

## FORMULATION AND EVALUATION OF CARICA PAPAYA CREAM

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## ABSTRACT

Papaya is the common name for the *Carica papaya*, which is a member of the Caricaceae family. Ayurvedic medicines have included *Carica papaya* for a very long period. It has a variety of effects, including those that are anti-inflammatory, antioxidant, diuretic, antibacterial, abortifacient, vermifuge, hypoglycemic, antihelminthic, and immunomodulatory. Scientific data points to their adaptable biological role, which supports their conventional use in treating many ailments. According to phytochemical investigations, the *Carica papaya* plant primarily includes the alkaloids camphor and pseudocarpaine, as well as sugars, tannins, flavonoids, carbinol, and gamma terpine. Effective pharmacological properties of the plant include anti-inflammatory, antioxidant, diuretic, antibacterial, abortifacient, hypoglycemia, antifungal, antihelminthic and immunomodulatory, hepatoprotective and anticonvulsant action.

**KEYWORDS:** Antifungal, antibacterial, Abortifacient.

## INTRODUCTION

Since ancient times, medications made from plant-based ingredients have been used to treat and prevent ailments. Because they have fewer side effects and don't affect physiological and biochemical pathways, natural products are superior to manufactured medications. The papaya (*C. papaya* L.), which is featured in this image, is a member of the Caricaceae family and is frequently used to treat and manage ailments all over the world, particularly in tropical and subtropical regions. In folk medicine, the *C. papaya* plant's various parts, including the leaves, bark, roots, latex, fruit, flowers, and seeds, are used to treat a variety of illnesses. Papaya's antioxidant activity plays a part in reducing the production of free radicals and ultimately halting pathogenesis. *Carica papaya* Linn. is such a marvelous plant, possesses various medicinal properties making it unique among other 22 species of the family Caricaceae. It is thought to have started in the Americas' tropics, possibly in neighbouring Central America and southern Mexico. It is a polygamous species and can only be identified during the blossoming season. It displays sex reversal to variable degrees.<sup>[1]</sup> This plant's varied parts are used to treat a variety of diseases. The papaya is now grown in most tropical nations, having formerly only been native to southern Mexico (especially Chiapas and Veracruz), Central America, and northern South America. When grown, it expands quickly and bears fruit in three years. However, due to its extreme sensitivity to frost, only tropical regions can support its production. Low temperatures, below 29 degrees Fahrenheit, can be lethal.

Growth in Florida is typically restricted to the state's southern regions. Additionally, because standing water would kill the plant within 24 hours, it prefers sandy, well-drained soil. The plants might be hermaphrodite, female, or male. The male trees are rare, although they occasionally appear when homeowners gather their seeds. The commercial standard for generating pear-shaped fruit is hermaphrodite trees.<sup>[2]</sup> These plants produce pollen from within. Except when the apical meristem is destroyed or injured, papaya exhibits great apical dominance and rarely branches. Although some variations in the shape and arrangement of leaves have been documented with Malaysian cultivars, typically big and palmately lobed leaves are grouped spirally and clustered at the crown. Papaya cultivars are often distinguished by the number of leaf main veins, the number of lobes at the leaf margins, the form of the leaf, the kind of stomata, the presence of waxy substances on the surface of the leaf, and the colour of the leaf petiole. Both female and hermaphrodite papaya trees can produce fruit, however, the fruit's form varies. Round fruits come from female trees, but elongated fruits come from hermaphrodite trees. Berries make up the fruit, which can range in size from 5 cm in diameter and 50 g in weight to 50 cm or longer and 10 kg or more in weight. When ripe, the smooth, thin green skin of papaya fruits turns yellow or red.<sup>[3]</sup> The flesh is succulent and ranges from yellow to orange to crimson in colour and texture.

### Nutritional Value of *Carica Papaya* Linn

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 off damage from free radicals. Unripe green papaya is used as a vegetable; it contains all other nutrients but no carotene. 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 food in acidic, alkaline, and neutral environments. Patients with celiac disease who are unable to digest the gliadin protein in wheat can tolerate it if it is treated with crude papain since papaya can tenderise meat. By preparing meat with raw papaya to

make it tender and palatable, this information is put to use.<sup>[4]</sup> A promising antioxidant nutraceutical is fermented papaya fruit. At a dose of 9 g/day taken orally, it strengthens the antioxidant defense in older people even in the absence of a clear antioxidant deficiency status. A "naturally immobilized" biocatalyst is papaya lipase, a hydrolase enzyme that is strongly bound to the water-insoluble portion of crude papain.<sup>[5]</sup> Using the erythrocyte usage 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 edible black seeds have a pungent, peppery flavour. They are occasionally used as a black pepper replacement. Young papaya leaves are sometimes boiled and eaten like spinach in several regions of Asia.<sup>[6]</sup>

Nutritive value of 100 gm of *Carica papaya* fruit are described in Table

**Table 1: Nutritional value of 100gm of carica papaya linn Fruit.**

Constituent	Ripe papaya	Green papaya
Protein	0.6g	0.7g
Minerals	0.5g	0.5g
Fibre	0.8g	0.9g
Fat	0.1g	0.2g
Carotene	888	0
Carbohydrate	7.2g	5.7g
Energy	32kcal	27kcal
Total	2740um	0

### MORPHOLOGY

Because papayas are polygamous, it can be challenging to tell whether a plant is male, female, or hermaphrodite. It is a palm-like tree that can grow to be 3–10 meters tall. The terminal bunch of leaves has long petioles and 5-7 lobes. The thick trunk is characterized by scars where leaves have fallen off.

Flowers are fragrant, trimorphous, and typically unisexual-dioecious. Male flowers are large, solitary, or in few-flowered racemes with short, thick rachis. Female flowers are larger, solitary, or in few-flowered racemes with long, thick rachis. Fruit is a huge berry that varies widely in size, is globose to elongated, has a sizable central hollow, and has seeds that are tuberculous and black that are encased in transparent arils. Fruit-bearing trees are less than 18 months old. Trees that yield fruit are under 18 months old. Unripe fruit and leaves contain milky fluid that contains the protein ferment papain.

A big plant resembling a tree, the papaya has a single stem that has spirally arranged leaves that are restricted to the top of the trunk. Where leaves and fruit were produced, there are noticeable scars on the lower trunk. The 50–70 centimeter (20–28 inch) diameter leaves are substantial. Unless lopped, the tree is often unbranched. Although considerably smaller and wax-like, the blossoms resemble the plumeria's flowers in shape. They emerge from the leaf axils and develop into a big fruit

that measures 15–45 centimeters (5.9–18 in) in length and 10–30 centimeters (3.9–12 in) in diameter. The fruit is considered to be ripe when its texture is soft (similar to or somewhat softer than an avocado) and its skin has an amber-to-orange tint. The melon-like fruit hangs on short, thick peduncles at the leaf axil and varies in size and shape. Most of its flowers are dioecious and, up until the development of sexual organs, resemble one another. The species is polygamous and can be divided into the staminate (male), hermaphrodite (bisexual), and pistillate (female) sex types. Some plants can also produce multiple varieties of blooms.

Scientists "Baker" and "Bawa" proposed that "pollination is conducted via mimicry of the pistillate blooms to the staminate nectar-producing flowers" even though the plant's pollination mechanism is not well understood. Another hypothesis holds that the oxalate bundles in papaya anthers contribute to the enrichment of the nectar and aid in pollination.<sup>[7]</sup>

Whatever the case, we do know that the fruit, which is widely cultivated for its delicious taste throughout tropical America, is of considerable economic significance. The fruit, which turns orange-yellow when mature and is a common breakfast ingredient, is also used in some Latin American countries as a beverage and in jams, jellies, and preserves. Additionally, the plant's leaves and root are utilised in a variety of recipes. The leaves are a great substitute for soap and may effectively

clean stains. The bark can also be used to make rope. In Java, even the blossoms are consumed.

### Taxonomical Classification

Varnacular Names	
Hindi	Papita
English	Papaya
Eclectics	Papaw
Brazil	Mamao
Caribbean	Ababaí
Cuba	Fruta de bomba

Botanical Classification	
Domain	Flowering plant
Kingdom	Plantae
Sub Kingdom	Tracheobionta
Class	Magnoliopsida
Subclass	Dilleniidae
Superdivision	Spermatophyta
Phylum	Streptophyta
Order	Brassicales
Family	Caricaceae
Genus	Carica
Botanical Name	Carica papaya Lin

### Botanical Description

**PLANT:** A 20–30 foot tall, single-stemmed herbaceous perennial tree, papayas grow in abundance (Fig. 1). Large (up to 212 feet broad), palmately lobed or deeply incised, with whole edges, and petioles of 1-3 feet in length, the leaves are also long. The stems have a diameter of 8 inches, are hollow, and range in colour from pale green to tan brown.<sup>[9]</sup>



Fig. 1: Papaya tree.

### FRUIT

The fruits are large and oval in shape, and because they have a central seed chamber like a melon, they are frequently referred to as pepo-like berries (Fig. 2). On the main stem, fruits are produced in an axillary position, generally single but occasionally in tiny clusters. Fruits are green when unripe, turning yellow or red-orange

when they are ripe, weighing between 0.5 and 20 lbs. At maturity, the flesh is yellow-orange to salmon in colour (pinkishorange). The huge centre seed chamber is surrounded by the edible section. Depending on the cultivator and climate, individual fruits grow in 5 to 9 months.



Fig. 2: Papaya.

### FLOWER

Only male, female, or hermaphrodite (hermaphrodite) flowers are produced by dioecious or hermaphrodite papaya plants. The term "trioecious" refers to the fact that different papaya trees can produce either female, male, or bisexual blooms. In the leaf axils along the main stem, female and bisexual blooms are waxy, ivory white, and carried on short peduncles. Flowers come in tiny cymes of three or in single form. The ovary location is the best. Bisexual flowers are tubular before they open, while female flowers are pear-shaped. Bisexual plants are chosen over female or male plants because they self-pollinate and yield the most palatable fruit. Smaller blossoms on long stalks are a male papaya's identifying feature. Unopened female papaya flowers are pear-shaped, while bisexual flowers are cylindrical.



FIG. 3:

Table 2: Indian synonyms of *Carica papaya* linn.

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

**Table 3: International synonym of carica papaya linn.**

Country	Names
Holland	Tree melon
France	Papaya
India	Papita
Australia	Paw paw
Brazil	Mamao
UK	Papaya, paw paw

**Pollination of Carica Papaya Linn**

There are three ways to transfer pollen

1. Self-pollination,
2. Pollen from the same plant but a different bloom, and cross-pollination.
3. Different plant pollen

While female plants must be cross-pollinated by either molar or bisexual plants, bisexual flowered plants can pollinate themselves.

**Geographical Spread**

The papaya is thought to be a native of Tropical America, maybe in Southern Mexico and nearby Central America, while the precise region of origin is uncertain. Aside from the common but lesser scale production in South Africa and Latin America, successful commercial production today is concentrated mostly in Hawaii, Tropical Africa, the Philippines, India, Ceylon, Malaysia, and Australia. India's states of Maharashtra, Bengal, Bihar, Haryana, Punjab, Delhi, Andhra Pradesh, and Uttar Pradesh are where papaya is grown.<sup>[9]</sup>

**Chemical Constituents****Fruits**

Protein, fat, fibre, carbs, amino acids, citric and malic acids (green fruits), volatile substances like linalool, benzyl isothiocyanate, cis and trans 2, 6-dimethyl-3,6 epoxy-7 octen-2-ol, calcium, phosphorus, iron, vitamin C, riboflavin, carotene, and thiamine, Alkaloid types include four isomeric malonated benzyl-D-glucoside, benzyl-D-glucoside, 2-phenylethyl-D-glucoside, 4-hydroxy-phenyl-2 ethyl-D-glucoside, and carpine.

Myristic, palmitic, stearic, linoleic, linolenic, cis-vaccenic, and oleic acids; n-butyric, n-hexanoic, and n-octanoic acids, lipids;

**Seed**

In addition to fatty acids, crude protein, crude fibre, papaya oil, sinigrin, Carpaine, benzylisothiocyanate, benzyl glucosinolate, glucotropacolin, benzylthiourea, hentriacontane, -sitosterol, caricin, and an enzyme called myrosin, there are also alkaloids, flavonoids, saponins, tannin.

**The benefits of c. Papaya and its components for illness prevention and treatment**

Due to a rich amount of vitamins, carbohydrates, and important minerals in various portions of the plants, papaya has medical significance in the management of

health. According to published material, parts like seeds, fruits, and leaves have therapeutic significance in the treatment of diseases going back thousands of years. They also play a significant role in traditional remedies. On the basis of earlier *In vivo* and *in vitro* discoveries, the significance of papaya in the treatment of diseases is discussed below.

**Antioxidant activity:-** Natural or plant-based products are a strong source of antioxidants and play a crucial role in the treatment and prevention of diseases. An important study's findings demonstrate that *C. papaya* seed water extract has potent antioxidant activity in human skin Detroit 550 fibroblasts subjected to H<sub>2</sub>O<sub>2</sub> oxidative stress. These findings also confirm that the extract is not toxic, reduces cell death, maintains Ca<sup>2+</sup> homeostasis, and combats mitochondrial dysfunction.<sup>[12]</sup> Another study was conducted to assess the antioxidant and cytotoxic potential of extracts of fruits and seeds, and study outcomes demonstrated that both ethyl acetate fractions from the fruits and seeds of *With* IC 50 values of 30.61 g/ml and 25.97 g/ml, papaya are very potent antioxidants. They are also very cytotoxic, with LC50 values of 163.96 g/ml and 142.27 g/ml.<sup>[13]</sup> The effects of *C. papaya* leaf aqueous extract on alcohol-induced acute gastrointestinal injury were examined, and the study's findings showed that the gastric ulcer index was considerably lower in rats pretreated with CPL extract than in rats treated with alcohol. Additionally, findings showed that CPL extract demonstrated some protection through an increase in erythrocyte glutathione peroxidase activity and a decrease in plasma lipid peroxidation level.<sup>[14]</sup>

**Anti-inflammatory activity:-** Numerous plants or isolated plant-derived substances exhibit anti-inflammatory properties through modulating a variety of functions. Nonsteroidal anti-inflammatory drugs (NSAIDs), which are commonly used medications, cause stomach and intestinal issues. A significant investigation revealed the anti-inflammatory properties of *Inhibition* levels in *C. papaya* seeds ranged from 57.1% to 64.2%, which is lower than the 85.7% of aspirin, a common anti-inflammatory medication.<sup>[15]</sup>

**Analgesic:** Many organic or plant-based products exhibit an anti-angiogenic action without any negative side effects. *C. papaya* also demonstrates its significant role as an analgesic in this view. Using a mouse model of acetic acid-induced pain, a study was conducted to examine the analgesic activity of *C. papaya* leaf extracts. The findings revealed that, in comparison to the control group, all extracts, including n-hexane, ethyl acetate, and ethanol, demonstrated considerable analgesic activity.<sup>[16]</sup>

Numerous plants and the elements they contain have been demonstrated to have a substantial impact on the healing of wounds. In a study, streptozotocin-induced diabetic rats were utilised to evaluate the aqueous extract of the *C. papaya* fruit for its wound healing activity using

excision and dead space wound models. The findings showed that the extract-treated animals showed a 77% reduction in the wound area as compared to controls, which were 59%. A second study was conducted to assess the ability of roots' aqueous extract to treat wounds, and the findings showed that latex-treated animals had wounds that were 89.40% smaller than controls' wounds, which were 80.38% larger, and that extract-treated animals also had epithelialization occur more quickly than controls. Another investigation verified the papaya leaf aqueous extract's beneficial effects on rats' ability to heal wounds.<sup>[17]</sup>

#### Anti-microbial activity

Antibiotic resistance is a side consequence of the current antibiotic-based health management. In this sense, the use of medicinal plants to limit bacterial development is demonstrated as being effective. The antibacterial activity of root extracts against some pathogenic bacteria was studied using water and organic solvents. The results showed that aqueous extracts did not show significant activity, whereas organic extracts did, with methanol extracts demonstrating the highest activity against the test bacteria. The maximum activity (14 mm zone of inhibition) was shown against *Salmonella typhi*, and extracts also showed higher activities against all gram-negative bacteria than the gram-positive bacteria tested. Another study was conducted to assess the antibacterial activity of aqueous, chloroform extracts of leaves and aqueous, methanolic extracts of seeds. The results showed that aqueous and methanolic extracts of seeds were effective to inhibit the bacterial pathogens, while chloroform extracts of leaves did not demonstrate any inhibition against the bacteria despite the strength of the aqueous leaf extract's ability to do so. Using isolates from wound cultures, the antibacterial activity of *C. papaya* fruit extracts was assessed. The results showed that extracts established antibacterial activity, and this activity was more pronounced with alcohol extracts than with water extracts. Additionally, *Enterococcus faecalis* demonstrated the least sensitivity, while *Staphylococcus aureus* was the most susceptible with a minimum inhibitory concentration (MIC) of 1:64. *Enterococcus faecalis* demonstrated the least sensitivity. Findings showed that the extracts of *C. papaya* in petroleum ether had a high antibacterial activity, with a Minimum Inhibitory Concentration (MIC) of 2 mg/ml as opposed to 4 mg/ml and 6 mg/ml for common medications like perflacine and cefuroxime. Additionally, whereas water extract was effective against *Escherichia coli* and *S. aureus*, extracts in 1% HCl and ethanol had antibacterial action against gram positive and gram negative organisms.<sup>[18]</sup> A significant investigation into the antibacterial effects of ripe and unripe *C. papaya* on a number of microorganisms was conducted, and fruit seed extracts inhibited *B. cereus* > *E. coli* > *S. faecalis* > *S. aureus* > *P. vulgaris* > *S. flexneri*.

**Gastroprotective effect:** One of the main causes of stomach ulcers and their complications is a variety of

substances, including food ingredients, microorganisms, and medications. Plant-based products have an anti-ulcer effect, although the precise mechanism is not fully understood. The results of the evaluation of the anti-ulcerogenic properties of *C. papaya* extract on aspirin-induced ulcer in rats suggested that *C. papaya* may exert its gastro protective function by free radical scavenging action. An experiment was carried out to determine the gastroprotective effects of aqueous *Carica papaya* seed extract on ethanol-induced gastric ulcer in male rats. The results revealed that the extract protected the gastric mucosa against the ethanol effect and significantly reduced the volume of gastric juice and gastric acidity when compared to the control.

#### Hepatoprotective effect

A study was conducted to compare the hepatoprotective effects of vitamin E and *C. papaya* against carbon tetrachloride (CCl<sub>4</sub>) induced hepatotoxicity. The results showed that both vitamins E and *C. papaya* showed significant hepatoprotection against CCl<sub>4</sub> induced hepatotoxicity, but that *C. papaya* showed more significant changes in ALP level. The purpose of the experiment was to determine whether *C. papaya* leaves had any hepatoprotective effects against ethanol and anti-tubercular drug-induced liver damage. The findings showed that both models had significantly lower levels of all serum markers, indicating that both treatments had hepatoprotective effects. The pretreatment of mice treated with thioacetamide with medium and high doses of *C. papaya* extracts, such as 250 and 500 mg/kg p.o., effectively restored the increased serum enzyme markers.

#### Anti-ulcerogenic Effect

The results of a study investigating the anti-ulcerogenic and antioxidant properties of an aqueous extract of *C. papaya* seed against indomethacin-induced peptic ulcer in male rats showed that the extract significantly increased gastric pH and the percentage of ulcer inhibition compared to the rats that had developed ulcers as a result of indomethacin.

#### Anti-cancer/ Tumor

Plants and their products play a therapeutic role in the prevention and treatment of cancer. In this context, papaya and its beneficial elements play a big part in the treatment of cancer. An important study looked at the impact of aqueous-extracted *C. papaya* leaf fraction on the development of different tumour cell lines as well as the anti-tumor activity of human lymphocytes. The findings revealed that the CP extract had growth inhibitory activity on tumour cell lines derived from cervical carcinoma (Hela), breast adenocarcinoma (MCF7), hepatocellular carcinoma (HepG2), lung adenocarcinoma (PC14).

**Antidiabetic/Hypoglycemic activity:** A major global health issue is diabetes mellitus and the complications that are associated to it. Although oral hypoglycemic

medications are helpful and effective in treatment, they can also have negative side effects. Natural remedies play a significant part in the treatment of problems and type 2 diabetes. A crucial study was conducted to assess the antihyperglycemic and hypolipidemic activity of aqueous extract of Linn leaves, and the outcomes demonstrated that extracts significantly reduced blood glucose levels and serum lipid profiles in alloxan-induced diabetic rats when compared to the control group with 400 mg/kg body weight.<sup>[19]</sup>

**Anti-nephrotoxicity effect:** Papaya and pumpkin seeds were tested for their ability to protect against cisplatin-induced nephrotoxicity, and the results showed that both seeds had this ability. Antioxidant studies that looked at lipid peroxidation in the kidney and nitric oxide scavenging activity also supported the seeds' ability to protect against nephrotoxicity. The results of a study to assess the protective effect of the aqueous seed extract of *C. papaya* L. on gentamicin-induced hepatotoxicity and nephrotoxicity showed that administration of the aqueous extract before gentamicin exposure prevented severe alterations of biochemical parameters and disruptions of liver and kidney structures.

**Diuretic effects:** An important study discovery revealed that root extracts of *C. papaya* validated considerably enhanced urine production, which was 74%, of the impact of an equivalent dose of hydrochlorothiazide when administered orally to rats at a concentration of 10 mg/kg.

**Anti-malaria effect:** One of the greatest health issues in the world today is human malaria. However, to prevent malaria and its consequences, a safe and effective strategy of therapy is required. Numerous therapeutic plants in this area have established their value in the fight against malaria. According to study findings, ethanol leaf extracts at concentrations of 25, 50, 100, and 150 g/ml showed promising inhibitory activity against the CQ-sensitive strain with IC<sub>50</sub> values of 40.75, 36.54, 25.30, and 18.0, and in the CQ-resistant strain with values of 50.23%, 32.50%, 21.45%, and 23.12% against *P. falciparum*. **Antifertility effect:** A significant investigation has proven that giving raw, ripe pawpaw seeds orally for eight days at a dose of 100 mg/kg body weight caused degeneration of the germ cells and germinal epithelium, a decrease in the number of Leydig cells, and the appearance of vacuoles in the tubules. The results of a different study demonstrated that oral administration of the aqueous extract of *C. papaya* (Linn.) seeds at all dose regimens tested, including 50 mg/kg, 100 mg/kg, and 800 mg/kg body weight, altered the normal progression of the estrous cycle without altering ovulation or the quantity of shed ova.

**Anti-amoebic activity:** An experiment was conducted to test the anti-amoebic properties of a methanol extract of mature seeds using an axenic culture of *Entamoeba histolytica*. The results showed that the seed extract's MIC

was higher than 62.5 g/ml, compared to metronidazole's MIC of 0.8 g/ml.

**Anxiolytic and sedative effects:** Numerous medicinal plants or their constituents have sedative and anxiolytic properties. In a study to assess the sedative and anxiolytic properties of ethanolic *C. papaya* pulp extract in mice, the findings revealed that extract at 100 mg/kg had anxiolytic effect.

**Anti-obesity effect:** The anti-obesity benefit of many plants and their products, including *C. papaya*, has been proven. Using obese rats fed a high-fat cafeteria diet (HFD), a study was conducted to assess the anti-obesity potential of *C. papaya* L. aqueous fruit extract. The results showed that BMI, body weight, and the weight of the liver, kidney, and spleen were all significantly lower in the treated groups than in the HFD group animals. Additionally, the study's findings showed that compared to the HFD group, the treated groups' serum levels of glucose, triglycerides, total cholesterol, LDL cholesterol, and VLDL cholesterol all dramatically dropped. In contrast, HDL cholesterol increased in a dose-dependent way.

**Safety and toxicities of papaya:** At specific doses, various medicinal plants and their constituents play a part in illness prevention and therapy. Overdosing or taking the wrong dose can have negative effects and change several biological processes. However, a safe dosage of any plants or products is crucial in the management of health. *C. papaya* leaf juice did not exhibit any toxicity effects, according to a study done to test the toxicity of CP leaf extracts on Sprague-Dawley rats. A second investigation on the acute and chronic oral toxicity of ethanol and aqueous leaf extracts of *C. papaya* in Wistar rats found no evidence of acute oral toxicity or fatalities in the animals. Oral sub-acute and sub-chronic toxicity also includes hyperglycemia, hypolipidemia, and hypoglycemia as well as elevated AST and BUN values in experiments with ethanol and aqueous extracts, respectively.

#### Medicinal And Pharmacological Properties Of Various Parts Of *Carica Papaya* Plant

**Leaves<sup>[21]</sup>:** Papaya leaf provides a plethora of advantages. Young papaya leaves are sometimes boiled and eaten like spinach in various regions of Asia.

**a) Dengue fever:** According to research done on 70 dengue fever patients by Dr. Sanath Hettige, papaya leaf juice increases white blood cells and platelets, normalises clotting, and heals the liver.

**b) Cancer cell growth inhibition:** Recent studies on papaya leaf tea extract have shown that it inhibits the proliferation of cancer cells. It seems to increase the synthesis of vital signalling molecules known as Th1-type cytokines, which aid in immune system control.

**c) Antimalarial and antiplasmodial activity:** Tea produced from papaya leaves is used to cure malaria. Some preparations of the plant have been recognised to

have antimalarial and antiplasmodial properties, however the mechanism is unknown and not supported by science.

**d) Facilitate digestion:** Papaya plants produce chemical compounds called carpain in their leaves, a substance that kills germs that frequently obstruct digestion. Added Advantages of Papaya Leaves As a treatment for acne, Boost your appetite and reduce period pain.

**Fruits**<sup>[21]</sup>: Provitamin A, carotenoids, vitamin C, vitamin B, lycopene, dietary minerals, and dietary fibre are just a few of the nutrients found in abundance in papaya fruit. The papaya fruit contains a phytoalexin called danielone. When tested against the papaya pathogen *Colletotrichum gloeosporioides*, this substance demonstrated strong antifungal action.

**a) Laxative:** The laxative properties of ripe papaya fruit provide regular bowel movements.

**b) Indigestion:** The "papain" enzyme can be found in the milky juice that is extracted from the green, mature fruit while it is still on the tree. This is used in the production of several indigestion treatments.

**c) Void the heart attack or stroke:** For homocysteine to be transformed into amino acids like cysteine or methionine, folic acid, which is present in papayas, is necessary. Unconverted homocysteine is a major risk factor for heart attacks and strokes because it directly damages blood vessel walls.

**Seeds**<sup>[21]</sup>: There is a strong, peppery flavour to the papaya's edible black seeds. They are occasionally pulverised and used as a black pepper replacement.

**a) Nephroprotective activity:** Nephroprotective activity was dose-dependently seen in wistar rats. Urine and creatinine concentrations were assessed.

**b) More potent:** The papaya seeds are practically inedible due to their strong peppery and spicy flavour. But compared to the flesh, the seeds appear to have more significant medicinal properties. The antibacterial qualities of papaya seeds make them useful against infections caused by *E. coli*, *Salmonella*, and *Staphylococcus*. Papaya seeds may also shield the kidneys against toxin-induced renal failure. In addition to helping the liver cleanse, seeds can get rid of intestinal parasites. used to cause skin irritation and reduce fever. qualities that are antihelminthic, antiamebic, and a cure for piles and typhoid Papaya seeds that have been dried actually resemble peppercorns quite a bit and can be used in the same way. Grinding a few over a meal, particularly one high in protein, is an easy method to increase the amount of enzymes in your diet and enhance the health of your digestive system.

**Peel:** Papaya peel is frequently utilised in cosmetic products. Numerous home treatments also employ papaya peel.

**a) Sunscreen and soothing lotion:** The presence of vitamin A aids in the repair and reconstruction of damaged skin. Papaya peel application is used as a skin lightening agent. Peel can soothe and hydrate skin when combined with honey and applied.

**b) Fight dandruff:** On combat dandruff, apply papaya vinegar and lemon juice to the scalp for 20 minutes before showering.

**c) Muscle Relaxant:** A bath infused with papaya oil, vinegar, and the essential oils of lavender, citrus, and rosemary can be nourishing, rejuvenating, and soothing. It can also serve as a muscle relaxant and pain reliever.

**Roots:** In several Asian nations, papaya root juice is used to treat urinary issues. Asthmatic people smoke papaya leaf that has been dried and cured like a cigar. To eliminate or expel intestinal worms, a person will drink an infusion of fresh papaya leaves. Additionally, fresh young papaya are utilised to treat colic, a specific gastrointestinal condition, or cramps. For the treatment of dyspepsia, a decoction made by boiling the outer portion of papaya tree roots.

**Latex:** Papain and chymopapain are found in the milky sap of an unripe papaya. For patients with confirmed herniated lumbar intervertebral discs who had not improved after receiving "conservative therapy," chymopapain was approved for intradiscal injection. In addition, papain is used to cure commercial beer, degum natural silk, tenderise meat, and make chewing gum. It is utilised cosmetically in shampoos and in a variety of face-lifting procedures. Papain lowers blood pressure in people by causing the heart to beat more slowly. Additionally, it relieves dyspepsia, treats diarrhoea, lessens burn pain when applied topically, stops bleeding from haemorrhoids, treats stomachic, and whooping cough.

#### Other Uses

**a) Colon cancer:** Papaya fibre can bind toxin-causing substances in the colon and block them from harming healthy colon cells. Together, these nutrients offer colon cells synergistic defence against DNA damage caused by free radicals.

**b) Anti-Inflammatory Effects:** The protein enzymes papain and chymopapain as well as the antioxidant vitamins C, E, and betacarotene contained in papaya lessen the severity of illnesses like asthma, osteoarthritis, and rheumatoid arthritis.

**c) Rheumatoid arthritis:** Foods high in vitamin C, like papaya, protect people from inflammatory polyarthritis, a kind of rheumatoid arthritis that affects two or more joints.

**d) Encourage lung health** if you smoke or if you frequently come into contact with secondhand smoke. Consuming foods high in vitamin A, like papaya, can prolong your life and keep your lungs healthy.

**e) Anti-sickling activity:** According to recent research, papaya has anti-sickling properties.

**f) Prevent prostate cancer:** When compared to men who consumed the fewest lycopene-rich foods, men who consumed lycopene-rich fruits and vegetables such papaya, tomatoes, apricots, pink grapefruit, watermelon, and guava had an 82% lower risk of developing prostate cancer.

g) Papain extract injection causes a dog's prothrombin and coagulation to increase threefold. Additionally, it is asserted that the enzyme gets rid of necrotic tissues in open sores, burns, and ulcers. The brewing sector, the food industry, and the textile industry all benefit financially from papain.<sup>[22]</sup>

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