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Pharmacognostic, Phytochemical and Pharmacology of Carica Papaya: An Update

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Abstract

COVID-19 is a new type of virus, a single-stranded and severe acute transmissible and pathogenic virus. Corona virus is a single-stranded RNA virus. Carica papaya is used in the prevention and treatment of diseases due to their medicinal properties. Carica papaya belongs to the family Caricaceae. According to the researchers Carica papaya is very effective against COVID-19 due to the reduced production of interleukin IL-6 and TNF-alpha in humans and animals, dengue fever due to the weakened thrombopoiesis is generally the result of decreased megakaryopoiesis at the onset of infection as well as anti-inflammatory, anti-helminthes, anti-bacterial, protect the kidney from toxin induced kidney failure, detoxify the liver, sun screen, soothing slave, dandruff, muscle relaxant, stomach disorder or cramps, ant malarial, anti-fertility and antispasmodic etc. Carica papaya contains several chemical constituents like Leaves contain karpain, a chemical compound that kills the microorganism that interferes with digestive function; Papain a chemical constituent is responsible for the manufacturing of different remedies for indigestion and rapidly digests the ascaris. Here, this review tells about the pharmacology, pharmacognosy and various role of Carica papaya in different diseases which may be beneficial in the future based on available published data.

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Sub-kingdom: Tracheobionta

Class: Magnoliopsida

Sub-class: Dilleniidae

Division: Magnoliophyta

Sub-division: Spermatophyte

Phylum: Stetophyta

Order: Brassicales

Family: Caricaceae

Genus: Carica

Botanical name: Carica papaya Linn [12].

solid/ treatable acid ratio) , vitamins (ascorbic acid and carotene) and organoleptic test [23].

Microscopical character and powder analysis of leaf

The papaya plant contains three types of flowers (female, hermaphrodite and staminate) and the seeds-external (shape, size, hilum, micropyle, funicle, raphe and testa) and internal characteristics (endosperm and embryo) [24].

Powder characteristics : Deepa Verma et al. examined the powder characteristics by standard method. She stained the powder with

Cultivation and collection

It is cultivated in tropical and sub-tropical areas of America and other tropical zones of the world, which is accessible all over the year. It requires warm and humid climate. Plant growth and the fruit are affected by the low temperature. At 0°C both foliage and fruit get damaged [13]. Papaya is economically propagated by seed and tissue culture plants. The seedling can be increased in nursery beds 3m long, 1m broad and 10 cm high in addition in pots or polyethylene bags. The seeds are sown with 0.1% Monsoon (phenyl mercuric acetate), ceresin etc. are scattered 1 cm in rows 10 cm aside and covered with fine leaf mould. The nursery beds are enveloped with polyethylene sheets or dry paddy straw to preserve the seedlings [14]. Medium, fertile and well drained and lime free soil are best for papaya cultivation. Planting is done during spring season (February- March), monsoon season (June-July), autumn season (October- November) [15].

Traditional use

The whole plant of the Carica papaya plant has medicinal value. Leaves can be used to cure dengue fever, cancer cell growth inhibition [17]. Seeds are used as a tender purgative for worms. Flower may be taken in an infusion to induce decoction and menstruation of the ripe fruit is helpful for curing diarrhea and dysentery especially in children. The ripe fruit act as mild laxative. Latex is applied externally to accelerate the healing of wound, ulcers, warts and cancerous tumors [18]. Peel can be used as sun screen and soothing slave, effective for dandruff, muscle relaxant etc. Roots can be used to cure stomach disorders or cramps [19].

Pharmacognostic Parameters of Carica papaya

Morphological parameters

Pawpaw's have a creamy, custard-like flesh with a complex combination of tropical fruit flavors. They are most commonly described as tasting like banana combined with mango, pineapple, melon, berries, or other fruit. [20]. Pericarp reveals single layer of thin walled cells enveloped with thick cuticle externally. Monocarp have broad zone consisting of circular to oval shaped parenchyma cells with dispersed and unbranched laticiferous cells. Endocarp made up of 2 to 3 layers of thin walled parenchyma cells. Plentiful calcium oxalate crystals are found in monocarp region of the fruit [21]. Flower of papaya exist in three types (female, hermaphrodite and staminate) [22]. The morphological characteristics (like fruit weight, fruit length, fruit diameter, internal cavity diameter, internal cavity shape, skin color, flesh color and stalk end fruit shape, fruit shelf life) , physicochemical (like pH, total soluble solids, treatable acid and total and total soluble

Table 1: Phytochemicals detected in different extract of *Carica papaya*.

| Plant part used | Type of extract | Phytochemicals found |
|----------------------|--|--|
| | Methanol | Kaempferol-3-(2Rhamnosylrutinoside) |
| | Ethanol, methanol and water | |
| | Hexane, chloroform, diethyl ether and methanol | P-hydroxybenzoic acid, salicylic acid, hyperoside gentisyl alcohol, kaempferol hexosides |
| | Methanol | Carpaine, kaempferol 3-(2G-glucosylrutinoside), kaempferol 3-(2-Rhamnosylgalactoside), 7-rhamnoside, kaempferol 3-rhamnosyl-(1->2)-galactoside-7-rhamnoside, luteolin 7-galactosyl-(1->6)-Galactoside, orientin 7-O-rhamnoside, 11-hydroperoxy-12,13-epoxy-9-Octadecenoic acid, palmitic amide, and 2-hexaprenyl-6-methoxyphenol |
| Bark, Roots And Pulp | N-hexane, dichloromethane, Ethyl acetate, ethanol, methanol, | Phenolics and flavonoids |
| | Petroleum ether, ethanol and Aqueous | Phenolics and flavonoids |
| | Methanol | Carotenoids and -tocopherol |
| | Ethanol | Triterpenoid/steroids |
| | Methanol | |
| | Methanol | Kaempferol-3-glucoside, p-coumaric acid ferulic acid, caffeic acid, p-hydroxybenzoic Acid, quercetin-3-galactoside Seeds Hexane, ethyl acetate, methanol And aqueous DPPH, FRAP, TBARS Octadecanoic acid, oleic acid, n-hexadecanoic acid, 14- methyl-, Methyl ester, 11-octadecenoic acid, methyl ester, and pentadecanoic Acid |
| Peel | Aqueous | Proteins and phenolic groups |

Table 2: Phytochemical analysis of papaya extract with different reagents.

| Material | Reagent | Color change | Phytochemical |
|--|--|-----------------|---------------|
| Carica papaya extract | Meyer | | Alkaloid |
| | Wagner | Brown ppt | |
| | ³ | Greenish | |
| | KOH | | |
| | NaOH+AlCl ₃ +H ₂ SO ₄ | | |
| | | Persistent foam | |
| | Fehling solution | Brick ppt | |
| Distilled water, H ₂ SO ₄ and Fehling solution | Brick red ppt | Glycosides | |

Table 3: Quantitative microscopy of leaf of *Carica papaya*.

| Parameter | Result |
|--------------------------------|--------------------------|
| Stomatal index (male plant)% | 32.57+ ₋ 3.21 |
| Stomatal index (female plant)% | 34.46+ ₋ 3.41 |

Table 4: Physicochemical analysis of leaves of *Carica papaya*.

| Parameters | results |
|----------------------|---------------|
| Ash value | 08.63% |
| Acid insoluble value | 00.79% |
| | 05.30 %w/w |
| Foaming index | |
| Swelling index | Less than 100 |
| Loss on drying | 09.41% |
| Resin content | 03.08% |

antiplasmodial activity in a dose-dependent manner but petroleum ether extract had the largest antimalarial activity [28].

Anti-microbial activity

Carica papaya Linn has been consistently used as ethno medicine for different diseases, including cancer. Norika Otsuki et al. examined the effect of aqueous extracted CP leaf fraction on the growth of several

tumor cell lines as well as human lymphocytes. The proliferative responses of tumor cell lines and human peripheral blood mononuclear cells (PBMC) and cytotoxic activities of PBMC were obtained by [³H]-thymidine incorporation. The production of IL-2 and IL-4 was decreased by the addition of CP extract in the case of PBMC [29]. According to investigators, cancer can be cured by using papaya leaf tea extract because it appears to improve the production of Th1-type cytokines, which help to control the immune system. The papaya berry has the ability to attach with toxin which results in colon cancer and keep them away from the healthy colon cells [30].

Effect of *Carica papaya* on metabolic syndrome

Obesity is observed due to the accumulation of body fat, which may be identified by various factors like several ethnological, social, behavioural, environmental, cultural, physiological, metabolic and genetic factors [31]. Uncontrolled fat accumulation can be an important condition in the development of metabolic dysfunction, like arterial hypertension, dyslipidaemia and insulin resistance, diabetes mellitus type 2, cardiovascular illness [32]. Tumor necrosis factor (TNF- α), interleukin 6 (IL6), monocyte chemo attractant protein, leptin, adiponectin and resistin are the adipokines secreted by adipose tissues [33]. The accumulation of adipose tissue is directly proportional to adipokines. This results to a variation in their secretion, with

raised pro-inflammatory and reduced anti-inflammatory adipokines, stimulating the systemic and local inflammatory process, giving to the development of insulin resistance [34]. Metabolic syndrome is related with the generation of reactive oxygen species (ROS), can persuade insulin resistance [35]. Lidani F. Santan et al. estimated that the presence of vitamins, bioactive compounds and lipids in the Carica papaya can be good for the treatment of metabolic dysfunction [36].

Anti-fertility effect

It was examined that the Carica papaya shows the anti-fertility effect by feeding pregnant rat with dissimilar components of the fruit. No attempt was assembled to force feed the animal and the outcome specified that the immature fruit the estrous cycle and cycle and persuade abortion. The over-ripped Carica papaya does not have this kind of effect.

Effect of Carica papaya on dengue fever: According to the investigators, Dengue haemorrhagic fever is identified by a thrombocyte count, it could be responsible for dengue-induced thrombocytopenia-impaired thrombopoiesis and peripheral platelet demolition. Many researchers have proposed that weakened thrombopoiesis is generally the result of decreased megakaryopoiesis at the onset of infection. The direct exposure of the virus on the megakaryocytes or the effect on the stromal cells (connective tissue cells of any organ) which could be the reason for the release of cytokines and control of megakaryopoiesis. [37]. The raised peripheral platelet demolition could be the other important cause of thrombocytopenia. This is caused by an autoimmune reaction, where antibodies generated by the host against the dengue virus created activation and destruction of platelets.

Effect of Carica papaya on hepatic and renal toxicity: The Carica papaya leaf extract shows antimicrobial activity on the inhibition of some human pathogens like Escherichia coli, Pseudomonas aeruginosa, Kleibseilla pneumonia, Staphylococcus aureus and Proteus mirabilis.

Effect of Carica papaya on COVID-19

The Corona virus can be spread in the form of respiratory droplet nuclei, other body fluids and secretions like faces, saliva, urine, semen and tears. It is commonly spread by the respiratory droplet formed while coughing, sneezing and talking of an infected person. According to the researchers Carica papaya reduces interleukin IL-6 and TNF-alpha in humans and animals. Interleukin IL-6 and TNF-alpha are mainly responsible for producing inflammation of lungs leading to pneumonia. TNF-alpha is an inflammatory cytokine generated by macrophages/monocytes during acute inflammation leading to necrosis or apoptosis. TNF-alpha shows various effects by binding, as a trimmer to either a 55 kDa cell membrane receptor called as TNF-1 or 7 kDa cell membrane receptor called as TNF-2 [38]. Cytokine storm is most prime mechanism that leads to death of COVID-19 infected person. According to the scientist, an enormous production of a host of arbitrator such as interleukins, interferon, tumor necrosis factor (TNF), and macrophage occurs. These mediators are combined together like cytokines or chemokines and this causes the serious effect on the lungs of the infected person followed by the death of the infected cell by apoptosis and necrosis. Due to this, the multiple organ failure occurs. Papain is found in the papaya latex. Papain is a cysteine proteinase which has the capacity to break a wide variety of necrotic tissue at Ph 3.0-12.0. This factor may help in wound healing and may decrease the oxidative tissue damage; similarly, they show burn healing property as the increment in the hydroxyproline content. Chen et al. observed that papain from Carica papaya latex was very efficient in curing histamine-induced ulcer in the rat by obstructing the acid secretion.

Effect of Carica papaya on Sickle Cell Disease (SCD)

neutraceutical plant because it contains a wide range of enzymes, vitamins, amino acids, flavonoids, alkaloids and other chemical constituents. Papain, chymopapain is effective in treating serious diseases like asthma and osteoarthritis. Carica papaya leaf extract also effective against *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Proteus mirabilis*. The size and texture is accessed by SEM and TEM and the biosynthesized silver nanoparticles by UV spectroscopy. The present review is based on the pharmacognosy, phytochemicals and pharmacological activity of *Carica papaya*

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Conflict of interest

There are no conflicts of interest.

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