JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Carica papaya Linn. Pharmacological Properties, Medicinal and Nutritional Benefits: A Review

Sanket Hire *[1], Nikita Damodar [2], Smita Aher[3], Rushikesh Bachhav[4]
[1]Department of Pharmaceutical Quality Assurance, R.G. Sapkal College of Pharmacy, Anjanery, Nashik
[2]Department of Pharmaceutical Quality Assurance, R.G. Sapkal College of Pharmacy, Anjanery, Nashik
[3]Department of Pharmaceutical Chemistry, R.G. Sapkal College of Pharmacy, Anjanery, Nashik
[4]Department of Pharmacology, R.G. Sapkal College of Pharmacy, Anjanery, Nashik

Abstract:

In tropical and subtropical regions of the world, papaya (Carica papaya L.) trees are a common and significant fruit tree. All around the world, people eat fruit either as a processed food or as a fresh fruit and vegetable. The entire plant, including the fruit, root, bark, peel, seeds, and pulp, is recognised to have therapeutic benefits in addition to being healthful and tasty. Its many components have been mentioned in various traditional literature for illnesses such as fever, swellings, jaundice, gonorrhoea, bilious fever, itches, eczema, and rheumatism. They have also been documented for colds, headaches, whooping cough, asthma, chicken pox, and bronchitis. According to an in vitro papaya research, the fruit has anticancer properties and can be used to treat a variety of cancer cell lines.

Keywords: Carica papaya, Nutritional value, pharmacological properties, medicinal plan, anticancer

Introduction:

The papaya is a member of the globally distributed four-genus family Caricaceae. In India, there are four species of the genus Carica L., with Carica papaya L. being the most popular and well-known. Papaya Melon Tree, Pawpaw or Papau, Kapaya, Lapaya, Papyas, Papye, Tapayas, Fan mu gua, papita, arand- kharpuja, papayabaum, and papaya are some of its most popular names.[1]

Papaya is a year-round fruit that is a nutritional powerhouse. The three potent antioxidant vitamins C, A, and E are abundant in this food. the vitamins B pantothenic acid, magnesium, and potassium; folate; and fibre. Along with all of this, it also has papain, a digestive enzyme that is useful in treating the root causes of trauma, allergies, and sports injuries.[2]

One of the most widely grown plants in tropical regions is the papaya (Carica papaya Linn.), which is also the most well-known and commercially significant species in the caricaceae family . It is a kind of blooming plant that is indigenous to Oman, India, Malaysia, Indonesia, the Philippines, and Sri Lanka. The papaya has been grown commercially in a number of Asian nations. Papaya is grown as a garden plant in various tropical nations. The plant is a single-stemmed, medium-sized tree with few branches.[3]

Pharmacogenetic studies: [4,5]

The height ranges from 5 to 10 metres on average. The plant's leaves are arranged in a spiral up to the top stem. The leaves are typically large and oval in form, measuring 20 to 28 inches in diameter. White latex is present in every section of the plant. The blooms have five segments and have petals that are a soft white colour. The

petals are united to the male and female flowers. The ovary and its five petals, which are twisted loosely together at the base, are found in female flowers. Papayas have medicinal properties in all sections and are utilised in many different traditional treatments across the world. It produces a huge, berry-like fruit with a diameter of 10 to 30 cm and a length of 15 to 40 cm.

Taxonomy :[6]

Domain: Flowering plant Kingdom: Plantae

Sub Kingdom: Tracheobionta

Class: Magnoliopsida

Subclass: Dilleniidae

Superdivision: Spermatophyta

Phyllum: Steptophyta

Order: Brassicales

Family: Caricaceae

Genus: Carica

Botanical Name: Carica papaya Linn

Table 1: Indian Synonyms of Carica papaya Linn [7]

Language	**Region**	**Names**
Hindi	Haryana, Delhi	Papaya, Papita
Bengali	West Bengal	Papaya, Pepe, Papita
Malyalam	Kerala	Omakai
Punjabi	Punjab	Papita
Marathi	Maharashtra	Papai
Tamil	Tamil Nadu	Pappali
Gujarati	Gujarat	Papaya
Kannada	Kannada	Pharangi
Rajasthani	Rajasthan	Eerankari

Chemical constituents: [8,9]

The different parts of papaya such as fruit, fruit juice, seed, root, leaves, bark, latex contain various chemical constituents, which are shown as follows

Fruit	protein, fat, fibre, carbohydrates, minerals, calcium, phosphorus, iron, vitamin C, thiamine, riboflavin, niacin, and caroxene, amino acid, citric acids and molic acid (green fruits), volatile compounds: linalol, benzylisothiocynate, cis and trans 2, 6-dimethyl-3,6 expoxy-7 octen-2-ol. Alkaloid, α; carpaine, benzyl-β-d glucoside, 2-phenylethl-β-D-glucoside, 4-hydroxyl -phenyl-2 ethyl-B-D glucoside and four isomeric malonated benzyl-β-D glucosides
Juice	N-butyric, n-hexanoic and n-octanoic acids, lipids; myristic, palmitic, stearic, linoleic, linolenic
Seed	Fatty acids, crude protein, crude fibre, papaya oil, carpaine, caricin, glucotropacolin, and an anzyme myrosin
Root	Carposides and an enzyme myrossin
Leaves	Alkaloids carpain, pseudocarpain, dehydrocarpaine I and II, choline, vitamine C and E, carposide
Bark	Glucose, fructose, sucrose, xylitol, β-sitosterol.
Latex	Papain, chemopapain, peptidase A and B, lysozymes

Parts and medicinal uses of C. papaya

C. papaya is an enzyme powerhouse. Different parts contain various enzymes, including unripe fruit (papain, chymopapain), fruits (B carotene, carotenoids, crytoxanthin, monoterpenoids, linalool), roots (carposides), leaves (Zn, Mn, Fe, K, minerals), shoots (flavonoids), seeds (papaya oil, glucosinolates, benzyl isothyocynate),[10]

Nutritional Value :

Carica papaya Linn's nutritional value. Papaya is a common fruit that is inexpensive and packed with nutrients. It is high in natural vitamins and minerals and low in calories. Being relatively low in calories (32 Kcal/100 g of ripe fruit), this fruit is a favourite of obese persons who are trying to lose weight. Compared to other fruits like apples, guava, sitaphal, and plantains, papaya has less carotene, which helps to fend against damage from free radicals. Green papayas that have not yet ripened are utilised as vegetables; while they lack beta-carotene, they do have all of the other nutrients. The fruit contains a variety of enzymes in abundance. Papain, a vegetable pepsin that is abundant in unripe fruit, is a great digestive aid that facilitates the breakdown of protein in meals in acidic, alkaline, and neutral environments.[11,12] Patients with celiac disease who are unable to digest the gliandin protein in wheat can tolerate it if it is treated with crude papain since papaya has the ability to tenderise meat. To make meat more soft and more digestible, raw papaya is being used in cooking. A potential antioxidant

nutraceutical is fermented papaya fruit. At a dosage of 9 g/day taken orally, it strengthens the antioxidant defence in older people even in the absence of a clear antioxidant deficiency status. A "naturally immobilised" biocatalyst is the papaya lipase, a hydrolase enzyme that is strongly bound to the water insoluble portion of crude papain [13]. Using the erythrocyte utilisation of radioactive Fe technique, iron (Fe) absorption from rice meal was studied in parous Indian women and shown to be significantly increased by papaya. The delicious black seeds have a pungent, peppery flavour. They can occasionally be used in place of black pepper when crushed up. Young papaya leaves are sometimes boiled and eaten like spinach in various regions of Asia .100 g of Carica papaya fruit's nutritional value is explained.[14]

Pharmacological properties of C. papaya:

Antioxidant, anti-hypertensive, wound-healing, hepatoprotective, anti-inflammatory, antimicrobial, antifungal, anti-fertility, histaminergic, diuretic, antiamoebic, anti-tumor, anthelmintic, effect on smooth muscles, antimalarial, hypoglycemic, immunomodulatory, anti-ulcer, and anti-sickling are just a few of the medicinal properties of the plant

Analgetic Activity

Using the Siegmund technique, the three leaf extracts of Carica papaya L. were tested for their ability to relieve pain in a mouse model of acetic acid-induced discomfort.When compared to aspirin (given as the usual medication), these three extracts (n-hexane, ethyl acetate, and ethanol extracts) showed considerable analgesic effect at all three dosage levels (0.175, 0.35, and 0.70 mg/kg bw orally).[15]

Antidiabetic activity

In an experimental rat model, a study was conducted to evaluate the antidiabetic effect of Carica papaya L. leaf extract. Various doses of the chloroform extract, which contains steroids and quinines, were given to diabetic and non-diabetic rats that had been induced with streptozotocin. The sacrifice was made after 20 days of therapy, and a biochemical analysis was conducted. After the injection of Carica papaya L. leaf chloroform extract, diabetic rats' blood glucose, transaminases, and triglyceride levels significantly decreased. The findings of this study suggest that C. papaya leaf may be used to alleviate the symptoms of diabetes patients.[16]

Anti-hypertensive action

For the anti-hypertensive action, ripe C. papaya fruit was extracted ethanolically. The normotensive, renal, and DOCA-salt hypertensive mice had baseline mean arterial blood pressures (MAP) of (93.84.5), (175.25.1), and (181.36.2) mmHg, respectively. Both the ethanolic extract of the unripe fruit of the C. papaya (20 mg/kg, i.v.) and the dose of hydralazine (200 L/100 g, i.v.) significantly decreased the blood pressure in the normotensive, renal, and DOCA-salt hypertensive animal groups compared to the control group. However, in the hypertensive group, the extract caused around 28% higher MAP depression than hydralazine. According to the study, the unripe fruit of C. papaya demonstrated strong anti-hypertensive properties.[17]

Anti-ulcer properties

Acute alcohol-induced stomach injury and blood oxidative stress in rats were prevented by aqueous seed extract of C. papaya at doses of 50 mg/kg and 100 mg/kg. Rats given 100 mg/kg of the extract had a considerable decrease in stomach acidity. [18]

Anthelmintic

With little adverse effects, the dried papaya seeds used as an elixir with honey have demonstrated a considerable impact on human intestinal parasites. The primary anthelmintic found in seeds is benzylisothiocynate.[19]

Antifungal activity

Fluconazole and the latex of the C. papaya work together to prevent the development of Candida albicans. Partial cell wall breakdown is the outcome of this synergistic action. The antifungal activity of latex proteins appears to be mediated by these proteins, and a minimal protein concentration of 138 mg/mL was observed to produce a full inhibition.[20]

Diuretic activity

When administered orally to rats at a concentration of 10 mg/kg, aqueous root extract of C. papaya significantly increased urine production and had urinary electrolyte excretion patterns comparable to those of hydrochlorothiazide.[21]

Anti-malarial activity

the papaya rind extract in petroleum ether, with concentrations ranging from 0.05 to 1000 g/mL. The extract had strong anti-malarial properties.[22]

Antimicrobial activity

In order to test the antibacterial activity of several extracts of Carica papaya L. leaves, it was found that ethanol, methanol, ethyl acetate, acetone, chloroform, petroleum ether, hexane, and aqueous extract all shown action against bacteria and fungus . The acetone extract was shown to be more effective against the Candida albicans fungus while the chloroform extract was more effective against the Micrococcus luteus bacterium.

Using the agar diffusion method, an aqueous extract of C. papaya leaves and roots at various doses (25, 50, 100, and 200 mg/mL) shown antibacterial efficacy against a few human pathogenic bacteria.[23]

Wound Healing Activity

In an experimental investigation, the capacity of Carica papaya L. leaf powder to cure wounds was assessed. In this case, wound contraction, fibroblast cell count, and histology of granulation tissue were used as evaluation criteria. Propylene glycol was used as a control check. It was noted that the little wound contraction had occurred. However, significant wound healing and fibroblast cell count wound healing and fibroblast cell count, however, were seen in the group that received powdered Carica papaya L. leaves. As a concluding observation, this study offers scientific support for Carica papaya L. leaves having exceptional wound healing capacity [24]. Due to the leaves of the Carica papaya L. having the ability to increase platelets, several products containing them are currently being quickly promoted. Reviews generally show that different production processes employed in multiple commercially available formulations of C. papaya leaves may degrade the phytochemical, suppressing the positive benefits of this component. Therefore, the conventional technique of presenting should be used, but it also requires some further updates.[25]

Anti-cancer

The carotenoid family, which includes lycopene, is produced by a variety of plants and microbes. It is an open straight chain hydrogen molecule with a high unsaturation level, 11 conjugated double bonds, and 2 unconjugated double bonds. Lycopene is responsible for many fruits and vegetables' red colour. Lycopene may exist in both the cis and trans isomeric forms since it has double bonds in its structure. The majority of the lycopene found in food is in the all-trans isomeric form, but it may also be converted to the cis isomeric form by mono- or poly-isomerization in the presence of light, heat energy, and chemical processes. It may be preserved and is quite stable at high temperatures.[26,27]

Additional benefits of Papaya:

Fruit is a great source of vitamins and minerals, including provitamin A carotenoids, vitamin C, B, lycopine, and dietary fibre. A phytoalexin called danielone is present in papaya fruit. By adding papaya enzymes to our diet and demonstrating strong antifungal action against the harmful fungus Colletotrichum gloesporiodes, this chemical helped to enhance our digestive health. An increase in appetite, relief from nausea, treatment of acne, relief from menstrual discomfort, lowering of fever, usage as a sunscreen and smoothing agent, meat tenderizer, and prevention of dandruff are some other advantages of papaya. The papaya fruit may also be used as cosmetics, such as rubbing the white pulp on pimples and wrinkles to reduce their appearance, as an excellent bleaching agent, an essential component of bath soap, an astringent, in hand washes and detergent bars, and to help remove dead, worn-out skin cells and brighten our skin tone.[28]

Mechanism of Functions of Papain:

The cysteine-25 component of the triad in the active site attacks the carbonyl carbon in the peptide chain's backbone, liberating the amino terminal portion, and this action enables papain to perform its activity. The protein disintegrates as a result, causing the peptide chains to split apart. Deprotonation of Cys-25 by His-159 is the process by which it dissociates peptide bonds. To enable this deprotonation, asparagine-175 assists His-159's imidazole ring in its orientation. These three amino acids are near one another because of the folding structure even though they are widely apart inside the chain. The special properties of this enzyme are due to the interaction of these three amino acids in the active site. The carbonyl carbon of a peptide backbone is then attacked by Cys-25 through a nucleophilic reaction. Cys -25 and His -159, a pair of thiolate imidazolium ions, are hypothesised to be catalytically active in the active site of papain. Peptidyl or non-peptidyl N-nitrosoanilines can effectively block papain. When a stable S-NO bond forms in papain's active site (Snitroso- Cys25), papain becomes inactive.[29]

Conclusion:

Because of its efficiency, accessibility, and safety, carica papaya is a significant and promising natural medicinal plant that might be used in a variety of pharmaceutical and medical applications. One of the most adaptable plants, it has been utilised for both domestic and medical uses. Different extracts have been discovered to have a variety of pharmacological effects.The pharmacological characteristics of papaya are quite diverse. According to traditional beliefs, papaya is a potent remedy.

Reference:

1. Bhattachrjee SK. Carica papaya. In: Hand Book of Medicinal Plant, edition: 3rd Revised, editors: Shashi Jain, (Pointer Publisher, Jaipur). 2001; 1-71
2. Aravind G, Debjit B, Duraivel S, Harish G. Traditional and medicinal uses of Carica papaya. J Med Plants Stud 2013; 1(1): 7-15
3. Nugroho A, Heryani H, SueChoi J, Park H. Identification and quantification of flavonoids in Carica papaya leaf and peroxynitrite scavenging activity. Asian Pac J Trop Biomed. 2017; 7(3):208–213.

4. Mohammad AH, Sabtu Hitam. Pharmacological and toxicological activities of the extracts of papaya leaves used traditionally for the treatment of diarrhoea. Journal of King Saud University- Science.2020; 32:962–969
5. Zunjar V, Mammen D, Trivedi BM and Daniel M: Pharmacognostic, Physicochemical and Phytochemical studies on Carica papaya Linn. leaves: Pharmacognosy Journal 2011; 3(20): 5-8
6. Ayurvedic pharmacopoeia of India, Govt of India, I.
7. Parle M, Gurditta. Basketful benefits of Papaya, Int Res J Pharm 2011; 2(7):6-12.
8. Jean B. Carica papaya. In: Pharmacognosy, phytochemistry of medicinal plants. 2nd ed. France: Lavoisier; 1999, p. 221-223.
9. Nadkami AK. Indian materia medica. India: Bombay Popular Prakashan; 1998
10. Oloyede OI. Chemical profile of unripe pulp of Carica papaya. Pak J Nutr 2005; 4(6): 379-381
11. The Wealth of India – A dictionary Indian raw materials and industrial products: Raw material series, Ca-Ci, publications and information directorate, CSIR 1992; 3:276-293.
12. Marotta F, Weksler M, Naito Y, Yoshida C, Yoshioka M. Nutraceutical supplementation, effect of a fermented papaya preparation on redox status and DNA damage in
13. Marotta F, Pavasuthipaisit K, Yoshida C, Albergati F, Marandolo P. Relationship between aging and susceptibility of erythrocytes to oxidative damage, in view of nutraceutical interventions, Rejuven Res 2006; 9(2):227-230.
14. Dominguez de Maria P, Sinisterra JV, Tsai SW, Alcantara AR. Carica papaya lipase, an emerging and versatile biocatalyst, Biotechnol Adv 2006; 24(5):493-499
15. Suwendar PH and Ernasari GI: Analgetic activity of Papaya (Carica papaya L.) leaves extract; Procedia Chemistry 2014; 13: 147-149
16. Juarez-Rojop IE: Phytochemical screening and hypoglycaemic activity of Carica papaya L. leaf in streptozotocin- induced diabetic rats; Revista Brasileira de Farmacognosia 2014; 24(3): 341-347
17. Eno AE, Owo OI, Itam EH, Konya RS. Blood pressure depression by the fruit juice of Carica papaya (L.) in renal and DOCA-induced hypertension in the rat. Phytother Res 2000; 14(4): 235-239
18. Owoyele BV, Adebukola OM, Funmilayo AA, Soladoye A. Anti– inflammatory activities of ethanolic extract of Carica papaya leaves. Inflammo pharma. 2008; 16:168- 173.
19. Panse TB, Paranjpe AS. Carpasemine isolated from Carica papaya seeds. Proc Indian Acad Sci. 1943; 18:140
20. Giordani R, Siepaio M, Moulin-Traffort J, Regli P. Antifungal action of Carica papaya latex, isolation of fungal cell wall hydrolyzing enzymes. Mycoses 1991; 34(11-12): 469-477
21. Sripanidkulchai B, Wongpanich V, Laupattarakasem P, Suwansaksri J, Jirakulsomchok D. Diuretic effects of selected Thia indigenous medicinal plants in rats. J Ethnopharmacol 2001; 75(2-3): 185-190
22. Bhat GP, Surolia N. In vitro Antimalarial activity of extracts of the three plants used in the tradtitional medicine of India. Am J Trop Hyg 2001; 65(4): 304-308.
23. Anibijuwn II, Udeze AO. Antimicrobial activity of Carica papaya (pawpaw leaf) on some pathogenic organisms of clinical origin from South-Western Nigeria. Ethnobotanical Leaflets 2009; 13: 850-864
24. Ukoba O, Adfisan IE and Aguawa US: The wound healing effect of powdered Carica papaya L. leaves. IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS) 2016; 4(3): 1-10.
25. Hossain N, Kumar PV and Wei YS: Dengue and drawbacks of marketed Carica papaya L. leaves supplements; International Journal of Green Pharmacy 2016
26. Stahl W, Schwarz W, Sundquist AR, Sies H. Cis-Trans, Isomer of Lycopene and Beta-carotene in human serum and tissues. Archives of Biochemistry and Biophysics. 1992; 294:173-177
27. Rao AV, Mira MR, Rao LG. Lycopene. Advances in Food and Nutrition Research. 2006; 51:99-164
28. Huang GJ, Deng JS, Chiu CS, Liao JC, Hsieh WT, Sheu MJ, et al. Hispolon protects against acute liver damage in the rat by inhibiting lipid peroxidation, proinflammatory cytokine, and oxidative stress and

down regulating the expressions of iNOS, COX-2, and MMP-9. Evid Based Complement Alternat Med 2012; 2012: 480714. doi: 10.1155/2012/480714

29. Xian M, Chen X, Liu Z, Wang K, Wang PG. Inhibition of papain by s-nitrosothiols. Journal of Biological Chemistry. 2000; 275:20467-2047