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An Overview of *Carica papaya* and its Medicinal Uses.

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ABSTRACT

Carica papaya belongs to family caricaceae. It is a tall slender soft wooded tree grows up to 10 meters in height. Leaves focused at the top, deeply lobed, palmate, with long petiole; flowers unisexual, males in drooping panicle and female in short clusters, fruits large, greenish, single chambered, cylindrical or spherical in size. Seeds are dark brown. Papaya is a good source of calcium and an excellent source of vitamins A and C. Papaya also has several industrial uses. Considerable work has been carried out on plant parts such as fruit, seed, latex and root, indicating the presence of biologically active compounds. The quantity of the compounds differs in fruit, latex, leaves and roots, and varies with the extraction method, age of the plant part, the cultivation and the gender of the tree. *Carica papaya* root has purgative effect. Papaya seed have anti-helminthic, anti-fertility, anti-implantation and abortifacient activity. Papaya fruit extracts have antihypertensive, antibacterial, antioxidant, anti-inflammatory, ulcer healing and diuretic activity. Crude papaya leaf showed significant increase in platelet count in normal mice.

Keywords: *Carica papaya*, medicinal use, platelet count, leaf extract,

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INTRODUCTION

It is well known that traditional herbal medicine existed before the application of modern scientific methods to healthcare, and even today majority of the world population depends on herbal healthcare practices. Exploring traditional herbal medicines in the context of modern science is the need for optimum and proper utilization of traditional plant drugs. In the last decade WHO, recognizing the importance of herbal medicines, has passed many resolutions vis-a-vis improving the quality and efficacy of plant drugs [1]. The world health assembly adopted a new resolution in 1989 that herbal medicine is of great importance to the health of individuals and community [2].

History

The first literary reference to papayas dates back to 1526, when they were found in the Caribbean coast of Panama and Colombia and described by the Spanish chronicler Oviedo. Because of its several hardy seeds (which can last for up to the 3 years in cool and dry conditions) the plant spread relatively easily throughout the tropics, and has become naturalized in several regions, especially those abundant with water and fertile soils. Papayas are thought to be native to tropical America, in a region that goes from the Andes of South America to Southern Mexico.

Synonym

Pawpaw, melon tree, papaia, Papaya, papaya tree, papaw.

Some Vernacular Name

English	Papaya
Hindi	Pappaya, Pappita
Malayalam	Pappaya, Karumoos, Kappalam, Pappali, Karmati
Tamil	Pappali

Habitat Description

This plant is native of America, more precisely Central and South America. It got spread all over the world by the traders and in India it came by Portuguese traders. It is now found all over the world. The best climatic condition for its growth is tropical region that suits its growth. Nowadays it is more commonly seen in India and South Eastern countries like Malaysia and Philippines.

Description of Plant

Carica papaya belongs to family Caricaceae. It is a large plant, like a tree, without branches; it is a herbaceous plant because the stem does not have much wood and remains soft and green until its death. The single stem grows from 5 to 10 m tall with all the leaves on the top. The leaves are large, deeply lobed, palmate, with long petiole; 50–70 cm wide. Some plants have perfect (with female and male organs) flowers but other plants have

flowers with only one sex (female or male). Generally, the fruit is oval to nearly round single chambered, cylindrical or spherical in size and, in some cases, like a big pear. Fruits are 15-50 cm long and 10–20 cm wide, and weigh up to 9 kg. The skin of the fruit is thin and tough; it is not eaten because it is too bitter. First, the skin is green but it changes to yellow in ripe fruits. In a ripe fruit, the pulp is yellow, orange, pink and even light red. Inside the fruit, there are many small black seeds.

Taxonomical Position of *Carica papaya*

Kingdom- Plantae (Plant), Division- Magnoliophyta, Class-Magnoliopsida, order- Brassicales, Family- Caricaceae, Genus- *Carica*, Species- *C.papaya*

Phytochemistry

The chemical constituents [3] present in *Carica papaya* are

- Fruits contains benzylisothiocyanate, *cis* and *trans* 2, 6-dimethyl-3,6 epoxy-7 octen-2-ol, carpaine, benzyl-D glucoside, 2-phenylethyl-D-glucoside, 4-hydroxy- phenyl-2 ethyl-D-glucoside and four isomeric malonated benzyl-D-glucosides.
- Seed contains Carpaine, benzylisothiocyanate, benzylglucosinolate, glucotropacolin, benzylthiourea, hentriacontane, sitosterol, caricin and an enzyme myrosin.
- Root has Carposide and an enzyme myrosin.
- Bark contains Sitosterol, glucose, fructose, sucrose, galactose and xylitol.
- Latex has Proteolytic enzymes, papain and chemopapain, glutamine cyclotransferase, chymopapains A, B and C, peptidase A and B and lysozymes.
- Leaf contain phenolic acids as the main compound, while chlorogenic acid was found in trace amounts, compared to the flavonoids and coumarin compounds. The compounds detected were caffeic acid, p-coumaric acid, protocatechuic acid. Kaempferol, quercetin and 5,7-dimethoxycoumarin.

Medicinal Use

Table 1: Medicinal uses of *Carica papaya*

S.No	Plant Part	Medicinal uses
1.	Seed	Antimicrobial, chronic ulcer, antihelminthic, abortifacient, male antifertility, immunomodulator, anti-inflammatory.
2.	Leaves	Antimicrobial, antitumor, thrombocytopenia.
3.	Fruit	Antimicrobial, antimalarial, antihypertensive, hepatoprotective, ulcer healing, antioxidant, immunomodulator
4.	Root	Antimicrobial, diuretic, female infertility
5.	Latex	Antihelminthic, antifungal, uterotonic

Antimicrobial

The seed of papaya has antimicrobial activity against *Trichomonas vaginalis* trophozoites. [4]. The seed and pulp of papaya was shown to be bacteriostatic against

Bacillus subtilis, Enterobacter cloacae, Escherichia coli, Salmonella typhi, Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa and Klebsiella pneumoniae by the agar cup plate method [5]. Purified extracts from ripe and unripe fruits also showed significant antibacterial activity on S. aureus, Bacillus cereus, E. coli, P. aeruginosa and Shigella flexneri [6]. The aqueous extract of fruit promoted significant wound healing in diabetic rats. The seeds bacteriostatic activity on Gram positive and Gram negative organisms, which could be useful in treating chronic skin ulcers [7] Herbal formulations containing papaya leaves and root or leaves alone as one of the constituent has antibacterial activity against Salmonella typhi, S. paratyphi and S. typhimurium; however, water, acetone and ethanol extract of papaya leaves showed no microbicidal activity [8].

Anti-helminthic

The air-dried papaya seeds given as elixir with honey have shown significant effect on the human intestinal parasites. It is reported that their consumption offers a cheap, natural, harmless, readily available mono therapy and preventive strategy against intestinal parasitosis, especially in tropical communities [9]. Benzylisothiocyanate, present in seeds is the chief or sole antihelminthic [10].

The latex of papaya has antihelminthic efficacy against Heligmosomoides polygyrus in experimentally infected mice, which suggests its potential role as an antihelminthic against potent intestinal nematodes of mammalian hosts [11]. The plant extracts of papaya possesses a dose dependent significant effect on the egg, infective larvae and adult worms of Trichostrongylus colubriformis. Alcoholic extracts of papaya shows potential in vitro anti-parasitic action, which affects eggs, infective larvae and adult Haemonchus contortus [12].

Anti-Amoebic

The cold macerated aqueous extract of matured papaya seeds has shown anti-amoebic activity against Entamoeba histolytica [13].

Antimalarial

The petroleum ether extract of the rind of raw papaya fruit exhibits significant antimalarial activity. There may be significant commercial potential in extracting the active element from this plant, which grows abundantly throughout the tropics and the rind of which is discarded as waste, can be exploited for antimalarial activity [14].

Antifungal

The latex of papaya inhibits Candida albicans growth [15]. Latex proteins appear to be responsible for antifungal action. The fungistatic effect of latex is the result of cell wall degradation due to a lack of polysaccharides constituents in the outermost layers of the fungal cell wall and release of cell debris into the culture medium [16].

Effect on Smooth Muscles

Pentane extract of papaya seeds has shown relaxation action on strips of dog carotid artery that had been pre-contracted with Phenylephrine [17]. A crude ethanol extract of unripe fruit produces a significant depression of mean arterial pressure. Fruit juice of papaya probably contains antihypertensive agent(s), which exhibits mainly alpha adeno-receptor activity [18]. Papaya leaves extracts exhibited more than 50% relaxing effect on aortic ring preparations. This property demonstrates that many edible plants common in Asian diets possess potential health benefits, affording protection at the vascular endothelium level [19].

Crude papaya latex contain a uterotonic principle which might be a combination of enzymes, alkaloids and other substances which can evoke sustained contraction of the uterus acting mainly on the alpha adrenergic receptor population of the uterus at different stages [20].

Diuretic

Aqueous root extract of papaya when given orally at a dose of 10 mg/kg to rats produces significant increase in urine output and shows similar profiles of urinary electrolyte excretion to that of Hydrochlorothiazide [21].

Hepatoprotective

The ethanol and aqueous extracts of the fruit possess remarkable hepatoprotective activity against CCl induced hepatotoxicity. But the hepatoprotective mechanism as well as active principles responsible for hepatoprotective activity of this plant is not yet known [22].

Male Antifertility

Seed extract showed pronounced hypertrophy and hyperplasia of pituitary gonadotrophs. Whereas the male rats treated with seed extract revealed gradual degeneration of Germ, Sertoli and Leydig cells as well as germinal epithelium, which confirmed its antifertility activity [23]. The benzene chromatographic fraction of the chloroform extract of the seeds possesses reversible male contraceptive potential and the effect appears to be mediated through the testis [24] and may be directly rendered on the spermatozoa [25] without adverse toxicity. Another study revealed inhibition of sperm motility due to other epididymal factors rather than the sub-cellular characteristics of testis and epididymis [26]. A recent report revealed that it has good contraceptive efficacy in langur monkey and the action is mediated through inhibition of sperm motility [27].

Even aqueous extract of papaya bark has potential contraceptive activity [28]. However, aqueous extract of the seeds of papaya failed to exhibit contraceptive effects at any of the dose regimens tested on male rabbits, contrary to the observations made in the previous studies [29].

Female Antifertility

It is reported that the composite root extract containing papaya root extract as one of the constituent which induces morphological changes in the endometrial surface epithelium in albino rat uterus [30]. Whereas seeds aqueous extract has shown abortifacient properties on female Sprague Dawley rats [31] and the petroleum ether, alcoholic and aqueous extracts inhibits ovulation in rabbits [32]. The papaya seed extracts did not exhibit anti-zygotic, anti- implantation, early abortifacient or antifertility activity [33]. Normal consumption of ripe papaya during pregnancy may not pose any significant danger. However, the unripe or semi-ripe papaya (which contains high concentration of the latex that produces marked uterine contractions) could be unsafe in pregnancy [34].

Histaminergic

Crude latex causes contraction of the isolated guinea pig ileum strips, which is mediated via H1-receptor and dependent on extracellular Ca²⁺ influx [35]. Papaya flower pollen is able to induce respiratory IgE-mediated allergy. The existence of common allergens among papaya flower pollen, fruit and papain has been demonstrated by RAST inhibition [36].

Topical Use

Papaya fruits are used as topical ulcer dressings, which promotes desloughing, granulation and healing; it also reduces the odour in chronic skin ulcers. It is cost effective and is considered to be more effective than other topical applications in the treatment of chronic ulcers [37]. It is currently used in Paediatric Unit as the major component of burns dressings, where it is well tolerated by the children. Economic and widely available, the pulp of the papaya fruit is mashed and applied daily to full thickness onto the infected burns. It appears to be effective in desloughing necrotic tissue, preventing burn wound infection and providing a granulating wound suitable for the application of a split thickness skin graft. Possible mechanisms of action include the activity of proteolytic enzymes chymopapain and papain, as well as an antimicrobial activity [38].

Immunomodulatory and Anti-Tumor Activity

The fermented papaya preparation has shown its ability to modulate oxidative DNA damage due to HO in rat pheochromocytoma cells protection of brain oxidative damage in hypertensive rats [39]. It has also exhibited potential supportive role on oxidative inflammatory damage in cirrhosis caused by hepatitis C virus [40]. The safety and antioxidative stress potential of papaya juice is found to be comparable to the standard antioxidant compound ocopherol [41]. The preparation containing yeast-fermented papaya as one of the constituents has antioxidant actions and that it may be prophylactic food against age related and neurological diseases associated with free radicals [42]. Consumptions of guava and papaya fruits reduce oxidative stress and alter lipid profile. Thus, it could reduce the risk of disease caused by free radical activities and high cholesterol in blood [43]. Carica papaya leaf extract possess significant growth inhibitory activity on tumor cell lines [44]. Papaya seed extract is currently being marketed as a nutritional

supplement. The product claims to improve immunity against common infection and body functioning. This provides the evidence for its immunomodulatory and anti-inflammatory actions [45]. Fermented papaya preparation exerts both immunomodulatory and antioxidant activity [46].

Thrombocytosis

Recently, crude formulations of papaya leaf have been successfully employed in folk medicine in continental Malaysia for the treatment of dengue infections with hemorrhagic manifestations, using suspensions of powdered leaves in palm oil, a popular vehicle in local herbal medicine. This use gave rise to investigation on the effect of *Carica papaya* crude leaf material on the thrombocyte count [47].

CONCLUSION

Carica papaya is the most versatile plant with immense potential. It is used for consumption as fresh fruit, dried and crystallized fruit as well as for use in drinks, jams and candies. Biochemically, its leaves and fruit are complex, containing several proteins and alkaloids with important pharmaceutical and industrial applications. Different parts of this plant are used for several conditions anti-helminthic, anti-fertility, anti-implantation, abortifacient, purgative, antihypertensive, antibacterial, antioxidant, anti-inflammatory, ulcer healing, diuretic and platelet count increasing activity. Because of these activities *Carica papaya* has found vast applications making it a green treasure. Current interest in the plant is its potential to increase platelet count in dengue fever associated thrombocytopenia and other thrombocytopenias.

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