of the compounds (Cornel University, 2009). A recent study has reported that the green, yellow and brown leaves of papaya contain various phytochemicals, vitamins and minerals composition (Ayoola and Adeyeye, 2010) [2]. Therefore, the papaya leaves can be seen as a potential source of useful food and drug items.

The HIV infected/ immune compromised individuals are extremely vulnerable to opportunistic infections and these infections can be prevented by specialized nutritional supplement in terms of ingesting phytonutrient-rich fruits particularly papaya very regularly. Since papaya is a gifted nutraceutical plant, it offers an opportunity for controlling various diseases, particularly neurodegenerative diseases and in AIDS management (Bonuccelli, 2012). Recent studies indicate that the papaya may hold the cure to the deadly AIDS virus. Researchers in the Philippines believe that eating papaya could help in boosting the immune system and can reduce the viral load of HIV in some patients. Papaya juice is sometimes used in pharmaceuticals as it can be used to remove blemishes. Latex obtained from unripe fruits is used in folk medicine to treat warts and corns (Dass, 2010) [3]. Fermented papaya preparation (FPP) (a product of yeast fermentation of C. papaya) is a food supplement. folk medicine reportedly uses papaya as an herbal remedy for the management of sickle cell anaemia. The results indicate that the previously reported anti-sickling properties of papaya may be due to the inherent antioxidant nutrient composition, thus supporting the claims of the traditional healers and suggests a possible correlation between the chemical composition of the papaya plant and its uses in traditional medicine as an ant sickle cell anemia agent (Imaga *et al*., 2010) [6]. In addition, Oduola *et al*. (2006) has described about the anti-sickling activity of unripe papaya extracts that the anti-sickling and reversal of sickling activities reside in the ethyl acetate fraction that prevents the sickling of haemoglobin of the sickle cell patients.

Conclusion

Carica papaya L. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in n-butanol solvent shows highest intensity and content of phytochemicals.

So, *Carica papaya* L. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

References

1. Aravind G, Bhowmik D, Duraivel S, Harish G. Traditional. Medicinal Uses of Carica papaya. J Med Plants Stud. 2013; 1:7-15.
2. Ayoola PB, Adeyeye A. Phytochemical and Nutrient Evaluation of Carica Papaya (Pawpaw) Leaves. Intl J Res Rev Appl Sci. 2010; 5:325-328.
3. Dass A. Papaya. National Library Board Singapore, 2010. Available at: http://infopedia.nl.sg/articles/SIP_170_2005-01- 11.
4. Debnath B, Uddin J, Patari P, Das M, Maiti D, Manna K. Estimation of Alkaloids and Phenolics Of Five Edible Cucurbitaceous Plants and Their Antibacterial Activity. Int J Pharm & Pharm Sci. 2015; 7(12):223-227.
5. Harborne JB. Phytochemical Method. A Guide to Modern Technique of Plants Analysis. Chapman and Hall, London, 1973.
6. Imaga NA, Gbenle GO, Okochi VI, Adenekan S, Duro Emmanuel T, Oyeniyi B *et al*. Phytochemical and antioxidant nutrient constituents of Carica papaya and Parquetinanigrescens extracts. Sci Res Essays. 2010; 5:2201-2205.
7. Jacquet A, Kleinschmidt T, Schnek AG, Looze Y, Braunitzer G. The thiol proteinases from the latex of Carica papaya L. III.The primary structure of chymopapain. Biol Chem Hoppe Seyler. 1989; 370:425-434.
8. Oloyede OI. Chemical profile of unripe pulp of Carica papaya. Paki J Nutr. 2005; 4:379-381.
9. Orwa C, Mutua A, Kindt R, Jamnadass R, Anthony S. Carica papaya. Agroforestry Database 4.0, 2009.
10. Plummer DT. Introduction to practical biochemistry. 3rd 25. Ed. Tata McGraw Hill Publishing Company Limited, India, 1990.
11. Singh O, Ali M. Phytochemical and antifungal profiles of the seeds of Carica papaya L. Indian J Pharm Sci. 2011; 73:447- 451.
12. Richharia RH. Plant Breeding and Genetics in India. (Ahmedabad, India: Scientific Book Company), 1957.