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Ethanobotonical and biological activities of *Carica papaya Linn*: A review

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Abstract

Papaya is widely known as paw-paw belongs to the family *Caricaceae*. It is generally recognized for its rich nutritional values all over the world. All most all parts of the plant are very well recognized for their traditional medicinal uses. Over the last several decades, significant progress has been made in terms of the pharmacological activity and therapeutic usage of papaya, and now is considered to be a beneficial nutritional supplement. *Papaya* possesses outstanding healing properties andhas been used to treat various disorders.The various parts of thepapaya plant, namely seeds, leaves,berries, andlatex, have excellent medicinal properties. The fruit, stem, and leaf of the *C. papaya* produce a lot of latex. This Latex from unripe papaya fruit produces enzymes chymopapain and papain which are helpful as digestive enzymes. This article focuses on the Ethnobotanical and Ethnopharmacological details of the Plant.

Key words: *Papaya,* traditional medicinal uses, digestive enzymes.

Introduction

Medicinal plants have played a significant role in the cure of numerous diseases since long ago. Natural products are essentially a great source of potential active ingredients [1]. Many ancient medicine systems, such as Chinese and Ayurveda, are primarily backed by herbal products [2]. Numerous therapeutic molecules have been synthesized by plants but are hard to synthesis within the laboratories due to the complexity of constituents.In addition, natural medicinal compounds are thought to be less harmful than synthetic drugs due to their natural origin. At present, further research is required on the importance of medicinal plants and remedies based on them for their suitability, protection, and efficacy as food for energy efficiency. *Carica Papaya Linn*, guy. (*Caricaceae*), an important medicinal plant species, belongs to the genus Carica, also known as papaya.The plant has historically been used in the treatment of malaria and is a well-known nutraceutical. According to The Plant List, the genus Carica has gained twenty-three scientific species and two are not in the main group of angiosperms. The papaya tree is a native tropical, cylindrical, hollow, fast-growing herbaceous plant species, distributed widely in the wild [3]. Papaya has its origin in Central America and presently cangrow in tropical areas around the world, especially in Africa and Asia continent [4].The papaya plantis well known for several pharmacological activities such aswound healing, cardiotonic, emenagogue, analgesic, anti bacterial, digestive laxative, febrifuge, hypotensive, amebicide, stomachic, vermifuge, and cholagogue [5, 6].

Botanical Description

Plant

C. papaya is having only one stem, can go up to the height of 10 meters and cultivated species height may upto 5 to 6 m [7]. The plant may possess upto twenty-five - forty leaves and generally, leaves grow around the stem provide an umbrella-type shape[8, 9]. It is perennial (Fig. 1) and

leaves may grow upto 2 feet wide, which is palmately lobed and deeply incised. The entire margins and petioles of 1-3 feet in length. Stem colour ranges from light green to tan-brown having a diameter of 8 inches [10].

Fig 1. Carica Papaya plant

Flowers

Papaya plants are hermaphroditic or dioecious, producing only female, male or bisexual flowers (Fig. 2). Bisexual and female flowers are ivory white, waxy, and borne on short penducles in leaf axils, along the main stem. Flowers are solitary or small cymes of three individuals. Ovary position is superior. Since, bisexual plants produce the most desirable fruit and are self–pollinating, they are preferred over male or female plants. Female flowers of papaya were pearshaped [10].

Fig.2 Carica Papaya flowers

Fruit

The fruit is oval and large in shape and often named pepo-like berries since they mimic melon with a core seed groove. Fruits grow axillary on the main stem, normally alone, but often in clusters. The flesh at development is yellow-orange to salmon. Plants start to yield fruits in 6-12 months [10].

Fig 3: *Carica Papaya* fruit

Stem

The stem trunk ishollow, delicate, and tubular ranging from 30 cm in diameter at the base to around 5 cm in diameter at the crown. Papaya typically grows as a single-stemmed tree, but trees may become multi-stemmed when injured [11, 12, 13].

Leaves

The leaves arelarge and about 50 to 70 cm wide. The plant consists of large palmate leaves having 5-9 pinnated lobes with diverse widths from 40-60 cm, shows spiral arrangement and groups are together in the upper part of fully-grown trees [14]. The leaf possesses epidermis and palisade parenchyma that are made of only a single layer of the cell, but squishy mesophyll consists of four to six cells layer. Leaves are rich in reflective grains and druses (calcium oxalate crystals). The leaves of papaya arehaving stomata underneath (hypostomatic), with anisocytic stomata or no subsidiary cells [11, 14]. Microscopy of the leaf showed the presence of collenchyma, and parenchyma,epidermis, sclerenchyma, xylem, and phloem[15, 16] Fig. (4).

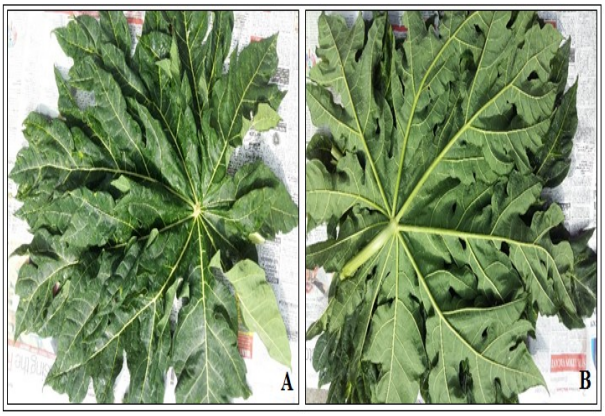

Fig. (4) Papaya leaves

Seeds

Generally, the papaya plant grew up from the seeds. The colour ofthe seeds is black and having fleshy endosperm, and a straight embryo [11]. The seeds are present inside the cavity of the fruit and coated with a mucilaginous substance [17, 18].

Fig.5. Papaya Seeds

Table I. Chemical constituentsof papaya plant [19,20,21].

Part	Constituents
Fruit	protein, minerals, phosphorus calcium, fiber, vitamin C, iron, riboflavin, carbohydrates, thiamine, fat amino acid, niacin,caroxene, folic acid, and citric acids, volatile compounds
Juice	N-butyric, lipids, n-octanoic acids and n-hexanoic, palmitic,myristic stearic, oleic acids,linoleic,and linolenic acids-vaccenic acid
Seed	Fatty acids, benzylglucosinolate, crude proteins papaya oil, benzylthiourea, benzylisothiocynate, glucotropacolin, β-sistosterol , crude fiber, hentriacontane,enzyme myrosin,carpaine, and caricin.
Root	myrosin andCarposide.
Leaves	dehydrocarpaine I and II andAlkaloids carpain, vitamin (C,E),cholineand carposide,
Bark	Xylitol,β-sitosterol,sucrose, fructose, glucose,and galactose,
Latex	proteolytic enzymes, chemopapain, and chymopapain (A,B,C) papain glutamine cyclotransferase, peptidase (A,B),andlysozymes.

Traditional ayurvedic Medicinal uses of *C. papaya* (literature) [8, 9].

Parts	Medicinal uses
Ripe fruits	chronic diarrhea, Carminative, ringworm,expectorant,diuretic dysentery, urinary tract wounds, sedative, bleeding piles, and tonic.
Unripe fruits	Diuretic, laxative,abortifacient, antibacterial activity
Seeds	Carminative, treatment of ringworm and psoriasis. anti-fertility agents in males counter-irritant,
Roots	Anti-fungal activity, piles., checking irregular bleeding from uterus, diuretic
Leaves	Fever, Asthma, abortion, beriberi, dressing wounds (fresh leaves), gonorrhea, antibacterial activity, vermifuge. jaundice, urinary complaints
Flowers	jaundice, febrifuge.
Stem bark	Anti-fungal, anti-haemolytic, and sore teeth.

Pharmacology of *C. papaya*

Antimicrobial activity [22]

The various solvent extracts from the roots and leaves were evaluated for their Antibacterial property using some pathogenic bacterias by the Agar diffusion method. The root extracts from organic solvents exhibit significant activity against tested pathogens in which methanolic extract shows superior activity. The gram-positive bacterias show higher sensitivity than the gram-negative to the root extracts where Pseudomonas aeruginosa shows high sensitivity. The leaves extracts exhibited better inhibition activity against tested pathogens compared to organic root extracts. For all extracts,the temperature is directly proportional and alkaline P^H is inversely proportional to the antibacterial activity.

Antifungal activity [23]

The latex of *C. papaya* shows synergistic antifungal action with fluconazole in inhibiting*Candida albicans* growth. This effect may be due to the degradation of the cell wall. The proteins present in the latex may be responsible for the exhibited antifungal action.

Hypoglycemic activity [24]

The ethanolic extract of leaves of papaya shows a significant effect on hyperglycemia and reduces the blood glucose level at the lower dose (5 mg/kg) but it does not show any significant effect at higher doses(10mg/kg). When the extract is given in combination with the glimepiride and metformin it delayed the onset and increased the hypoglycemic effect respectively.

Anti-sickling activity [25]

The methanolic leaf extracts of *Carica Papaya* L. exhibit in vitro antisickling and membrane-stabilizing activities. The study involves the use of negative (normal saline) and positive (p-hydroxybenzoic acid 5 µg/ml) controls for the antisickling experiments and osmotic fragility test on red blood cells obtained from non-crisis state sickle cell

patients. Fragiliograms indicated that the plant extract reduced hemolysis and protected erythrocyte membrane integrity under osmotic stress conditions. These results indicate the feasibility of papaya as an attractive potential candidate for Sickle cell disease therapy.

Diuretic activity [26]

The aqueous root extracts of Papaya were evaluated for their diuretic activity at the dose of 10mg/kg which is an equivalent dose of standard diuretic hydrochlorothiazide. The results show a 74% reduction in urine output when compared to the control group.

Hepatoprotective activity [27]

The ethanolic and aqueous extracts obtained from dried papaya fruits were tested for hepatoprotective activity using the CCl4 induced liver toxicity model. Both the extracts demonstrated the significant liver protective action by beneficially altering (lowering) the liver biochemical parameters like Alkaline phosphate, Serum bilirubin, SGPT, and SGOT.

Antioxidant activity [28]

The methanolic extract of unripe fruits of papaya has been reported to shows antioxidant activity. The antioxidant activity of the extract was evaluated in mice treated with an oral dose of 100 mg/kg. The researchers conclude that there is a significant increase in the activities ofglucose-6-phosphate dehydrogenase, GPx,glutathione reductase, GST, due to the ethyl acetate fraction. A significant decrease in GPx was observed in the kidney following administration of ethyl acetate fraction. The quercetin and β-sitosterol are responsible for the antioxidant potential of the extract.

Anti-malarial activity [29]

The Aqueous and organic solvent extracts obtained from *Carica Papaya* possesses Anti-malarial activity. The activity is evaluated on *Plasmodium falciparum*(malaria strain) in vitro. The Visual evaluation of the antimalarial activity of the plant extracts on thin blood smears was followed by quantification of the activity by the use of [35S]-methionine incorporation into parasite proteins to determine the value that inhibits 50% (IC50). The result shows that the extract significantly inhibits the effect of *P. falciparum*.

Anti-inflammatory activity [30]

The anti-inflammatory activity of an ethanolic extract of *Carica Papaya* leaves was investigated in rats using cotton pellet granuloma,carrageenan-induced paw edema, and formaldehyde induced arthritis models. The results show that the extracts significantly reduced, the amount of granuloma formedand paw edema. In the formaldehyde arthritis model, the extracts significantly reduced persistent edema. The anti-inflammatory activity of *C. papaya* leaves was established.

Conclusion

Papaya, popularly known as a food article, is a great collection of compounds with a very diverse composition. A large number of studies on its pharmacological activity and the promising application of these compounds have been carried out. A comprehensive analysis of its pharmacodynamic properties, pharmacokinetic properties, proper standardization as well as clinical trials is required to maximize its therapeutic benefit and efficacy.Clinical trials were necessary to prove research results and build trust with papain enzyme to pave the way for enzyme therapy for palliative treatment of celiac patients. In summary, extracts from its various sections tend to be used in herbal medicine for the treatment of acute and chronic health diseases and viral pathologies.Paying special attention to its therapeutic, nutraceutical, and functional assets; its nutritional therapy for the treatment and prevention of various diseases and disorders. Seeds of papaya fruits are usually discarded, however, to make the use of papaya more effective, it is worth examining the use of its seeds as a source of oil.

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