



INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY RESEARCH AND STUDIES

ISSN: 2640 7272

Volume:04, Issue:12, 2021

PLATELET REGENERATION WHILE EATING PAPAYA

PROF. ANIR BHATT¹; PROF RAVISH SHAH¹

¹ Faculty at department of pharmaceutics in university of Dhaka Bangladesh.

ARTICLE INFO

ABSTRACT

Corresponding Author:

PROF. ANIR BHATT¹

¹Faculty at department of pharmaceutics in university of Dhaka Bangladesh

The different corridor of the Papaya (*Carica papaya* Linn.) belonging to the family Caricaceae similar as leaves, seeds, latex, and fruit retain excellent medicinal parcels for the treatment of different affections. The stem, splint, and fruit of papaya contain plenitude of latex. The latex from callow fruit contains the enzyme papain, other factors include admixture of cysteine end peptidases, chitinases, and an asset of serine protease, alkaloids, glycosides, flavanoids, saponins, tannins, phenols, and steroids. This evaluation focuses on the nutritive merit, phyto-chemical component, tocopherol and free comprehensive scavenging exertion, medicaments for dengue fever, and anticancer exertion of paw-paw. Papaya acts as an amulti-faceted factory. It's also essential to identify the medium of the factory composites and study the active principle of the excerpt. It's proposed to involve the paw-paw in our diet as fruit mixed greens, fruit sap, splint excerpt, a decoction prepared through paw-paw leaves, etc.⁽³¹⁾

KEYWORDS

Carica Papaya Linn; Benefits; Tocopherol (antioxidents; Regeneration; Blood Platele; and Free Comprehensive (radical)Scavenging;

ABSTRACT

C. papaya is a multi-featurefoundary primarily native to southern Mexico and Central America and now cultured in countless equatorial countries. Papaya is appertained to as the fruit of the angels. Occasionally known as a tree melon or pawpaw, papaya is known not just for its rich sweet relish, but also for its use as a meat tenderizer. Fruit is sweet and succulent with satiny thickness. Slice open a papaya and see hundreds of candescent black seeds that all need to get there start in life from the nutrition plant in the fruit. This implies that fruit must be power packed. Originally green and kindly bitter in taste, papayas are adulation-unheroic when completely grew and shaped like a pear. Their pale-orange meat has dozens of small, black, gelitonus seeds at the center, analogous to a melon. Callow papaya is used in some areas of the world as a vegetable cover, but isn't recommended as a food when green, unless cooked. Approved ways to eat papaya include its sap, which is occasionally added to other natural fruit authorities because of its pleasing taste, but it's also awful in salads, salsa, and, of course, all by itself. Papaya is veritably low in Saturated Fat, Cholesterol and Sodium. It's a good source of salutary fiber and potassium, and a veritably good source of Vitamin A, Vitamin C and folate. Vitamin C is one of the strong points of papaya, furnishing a whopping 144 of the diurnal recommended value per serving, which is great as an infection fighter as well as a free revolutionary-scavenging antioxidant.⁽³¹⁾ Papaya provides 13 of the diurnal recommended value in folate, and good quantities of fiber and potassium, a cell and body fluid element that helps control heart rate and blood-pressure. The B vitamins in papayas similar as folic acid, pyridoxine (vitamin B6), riboflavin, and thiamin (vitamin B1) are called" essential"because they are needed by the body, but not produced within, so they're needed through the diet to give what's to be metabolized. Therefore, including foods like papaya in your diet is important. Papaya is a natural remedy for numerous affections, including atherosclerosis, heart complaint, and rheumatoid arthritis, and helps keep digestive and vulnerable systems healthy. Papaya also contains the flavonoid beta carotene, which studies have proven to help cover against lung and mouth cancers. Other flavonoids, videlicet lutein, zeaxanthin and cryptoxanthins, have potent antioxidant parcels against free revolutionaries that can wear down your body and beget unseasonable aging and degenerative conditions. Papaya contains 212 amino acids and several enzymes, including papain, a proteolytic enzyme that has ananti-inflammatory effect on the guts, including swelling and fever that can develop post-surgery. Juice of papaya seeds plays an essential part to cover order from getting dysfunctional because seeds contain flavonoids and phenolic, which provides forestallment from origins of similar conditions. Besides this

papaya seeds can also cover from number of infections and could also be used to clean Bowel insects. Its seeds can be used with milk to avoid typhoid complaint and it can also cure from hemorrhoids- kind conditions and dengue fever. Papain helps proteins digest briskly, which discourages acid influx, and has demonstrated effectiveness in treating ulcers and indeed relieving perverse bowel pattern. Papaya seeds have been used in folk drug to treat sponger and ringworm infections. Papaya is an effective anti-cancer agent against cervix, bone, liver, lung and pancreas cancers. Studies were carried out by using a tea made from the excerpts of dried papaya leaves and put them in dishes which contain cancerous cells and plant that the papaya splint excerpt boosted the product chemicals that regulate the vulnerable system.⁽³¹⁾

CARICA PAPAYA DISTRIBUTION

Papaya (*Carica papaya*L.) belongs to the dilleniid dicot family comprising 31 species in four rubrics of which three rubrics are from America (*Carica*, *Jacaritia* and *Jarilla*) and one from. tropical Africa (*Cylicomorpha*). It's an economically important fruit crop in Hawaii, Australia, India, Srilanka, Phiilipines and South-east Asia including Thailand. It's also referred to as pa, pawpaw, papayer (French), melonenbaum (German), lechosa (Spanish).⁽¹⁾⁽³¹⁾

The origin of papaya is tropical America. Its seeds were distributed from the Caribbean to Malacca and India by trippers and botanists within the eighteenth century. Its issuance was continued throughout Asia and Pacific. Papaya is grown all told tropical countries and diverse tropical countries between 32 ° North and South authorizations but the high marketable product is plant between 23 ° North and South authorizations.⁽¹⁾⁽³¹⁾

Biology of papaya:The rubric *Carica* is from the Latin for a sort of fig which the leaves and fruits of papaya act and therefore the specific epithet papaya presumably comes from the common name for the fruit.⁽²⁾ it is a dicotyledonous, polygamous (having manly, womanish or hermaphrodite flowers on the identical factory), diploid species with atiny low genome of 372 Mbp/ 1C⁽³⁾ and nine dyads of chromosomes.⁽⁴⁾⁽³¹⁾

CHEMICAL CONSTITUENTS OF PAPAYA

Papaya may be a precious factory of medicinal value. Leaves, fruit, seeds, root, dinghy and latex of the papaya are used as ethno drug (Table.1).⁽³¹⁾

Table 1: Chemical composition of various parts of papaya plant.^[5,6,7,8]

S.No	Part of the Plant	Constituents
1	Fruit	Protein, fat, fibre, carbohydrates, minerals, calcium, phosphorus, iron, vitamin C, thiamine, riboflavin, niacin, and caroxene, amino acid, citric acids and molic acid (green fruits), volatile compounds : linalol, benzylisothiocynate, cis and trans 2, 6-dimethyl-3,6 epoxy-7 octen-2-ol. Alkaloid, α; carpaine, benzyl-β-d glucoside, 2-phenylethyl-β-D-glucoside, 4-hydroxyl-phenyl-2 ethyl-B-D glucoside and four isomeric malonated benzyl-β-D glucosides
2	Juice	N-butyric, n-hexanoic and n-octanoic acids, lipids; myristic, palmitic, stearic, linoleic, linolenic acids-vaccenic acid and oleic acids
3	Seed	Fatty acids, crude proteins, crude fibre, papaya oil, carpaine, benzylisothiocynate, benzylglucosinolate, glucotropacolin, benzylthiourea, hentriacontane, β-sitosterol, caricin and an enzyme nyrosin
4	Root	Arposide and an enzyme myrosin
5	Leaves	Alkaloids carpain, pseudocarpain and dehydrocarpaine I and II, choline, carposide, vitamin C and E
6	Bark	β-sitosterol, glucose, fructose, sucrose, galactose and xylitol
7	Latex	proteolytic enzymes, papain and chemopapain, glutamine cyclotransferase, chymopapain A, B and C, peptidase A and B and lysozymes

NUTRITIONAL VALUE OF PAPAYA

Papaya is human’s fruit with a high nutritional value available at an inexpensive price. It is rich in natural vitamins, minerals and low spicy value. The low calories content (32 Kcal/ 100 g of ripe fruit) makes a favorite fruit of fat those that are into weight reducing governance. Papaya has low carotene which helps to assist damage by free revolutionaries compared to other fruits but all other nutrients are present. The fruit is rich source of various varieties of enzymes. Papain present in good quantum in callow fruit is a wonderful aid to digestion, which helps to break down the protein in food at acid, alkaline and neutral medium. The celiac complaint cases, who cannot digest the wheat protein gliandin, can tolerate it, if it’s treated with crude papain. Papaya has the property of tenderizing meat. This data is being put to use by cooking meat with raw papaya to create it tender and digestible^(9,10). The fermented papaya fruit may be a promising nutraceutical as an antioxidant. It improves the antioxidant defence in senior cases indeed with none overt antioxidant insufficiency state at the cure of 9 g/ day orally. The papaya lipase, a hydrolase enzyme tightly clicked to the water undoable little bit of crude papain, is taken into account as a “naturally paralyzed” biocatalyst¹⁰. Papaya markedly increases iron (Fe) immersion from rice mess, which was measured in parous. Indian women, using the erythrocyte application of radioactive Fe system. The black seeds comestible and have a pointy, racy taste. They’re occasionally base up and used as a canopy for black pepper. In some corridor of Asia, the youthful leaves of papaya are fumed and eaten like spinach.⁽¹¹⁾⁽³¹⁾

Table.2: Nutritive value of 100 gm of raw papaya.

Nutrient		Value per 100 g	References
Proximates	Water	88.06 g	12,13,14,15,16,17
	Energy	43 kcal	
	Energy	179 kJ	
	Protein	0.47 g	12,13
	Total lipid (fat)	0.26 g	12,13
	Ash	0.39 g	12,13
	Carbohydrate, by difference	10.82 g	
	Fiber, total dietary	1.7 g	12,13,14,15
	Carbohydrates	Sugars, total	7.82 g
	Sucrose	0	13
	Glucose(dextrose)	4.09 g	13
	Fructose	3.73 g	13
	Lactose	0	13
	Maltose	0	13
	Galactose	0	13
	Starch	0	13
Minerals	Calcium, Ca	20 mg	12,13,16,18
	Iron, Fe	0.25 mg	12,13,16,18

	Magnesium, Mg	21 mg	12,13,16,18
	Phosphorus, P	10 mg	12,13,16,18
	Potassium, K	182 mg	12,13,16,18
	Sodium, Na	8 mg	12,13,16,18
	Zinc, Zn	0.08 mg	12,13,16,18
	Copper, Cu	0.045 mg	12,13,16,18
	Manganese, Mn	0.04 mg	12,13,16,18
	Selenium, Se	0.6 µg	
Vitamins	Vitamin C, total ascorbic acid	60.9 mg	12,13,16,19
	Thiamin	0.023 mg	12,13
	Riboflavin	0.027 mg	12,13
	Niacin	0.357 mg	12,13
	Pantothenic acid	0.191 mg	12,13
	Vitamin B-6	0.038 mg	12,13
	Folate, total	37 µg	12,13
	Folic acid	0	
	Folate, food	37 µg	
	Folate, DFE	37 µg	
	Choline, total	6.1 mg	
	Vitamin B-12	0	
	Vitamin B-12, added	0	
	Vitamin A, RAE	47 µg	12,13,16,20,10
	Retinol	0	
	Carotene, beta	274 µg	12,13,16,20,10
	Carotene, alpha	2 µg	13,16,10
	Cryptoxanthin, beta	589 µg	12,13,16,20,10
	Vitamin A, IU	950 IU	12,13,16,20,10
	Lycopene	1828 µg	13,16,17
	Lutein + zeaxanthin	89 µg	13,16,10,21
	Vitamin E (alpha-tocopherol)	0.3 mg	13,11
	Tocopherol, beta	0.02 mg	13,11
	Tocopherol, gamma	0.09 mg	13,11
	Tocopherol, delta	0.01 mg	13,11
	Vitamin D (D2 + D3)	0	
	Vitamin D	0	
	Vitamin K (phyloquinone)	2.6 µg	
Other	Alcohol, ethyl	0	
	Caffeine	0	
	Theobromine	0	
Flavones	Apigenin	0	19
	Luteolin	0	19
Flavonols	Kaempferol	0	
	Myricetin	0	19,17
	Quercetin	0	19,17
Isoflavones	Daidzein	0	22
	Genistein	0	22
	Total isoflavones	0	22

ANTIOXIDANTS AND FREE RADICAL SCAVENGING ACTIVITY

The leaves, seeds and juice of papaya show free revolutionary scavenging and antioxidant exertion. The antioxidant exertion of colorful fragments (ethanol, petroleum ether, ester, n-butanol and waterless excerpt) from seeds of C.papaya showed that ester and n-butanol fragments demonstrated antioxidant and radical scavenging exertion than other fragments.⁽²³⁾ juice is an efficient scavenger of largely reactive hydroxyl revolutionaries (OH)⁽²⁴⁾, which significantly dropped the lipid per oxidation situations and increased the antioxidant exertion in rats.⁽²⁵⁾ The splint excerpt of papaya

substantiated significant antioxidant and radical scavenging eventuality.⁽²⁶⁾ The per oxidase is present within the callow fruit of papaya but it gradationally dropped after fruit growing.⁽²⁷⁾ Whereas, the mush of papaya is rich in benzyl glucosinolate within the unseasonable stage, which is present within the seed after fruit growing.⁽²⁸⁾ The benzyl glucosinolate is hydrolyzed to benzyl isothiocyanate (BITC). The seed excerpt of papaya demonstrated rich source of BITC.⁽²⁹⁾⁽³¹⁾

The major groups of phytochemicals that are suggested as a natural source of antioxidants may contribute to the overall antioxidant exertion of factory accoutrements including polyphenols, carotenoid and traditional antioxidant vitamins similar as water-soluble vitamin and E. Antioxidant is any substance that when present at low attention compared to those of an oxidisable substrate significantly detainments or prevents oxidation of that substrate.⁽³⁰⁾ Antioxidant functions are related to dropped DNA damage, lowered lipid peroxidation, maintained vulnerable function and inhibited nasty metamorphosis of cells.⁽³¹⁾ Several studies showed that phenolic composites are the most important bioactive phytochemicals with mortal health benefits.⁽³²⁾ In fact, numerous authors have reported an immediate relationship between total phenolic content and antioxidant exertion in multitudinous seeds, fruits and vegetables.⁽³⁰⁾⁽³¹⁾

The excerpt with the littlest β-carotene declination rate parade the loftiest antioxidant exertion. All excerpts had lower antioxidant conditioning than had standard (α-tocopherol). The loftiest antioxidant exertion among the samples was observed in callow fruit whereas seed had the littlest antioxidant exertion. Result showed that there was vastly variation within the antioxidant conditioning where it ranges from the tiniest of 58 to the loftiest of 91 where the orders of the antioxidant exertion are as follow α-tocopherol > callow fruit > youthful leaves > ripe fruit > seed (Table.3)⁽³¹⁾

Table 3: Antioxidant activity, DPPH radical scavenging activity, total phenolic content and total flavanoid content⁽⁴³⁾

Papaya plant material	Antioxidant activity (%)	EC ₅₀ (mg/ml)		
		DPPH radical scavenging activity	Total Phenolic content	Total Flavanoid content
Ripe	88.12	6.5 ± 0.01	272.66 ± 1.53	92.95 ± 7.12
Unripe	90.67	4.3 ± 0.01	339.91 ± 9.40	53.44 ± 6.63
Seed	58.97	1.0 ± 0.08	30.32 ± 6.90	59.54 ± 12.23
Leaves	90.01	7.8 ± 0.06	424.89 ± 0.22	333.14 ± 1.02
Standard	96.73			

PAPAYA AGAINST DENGUE FOR PLATELET COUNT

Papaya leaves were collected and completely washed with water. The leaves were grinded and as the taste of papaya leaves excerpt was veritably bitter, some quantum of sucrose was added. for easy administration. About 25 mL of leaves excerpt was conducted orally, doubly daily for five successive days. Before

excerpt administration, the patient blood was estimated for integral platelets counts, after 24 hours each time. After excerpt administration the patient blood was revised for platelets counts again for five successive days. After which the patient starts enhancement. Before administration of leaves excerpts, the patient blood test has been taken. From the tests results it was observed that PLT, WBC and NEUT dropped from normal Position. After the infection the case incontinently felt fatigue and fever, these symptoms exacerbated over the night. Different antibiotics and anti-malarial medicines were regulatory orally and intravenously, but no successful results. This case report shows the exertion of papaya leaves excerpt against Dengue fever. The papaya leaves excerpt in water was given to the case doubly daily. The case started puking as eating, so croakers recommended fruits and fruit authorities. 25 mL of excerpt was given to the case in the morning and evening. After two successive days the blood samples were checked for different parameters. In the first blood report, it was noticed that the PLT count, WBC and NEUT increased to 73 X10³/ μL, 3.8 X10³ / μL and 56.0, independently. With analogous cure of excerpts, on the coming day the blood report indicated that the PLT count reached to 120 X10³ / μL while WBC and NEUT reach to 4.4 X10³ / μL and 64.2. independently. On the third day, it was noticed that PLT count (137 X10³/ μL), WBC (5.3 X10³ / μL and NEUT (71.1) increased. In the fourth blood report (PLT 159 X10³ / μL, WBC .5.9 X10³ / μL and NEUT 73.0) and fifth report (PLT 168 X10³ / μL, WBC 7.7 X10³ / μL and NEUT 78.3) the PLT, WBC and NEUT reached their normal situations. The Dengue fever reprises every time and causes several deaths. The arise of PLT count in the present case from 55X10³ / μL to 168X10³ / μL indicates the exertion of papaya leaves excerpt. Still, this is a primary work and further workshop on segregating the active composites from this precious species are demanded which may help in control of similar contagious conditions.⁽²⁹⁾⁽³¹⁾

CONCLUSION

C. papaya is a multi-faceted factory firstly native to southern Mexico and now cultivated in numerous tropical countries. Fruit is sweet and succulent with satiny thickness. Slice open a papaya and see hundreds of candescent black seeds that all need to get there start in life from the nutrition plant in the fruit. This inferred that fruit must be power packed. Papaya is appertained to as the fruit of the angels. It's also imperative to identify the medium of the factory composites and studying the active principle of the excerpt. The papaya factory has been touted by traditional hearlers for counties as source of important drug. Papaya possesses rich derivation of phytochemicals which includes vitamins, antioxidants, flavanoids, polyphenols, various minerals and having some important enzyme like papain, lycopene, Isothiocyanate and some proteolytic enzyme which help to treat health problems and hence, regular input of papaya will ameliorate our health by quenching the free revolutionaries generated in the body and

enhance our vulnerable system to fight against the foreign pathogens. Papaya promotes vulnerable system. It's a potent cancer fighter that's largely effective against hormone related to cancer as well as other cancers. Papaya can stop the growth of cancer cell pull-up metastasis and regularized cell cycle. Therefore, input of papaya as fruit salads, fruit juice, splint excerpt decoction prepared through papaya leaves, etc. shall be a part of our diet.

REFERENCES:

1. Nakasone HY, Paull RE. Tropical Fruits. CAB International, Wallingford, England, 1998;445.
2. Du Puy DJ, Telford IRH. Caricaceae. Chapter 30: In Flora of Australia, Oceanic Islands 2. Australian Government Publishing Service, Canberra, Australia, 1993; 50: 163-164.
3. Arumuganathan K, Earle ED. Nuclear DNA content of some important plant species. *Plant Mol. Biol. Rep.*, 1991; 9(3): 208-218.
4. Bennett MD, Leitch IJ. Nuclear DNA Amounts in Angiosperms: Progress, Problems and Prospects. *Ann Bot*, 2005; 95(1): 45-90.
5. Bruneton J. *Carica papaya*, In: Pharmacognosy, phytochemistry of medicinal plants, Tech Docu Fra, 1999; 2: 221-223.
6. The Wealth of India-A dictionary Indian raw materials and industrial products: Raw material series, Ca-Ci, publications and information directorate, CSIR, 1992; 3: 276-293.
7. Nadkarni KM. Indian material medica, Pop Pra Pvt Ltd, Bombay, 1954; 1: 273-277.
8. Vijay Y, Pradeep KG, Chetan CS, Anju G, Bhupendra V. *Carica papaya* Linn: An Overview. *Int. j. herb. Med.*, 2014; 2(5): 1-08.
9. Philip T, Chen TS. Quantitative analyses of major carotenoid fatty acid esters in fruits by liquid chromatography: Persimmon and Papaya. *J. Food Science*, 1988; 53(6): 1720-1722.
10. National Institutes of Health (NIH) Carotenoid analyses of U.S. foods, Food Composition Laboratory, 1997.
11. Franke AA, Suzanne M, Lacey R, Custer LJ. Tocopherol and tocotrienol levels of foods consumed in Hawaii, *J Agric Food Chem*, 2007; 55(3): 769-778.
12. Produce Marketing Association (PMA). Nutrient Content of Papaya, 1984.
13. Nutrient Data Laboratory, ARS, USDA National Food and Nutrient Analysis Program Wave 12i, 2008 Beltsville MD.
14. Vollendorf N, Marlett J. Comparison of Two Methods of Fiber Analysis of 58 Foods. *J. Food Comp. Anal.*, 1993; 6(3): 203-214.
15. Mahattanatawee K, Manthey JA, Luzio G, Talcott ST, Goodner K, Baldwin EA. Total antioxidant activity and fiber content of select Florida-grown tropical fruits, *J Agric Food Chem*, 2006; 54(19): 7355-7363.
16. Wall MM. Ascorbic acid, vitamin A, & mineral composition of banana & papaya cultivars grown in Hawaii. *J. Food Comp. Anal.*, 2006; 19(5): 434-445.
17. Lako J, Trenerry VC, Wahlqvist M, Wattanapenpaiboon N, Sotheeswaran S, Premier R. Phytochemical flavonols, carotenoids and the antioxidant properties of a wide selection of Fijian fruit, vegetables and other readily available foods. *Food Chemistry*, 2007; 101: 1727-1741.
18. Miller-Ihli NJ. Atomic absorption and atomic emission spectrometry for the determination of the trace element content of selected fruits consumed in the United States. *J. Food Comp. Anal.*, 1996; 9(4): 301-311.
19. Franke AA, Custer LJ, Arakaki C, Murphy SP. Vitamin C and flavonoid levels of fruits and vegetables consumed in Hawaii. *J. Food Comp. Anal.*, 2004; 17: 1-35.
20. Philip T, Chen TS. Development of a method for the quantitative estimation of provitamin A carotenoids in some fruits. *J. Food Sci.*, 1988; 53(9): 1703-1707.
21. Humphries JM, Khachik F. Distribution of lutein, zeaxanthin, & related geometrical isomers in fruit, vegetables, wheat, & pasta products. *J Agric Food Chem*, 2003; 51(3): 1322-1327.
22. Horn-Ross PL, Barnes S, Lee M, Coward L, Mandel E, Koo J, John EM, Smith M. Assessing phytoestrogen exposure in epidemiologic studies: development of a database (United States)., *Cancer Causes Control*, 2000; 11(4): 289-98.

23. Zhou K, Wang H, Mei W, Li X, Luo Y, Dai H. Antioxidant activity of papaya seed extracts. *Molecules*, 2011; 6(8): 6179-6192.
24. Webman EJ, Edlin G, Mower HF. Free radical scavenging activity of papaya juice. *Int J Radiat Biol*, 1989; 55(3): 347-351.
25. Mehdipour S, Yasa N, Dehghan G, Khorasani R, Mohammadirad A, Rahimi R, Abdollahi M. Antioxidant potentials of Iranian *Carica papaya* juice in vitro and in vivo are comparable to alpha-tocopherol. *Phytother Res*, 2006; 20(7): 591-594.
26. Okoko T, Ere D. Reduction of hydrogen peroxide-induced erythrocyte damage by *Carica papaya* leaf extract. *Asian Pac J Trop Biomed*, 2012; 2(6): 449-453.
27. Pandey VP, Singh S, Singh R, Dwivedi UN. Purification and characterization of peroxidase from papaya (*Carica papaya*) fruit. *Appl Biochem Biotechnol*, 2012; 167(2): 367-376.
28. Li ZY, Wang Y, Shen WT, Zhou P. Content determination of benzyl glucosinolate and anti-cancer activity of its hydrolysis product in *Carica papaya* L. *Asian Pac J Trop Med*, 2012; 5(3): 231-233.
29. Nakamura Y, Yoshimoto M, Murata Y, Shimoishi Y, Asai Y, Park EY, Sato K, Nakamura Y. Papaya seed represents a rich source of biologically active isothiocyanate. *J Agric Food Chem*, 2007; 55(11): 4407-4413.
30. Halliwell B, Aeschbach R, Löliger J, Aruoma OI. The characterization of antioxidants. *Food Chem Toxicol*, 1995; 33(7): 601-617.

31. Source

https://www.researchgate.net/publication/319048781_NUTRITIONAL_AND_MEDICINAL_VALUE_OF_PAPAYA_CARICA_PAPAYA_LINN

