



E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(4): 629-633
Received: 10-05-2020
Accepted: 12-06-2020

S Gadge
PR Patil Institute of Pharmacy,
Talegaon (SP), Wardha,
Maharashtra, India

M Game
Vidyabharati College of
Pharmacy, Amravati,
Maharashtra, India

V Salode
PR Patil Institute of Pharmacy,
Talegaon (SP), Wardha,
Maharashtra, India

Marvelous plant *Carica papaya* Linn: A herbal therapeutic option

S Gadge, M Game and V Salode

DOI: <https://doi.org/10.22271/phyto.2020.v9.i4i.11771>

Abstract

Carica papaya belonging to the family Caricaceae is an effective medicinal plant and is used in the treatment of various diseases throughout the world. There are several Indian and International synonyms of *Carica papaya* in different language and region. Not only the fruit, but each part of the papaya plant is also used for medicinal purpose. The papaya plant has great nutritional value and energy and contains almost no cholesterol which is the best remedy for weight management. The plant contains many chemical constituents such as vitamin A, B, C, proteolytic enzymes papain, carpaine, chymopapain, antioxidants which have various pharmacological properties like antimicrobial, antifungal, anti-inflammatory, antihypertensive, antifertility, antisickling, antimalarial, anticancer, antiobesity activity. The juice of papaya leaves is the best option for increasing the platelet count. The seeds are used to inhibit pancreatic lipase in obesity. The papaya plant also has many cosmetic uses in the skin and hair treatment.

Keywords: *Carica papaya*, proteolytic enzymes, nutritional value, Pharmacological properties, antimalarial activity, antiobesity activity

Introduction

India is covered by tropic and sub-tropic regions that become the main source of aromatic and medicinal plants (AMPs) biodiversity which foundation for traditional medicine and the plant Papaya, belonging to the family, Caricaceae, scientifically it is known as *Carica Papaya*. *Carica papaya* is commonly known as papaya in English ^[1], Papita in Hindi and Erandarkarkati in Sanskrit. There is a rapidly growing response to the use of medicinal plants by the Indian population. WHO estimates that in many countries 80% of the rural patients seek alternative treatment using medicinally.

In Asian countries, peoples cook green fruits, leaves, young shoots and flowers of the papaya as vegetables and grind dried papaya seeds are used as pepper. Though it is mainly (more than 90%) used for nourishment purpose in developing and developed countries, it also contains numerous medicinal properties ^[2, 3]. Papaya is fresh, palm-like, a soft-stemmed green tree which is succulent, diploid, polygamous and dicotyledonous species, popularly known as Pawpaw. As it has buttery taste and appearance, it was considered as an exotic fruit in ancient time ^[4].

It is originated from Southern Mexico, Central America, and the northern part of South America. It is now cultivated in many tropical countries such as Bangladesh, Malaysia, Indonesia, Sri Lanka, the Philippines, and the West Indies including India. India is included as the top 5 papaya exporting countries ^[5, 6]. The papaya fruit is consumed either in its fresh form or the form of juices, jams and crystallized dry fruit. The ripe fruit is claimed to be an upscale source of vitamin A, C, and calcium. There are many commercial products derived from the various parts of the *Carica papaya* plant, the most prominent being papain and chymopapain, that is useful in tenderizing meat and for treatment of indigestion which is produced from the latex of the young fruit, stem, and the leaves. Papaya is considered to be the powerhouse of the nutrients and it is available in every part of the region throughout the year. Papaya is rich in Vitamin C, A and D, which are considered to be the powerful antioxidant. There is almost no fat in papaya ^[7].

Corresponding Author:
S Gadge
PR Patil Institute of Pharmacy,
Talegaon (SP), Wardha,
Maharashtra, India

Scientific Classification of Papaya

Kingdom	Plantae
Subkingdom	Trichobionata
Division	Magnoliophyta
Subclass	Dilleniidae
Order	Brassicales
Family	Caricaceae
Genus	Carica
Species	C. Papaya
Botanical Name	<i>Carrica Papaya</i> Linn ^[8]

Synonyms of *Carica papaya* Linn

There are several Indian and International synonyms of *Carica papaya* Linn ^[9, 10] and different species of *Carica papaya* Linn are described in table

Table1: Indian synonyms of *Carica Papaya* Linn

S. No.	Language	Region	Names
1.	Marathi	Maharashtra	Papai
2.	Hindi	Haryana, Delhi	Papaya, Papita
3.	Gujarati	Gujrat	Papaya
4.	Punjabi	Punjab	Papita
5.	Rajasthani	Rajasthan	Eerankari
6.	Bengali	West Bengal	Papaya, Pepe, Papita
7.	Kannada	Karnataka	Pharangi
8.	Tamil	Tamil Nadu	Pappali
9.	Malyalam	Kerala	Omakai

Table 2: International synonym of *Carica papaya* Linn

S. No.	Country	Names
1.	India	Papita
2.	Brazil	Mamao
3.	Australia	Paw paw
4.	Holland	Tree melon
5.	France	Papaya
6.	UK	Papaya, paw paw

Table 3: Different species of *Carica papaya* Linn

S. No.	Different Species
1.	<i>Carica candamarcensis</i>
2.	<i>Carica Mexicana</i>
3.	<i>Carica caudate</i>
4.	<i>Carica cauliflora</i>
5.	<i>Carica chilensis</i>
6.	<i>Carica horovitziana</i>
7.	<i>Carica cundinamarcensis</i>
8.	<i>Carica dodecaphylla</i>
9.	<i>Carica glandulosa</i>
10.	<i>Carica goudotiana</i>
11.	<i>Carica heterophylla</i>
12.	<i>Carica candicans</i>
13.	<i>Carica longiflora</i>
14.	<i>Carica crassipetala</i>

Nutritional value of Papaya fruit

Papaya fruit is an excellent and rich source of vitamin C, and one single medium fruit provides 224 per cent of recommended daily intake. One medium papaya has approximately 120 calories and contains no cholesterol, 30 grams of carbohydrate including 5 grams of fibre and 18 grams of sugar, 2 grams of protein. Papaya fruit is also a good source of folate, vitamin A, magnesium, copper, pantothenic acid, fibre. The fruit also contains B vitamin, alpha and beta-carotene, lutein and zeaxanthin, vitamin E, calcium,

potassium, vitamin K, and lycopene, the powerful antioxidant most commonly associated with tomatoes.

Depth analysis of nutrients of Papaya fruit (*Carica papaya*) (Nutritive Value per 100g)

Principle	Nutrient Value	Percentage of RDA
Energy	43 Kcal	2%
Carbohydrates	10.82 g	8%
Protein	0.47 g	1%
Total Fat	0.26 g	1 %
Cholesterol	0 mg	0 %
Dietary Fiber	1.70 g	4 %
Vitamins		
Folates	37 µg	9 %
Niacin	0.338 mg	2 %
Pantothenic acid	0.218 mg	4 %
Pyridoxine	0.038 mg	3 %
Riboflavin	0.027 mg	2 %
Thiamin	0.023 mg	2 %
Vitamin A	950 IU	32 %
Vitamin C	60.9 mg	102 %
Vitamin E	0.30 mg	2 %
Vitamin K	2.6 µg	2 %
Electrolytes		
Sodium	8 mg	0.5 %
Potassium	182 mg	4 %
Minerals		
Calcium	20 mg	2 %
Iron	0.25 mg	3 %
Magnesium	21 mg	5 %
Phosphorus	10 mg	1 %
Zinc	0.08 mg	0.5 %
Phytonutrients		
Caarotene-β	276 µg	--
Cryptoxanthine- β	761 µg	--
Lutein-zeaxanthin	75 µg	--

Source: USDA National Nutrient Database

Chemical Constituents

Papaya is one of the most valuable plants used for various purposes in the medicinal field. Leaves, fruits and seeds of the *Carica papaya* are used as ethnomedicine ^[8]. Chemical constituents of various part of the papaya plant are as follow

Fruit

Fruit of papaya is the rich source of protein, fat, fibre, carbohydrates, minerals, calcium, iron, phosphorus, thiamin, riboflavin, niacin, vitamin C, carotene, amino acids, citric acid and malic acid (green fruits), volatile compounds like linalool, benzyl isothiocyanate, cis and trans-2,6-dimethyl-3,6 epoxy-7octen-2-ol ^[9]. Alkaloids like α carpaine, benzyl-β-dglucoside, 2-phenylethyl-β-D-glucoside, 4-hydroxyl-phenyl-2 ethyl-β-D glucoside and four isomeric malonated benzyl-β-D glucosides.

Juice

The papaya juice contains N-butyric, n-hexanoic acid and n-octanoic acids, lipids, myristic, palmitic, stearic, linoleic, linolenic acid and oleic acid.

Seed

Seeds of the papaya plant contain fatty acids, papaya oil, crude proteins, crude fibre, carpaine, benzyl isothiocyanate,

benzyl glucosinolate, benzylthiourea, glucotropacolin, hentriacontane, β -sistosterol, caricin and an enzyme tyrosin.

Root

Roots of the papaya plant contain arposide, carposide and an enzyme myrosin.

Leaves

Leaves of the papaya plant are the richest source of alkaloids carpain, pseudocarpain and dehydrocarpaine I and II, choline, carposide, vitamin C and E.

Bark

The bark of papaya contains β -sitosterol, glucose, fructose, sucrose, galactose and xylitol.

Latex

The milky sap of unripe papaya contains proteolytic enzymes, papain and chemopapain, glutamine cyclotransferase, chymopapain A, B and C, peptidase A and B and lysozymes [11].

Medicinal uses of different parts of the *Carica Papaya* Linn

Flower

The papaya flowers until start to develop sexual organs they are mostly dioecious and resemble each other. The species is polygamous and can be classified into three sex types: male staminate, hermaphroditic and female pistillate. Male flowers are arranged as clusters, straw-colored and fragrant. Female flowers are short, axillary spikes or racemes, the petals are about 7 cm long [12]. The papaya flowers are used in the treatment of jaundice and have pectoral properties. Male flowers are used in the dietary supplement for herbal tea consumption [13].

Fruit

The papaya fruit is 5-30 cm long, oblong cylindrical, fleshy and yellowish or yellow-orange. Average-sized papaya weighs about a pound. The fruit is claimed to ripen when it yields to gentle thumb pressure, and its skin turned amber to an orange tint. Papaya fruit contains many vitamins and minerals like vitamin C, vitamin A, calcium, riboflavin, folate, thiamine, iron, niacin, potassium and fibre. Papaya fruit act as antihelmintic, antibacterial, antiprotozoal, anti-inflammatory, neuroprotective, diuretic, antihypertensive, antitumour and antifertility properties [14].

Seeds

Seeds are present in many numbers, they are enclosed in the sweet pulp of ripe fruit and are black. Seeds possess pepper to taste and hence it can be used in place of pepper. Seeds possess various pharmacological activities like anthelmintic, contraceptive, anti-inflammatory, analgesic, antifertility and antimicrobial activity. In some traditional medicines, papaya seeds employed as a proven natural remedy for several ailments. Seeds are also used to treat stomachache and ringworm infections [15].

Fruit peel

The dried papaya peel used as a dietary ingredient for poultry feed. Papaya peel has anti-oxidant, anti-cancer and antibacterial properties. The research project was done to develop papaya peel flour for the development of value-added cookies [16].

Leaves

Papaya leaves contain phenolic compounds, papain and alkaloids and these nutrients acts as strong antioxidants which, in turn, enhance the body immunity. Also, the mixture of papain and another compound helps in effectively digesting the essential proteins which can cure digestive disorders. Fresh papaya leaves are a rich source of papain, chymopapain, and essential fibres that when consumed within the sort of juice improves gastrointestinal system and control issues like bloating, heartburn, constipation and bowel movement. Fresh papaya leaves extract increases platelets and neutrophils counts in dengue patients [17].

Roots

Papaya roots are used as a remedy for and renal urinary bladder problems. It prevents the risk of kidney stones and kidney inflammation. The roots are used to treat rheumatism. It also helps in the treatment of urethritis, gastroenteritis [18].

Pharmacological Properties

The plant *Carica papaya* is known to have various activities like antioxidant, antihypertensive, wound healing, hepatoprotective, anti-inflammatory, antimicrobial, antifungal, antifertility, histaminergic, diuretic, anti-amoebic, anti-tumour, antihelmintic, the effect on smooth muscles, immunomodulatory activity, anti-ulcer activity, anti-sickling activity.

Antifungal activity

The latex of *Carica papaya* and fluconazole has synergistic action which inhibits the growth of *Candida albicans*. The synergistic effects result in the partial degradation of the cell wall. Latex protein possesses antifungal action and minimum protein concentration for producing complete inhibition [19].

Antimicrobial activity

It was found that the aqueous extract of *Carica papaya* leaves and roots at different concentrations (25, 50, 100, 200 mg/ml), showed antimicrobial activity against human enteropathogens like *Bacillus subtilis*, *Enterobacter cloacae*, *Escherichia coli*, *Salmonella typhi*, *Staphylococcus*, *Proteus vulgaris*, *Pseudomonas aeruginosa* and *Klebsiella pneumonia* by using agar diffusion method [20].

Anti-sickling activity

The recent studies showed that the unripe papaya fruit extract has antisickling activity. It was observed that *Carica papaya* leaf extract possess potent antisickling activity. The effective doses are 5 and 10 mg/ml extract concentrations [21, 22].

Anti-inflammatory activity

Several studies have shown significant inflammatory and immunomodulatory activities of different parts of the papaya plant by different mechanisms [23].

Antihypertensive activity

The ethanolic extract of ripe fruit of *Carica papaya* possesses anti-hypertensive activity. The basal meal arterial blood pressure were (93.8 \pm 4.5), (175.2 \pm 5.1), (181.3 \pm 6.2) mmHg in the normotensive, renal and DOCA-salt hypertensive animals. Both hydralazine (200 μ l/gm, iv) and ethanolic extract of the unripe fruit of *Carica papaya* (20 mg/kg, iv) produced a significant depression of MAP in normotensive, renal and DOCA-salt hypertensive animals groups as compared to control. But the extract produced about 28%

more depression of MAP than hydralazine within the hypertensive group. The study suggested that the unripe fruit of papaya had a potent antihypertensive activity [24].

Antifertility activity

The research was done to study the antifertility effects of *Carica papaya* Linn on methanol leaf extracts in male Wistar rats. The results obtained from the study that some level of caution in the use of these leaves in folkloric therapy of diseases. However, the drug could be a good source of birth control. Further, it was shown that the papaya leaves were responsible for the changes seen in the semen as well as to identify actual fractions of the extract which possesses the antifertility properties [25].

Antimalarial activity

The petroleum ether extract of the raw papaya fruit possess highest antimalarial activity against *Plasmodium berghei* and could be targeted as a potential source of a lead compound in the development of the new antimalarial drug. As a result, further study showed that the chemical and metabolomic profile of active ingredients from the papaya plant [26].

Increase in Platelet count

The therapeutic effects of aqueous extract of papaya leaves are presumed to be several active components such as papain, chymopapain, cystatin, L-tocopherol, ascorbic acid, flavonoids, cyanogenic glucosides and glucosinolates. These are antioxidants that reduce lipid peroxidation, exhibit antitumour activity and immune-modulatory effects. Animal studies suggested that papaya leaf extracts have a potential therapeutic effect on disease processes causing destabilization of biological membranes as they inhibit hemolysis *in vitro* and may cause increased platelet and red blood cell counts. A recent open labelled trial from Malaysia demonstrated significantly higher platelet count after 40-48 hours of the first dose of papaya leaves' juice [27].

Anti-amoebic activity

The study showed the results of the aqueous extract of matured papaya seeds possess anti-amoebic activity against *Entamoeba histolytica* [28].

Anticancer activity

The pharmaceutical preparation contains various proteolytic enzymes i.e. papain used in the treatment of malignant diseases. Research indicates that oral administration of polyezymes preparations produces induction of cytokines by human peripheral blood nuclear cells. *In vitro* studies showed that it will treat many cancer cell line and shows anticancer activity. The enzyme papain from papaya is effective against cancer. Papaya also contains lycopene enzyme which is reactive towards oxygen and free radicals. These enzymes inhibit the formation and development of cancer cells [29].

Hypoglycemic activity

The ethanolic extract of *Carica papaya* of dose 5 mg/kg reduces blood sugar level. The onset of hypoglycemic activity of glimepiride was delayed and the hypoglycemic effect of metformin was increased [30].

Anti-obesity activity

It was concluded 25.1 grams of papaya seed powder obtained from 250 grams of wet papaya seeds. The recipients like color, texture, aroma and taste of papaya seeds' 'coffee'. 1.42

grams of papaya seeds' powder inhibits the action of pancreatic lipase. As a result, papaya seeds' powder is used as obesity 'coffee' drink [31].

Anxiolytic and Sedative activity

The ethanolic extract of *Carica papaya* showed anxiolytic and sedative activity in mice. Based on this study, the anxiolytic and sedative activity was performed by using ethanolic extract of *Carica papaya* pulp and the result was shown that the extract at 100 mg/kg showed anxiolytic activity [32].

Cosmetic uses of *Carica papaya* Linn

Papaya is the favorite fruit of many, but not many know of its tremendous hair and skin benefits.

Skin: The sweet papaya because of its soft butter-like consistency, which is available throughout the year, maybe a rich source of nutrients anti-oxidants, making it with favorite who want to possess glowing skin. Papaya containing vitamin A and papain enzyme helps in the removal of dead skin cells and inactive proteins, thus rejuvenating the skin. It also helps to keep the skin hydrated. Raw papaya helps to reduce blemishes.

Hair: According to studies, the nutrients in papaya help in preventing balding. Eating the fruit a minimum of thrice every week can help reduce hair thinning. Hair mask containing papaya can help treat the dry and flaky scalp. As it is rich in minerals, vitamins and enzymes, papaya acts as a natural conditioner, making the hair softer and smoother.

Safety profile

Papaya contains white milk-like sap (i.e. latex) substance which can cause irritation to the skin and provoke an allergic reaction in some sensitized person. Papaya contains an enzyme called chitonases. They can cause a cross-reaction between latex and the food that contain them. Pregnant women can safely use ripe papaya fruit. Unripe green papaya should be avoided since it contains high levels of papain, a proteolytic enzyme. In addition, unripe papaya, its seeds, latex and leaves also contain carpaine, an alkaloid which could be dangerous when eaten in high doses. Unripe papaya, however, can be eaten safely as cooked vegetable.

Conclusion

The papaya plant is cultivated globally. Not only the fruit but also the whole plant including its leaves, seeds, roots, peel and stem has the medicinal uses. It consists of vitamins, minerals, enzymes, flavonoids which have various biological and medicinal properties. Many types of research have done on each part of the papaya plant. It can be used as a diet supplement for children and adults.

Acknowledgement

Nil

Conflict of Interest

The authors do not have conflict of interest.

References

1. Naria A, Jhala D. Pharmacognostic study of carica papaya leaf extract as inhibitors of reactive oxygen species. *International Research Journal of Pharmacy*. 2017; 8(3):13-17.

2. Sagadevan P, Selvakumar S, Raghunath M, Megala R, Janarthan P, Vinitha Ebziba C *et al.* Medicinal properties of *Carica papaya* Linn: Review. Madridge Journal of Novel Drug Research. 2019; 3(1):120-125.
3. Dawkins G, Hewitt H, Wint Y, Obiefuna PC, Wint B. Antibacterial effects of *Carica papaya* fruit on common wound organisms. West Indian Medical Journal. 2003; 52(4):290-292.
4. Arumuganthan K, Earle ED. Nuclear DNA content of some important plant species. Plant Molecular Biology Reporter. 1991; 9(3):208-218.
5. Agarwal A, Vyas S, Agarwal DP. Therapeutic benefits of *Carica papaya* leaf extracts in dengue fever patients. Scholars Journal of Applied Medical Sciences. 2016; 4(2A):299-302.
6. Gurung S, Skalko-Basnet N. Wound healing properties of *Carica papaya* latex: *in vivo* evaluation in mice burn model. Journal of Ethnopharmacology. 2009; 121(2):338-41.
7. Krishna KL, Paridhavi M, Patel JA. Review on nutritional, medicinal and pharmacological properties of papaya (*Carica papaya* Linn.). Natural Product Radiance 2008; 7(4):364-373.
8. Roshan A, Verma NK, Anubha Gutpa. A brief study on *Carica papaya*-A review. International Journal of Current Trends in Pharmaceutical Research. 2014; 2(4): 541-550.
9. Yogiraj V, Goyal PK, Chetan, Chauhan S, Goyal A, Bhupendra Vyas B. *Carica papaya* Linn: An Overview. International Journal of Herbal Medicine. 2014; 2(5):01-08.
10. Parle M, Gurditta. Basketfull benefits of papaya. International Research Journal of Pharmacy. 2011; 2(7):6-12.
11. AK Nadkarni. Indian Materia Medica, K M Nadkarni, 1st Edition Popular Prakashan, Pvt Ltd, Bombay, 1954, 273-277.
12. Anitha B, Raghu N, Gopenath TS, Karthikeyan M, Gnanasekaram A, Chandrashekrappa GK *et al.* Medicinal uses of *Carica papaya*. Journal of Natural Ayurvedic Medicine. 2018; 2(6):000144.
13. Bergonia KB, Perez MA. The potential of male papaya (*Carica papaya* L.) flower as a functional ingredient for herbal tea production. Indian Journal of Traditional Knowledge. 2016; 15(11):41-49.
14. Maisarah AM, Asmah R, Fauziah O, Analysis P. Antioxidant and antiproliferative activities of different parts of *Carica papaya*. Journal of Nutrition and Food Sciences. 2014; 4(2):1-7.
15. Agarwal A, Vyas S, Agarwal DP. Therapeutic benefits of *Carica papaya* a leaf extracts in dengue fever patients. Scholars Journal of Applied Medical Sciences 2016; 4(2A):299-302.
16. Development of papaya peel flour based cookies and evaluation of its quality. Bokaria K, Dr. Ray S. Development of papaya peel flour based cookies and evaluation of its quality. Journal of Multidisciplinary and Engineering and Technology. 2016; 3(12):6393-6397.
17. Imaga NA, Adepoju OA. Analysis of anti sickling potency of *Carica papaya* dried leaf extract and fractions. Journal of Pharmacognosy and Phytotherapy. 2010; 2(7):97-102.
18. Chinonye II, Cynthia O, Maureen A *et al.* Phytochemicals and antimicrobial properties of the root and leaf extract of *Carica papaya*. International Journal of Innovative Research and Development. 2016; 5(8):175-179.
19. Vij T, Prashar Y. A review on medicinal properties of *Carica papaya* Linn. Asian Pacific Journal of Tropical Disease. 2015; 5(1):1-6.
20. Anibijuwun II, Udeze AO. Antimicrobial activity of *Carica papaya* (pawpaw leaf) on some pathogenic organisms of clinical origin from South-Western Nigeria. Ethnobotanical Leaflets. 2009; 13(7):850-864.
21. Odula T, Adeniyi FA, Ogunyemi EO, Bello IS, Idowu IO. Anti-sickling agent in an extract of unripe pawpaw (*Carica papaya*): is it real? African Journal of Biotechnology. 2006; 5(20):1947-1949.
22. Imaga NOA, Gbenle GO, Okochi VI, Akanbi SO, Edeoghon SO, V Oigbochie V *et al.* Antisickling property of *Carica papaya* leaf extract. African Journal of Biochemistry Research. 2009; 4(4):102-106
23. Pandey S, Cabot PJ, Shaw PN and Hewavitharana AK. Anti-inflammatory and immunomodulatory properties of *Carica papaya*. Journal of Immunotoxicology. 2016; 13(4):590-602.
24. Eno AE, Owo OI, Etam EH, Konya RS. Blood pressure depression by the fruit juice of *Carica papaya* (L.) in renal and DOCA-induced hypertension in the rat. Phytotherm Res. 2000; 14(4):235-239.
25. Nkeiruka UE, Chinaka NO. Antifertility effects of *Carica papaya* Linn: Methanol leaf extracts in male Wistar rats. Journal of Pharmacology and Toxicology. 2013; 8(1):35-41.
26. Gemechu Z, Kebeb D, Mulisa E, Gashe F. *In vitro* antimalarial activity of the solvent fractions of fruit and root of *Carica papaya* Linn (Caricaceae) against *Plasmodium berghei* in mice. Journal of Parasitology Research, 2017, 1-9.
27. Dharmarathna SL, Wickramasinghe S, Waduge RN, Rajapakse RP, Kulratne SA. Does *Carica papaya* leaf-extract increase the platelet count? An experiment study in a murine model. Asian pacific Journal of Tropical Biomedicine, 2013; 3(9):720-724.
28. Tona L, Kambu K, Ngimbi N, Cimaga K, Vlietinck AJ. Antiamoebic and phytochemical screening of some Congolese medicinal plants. Journal of Ethnopharmacology. 1998; 61(1):57-65.
29. Gunde MC, Amnerkar MD. Nutritional, medicinal and pharmacological properties of papaya (*Carica papaya* Linn): A Review. Journal of Innovations in Pharmaceutical and Biological Sciences 2016; 3(1):162-169.
30. Fekeye TO, Oladipupo T, Showande O, Ogunremi Y. Effects of co-administration of extract of *Carica papaya* on activity of two oral hypoglycemic agents. Tropical Journal of Pharmaceutical Research 2007; 6(1):671-678.
31. Subandi and Nurowidah A. The potency of *Carica papaya* L. seeds powder as anti-obesity 'coffee' drinks. Materials Science and Engineering. 2019; 575:1-7.
32. Athesh K, Karthiga D, Brindha P. Anti-obesity effect of aqueous fruit extract of *Carica papaya* L. in rat fed on high-fat cafeteria diet. International Journal of Pharmaceutical Sciences. 2012; 4(5):327-330.