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Herbal Plant And Phytochemistry Of Carica Papaya Linn

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Abstract:

Papaya (Carica papaya Linn.) is well known for its nutritional as well as medicinal value since long time. The medicinal properties of fruit and other parts of papaya are well known in the different system of traditional medicine including Ayurveda. Its various parts has been reported for various disease conditions viz. fever, swellings, jaundice, gonorrhea, bilious fever, itches, eczema, and rheumatism cold, headache, whooping cough, asthma, chicken pox, and bronchitis in various traditional literature. The various remarkable researches on biological activities and medicinal application have been reported during past four decades and established it as an important nutraceuticals agent. Carica papaya Linn. leaf has been scientifically studied for various therapeutic activities like antibacterial, antioxidant, antipyretic, insecticidal, antimicrobial, antimolluscal etc. In view of this leaves have been explored through several advanced techniques like phyto-extraction of heavy metals, phytoremediation of particulate pollution and many others. Various studies on phytoconstituents and chemical composition of leaves have been reported in last few decades. The present review aims an exploration of pharmacognostical, phytochemical and pharmacological studies of Carica papaya Linn. leaf till now.

Keywords: Carica papaya, Papaya, antioxidant, free radical scavenging, anticancer.

Biology of papaya

The genus *Carica* is from the Latin for a kind of fig which the leaves and fruits of papaya resemble and the specific epithet *papaya* probably comes from the common name for the fruit.[2] It is a dicotyledonous, polygamous (having male, female or hermaphrodite flowers on the same plant), diploid species with a small genome of 372 Mbp/1C[3] and nine pairs of chromosomes

Morphology

The papaya is a polygamous species. The plants may be classified into three primary sex types such as
(i) Male (staminate)
(ii) Hermaphroditic (bisexual)
(iii) Female (pistillate).
In addition, some plants can produce, at the same time, more than one kind of flower. Also, some produce flowers that are not of these basic forms, but exhibit different degrees of maleness and femaleness. This tendency to change in sexual expression seems to be triggered by climatic factors, such as drought and variable temperaturesThe tendency to produce male flowers seems to increase at high temperatures. Since male trees are unfruitful and fruit from bisexual plants is preferred in some markets, it is very important to select seed which will produce fruitful trees of the desired type. One can predict fairly accurately the progeny by knowing the source of pollen and the kind of flower. The fruit came from Pollination studies have shown that (i) Pistillate flowers pollinated by staminate flowers give equal numbers of male and female progeny, (ii) Pistillate flowers

pollinated by pollen from bisexual flowers give an equal number of female and bisexual progeny, (iii) Bisexual flowers either self or crossed-pollinated with other bisexuals give a ratio of one female to two bisexual

Leaves

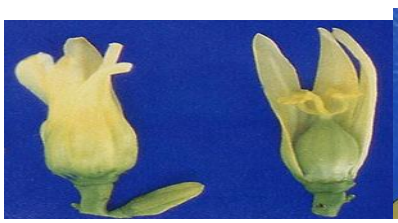
The leaves are spirally arranged in a terminal cluster, simple, on petioles 30-70 cm long. The margins of the lobes are very variable, and range from entire to undulate to deeply lobed. The leaves are rounded in outline, 60-90 cm in diameter, alternately arranged, bundled at the apex between stem and 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

Flowers

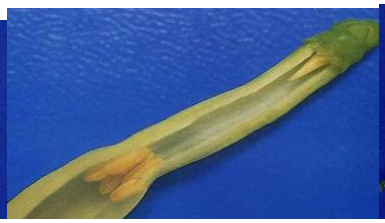
Flowers are the reproductive structure found in flowering plants. The biological function of a flower is to facilitate reproduction. Six types of flowers are known in papaya plant.

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. Similar to the above when closed



Typical Female Flowers



Hermaphrodite sterile flower

Hermaphrodite elongated flower

Typical male flower

This type of flower has a long and thin corolla contain anthers in two series of five; one series longer than the other. They have a rudimentary pistil no stigma and are non-functional. In nature, these plants are dioecious: male and female flowers are found on separate plants. Male flowers are morphologically distinct from female flowers. Male inflorescences are borne in many-flowered panicles of cymes on horizontal or pendent stalks to 1 m long. The flowers are yellowish, 2-4 cm long. The petals are fused into a long tube, have 10 fertile stamens, and a rudimentary, non-functional ovary. Female inflorescences are much shorter –only 3-4 cm long– and have fewer flowers. Female flowers are larger, usually white or cream in color, with five free petals. There are no stamens, but a large ovary with 5 fan-shaped stigmas.

Fruits

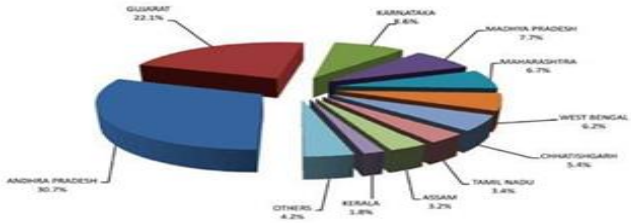
An ovoid-oblong berry pyriform or almost cylindrical, large, fleshy, juicy, grooved along the upper longer side, green yellow to yellow or yellow-orange color when ripen, single cell of orange or reddish internal color with many parietal seeds and a length of 10-25 cm or longer and 7-15 cm or more of 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.

Seeds

The seeds account for about 16 % of the fresh fruit weight and each seed is made up of sarcotesta and endosperm. papaya seed extracts had been shown to have several medicinal as well as nutritional properties Several species of Caricaceae have been used as medication against a variety of diseases It had been argued by scientists that all parts of a pawpaw plant, including the seeds, roots, rinds, and fruits have positive effects on general health preventing diseases.

Geogrphical distrubuation

Papaya (*Carica papaya* Linn.) is one of the most cultivated plants in tropical countries and the most popular and economically important species among the caricaceae family [14]. It is a species of the flowering plants that is native to India, Malaysia, Indonesia, Philippines and Sri Lanka including Oman. Several Asian countries have cultivated the papaya on commercial basis. In some tropical countries, papaya is also cultivated as garden plant.Mostly in india is culivated state is andhar pradesh second cultivated state in india is gujarat and the lowest state of india is karnataka



Indian state that cultivated papay

Botanical description

Carica branched due to injury, containing white latex in all parts. Stem cylindrical, 10-30 cm in diameter, hollow with papaya is an evergreen, tree-like herb, 2-10 m tall, usually unbranched, although sometimes prominent leaf scars and spongy-fibrous tissue. Has an extensive rooting system. Leaves spirally arranged, clustered near apex of trunk; petiole up to 1 m long, hollow, greenish or purplish-green; lamina orbicular, 25-75 cm in diameter, palmate, deeply 7-lobed, glabrous, prominently veined; lobes deeply and broadly toothed. 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 pistillode; hermaphrodite flowers larger than males, 5-carpellate ovary; occurrence depends on the season or age of the tree.

Domain	**Flowering plant**
Kingdom	Plantae
Sub Kingdom	Tracheobionta
Class	Magnoliopsida
Subclass	Dilleniidae
Super division	Spermatophyta
Phyllum	Steptophyta
Order	Brassicales
Family	Caricaceae
Genus	Carica
Botanical name	*Carica papaya* Linn.

Phytoconstituents of plant

Papaya leaves contain tannin, saponin, alkaloids, flavonoids, and glycosides; while shoots contain various minerals like Ca, Fe, Mg, K, Zn, Mn etc. Enzymes are present in the unripe fruit such as papain and chymopapain. Fruit also contains carotenoids β carotene and crytoxanthin. The chemical composition of the root showed the presence of benzyl isothiocyanate, glucosinolatescarposide. Papaya oil is found in seeds and also contains flavonoids, kaemferol, myricetin,and fruit contains Linalool, 4-terpinol, monoterpenoids. Papaya leaves contain tannin, saponin, alkaloid, flavonoid, and glycoside; while shoots contain various minerals like Ca, Fe, Mg, K, Zn, Mn etc. Enzymes are present in the unripe fruit such

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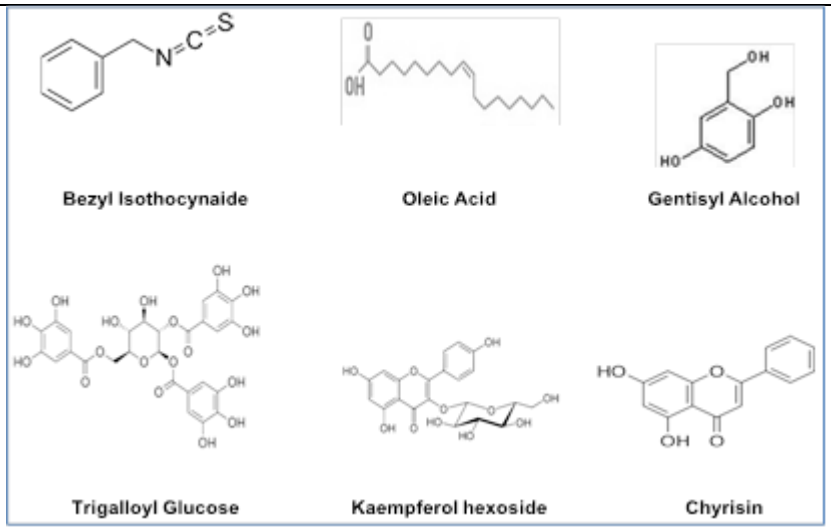
Part	Phytoconstituents
Fruits	Protein, fat, carbohydrates, minerals, vitamins, volatile compound, alkaloids, Glycosides.
Juice	N-butyric, n-hexanoic and n-octanoic acid, lipid, myristic, palmitic, stearic linoleic, linolenic acid and oleic acid
Seed	Fatty acid, crude protein, crude fibres, papaiya oil, carpaine, benzyl isothiocyanate, benzylthiourea, β-sitosterol, caricin and enzyme myrosin.
Root	Caproside and enzyme myrosine
Leaves	Alkaloids carpain, pseudocarpain and dehydrocarpain 1,2, choline, caproside,vitamin C and E.
Bark	β-sitosterol, glucose, fructose, galactose and xylitol.
Latex	Proteolytic enzyme papain, chemopapain, glutamine cyclotransferase,Chymopapain A,B,C, peptidase A and B, lysosome.



Pharmacological activities

C. papaya is tremendously efficient in different types of ailment cure due to availability of wide varieties of phytoconstituents in almost all parts of plant. Antioxidant activity Free radical causes many chronic health problems. Antioxidants can help us by preventing the formation of free radicals. Research is going on to find new sources of antioxidants of natural origin which are safe and economically viable.

1.1. Antibacterial activity

Papaya leaf extract showed antimicrobial activity against Pseudomonas aeruginosa. The leaf extract showed superior effects against all Gram-positive bacteria as compared to Gram-negative bacteria also reported the antibacterial activity of papaya leaf aqueous and methanolic extracts against Escherichia coli, Staphylococcus aureus, and Candida albicans. The antibacterial activity of the methanolic extract was significant compared to aqueous extract.

1.1. Anti-diarrheal responses

Chloroform extract (25 mg/mL) of raw *C. papaya* and acetone extract (25–0.39 mg/mL) of ripe *C. papaya* had essential antidiarrheal activity against the gut pathogens. The antidiarrheal activity of ripe *C. papaya* extract was extensively seen against *Plesiomonas shigelloides* with ranges from 50 mg/mL 0.39 mg/mL. DAS-77 (herbal mixture prepared dried root of *C. papaya* with young bark of *Mangifera indica*) effective in the treatment of diarrhoea. DAS-77 was tested on mice and the result showed that DAS-77 possesses antidiarrhoeal activity. In another study antidiarrheal activity of leaf aqueous extract of *C. papaya* was tested in rats' model and found that extract has good antidiarrheal activity and the extract was observed to be safe at 200 mg/kg in the case of rats model [53,54,55].

1.2. Wound-healing activity

Various skin disorders as well as wounds can be cured by papaya. The ethanolic papaya seed extract was tested in Sprague-Dawley rats, for its wound-healing activity. Results showed that the seed extract assists wound healing in rats.

C. papaya loaded PVA/Gelatin nano fibrous was prepared from leaves of *C. papaya* by electrospinning process. The fabricated nano fibers were hydrophilic and showed wound healing activity. It also exhibited strong antibacterial activity against both *S. aureus* (Gram-positive) and E. coli (Gram-negative). In a research investigation, the effect of aqueous extract of the root of *C. papaya* on wound healing in albino rats was checked and root extract showed wound healing activity.

Anticancer activity

In vitro investigation of *C. papaya* suggested that it has anti-cancer properties. The plant contains an enzyme, namely papain which is a constituent of papaya and very helpful in cancer treatment. Fibrin breaks down by papain which coats the tumor cells into amino acid. The pigment lycopene is found inside the papain which is highly reactive towards free radical and oxygen. Papaya also contains isothyocynate which protects the breast, prostate, pancreas, lung, leukemia, and colon cancer

Anti-dengue activity

Chandrasekaran et al. (2018) have reported that the larvicidal efficiency of chloroform, methanol and aqueous extracts of *C. papaya* latex against larvae of *C. quinquefasciatus* and *A. aegypti* which were effective in a was dose-dependent manner. Order of toxicity effect is as chloroform extract > methanol extract > aqueous extract. One report on the clinical trial of *C. papaya* suggested that improve in platelet count of dengue patients and faster improvement (Singh and Rawat, 2017). *C. papaya* leaf juice prepared by the traditional method; and two tablespoons of juice were given to 5 dengue patients three times/day after 6 h. It was found that leaf juice causes a significant intensification in the platelet counts within 24 h of treatmen

Conclusion

C. papaya is an herbaceous tree-like plant that grows in variousparts of the world. Different parts of the plants are rich in terms ofenzyme, minerals, vitamins, alkaloids, phenolics, and flavonoidswhich are responsible for its traditional and modern use. Proven phar-macological activities (such as anti-inflammatory activity antioxidantactivity, antimicrobial activity, and immunomodulatory activity) ofpapaya make it suitable to treat several diseases and some commercialdrugs are also available for instance to cure dengue fever.

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