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Formulation and Processing of papaya by products

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Abstract
Papaya (Carica papaya Linn.) is commonly known for its food and nutritional values throughout the world. The medicinal properties of papaya fruit and other parts of the plant are also well known in traditional system of medicine. Since, each part of papaya tree possesses economic value; it is grown on commercial scale. During the last few decades considerable progress has been achieved regarding the biological activity and medicinal application of papaya and now it is considered as valuable Nutraceutical fruit plant. It can be chosen as a source of Papain for the development of various industrial and pharmaceutical products. In the present review nutritional value of the fruit and medicinal properties of its various parts have been discussed to provide collective information on this multipurpose commercial fruit crop. These products mainly contains are Antimicrobial, Antimalarial, Ant amoebic, and Antifungal. Ripe papaya fruit is most commonly consumed like a melon. It can be peeled, the seeds removed, cut into pieces and served as a fresh fruit. It can also be cut into wedges and then served with lime or lemon. Ripe pawpaw is also used in jam, jelly, candy, chutney and other products containing added sugar.

Keywords: Papaya, Nutraceutical, Medicinal, Antimicrobial, Antimalarial

Introduction
The papaya tree belongs to a small family — Caricaceae having four genera in the world. The genus *Carica* Linn. is represented by four species in India, of which *Carica papaya* Linn. is the most widely cultivated and best-known species. Among the other species, *C. cauliflora* Jacq. *C. pubescens* Lenne & K. Koch and *C. quercifolia* Benth. & Hook.f. ex Hieron. are possible sources of breeding material for inducing frost and virus resistance in cultivated papaya. The fruits, leaves and latex obtained from papaya plant are used medicinally and for various other purposes. Papain, a major chemical compound extracted from fruit and stem latex is used in brewing and wine making and, in the textile, and tanning industries1-3. Papaya contains broad spectrum of phytochemicals including, polysaccharides, vitamins, minerals, enzymes, proteins, alkaloids, glycosides, fats and oils, lectins, saponins, flavonoids, sterols, etc. (Table 1) The present paper deals with origin and distribution, brief morphological characters, nutritional value and results of reported research findings on its medicinal properties.

Origin, Distribution and Morphology
Papaya is probably originated in southern Mexico and Costa Rica, subsequently it was introduced as a plantation crop in Australia, Hawaii, Philippines, Sri Lanka, South Africa, India and in all tropical and subtropical regions. It is grown both commercially and in home gardens. Papaya is a polygamous species and it is difficult to identify a plant whether it is male, female or hermaphrodite. It is a tree reaching 3-10 m in height, with the habit of a palm; the fleshy stem marked by scars where leaves have fallen off, is surmounted by a terminal panache of leaves on long petioles and with 5-7 lobes. Flowers fragrant, trimorphous, usually unisexual-dioecious, male flowers in lax many-flowered, densely pubescent cymes at the tips of the pendulous, fistular rachis; female flowers large, solitary or in few flowered racemes.

Table 1: Chemical composition of various parts of Papaya plant

Part	Constituents
Fruits	Protein, fat, fiber, carbohydrates, mineral: calcium, phosphorous, iron, vitamin C, thiamine, riboflavin, niacin and carotene, amino acids, citric and malic acids (green fruit)
Juice	N-butyric acids, n-hexanoic and n-octanoic acids, lipids, Myristic, planets, stars, linolec, linolenic and *cis*-vaccenic and oleic acid
Seeds	Fatty acids, crude protein, crude fiber, papaya oil, carpaine, benzylisothiocynate, benzylglucosinolate, glucotropacolin, bemzylthiourea, hentriacontane, sitostrol, caressing and enzyme myrosin
Root	Carposide and enzyme myrosin
Leaves	Alkalodis carpain, pseudocarpain and dehyrocarpaine and,choline, carposide vitamin C and E
Bark	β-sitosterol, glucose, fructose, sucrose and xylitol
Latix	Proteolytic enzymes, papain and chemopapain, glutamine, cyclortransferase, chymopapains A, B and C, peptidase A and B and lysozymes

With a short thick rachis, fruit a large berry, varying widely in size, elongate to Globose with a large central cavity, seeds black, tuberculous and enclosed in a Transparent aril. The fruit bearing trees are less than 18 month old. The leaves and unripe fruit contain milky juice in which the protein ferment papain is present.

Table 2: Nutritive value of 100g of Papaya fruit

Constituents	Ripe papaya	Green papaya
Protein	0.6g	0.7g
Fat	0.1g	0.1g
Crude fibre	0.8g	0.9g
Carbohydrate	7.2g	5.7g
Energy	32 Kcal	27 Kcal
Total carotene	2,740µm	0
Beta carotene	888µm	0
Minerals	0.5g	0.5g

Medicinal and Pharmacological properties

Many biologically active phytochemical (s) have been isolated from papaya and studied for their action, recently an antifungal chitinase has been gene cloned and characterized from papaya fruit. The chitinase is classified as class IV chitinase based on its amino acid sequence homology with other plant chitinases. The recombinant papaya chitinase also has antibacterial activity. The purified chemopapain from commercially available spray dried latex of the fruits has shown immunological properties. The anthelmintic activity of papaya seed has been variously ascribed to carpaine (an alkaloid) and carpasemine (later identified as benzyl thiourea) and benzylisothiocyanate, cysteine proteinases from papaya fruit have also been reported20. Carpaine, an alkaloid with an intensively bitter taste and a strong depressant action on the heart, has been obtained from the fruit and seed, but especially from the leaves. Various pharmacological action(s) and medicinal uses of different parts of papaya are well reported in the ancient literature. Some of them especially Ayurvedic have been summarized in Table 3. Biological activities of papaya are reported with the crude extracts and different fractions from latex, seed, leaf, root, stem bark and fruit. However, crude extracts of different parts of papaya have been used as traditional medicine for the treatment of various diseases. However, apart from these, there are several reports on the therapeutic properties and pharmacological actions of papaya based on modern scientific investigations. Some have been discussed below.

Table 3: Some Medicinal use of Papaya plant as mentioned in ancient Ayurvedic literature.

Part	Medicinal uses
Latex	Anathematic, relieves dyspepsia, cures diarrhoea, pain of burn and topical use, bleeding haemorrhoids, stomachic, whooping cough.
Ripe fruit	Stomachic, digestive, carminative diuretic, dysentery and chronic diarrhoea, expectorant, sedative and tonic, relieves obesity, bleeding piles, wound of urinary tract, ringworm and skin disease psoriasis.
Unripe fruit	Laxative, diuretic, dried fruit reduces enlarged spleen and liver, use snakebit to remove poison, abortifaciant, anti- implantation activity and antibacterial activity.
Seeds	Carminative, emmenagogue, vermifuge, abortifaciant, counter irritant, as paste in the treatment of ringworm and pasoriasis,anti-fertility agent in malic
Bleeding piles and enlarged liver and pectoral properties	
Seed juice	Abortifacient, diuretic, checking irregular bleeding from the uterus, piles, antifungal activity
Root	Young leaves as vegetable, Jaundice(fine paste), urinary complaints &gonorrhoea (infusion) dressing wound fresh leave, antibacterial
Leaves	Jaundice, emmenagogue, febrifuge and pectoral properties
Flower Steam bark	Jaundice, anti-haemolytic activity, STD, store teeth(inner bark),anti-fungal activity

Materials and Methods

Research design

Research design is a coherent plan in conducting research which deals with investigation so conceived to obtain sample to research. Research design is used to conduct research objectivity of accuracy. The research design followed in the present study by research on Papaya and their products available in the market. Papaya is use as Fruit, not using in daily food. The research was developing innovative food products by using of Papaya Fruit in daily food, especially for sports persons and other Medicinal uses.

Locate of study

The study was conducted in the laboratory of the Department of Food Science and Technology, School for Home Science, BBAU, Lucknow and the analysis laboratory of RFRAC (Regional Food Research and Analysis Centre) located in Lucknow.

Period of the study

The present study was carried out 6 months during session 2017-2018 between January 2018 to May 2018.

Study design

The present study carried out with the experimental Research Design. Phases are incorporated to finish the research work. These are in clude for study.

Sample size

The sample size is based on three different products prepared by Papaya. These products are, Papaya Candey, Papaya Jam and Papaya Chutney. All these products were different ratio of Papaya. Products are prepared with Papaya and other ingredients.

Table 4: Ingredients preparation for Papaya Candey

Papaya Candey	
Ingredient	**Amount**
Papaya	500 gm
Brown sugar	250 gm
Coconut powder	50 gm
Mint	20 gm
Ginger	20 gm
Lemon Juice	20 gm

Table 5: Ingredients preparation for Papaya Jam

Papaya Jam	
Ingredient	**Amount**
Papaya	500 gm
Sugar	250 gm
Pectin	100 gm
Lemon Juice	50 gm

Table 6: Ingredients preparation for Papaya Jam

Papaya Chutney	
Ingredient	**Amount**
Papaya	500 gm
Sugar	250 gm
Green Cardamom	15 gm
Black Cardamom	10 gm
Cashew nut	20gm
Almond	20 gm
Currant	50 gm
Cinnamon powder	10 gm
Synthetic white vinegar	40 gm
Yellow food color	5 gm
Papaya Flavor	10 gm

Table 7: Sampling design

PHASE 1
Collection and processing of Raw ingredients
PHASE 2
Product development and their standardization
PHASE 3
Sensory Evaluation
PHASE 4
Enriched Spirulina by-product nutritional profile
PHASE 5
Rating scale 9 Point hedonic scale

Development different Papaya product

Develop the different papaya base product like papaya candy, papaya jam and papaya chutney, these are follow different method and technique in papaya products.

Step 1: To take fresh ripe papaya

Step 2: To Cutting in small size

Step 3: To make pulp by Grinder machine

Step 4: To Mix brown sugar, coconut powder, Lemon juice & mint in pulp

Step 5: To Cooking by induction

Step 6: Cooking stop After thikness

Step 7: To make candy

Fig 1: Flow chart of various steps involved during preparation of Papaya candy

Step 1: Take a fresh ripe Papaya

Step 2: To cutting a small parts

Step 3: To make a pulp by grinder

Step 4: To Mix sugar, pectin,

Step 5: To make jam
Lemon juice on the induction

Fig 2: Flow chart of various steps involved during preparation of Papaya Jam

Treatment

The Experimental Papaya by products (Papaya Candey, Papaya Jam and Papaya Chutney) of spices were characterized as developed product in the present study. The various parameters were incorporated for product development to reach acceptability and human population. For that sensory evaluation process was done by of panellist constitute 5 Members in the expertise field of nutrition.

Table 8: Individual marking for colour

Member	T1	T2	T3
1	8	9	9
2	8	8	8
3	9	9	9
Total	25	26	26

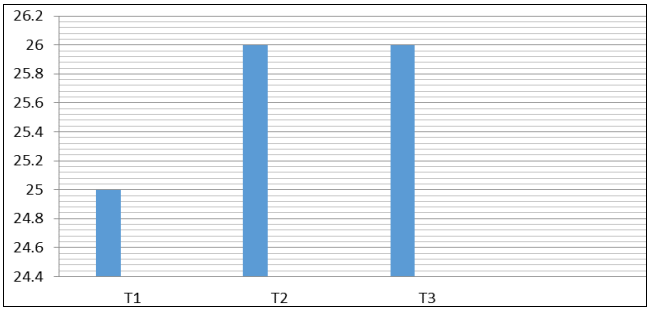

Fig 1: Graphical Representation- color

Parameter 1-body & texture Quality

Table 9: individual marking for body & texture

Member	T1	T2	T3
1	9	9	9
2	8	9	7
3	9	7	7
Total	26	25	23

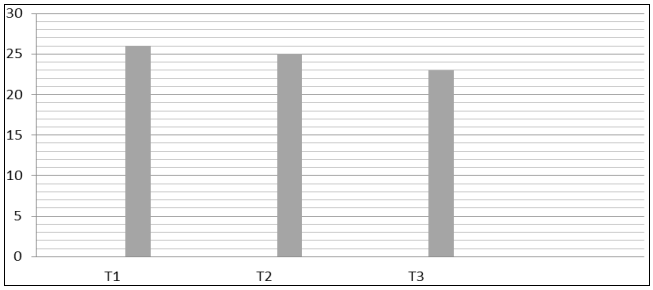

Fig 2: Graphical Representation-body & texture

Parameter 1-Flavour Quality

Table 10: Individual marking for Flavour

Member	T1	T2	T3
1	9	8	7
2	7	9	7
3	8	8	8
Total	24	25	22

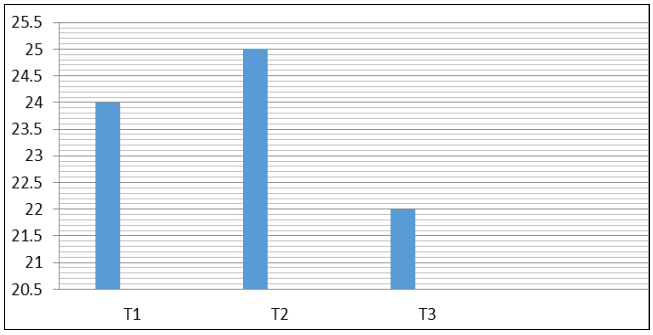

Fig 3: Graphical Representation-Flavour

Parameter 1-Appearance Quality

Table 11: Individual marking for Flavour

Member	T1	T2	T3
1	8	8	8
2	9	9	8
3	7	9	9
Total	24	26	25

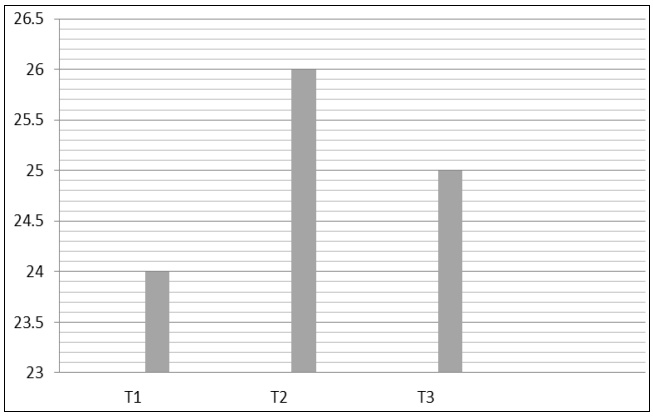

Fig 4: Graphical Representation-Appearance

Parameter 1-Taste Quality

Table 12: Individual marking for Taste

Member	T1	T2	T3
1	8	8	9
2	7	9	8
3	8	7	8
Total	23	24	25

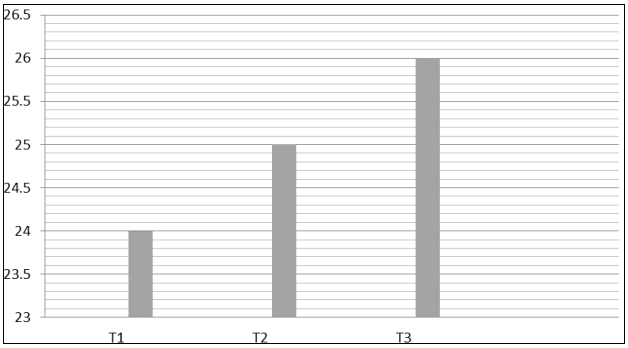

Fig 5: Graphical Representation-Tast

Parameter 1-Overall acceptability

Overall calculation are done to know most acceptability of the product in all terms of quality by sensory evaluation scoring given by the panelist Members, in this all scoring of colour, flavour consistency and absence of defects are calculated in the table, by this get do statistical analysis and obtained standard deviation, average and other calculation.

Table 13: Overall acceptability-

Member	T1	T2	T3
P1	25	26	26
P2	26	25	23
P3	22	25	22
P4	24	26	25
P5	23	24	25
Total	120	126	121
Average	24	25.2	24.2
Standard deviation	1.581	0.836	1.643

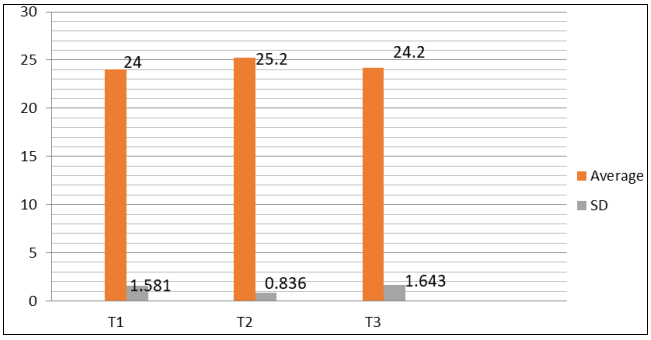

Fig 6: Graphical Representation of Average Score and Standard

Deviation for Overall Calculation

Where – T1, T2, T3was coded samples prepared

P=parameter (colour, P2=Body and texture, P3= flavour, P4=appearance)

S.D. = Standard Deviation (SD reflex the fluctuation in the marks given by different parameter)

T_2 Scored maximum with highest average and lest SD which indicate its highest acceptability among the three prepared experimental samples.

Conclusion

The utilization of spirulina by- products enhances due to the quality of spirulina by products that are rich source of many utilizable component. The product formation by using the spirulina by-products contain many health enhancement substances for supplement and balance diet. These products optimize the availability of antioxidant, protein, carbohydrate, minerals and fat. These foods are ready to eat which is very easily too consumed by others. For the insurance product quality, organoleptic indicator is good to determine the quality and freshness of product. The organoleptic evaluation of the spirulina by-product was done by using nine-point hedonic scales by panels of 5 members. The scoring for each of the product was done according to various parameters i.e. texture, taste, flavor, colour and appearance and overall acceptability.

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