Review Article

Food-nutrition, Cosmetic and Drug value of *Carica papaya* - A short review

ABSTRACT

Papaya is an evergreen plant which offers different food, nutrition and therapeutic values for human beings. The fruit is delicious and nutritious. The different parts of the plant such as leaves, seeds, peel, blooms, bark, root, and squash have beneficialactivities. It is used for the cure of a varietydiseasesincludingdigestive disorders, constipation, expulsion of worms, antibacterial, corns, sinuses, skin inflammation, antifertility, dengue fever, warts, glandular tumors, blood pressure, diabetic, anti-HIV, invigorate regenerative organs. It is also used as nutraceutical agent. The present workemphasis on majorcharacteristics of chemical constituents, nutritional components, health and medical benefits of papaya.

Keywords: Papaya, food, nutrition and therapeutic values, antifungal activity, anti-HIV activity, anti-fertility activity, cosmetic value.

1. Introduction

Papaya is grown in all areas of the globe. Papaya is considered as the one of the most profitable agricultural produces and it containsprotein, starch, vitamins, beta-carotene and minerals. The papaya plant is a little, scarcely expanded plant, the stem developing from 5-10 m tall, leaves are extensive lobed with usually seven projections and about 0.5-0.7m in width. Common componentsof papaya have smooth skin, green, while ripe papaya becomes yellow (**Figure 1**). The papaya grown in Philippine is usually pear shape around 0.1 to 0.4 m long when become fully mature. Ripe papaya when served feels slippery, the skin has yellowish color, and when opened it has orange toyellowish tissue. Its seeds areblackand located in the vacant inner core[1,2].

2. Methodology

Google Scholar, Pub Medand Research Gate etc. have been consulted to find out the needed literatures to have relevant research papers as we have done in our previous works[3-7]. The keywords, "***C. papaya***", "***Food and nutritional value of C. papaya***", ***Drug value of C. papaya*** "**Anticancer activities**", "***Pharmacology of C. papaya***", "***Cosmetic value of C. papaya***" etc. have are used to get expected research papers and accumulate necessary information on different aspects of the papaya and chemical constituents to be used in this review work.

3. Findings and Discussion

3.1. Plant Taxonomy

Carica papaya belongs to the family Caricaceae[8]. Its botanical identification is given below -

Kingdm: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Brassicales, Family: Caricaceae, Genus: Carica, Species: papaya Linn.

As a tropical fruit, its position is fourth in the global trade and commerce. It is extensively cultivated in different parts of the world such as Bangladesh, India, Thailand, Philippines, southern Mexico and Central America. It is called pepe (in Bangla),papita (in Hindi), pawpaw tree (in English), and Erandkarkati (in Sanskrit). Papaya is being used from ancient time as a nutritional and medicinal plant. Papaya is a polygamous species; hard to recognize whether it is female, male, or hermaphrodite. Its fruit differs in size and shape; it widens as globe and has a large central cavity. The seeds of the ripe papaya are black and that of green papaya is white.The plant grows vertically that grows about 5-10 m tall, is a perennial herb with spirally arrayed leaves located to the top of the trunk. The trunk is hollow, brown, or deep purple, and leaf scars

roughen the base.The color of the flowers yellowish-white color, these are small, and numerous in number.

Figure 1: The *C. papaya* plant with different parts (Photograph was taken by MSA from Dhaka University Residential area at Fuller Road).

3.2. Chemical constituents of *C. papaya*

*C. papaya*contains a lot of chemical components such as antioxidant nutrients (e.g., vitamin C, flavonoids and Carotene), vitamins B (e.g., pantothenic acid), minerals (e.g., potassium and magnesium), and fibers. Papaya leaves containalkaloids, carpaine, vitamins C and vitaminE, pseudocarpain, caproside, choline and dehydrocarpain. Fruits possessmacromolecules such as carbohydrates, protein, fats, vitamins, minerals, volatile compounds, alkaloids, and glycosides. Its juice contains stearic acid, linolenic acid, myristic acid, palmitic acid, N-butyric acid and n-hexanoic. C. Papaya plant contains specialized cells called lucifers and hence the plant is known as lactiferous plant. Latex oozes out from the lactifercellss and distributethis to all most all tissues of the plant. It has been found that papain is the most vital proteolytic protein (enzyme) extracted from the unripe fruit of the C. papaya plant[9]. The outcomes of the test results exhibited that latex componentscandiffer in leaves fruit, and roots. Lucifer cells fall in number when the fruit ripens[10]. Another report showed a lipase (an enzyme) which was unstable for the necessary lipolysis function in papaya latex[11]. Vitamin A, vitamin E and vitamin C are excellent antioxidants found in C.papaya and the minerals K and Mg; the vitamin B includes - B_5 and folate are also found in papaya. It is rich in fibers. The root is abundant in myrosin and

caprosideenzymes. The seeds of papaya is enriched in benzyl isothiocyanate, carpain, fatty acid, protein, fibers, myrosin enzymes, and carcaine[12]. The chemical constituents are shown in **Table 1**.

Table 1: Phytoconstituents found in*C. papaya*.

Parts of Plant	**Chemical constituents present**
Flower	Phalobatanine, Flavonoids
Fruits	Ascorbic acid, Fibers, Sugar, Protein, minerals, phosphorus, iron, Vit C, thiamine, niacin, riboflavin, citric acid, malic acid, carotene, amino acod, benzyl isothiocyanate, cis and trans 2.6-dimethyl-3.6epoxy-7-octen 2-ol.
Leaves	Papain, cystatin, tocopherol, carpain, chymopapain, dihydrocarpain I & II, carposide, Vitamin C and E.
Seed	Benzyl isothiocyanate, fatty acid, protein, fibers, carpain, myrosin enzyme and carcaine
Root	Myrosin, Caproside.

3.3. Food and nutritional features of *C. papaya*

Papaya is an excellenthub of food and nutrition as it contains many of the elements of basic food needed for human being. It's calory value is low butenrich in necessary minerals and vitamins. The comparative low calory content helps the obese people to reduce their weight. The nutritional values[13,14]of C. papaya has beenshown in **Table2**.

Table 2: Nutritional elements and their values in *C. papaya* in 100g of papaya fruit both green and ripe.

Nutrients	**Green papaya**	**Ripe papaya**
Proteins	600mg	700mg
Fat	100mg	200mg
Mineral	500mg	500mg
Carbohydrate	720mg	570mg
Fiber	800mg	900mg
Energy	32Kcal	27Kcal
Total carotene	2740µg	-

Beta- carotene	888µg	-

3.4. **Pharmacological properties of *C. papaya***

A schematic diagram (Figure 2) summarizes the pharmacological properties of *C. papaya*. A brief description is also given in the following sections.

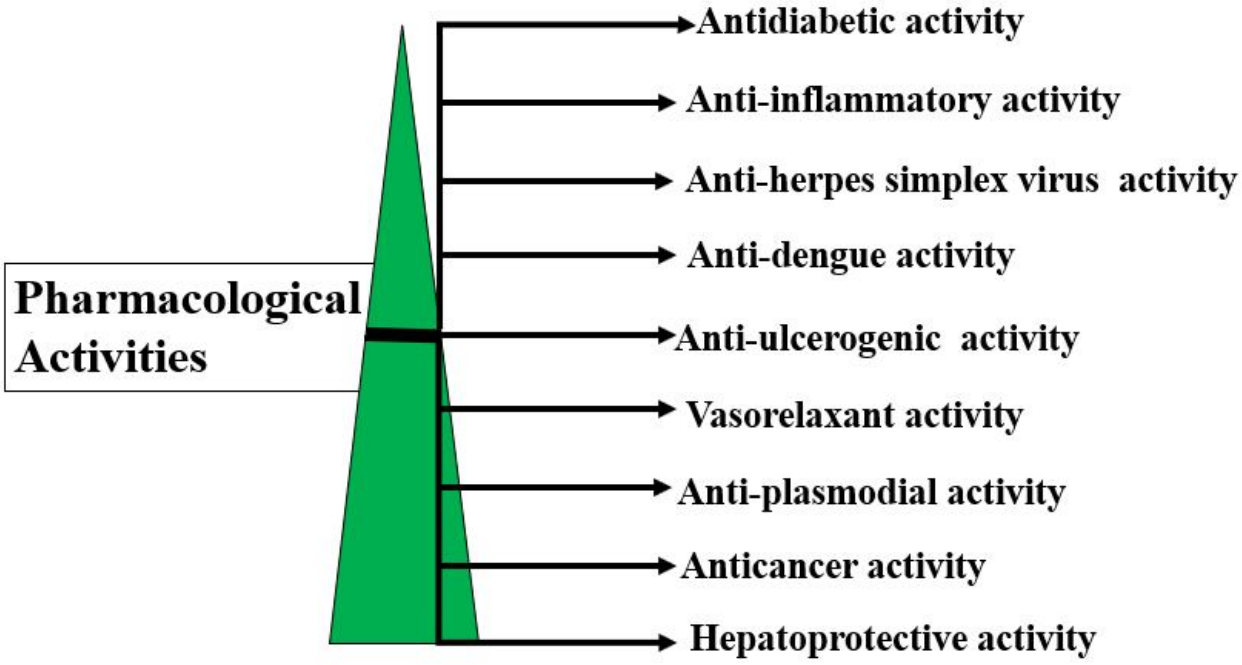

Figure 2: Pharmacological activities of *C. papaya* at a glance.

3.4.1. Effect of *C. papaya* on blood-relatedissues

Different parts of C. papaya show activity against blood related diseases. One such study with seed and leaf explored the phytoconstituents and hematological activity of C. papaya[15].Another study showed that *C. papaya* improved the formation of certain blood parameters in albino rats[16].

3.4.2. Effect of *C. papaya* on digestive disorder

C. papaya showed beneficial activity against different ailments of digestive disorder. The astringent ashes of the unripe peel and of the leaves are taken in dysentery and diarrhea. The roots are administered in digestive disorders, dysentery and other ailments. The C. papaya preparation also showed beneficial effect in the symptoms of acid reflux[17].

3.4.3. Hyperglycemia and ethanolic extract of *C. papaya*

The phytoconstituents of *C. papaya* showed antihyperglycemic activity. C papaya was extracted by ethanol and the obtained extract was administered to streptozotocin-induced diabetic rats and

blood sugar was measure. It was seen that C. papaya exhibited hypoglycemic activityin diabetic rats. This experiment concluded that the phytoconstituents present in *C. papaya* couldoffer anti-diabetic action[18,19].

3.4.4. Effect of C. papaya on dengue fever

C. papaya leaves have beneficial effects on recovering from dengue fever which is caused by the bite of female anopheles mosquitoes during day time. A group of dengue fever patients weregiven 25 mL of leaf extract of C. papaya for two times a day and the patients recovered from dengue fever as evidenced by rising of platelet counts from 46.0% to 78.3%[21].

Cyclophosphamide-induced thrombocytopenic rats showed an increase in thrombocyte after administration of 400 mg/kg and 800 mg/kg of C. papaya leaf extract for fifteen days[22]. It was thus concluded that C. papaya leaves have a positive impact in curing dengue fever.

3.4.5. *Antifungal activity*

Fungicidal actions of C. papaya has been studied by Chavez-Quintal *et al*. and they have showedthat the extracts exhibitedblocking of fungal activity against threephytopathogenic growths -*Rhizopus stolonifer, Fusarium* spp., and Colletotrichum gloeosporioides[23]. Another report showed the fungicidal activity of the methanolic extract of the seedsand the extract imparted fungicidal actions against *Aspergillus flavus*, *Candida albicans*, and *Penicillium citriniumin*.

3.4.6. Safety and side effectsof papaya on pregnancy

The activity of ripe papaya preparation (500 ml/l water) and latex of papaya was studied on pregnant rats (Sprague Dawley species).It was found that that ripe papaya has no threatening effect but the latex inducedshrinking of the muscles of uterine. It was inferred that normal use of ripe papaya have little impact on pregnancy. The unripe or semiripe papaya might not be safe in pregnancy[24].

3.4.7. *Antihelminthic and antiamoebic activity of C. papaya seeds*

The beneficial effect of powdered and dried C. papaya seed was examined against human intestinal parasitosis[25]. The dried powder of C. papaya was given to the patients diving in two groups -blended with nectar and nectar alone as control. It was seen that 76.7% of the patients who have been administered nectar mixed with powder of seeds of papaya eliminated the parasites within seven days, on the other hand parasites were eliminated from only 16.7% of the patients who have been administered nectar alone.This study indicated that shade-dried *C.*

papaya seeds are able to treat human intestinal parasites and there are no major critical adverse effects.

3.4.8. *C. papaya* and its effects on cancer and immune system

Few studies reported the anti-cancer and immune adjuvant property of leaf extract of *C. papaya*. The studies were done on tumor cell lines[26,27, 33]. A compound 'papain' found in Papaya which is considered to have activity against cancer growth. It also contains'lycopene' which gives free radical scavenging activity. Papaya contains another compound 'Isothiocyanate' which has strong action against lung, pancreas and prostate cancer. These compounds preventDNA re-arrangement process and healing of diseased cell.

3.4.9. *Antibacterial and wound healing effect of C. papaya*

A study on C. papaya demonstrated the antibacterial property of seed extract against *Streptococcus faecalis, Bacillus cereus, Escherichia coli, Proteus vulgaris, Staphylococcus aureus*, and *Shigella flexneri*[28]. This studyshowed that *C. papaya* has antibacterial effects whichcould be beneficial in treating skin ulcers. Another study showed antibacterial action of the papaya latex against *Agrobacterium* sp., *Bacillus subtilis*, *E. coli*, and *Rhizobium* sp[29].

3.4.10. *Antifertility activity*

A study by Poharkar*et al*. focused light on the impacts of *C. papaya*on grown-up and pregnant rodent which were administered different parts of the natural product[30]. The animals were allowed to take the papaya mixed-food normally and the resultsexhibited that the green papaya fruit interrupted with the estrous cycle and fetalexpulsion. This effectdisappeared when ripe fruit was given to the animals. Chloroform fraction of *C. papaya* seeds showedazoospermia in monkey. Moreover, papaya indicated the counter implantation and abortifacient action.

3.4.11. *Hepatoprotective effect*

Hepatotoxicity was induced by CCl_4 in rats by Sadeque*et al*. and they applied driednatural products of papaya which showed hepatoprotective action. This action supportedthe action of Vitamin-E[31]. The results indicated that*C. papaya* and Vitamin E showedexcellent hepato-protectiveaction against CCl_4-induced hepatotoxicity. However, *C. papaya* showedmore subtlealterations in alkaline phosphatase level than VitaminE. In another study, the ethanol and aqueousextracts of *C. papaya* exhibitedimpressive hepatoprotective activityagainst CCl_4 induced hepatotoxicity[32].

3.4.12. C. p*apaya male flower and its effects as Antioxidant*

The antioxidant functions of n-hexanefraction of male flower part was studied by Sianipar*et al*[34]. The antioxidant property was tested by using the α,α-diphenyl-β- picrylhydrazyl method.Phytochemical screening of the n-hexane partcontains triterpenoids and steroids.

3.4.14. *Antimicrobial activity of C. papaya*

A study investigated theof phytoconstituents and antimicrobial activities of various parts of C. papaya[35]. The antimicrobial activities were tested against the Gram-positive andGram-negative bacterial strains and growth by observing the zone of inhibition. The strains of Gram-positive bacteria were *S. aureus, B. cereus,* and *Micrococcus luteus*, and that od Gram-negative bacteria were *E. coli*, and *Klebsiella pneumoniae*. The fungus applied in the test were *Aspergillus niger, A.flavus, C.albicans,Candida tropicalis, Cryptococcus neoformans and Candida kefyr*.Sumathi[36] studied the *in vitro* antimicrobial action of of*C. papaya*against pathogens.Among the different parts of C. papaya, leaf extract showed greater antimicrobial action than stem and root. Cold water, hot water and ethanol were used as solvent to extract the phytochemicals from different parts of C. papaya.

3.4.15. *Activity of C. papaya* against HIV

Phytochemical screening and the evaluation of papaya extract against HIV-1 was done Rashed *et al*. (2013)[37].The methanol and water extract of*C. papaya* were used by applying the syncytia advancement test to find out activity of papaya against HIV-1. The resultindicated that *C. papaya* have limited action against HIV-1.

4. Use of *C. papaya* in Cosmetics

Papaya can be used in cosmetics for its skin-brightening, exfoliating, and moisturizing properties[35]. Some of these uses are – (i) **Face mask -** Mash papaya and mix with honey to create a face mask that can help remove tan and lighten skin, (ii) **Body scrub -** Blend papaya flesh with papaya seeds and olive oil to create a body scrub that exfoliates, (iii) **Facial -** Mash papaya with turmeric to create a facial that can give your skin a natural glow, (iv) **Hand soap -** Some hand soaps contain papaya to soften and cleanse hands.

Papaya is rich in vitamins and enzymes, including papain, which can help improve the health and appearance of the skin, for example – (i) **Exfoliation** - Papain removes dead skin cells and promotes cell renewal, (ii) **Skin tone -** Papaya can help reduce the appearance of blemishes, acne scars, and uneven skin tone, (iii) **Antioxidants**– Papaya's vitamin C content helps protect skin against free radicals, environmental pollutants, and UV damage, (iv) **Hydration**– Papaya's

vitamin E provides deep hydration and nourishment. But before using papaya for the skin or hair, a doctor or dermatologist should be consulted.

5. Conclusion

Fruits part of papaya plant is mainlyconsumed as the food component all over the globe for its food, nutritional, cosmetic and medicinal properties. Different parts of papaya plant such as leaves, seeds, roots, blossoms, ripe and unripe fruit juices show these properties.It's pharmacological activities indicate that it might be good pharmaceutical product if processed properly. Therefore, critical measure of work on the uses of its constituents, appropriate institutionalization, clinical trials are expected to explore the healing utility to fight diverse ailments by applying *C. papaya*.

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