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Effect of Nutritional, Medicinal and Pharmacological Properties of Papaya (*Carica papaya* Linn.) to Human Development: A Review

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ABSTRACT

From time immemorial fruits have always played a major role in Human nutrition, in addition to playing a crucial role in pharmaceutical/industrial production of consumable products. Papaya (*Carica papaya* Linn.) has been shown to have high value of medicinal properties, serving numerous treatments in traditional/herbal medication. Papaya has been found to contain phytochemicals, serving Antimicrobial, Anthelmintic, Antimalarial including Pharmacological purposes. Other part of Papaya like the seed including the skin have also been found to contain unique chemicals which aid in the development of human/animal nutrition, healthcare, industrial including pharmaceutical production.

***Keywords*:** *Carica papaya*, Human development, phytochemicals, pharmaceutical, fruit

1. INTRODUCTION

From the early Man (the primitive Man) to the modern times, fruit crops has always played a major role in Human nutrition, providing Humanity with end-less minerals/vitamins including electrolyte and water for proper functioning of the biological systems. Papaya is one

of the fruit crops utilized by Mankind for her development/advancement. Papaya belongs to the family **Caricaceae**, having four genera. The genus *Carica* Linn. has different species including: *C. cauliflora* Jacq., *C. pubescens* Lenne & K. Koch and *C. quercifolia* Benth. & Hook. f.ex Hieron. Papaya leaves, fruits, latex including its extract are used widely in Medical, Pharmaceutical, Herbal, Industrial and for Research purposes. Papain, a major chemical compound extracted from Papaya fruit and stem latex is used in brewing and wine making and in textile/tanning industries (Bruneton, 1999; Bhattacharjee, 2001).

A survey by Krishna *et al.* (2008) stated that Papaya contains phytochemicals including polysaccharides, vitamins, minerals, enzymes, proteins, alkaloids, glycosides, fats and oils, lectins, saponins, flavonoids, and sterols (Bruneton, 1999; Dictionary of Indian Raw Materials and Industrial Products, DIRMIP, 1992; Nadkarni, 1954), presenting Papaya as one of the important fruit crops enhancing Human development. This paper deals with the contribution of Papaya to Human development, presenting the crop; origin, distribution/morphology. Further stating the nutritional value and result findings on medicinal properties of Papaya.

Origin of Papaya (*Carica papaya* Linn.), its Distribution and Morphology

Photo 1. Papaya fruit tree

Photo 2. Dried Papaya seeds

Photo 3. Fresh Papaya seeds

The origin of Papaya can be traced back probably to Southern Mexico and Costa Rica (Krishna et al., 2008). The fruit crop was introduced as a plantation crop in Australia, Hawaii, Philippines, Sri Lanka, South Africa, India and to all tropical and subtropical regions including Nigeria where the crop is been grown today. The crop can be grown as a plantation crop or grown in small farms and in home garden. The crop exhibit polygamous attitude (possessing male, female or a times hermaphrodite). Papaya is a tree that grows up to 3-10m in height, the crop stem is marked by scars where leaves have fallen off, surmounted by a terminal panache of leaves on petioles and with 5-7 lobes. The crop has a short thick rachis, with its fruit elongated to globose with a large central cavity. The seeds are black in colour, tuberculous and enclosed in a transparent aril structure. Papain; a protein ferment has been reported to be present in leaves and unripe fruit (Bruneton, 1999; Bhattacharjee, 2001, DIRMIP, 1992).

Photo 4. Papaya extract

Contribution of Papaya (*Carica papaya* Linn.) to Human Nutritional Development

Consumption of Papaya fruit is of high nutritive value to Human nutrition. The fruit crop has low calories of (32 kcal/100 g of ripe fruit) and rich in vitamins and minerals. Papaya is the leading fruit crops in Vitamin C, Vitamin A, Riboflavin, Folate, Calcium, Thiamine, Iron, Niacin, Potassium and Fibre.

High carotene content has been identified in Papaya compared to such fruit as apples, guavas, sitaphal and plantains. Unripe Papaya can be used as vegetable, it is also used in pies, sherbet and salads preparation.

Photo 5. Unripe Papaya fruit

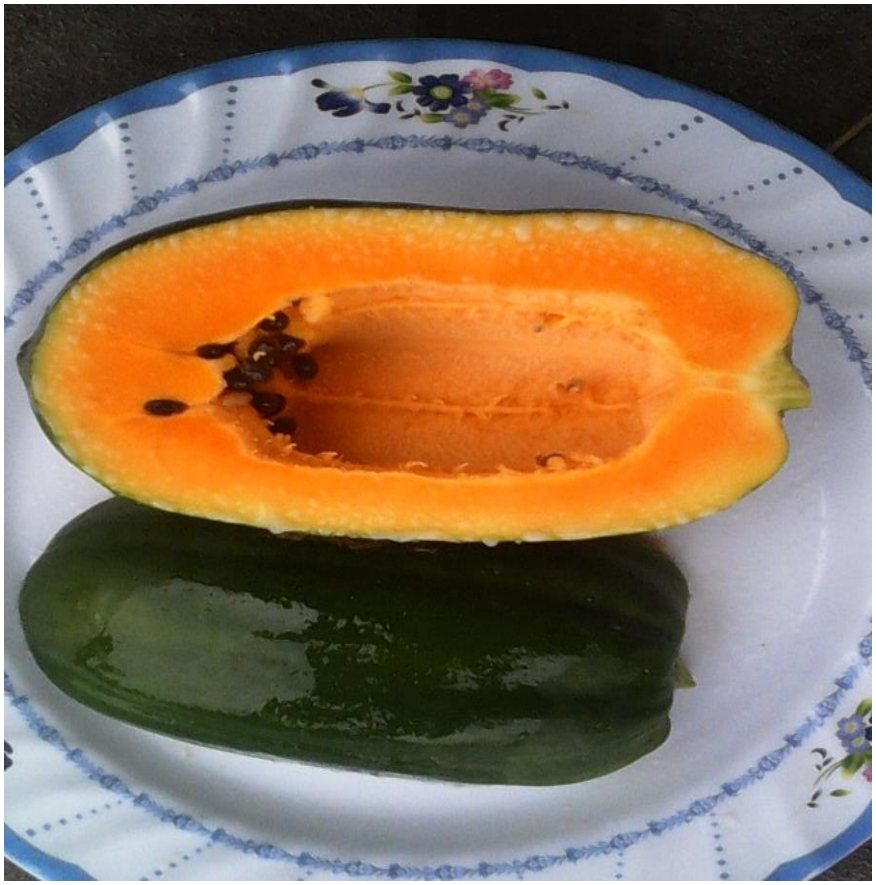

Photo 6. Posterior view of mature Papaya fruit

Photo 7. Inner view of mature Papaya fruit

Papaya ability to supply the body with Vitamin A and C makes it a good fruit for improvement of eyesight. The fruit is rich in different types of enzymes. The Papain, a vegetable pepsin, present in the unripe fruit aids in digestion, which helps in the digestion of proteineous materials in food, both in acidic, alkalinic or neutral medium. Papaya possesses the ability to tenderize meat, making meat easily digestible (DIRMIP, 1992; Mendows and Herald, 1995). Fermented Papaya fruit acts as an antioxidant; it also helps improve the antioxidant defense in elderly patients. Papaya lipase, an hydrolase enzyme bonded to the water insoluble fraction of the crude papain serves as a "naturally immobilized biocatalyst" (de Maria *et al*., 2006).

Photo 8. Dried Papaya fruit skin

Photo 9. Fresh Papaya fruit skin

Photo 10. Papaya fruit and seeds

Dried Papaya fruit skin serves as a dietary ingredient for poultry feed. Findings of Kamaruzzaman *et al*. (2005) presents that dried Papaya fruit gives similar food consumption, food conversion efficiency, survivability and meat yields to a control diet when used up to 120g/kg of diet. A survey by Fouzder *et al*. (1999) presented that Papaya skin could be safely use to a tune of 90 g/kg in diet of growing pullets.

Papaya seed has been reported by Lans *et al*. (2000) been used in enthno-veterinary practices. Papaya has been found to have the ability to increase iron (Fe) absorption in human biological system, this view was confirmed by Ballot *et al*. (1987), where they used absorption of Fe from rice meal, which was measured in Parous Indian women using the erythrocyte utilization of radioactive Fe method. Findings of Savickiene *et al*. (2002) further presented Papaya to contain minerals, proteins, polysaccharides, lectins, saponins and

flavonoids. Which can be helpful in the prevention of complications of diabetes mellitus. Papaya black seeds are edible and have sharp and spicy taste.

Medicinal/Pharmacological Contribution of Papaya (*Carica papaya* Linn.) to Humanity

Over the years fruits have always played a key role in biological systems, providing basic nutrients required for a healthy living. Many biologically active phytochemicals has been identified in Papaya. Chitinase, an antifungal phytochemical have been isolated from Papaya fruit. Dried latex of the fruit has shown immunological properties (Buttle and Barrett, 1984). The anthelmintic behavior of Papaya seed is attributed to Carpaine (alkaloid) and Carpasemine identified as Benzylthiourea and Benzylisothiocyanate (Kermanshai *et al*., 2001). An investigation by Stepek *et al*. (2005) reported that Papaya fruit contains cysteine proteinases, presenting Papaya fruit as an important tool for medicinal/pharmacological utilization. Papaya fruit, seed and leaves has been reported by Kirtikar and Basu (1998) to contain Carpaine, an alkaloid with bitter taste which has a strong depressant action on the heart.

Reports by DIRMIP (1992); Kirtikar and Basu (1998) and Vaidya Sala (2005) present Papaya as having the potentials of pharmacological actions, in addition to serving medicinal purposes. Over the years, various report on the therapeutic properties/pharmacological actions of Papaya have been stressed. Modern-day scientific research have proved Papaya having:

Antimicrobial Ability

Seed of Papaya has been found to have the ability to act as an antimicrobial agent, a report by Calzada *et al*. (2007) stated Papaya seeds having an antimicrobial ability against *Trichomonas vaginalis* trophozoites. Seeds of Papaya has been shown to have bacteriostatic ability against enteropathogens such as *Bacillus subtilis, Escherichia coli* including *Salmonella typhi*, this view was confirmed by Osato *et al*. (1993) using agar cup plat method.

Anthelmintic Ability of Papaya

Air dried Papaya seed has been used in herbal homes for treatment of intestinal parasites. Consumption of Papaya seeds has been reported by Okeniyi *et al*. (2007) to offer cheap, natural, harmless, readily available monotherapy and prevention strategy against intestinal parasitosis.

The latex of Papaya has been reported by Satrija *et al*. (1995) having anthelmintic efficacy against *Heligmosomoides polygyrus* in experimentally infected mice, pointing to the fact that Papaya has a potential characteristics acting as an anthelmintic agent against intestinal nematodes. Latex of Papaya also has anthelmintic potential against *Ascaris suum* in pigs, it has been further found to be 100% effective at 8g/kg of body weight as reported by Satrija *et al*. (1994). Investigation of Hounzangbe-Adote *et al*. (2005) revealed Papaya having the ability to act against egg, infective larvae and adult worms of *Trichostrongylus colubriformis.*

Antimalarial Ability of Papaya

Papaya fruit exhibit antimalarial activity. This can be observed in petroleum ether extract of the rind of Papaya fruit.

Several contribution of Papaya to human development has been recognized. Papaya has been known to have antifungal properties, this as observable in the latex of Papaya and Fluconazole, having synergistic action on the inhibition of *Candida albicans* growth. This synergistic effect results in partial cell wall degradation indicated by transmission election microscopy observations as reported by Giordani *et al*. (1997).

Ethanol extract from Papaya seed at 0.1 – 6.4 mg/ml showed concentration dependent inhibition of jejunal concentrations. The seeds extract of Papaya is capable of weakening the contractile capability of isolated rabbit jejunum as confirmed in the findings of Adebivi and Adaikan (2005). In recent years Papaya has shown ability to be used in an end-less manner, ranging from topical use, to where the fermented fruit parathion is been used, showing ability to modulate oxidative DNA damage due to H_2O_2 in rats pheochromocytoma cells and protection of brain oxidation damage in hypertensive rats, as revealed in a study by Aruoma *et al*. (1998).

2. CONCLUSION

From the various literature studied, it could be concluded that Papaya possesses unique compounds, which aids pharmacological improvement/development in human and animals. Apart from serving as food, Papaya has been found to possess nutritional including medicinal properties, hence consumption/utilization of Papaya is therefore encourage, as the fruit crop stands to supply unique compounds which aids Mankind development/advancement.

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