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DEVELOPMENT OF PAPAYA JACKFRUIT FRUITBAR

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Abstract

Papaya (*Carica papaya* L.) is a member of the Fruit bar was prepared from blend of ripe papaya (variety, in the ratio 75:25 on weight basis. Effects of hydrocolloids viz. pectin (P), starch and its three different levels on physico-chemical, sensory, and textural characteristics were investigated. It was found that different samples of fruit bar had moisture contents of 20.9–22.1% and total soluble solids 78.1–78.8°Brix while pH, browning index, and vitamin C contents were in the following ranges, 4.3–4.50, 0.137–0.150 (OD), and 40.5–41.4 mg/100 g respectively. Texture study revealed that hydrocolloids incorporation at each caused significant ($P < 0.05$) increased in compactness/hardness of texture. Sensory characteristics study revealed that all the samples of fruit bar were acceptable in taste, color, and aroma but differed significantly ($P < 0.05$) in their texture. The samples packed in LDPE bags (100 μ), stored at 35–45°C for four months. It was found that there were significant ($P < 0.05$) changes in physico-chemical properties like acidity and vitamin C during four months storage. No significant ($P < 0.05$) effect on either browning index (OD) or deterioration in color, taste, and aroma of these samples was observed. During four months storage change in color and texture were not uniform for all treatments. Addition of 0.5 and 1% of each starch + ethyl cellulose were effective in maintaining the color while 0.5, 1, and 1.5% of each P + S was effective in improving the texture during four months storage.

Chapter-I

Introduction

Carica papaya is a small dicotyledonous family consisting of six genera of herbaceous, shrubby or arborescent plants (Badillo 1971, 1993, 2000). It is now the only species belonging to the genus *Carica*, since Badillo rehabilitated the *Vasconcella* group, until recently considered as a section within the genus *Carica* **(Badillo 2000).**

The first mention of the existence of the papaya tree (*Carica papaya* L.) was made in Europe in 1535 by the Spanish author, G. H. de Oviedo, in his book, "La natural hystoria de las Indias" in which he informed the King of Spain of the discovery of papayas growing between the south of Mexico and the north of Nicaragua.

Jackfruit (Artocarpus heterophyllus Lam.) belongs to family Moraceae, is a major tropical fruit accounting in rainforests of India, Bangladesh, Sri Lanka, southern China, southeast Asian countries and with limited production in Australia, Mauritius, Brazil, Surinam, Jamaica, Mexico, Hawaii and southern Florida **(Samaddar, 1985).**

It is one the most significant evergreen trees in tropical areas and widely grown in Asia including India. It is a medium-size tree typically reaching 28 to 80 ft in height that is easily accessible for its fruit. The fruit is borne on side branches and main branches of the tree. Average weight of a fruit is 3.5 to 10 kg and sometimes a fruit may reach up to 25 kg. There are 2 main varieties of jackfruits: one is small, fibrous, soft, and mushy, and the carpels are sweet, with a texture like that of a raw oyster the other variety is crisp and crunchy, but not very sweet. The large seeds from this non leguminous plant are also edible, even though they are difficult to digest (Siddappa 1957).

Worldwide production of papaya (Carica papaya) has exceeded 12.6 million metric tons in 2014 as reported by the Food and Agriculture Organization of the United Nations. With such a large amount of papaya produced, and an estimated 30–50% cull rate, there is a large amount of agricultural waste produced. Thus, in order to not only alleviate papaya waste but also produce value-added products, microbial utilization of papaya waste has attracted considerable interests and a number of recent studies have been published.

Jackfruit production and consumption in many other countries is on the rise and it is becoming of great economic value because of its traditional value and rich mouth feel. In India, the total area under jackfruit cultivation is approximately 30,000 acres, of which, an estimated one million trees are grown in back yards of Karnataka region alone producing fruits valued at 19 million dollars per year Jackfruit is also widely grown and consumed in East Africa (Burundi, Kenya, Uganda and Tanzania.

Nutritive value of jackfruit (100 g)

Constituent	Average value
Moisture (%)	76.20
Energy (cal)	88.00
Protein (g)	1.90
Fat (g) 0.10	0.10
Fibre (g)	1.10
Carbohydrates (g)	19.80
Potassium (mg)	107.00
Calcium (mg)	20.00
Phosporous (mg)	41.00
Iron (mg)	0.56
β Carotene (mg)	175.00
Thiamine (mg)	0.03
Riboflavin (mg)	0.13
Niacin (mg)	0.40
Vitamin C (mg)	7.00

Need and scope of the study

Fruits and vegetables plays a vital role in indian diet from ancient period of human health. Consumption of fruits and vegetables significantly contribute in providing us a well balanced diet. Fruits possess a significant nutrients with potential health benefits and act as a immune boosters.In this digital world all are engaged in numerous professions for income generation, the technology enhanced society is spend less time

in food preparation and health monitoring.The sedentary life style, poor eating habits, modified food behaviours and lack of time facilitate the incidence of various degenerative diseases.The processed foods occupies major role in nutritional status, the nutritious foods with updated processing techniques improve the food selection as well the food behaviour.Therefore is more and more demand from culturally conscious consumers for the healthier food products made from fruits and vegetables, which can improve their health and well being. Fruit bar is highly convenient product interms of packaging and transportation, easy to eat and delicious product which can be consumed and distributed anywhere. Therefore, processing of fruits into fruitbar or fruit leather is very advantageous, as fully ripe fruits having higher sugar, superior colour, flavour and carotenoid content can be used, in addition to use of culled and over-ripe fruits.Generally reports on fruit bars are based on use of single type of fruit or pulp. Beside usual process of fruit bar preparation, blending of different fruit pulp for preparation of fruit bars has also been reported. The main purpose of choosing two or more fruits for blending is improvement in nutritional qualities, sensory stability as per the contribution from different fruits during product formulation. Further, it also gives an opportunity to utilize fruit which are available throughtout the year.

The present study increases the vitamins intake and improves the nutritional status. The new food product development in fruits will provide the new fruit flavour for children and also facilitate the employment generation in food processing sectors.

Objectives of the study

1. To formulate the fruit bar with papaya and jackfruit.
2. To evaluate acceptability of fruit bar by sensory evaluation.
3. To estimate the nutrient content of the developed fruit bar by standard methods.

Chapter-2

Review of literature

Fruits and vegetables form an integral part of the dietary habits of human beings. They are fundamental sources of vitamins and minerals **(Kader, 2001).** Vitamins are recognized to be potent compounds that perform vital tasks in the body such as growth, reproduction and maintenance of life. Since vitamins and mineral play a significant role in the body's metabolic activities, their deficiencies cause deficiency diseases; however, prolonged lack of micronutrients leads to hidden hunger. Fruits usually contain large amount of water and therefore are highly perishable. Hence, they are processed into various shelf stable forms adopting drying, freezing, concentration and fermentation technologies, not only to prevent their postharvest loss but also to enhance their acceptability.

The present study aims to formulate fruit-based products and its sensory, nutrient analysis. The review of literature for this study presented in the following headings.

2.1 Papaya and jackfruit: an overview

2.2 Nutrient composition of Papaya and jackfruit:

2.3 Health benefits of Papaya and jackfruit.

2.4 Papaya and jackfruit-based food products.

2.1 Overview of Papaya and jackfruit:

The importance of a high fruit and vegetable intake as an essential part of a healthy life style has received an increasing amount of attention during the last decade. The benefits of an adequate intake of fruit and vegetables are observed in a wide range of epidemiological studies. It is well known that an adequate intake of fruit and vegetables promotes health as it is important in the prevention of non-communicable diseases like cardiovascular disease, obesity and cancer, which today are large public health problems. The health promoting effect of fruit and vegetables is related with their bioactive constituents, in particular phenolic compound. These substances act through several mechanisms, such as reducing oxidative stress, improving lipoprotein profile, lowering blood pressure and improving homeostasis regulation thus contributing to healthy lifestyle **(Scalbertat *et al*., 2005).**

Carica papaya belongs to the family *Caricaceae* which consists of 34 species (and one formally named hybrid) and six genera (*Carica*, *Jacaratia*, *Horovitzia*, *Jarilla*, **Asia** is the leading production region for papaya, accounting for 54.98% of total world production during the period 2008–2017, followed by the Americas and the Caribbean
(33.46%), Africa (11.43%) and Oceania (0.12%) **(FAO, 2019).**

Jackfruit (Artocarpus heterophyllus Lam.) trees belong to the family Moraceae. They grow abundantly in India, Bangladesh, and in many parts of Southeast Asia **(Rahaman and others 1999).**

2.2 Nutrient composition of Papaya and jackfruit

The fruits contain excellent sources of various nutrients. The nutrient composition of the papaya and jackfruit is presented in this chapter.

Zuhair *et al*., (2012) revealed that study on exhibits different physicochemical properties, antioxidant capacities, and sensory quality results. The study also aimed to study physicochemical changes of papaya fruits based on measured pH, titratable acidity (TA), total soluble solids (TSS), moisture and fruit colour at five different stages of ripening. Sensory evaluation based on the colour, sweetness, sourness, flavour, and overall acceptance for the last three maturity stages was also performed. RS5 had a better score than RS3 or RS4. The results showed the important role of the ripening stage in increasing the antioxidant content of papaya fruits.

Marisa, 2005 this studied is carried out Banana (Musa sp.) and papaya (Carica papaya) the cultivars were harvested from different locations throughout Hawaii and analysed for vitamin C (ascorbic acid), provitamin A (b-carotene, a-carotene, b-cryptoxanthin), and mineral composition. The average K content for Hawaii's bananas was 330.6 mg/100 g. Papayas (100 g) contained 9% of the dietary reference intake (DRI) for Cu, 6–8% of the DRI for Mg, but less than 3% of the DRI for other minerals.

Alok Saxena *et al.*, (2009) revealed that study of the kinetics of colour and carotenoids degradation in jackfruit bulb slices was evaluated during hot air drying at 50, 60 and 70 °C. Visual colour as well as total carotenoids (TC) content was found to be influenced by the drying process.

Nelly *et al.*, (2020) The objective of this study was to determine the optimal thermo ultrasound processing conditions for jackfruit nectar by applying response surface methodology and comparing the physicochemical parameters, antioxidant properties, microbiology, and fatty acid profile with pasteurized jackfruit nectar.

2.3 Health benefits of papaya and jackfruit

Tarun (2015) reported the study on 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. The many benefits of papaya are owed due to high content of vitamin A, B and C, proteolytic enzymes like papain and chymopapain which have antiviral, antifungal and anti-bacterial properties.

Tasqiah (2014) revealed that study on antiplasmodial activity of extracts was confirmed and the active fractions in the extract were identified by HPLC-based activity profiling, a gradient HPLC fractionation of a single injection of the extract, followed by offline bioassay of the obtained micro fractions. Further investigations are needed to clarify the divergence between us negative in vivo results for carpaine, and previous reports of in vivo activity with papaya leaf extracts.

Jhoti (2018) conducted the study on papaya or formulations of fermented papaya promotion (FPP) display effective free radical scavenging abilities thought to be influenced by its phenolic, carotenoid, flavonoid, or amino acid profile. The focus of this review is to appraise the potential of oxidative stress reduction strategies of FPP and discuss its holistic approach in disease prevention and management, with a particular focus on diabetes and cancer.

2.4 Papaya and jackfruit-based food products

This study was conducted by **Surekha (2012**) revealed that various treatments were optimized for the preparation of toffee and bar/leather from papaya fruit. Out of various treatments papaya toffee prepared in combination with apricot (50:50) and papaya bar/leather prepared using 30ºB TSS, 0.5 per cent acidity and 0.02 per cent KMS were rated the best on the basis of sensory evaluation. The sensorial quality of the developed products was not affected during storage and these were rated 'liked very much' even after six months of storage at ambient temperature.

Ankit Kannaujiya (2018) made a study on to optimize the ingredients and process condition in papaya candy production. Analysis of papaya candy made with optimum formula and process showed that papaya candy had hardness, gumminess, chewiness, resilience, moisture, sugar, ash, total phenolic compound, DPPH (RSA), and Ascorbic Acid of 7.887gf, 1.867, 0.328, 0.089, 41.90 ± 0.2, 69.72 ± 0.39, 0.33 ± 0.01, 0.24 ± 0.01, 31.71 ± 0.2, and 30.56 ± 0.1, respectively.

Tiwari (2019) made a study on fruit bar prepared by blending fruit purees or pulp extracted from ripe pulpy fruit, sugar or other nutritive sweeteners and other ingredients and additives desired for product and dehydrated to form sheet which can be cut to desired shape and size. There is also great potential for use of solar energy as well as alternate drying techniques for popularization of fruit bar processing in rural areas.

The review of literature highlighted the nutritional importance of papaya and jack fruits. The various studies focused on health benefits of papaya and jack fruit. There is very a smaller number of articles on blended papaya and jackfruit fruit bar. Hence this study will fill the research gap.

The methodology adopted for this study presented in the next chapter.

Chapter-3

Methodology

The present entitled "**Formulation of papaya jackfruit fruit bar and its nutritional, sensory analysis".** The methodology adopted for this study is followed.

3.1. Objectives of the study

3.2. Research design

3.3. Selection of raw material

3.4. Formulation of papaya jackfruit fruit bar

3.5. Estimation of nutrient analysis

3.6. Organoleptic analysis

3.7. Analysis of data

3.1. Objectives of the study

4. To formulate the fruit bar with papaya and jackfruit.
5. To evaluate the acceptability of the developed product by organoleptic evaluation.
6. To estimate the nutrient content of the developed fruit bar by standard methods.

3.2. Research design:

Research design is a plan, strategy of investigation conceived so as to obtain answer to research questions and control variance **(Gupta, 1993).** The present study was done to prepare papaya jackfruit fruit bar and also conducted sensory evaluation to assess overall acceptability of the product. Experimental design was the used for the present study **(Kothari, 2011),** experimental design in the one which deals with information – gathering exercises where variation present, whether under the full control of the experimental or not . One or more process variables (or factors) are deliberately changed in order to observe the effect the changes have one or more response variables.

3.3. Selection of raw material

For the present study conducted to assess the nutritive value and acceptability of papaya and jackfruit were purchased the local market at Madurai, Tamilnadu, India.

Basic ingredients:

Basic ingredients for products such as papaya, jackfruit, sugar, citric acid, refined oil was collected in the departmental store in Madurai, Tamilnadu.

Papaya and jack fruit were washed and cutting in to small pieces and then grinding in to a smooth paste.

Papaya:

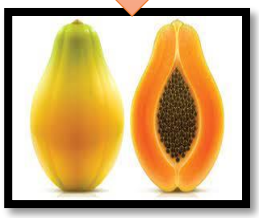
Papaya is a rich sources of antioxidant nutrients like carotenes, vitamin C and vitamin B. Its mineral composition comprises of K and Mg along with calcium, iron, manganese, phosphorus and zinc.

Jackfruit:

Jackfruit has been reported to contain high levels of protein, starch, calcium and thiamine. The bulbs are rich in sugar, fairy well in carotene and also contain vitamin C. It also rich sources of potassium, magnesium, manganese and iron.

3.4.1. PREPARATION OF PAPAYA JACKFRUIT FRUITBAR

1.COLLECTION OF RAW MATERIAL




2.Cleaning (wash the fruits in to cold running water)

3.cutting



4.Grinding

Cooked the pulp for 10 minutes with sugar and citric acid

Transfer in to oil greased parchment paper

3.4. Development of papaya jackfruit fruit bar:

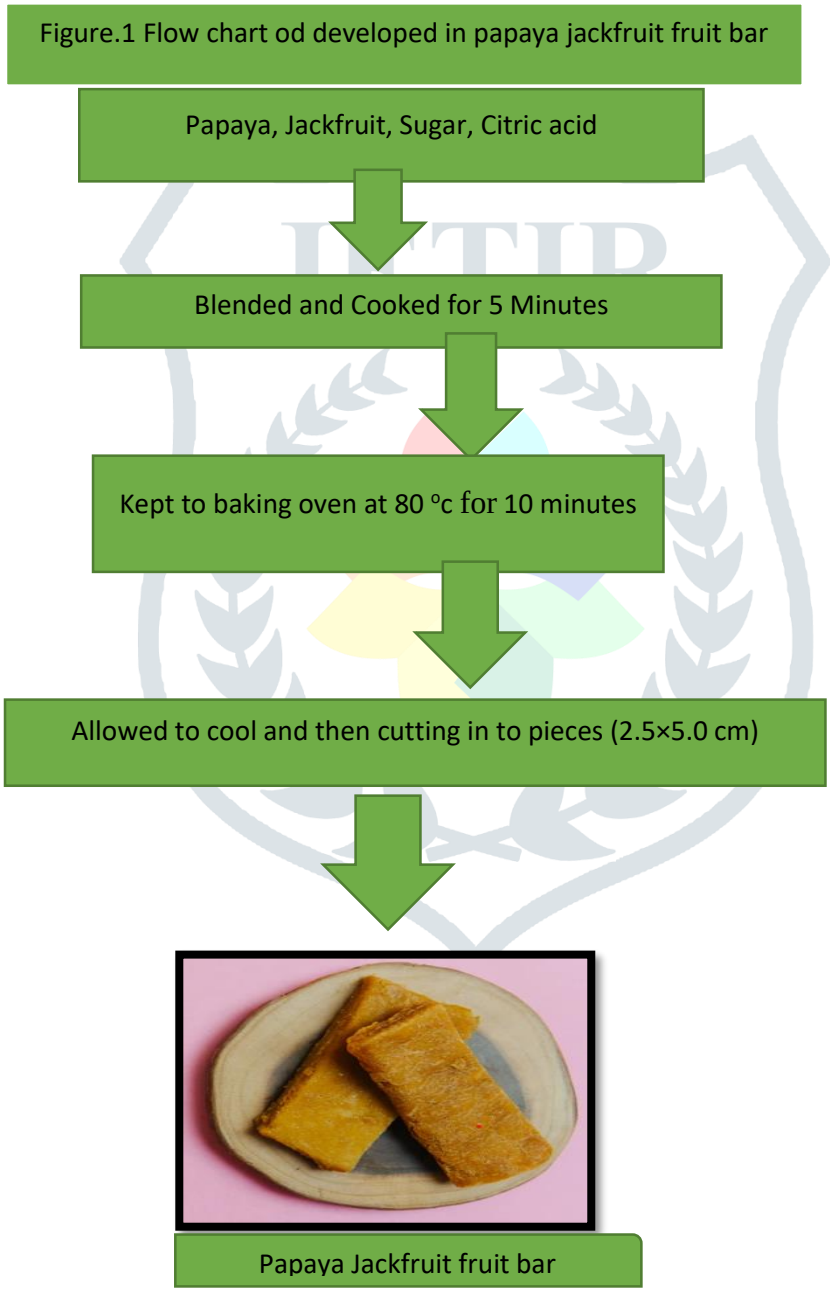
Preparation for fruit bar:

S.NO	Ingredients	Quantity
1.	Papaya	500g
2.	Jackfruit	500g
3.	Sugar	250g
4.	Citric acid	0.6g
5.	oil	5ml

Method:

- Fruit bar were prepared using papaya and jackfruit in different ratios.
- Papaya and jackfruit were selected and washed the fruits thoroughly and cut in to small pieces.
- The pulper was used for extraction of pulps.
- Blend of these pulps were taken in the ratio (50:50, 60:40).
- Now the pulp is cooked with sugar for 5 minutes and added citric acid.
- Now the pulp is transfer in to oil greased parchment paper.
- And the fruit bar was baked at 80°c for 10 minutes.
- The fruit bar sample was allowed to cool and cutting into pieces (2.5×5.0 cm)
- And then stored at a dry place (at ambient temperature, 35°-45° c).

Figure.1 Flow chart od developed in papaya jackfruit fruit bar



3.5. Estimation of nutrient composition of papaya jackfruit fruit bar:

The nutrient analysis was conducted to estimate the nutrient content or quality of the products. The nutrients such as carbohydrates, vitamin C, calcium and iron were estimated.

3.6. Organoleptic evaluation of fruit products:

The sensory evaluation was conducted to assess the acceptability of the developed products. The developed fruit bar was assessed by untrained panel members. According to (Srilakshmi 2006). The minimum number of panel members should not less than 25. Hence, 25 students who were cooperative and willing to participate in the study were selected and trained for evaluating the developed products.

Precautions were taken to avoid unbased results thus, reliability and validity of the data. The evaluation was done by hedonic scale and numerical score methods. The score cards used for the sensory evaluation is enclosed in appendix.

Hedonic scale test and numerical score method can be used to measure the acceptability of the products (Srilakshmi 2006). Developed product of fruit bar sample 1 and sample 2 were subjected to sensory evaluation using 5 point hedonic scale such as appearance, taste, texture, flavour and colour to find the overall acceptability they were also numerically scored as excellent, very good, good, fair, poor used to assess the overall acceptability of selected products.

3.7. Analysis of the data:

The collected data was analysed by SPSS version 17.0.

The results of the study presented in the next chapter**.**

Chapter-4

Results and Discussion

. Fruits and vegetables are an important source of health promoting components such as vitamins, minerals, antioxidants and fiber. These high value commodities play an important role in providing food and nutritional security. Consumption of fruits and vegetables significantly contribute in providing us a well-balanced and healthy diet. Therefore, there is a more and more demand from culturally conscious. Consumers for the healthier food products made from fruits and vegetables, which can improve their health and well-being. Consumption of fruits and vegetables is known to prevent many non-communicable life style diseases such as obesity, bone disease, diabetes, cardiovascular disease and stroke **(Lydia *et al.,* 2002; Yahia *et al.*, 2019).**

The data collected for this study on **"Formulation of papaya jackfruit fruit bar and its nutritional, sensory evaluation".** The experimental design was used for this study. It should be prepared in two different ratios (50:50, 60:40) were formulated from papaya and jackfruit. The nutrient compositions of the products were evaluated by the standard methods. The acceptance of the products evaluated by sensory analysis. The results of the presented study in the following headings.

4.1. Nutritional profile of the ingredients used for product formulation

4.2. Nutritive value of the developed product

4.3. Estimated nutrient content of the developed products

4.4. Sensory evaluation of the developed product by hedonic scale method

4.5. Comparison of nutrient content of the products with RDA(School going children)

4.6. Cost calculation of the formulated products

4.1. Nutritional profile of the ingredients used for product formulation:

In this present study products were developed from various ingredients such as papaya, jackfruit, sugar. Citric acid, rice bran oil. The ingredients were selected based on its nutrient composition and its potential health benefits. The nutrient content of the ingredients used to develop the product were collected from the nutritive value of the Nutritive value of Indian foods and tabulated in the present table 4.1

Table-4.1.1

Nutrient composition of selected products

Ingredients (100g)	CHO (g)	Vitamin-A carotene (µg)	Vitamin-C (mg)	Iron (mg)	Calcium (mg)
Papaya	7.2	666	57	0.5	17
Jackfruit	19.8	175	7	0.56	20
Sugar	99.4	-	-	0.155	12

(Nutritive value of Indian foods, (Gopalan,2009)

According to NIN (National Institute of Nutrition) data, the ingredients papaya contains 7.2g of carbohydrate, 666µg of carotene, 57g of vitamin C, 0.5mg of iron and 17mg of calcium. Jackfruit contains 19.8g of carbohydrate, 175 µg of carotene, 7mg of vitamin C, 0.56mg of iron and 20mg of calcium. Sugar contains 99.4g of carbohydrate, 0.155mg of iron and 12mg of calcium.

All the ingredients are rich in carbohydrate, papaya and jackfruit are rich in carotene, vitamin C, iron and calcium.

4.2. Nutritive value of the developed product:

The nutritive value of the formulated product calculated from the nutritive value of Indian foods. The calculated data were presented in the table 4.3.

Table 4.2.1

Calculated nutritive values of the formulated products

S. No	Nutrient	Nutritive value (Fruit bar 50:50 ratio) per 100g	Nutritive value (Fruit bar 60:40 ratio) per 100g
1.	Carbohydrate(g)	75	73
2.	Vitamin C(mg)	120	112
3.	Iron	1.6	1.3
4.	Calcium	787	683

The nutrient content of the formulated product reveals that fruit bar (50:50) contain 75g of carbohydrate, 120mg of vitamin C, 1.6mg of iron and 787mg of calcium.

The nutrient content of the formulated product reveals that fruit bar (60:40) contains 73g of carbohydrate, 112mg of vitamin C, 1.3g of iron and 683mg of calcium.

4.3. Sensory evaluation of the developed product by hedonic scale method

The sensory evaluation was conducted to assess the acceptability of the developed products. The developed fruit bar was assessed by untrained panel members. According to (Srilakshmi,2006). The minimum number of panel members should not less than 25. Hence, 25 students who were cooperative and willing to participate in the study were selected and trained for evaluating the developed products.

Hedonic rating test and numerical score method can be used to measure the acceptability of the products(srilakshmi,2006). Developed products such as fruit bar were subjected to sensory evaluation using 5 point hedonic rating scale such as appearance, taste, texture, flavor and color to find the overall acceptability they were also numerically scored as excellent, very good, good, fair, poor used to assess the overall acceptability of selected products (Chandra and smasher,2006).

The formulation products were analyzed by sensory evaluation for acceptance. The sensory evaluation was carried out with untrained panel members. The hedonic and numerical score method was adopted and the results of the analysis presented in the table 4.5

Table 4.3.1

Sensory evaluation of the developed product by hedonic scale method

Variables	Fruit bar sample-I(N=25)	Fruit bar sample-II(N=25)
Appearance		
Excellent	60	40
Very good	40	52
Good	0	8
Fair	0	0
Poor	0	0
Taste		
Excellent	88	56
Very good	12	40
Good	0	4
Fair	0	0
Poor	0	0
Texture		
Excellent	68	28
Very good	32	40
Good	0	32
Fair	0	0
Poor	0	0
Flavor		
Excellent	76	36
Very good	24	52
Good	0	12
Fair	0	0
Poor	0	0
Color		
Excellent	68	36
Very good	20	52
Good	12	12
Fair	0	0

Poor	0	0
Overall acceptability		
Excellent	88	36
Very good	12	64
Good	0	0
Fair	0	0
Poor	0	0

The above table reveals that based on the appearance, majority 60 percent gave an "excellent" score for fruit bar sample I, 52 percent gave a "very good" score for fruit bar sample II.

The taste score of the fruit bar sample I revealed that the majority 88 percent provide an 'excellent' score, about 56 percent gave an 'excellent' score for fruit bar sample II.

The texture criteria of the product denote that 68 percent gave an 'excellent' score for fruit bar sample I and 40 percent of the respondents provide 'very good' score for fruit bar sample II.

The flavour of the product shows that 76 percent provide an 'excellent' score for fruit bar sample I and 52 percent gave 'very good' score for fruit bar sample II.

The colour of the fruit bar sample I accepted and 68 percent of the respondents gave an 'excellent' score and 52 percent gave 'very good' score for fruit bar sample II.

The overall acceptability of the product shows that 88 percent gave an 'excellent' score for fruit bar sample I and 64 percent gave an 'very good' score for fruit bar sample II.

Table 4.3.2

Sensory evaluation of the formulated products by numerical score card method

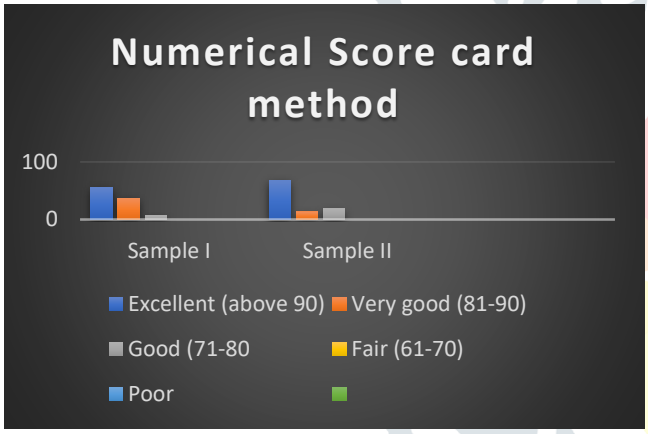
Variables	**Sample I(N=25)**	**Sample II(N=25)**
Excellent (above 90)	56	68
Very good (81-90)	37	13
Good (71-80)	7	19
Fair (61-70)	-	-
Poor (below 60)	-	-

The numerical score of the formulated products shows that 56 percent of the respondents gave an 'excellent score (90)' for sample I. The majority 68 percent gave an 'excellent score (above 90)' for sample II.

Figure 4.3.1

Sensory evaluation of the developed product by hedonic scale method

Sensory evaluation of developed product (Papaya Jackfruit Fruit bar) by numerical score card method.



4.4 Comparison of nutrient content of the product with RDA (School going children 10-12 in years):

The nutrient content of the developed products compared with school going children recommended levels of nutrients. The nutrients compared with RDA of the school going children (10-12) years and presented in the table 4.4.

Table-4.4.1

Comparison of nutrient content of the product fruit bar sample I with RDA (School going children girls 10-12 in years):

Nutrient(100g)	Fruit bar (sample I)	Actual RDA for School going children girls (10-12 years)	RDA %
Carbohydrate(g)	75	130	57.6%
Vitamin C(mg)	120	40	3%
Calcium(mg)	787	600	1.3%
Iron(mg)	1.6	19	8.4%

The table results of the analysis shows that, the formulated fruit bar sample I provide 57.6% of carbohydrate, 3%of vitamin C, 1.3% of calcium and 8.4% 0f iron recommended levels of intake for school going children girls.

Table-4.4.1

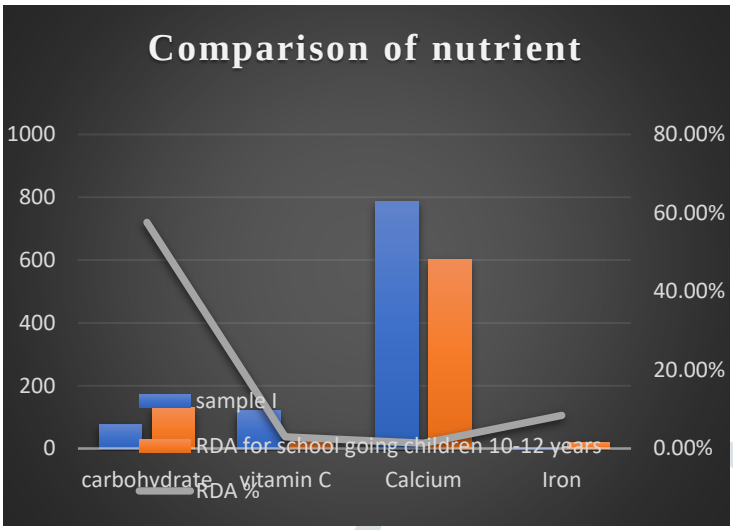


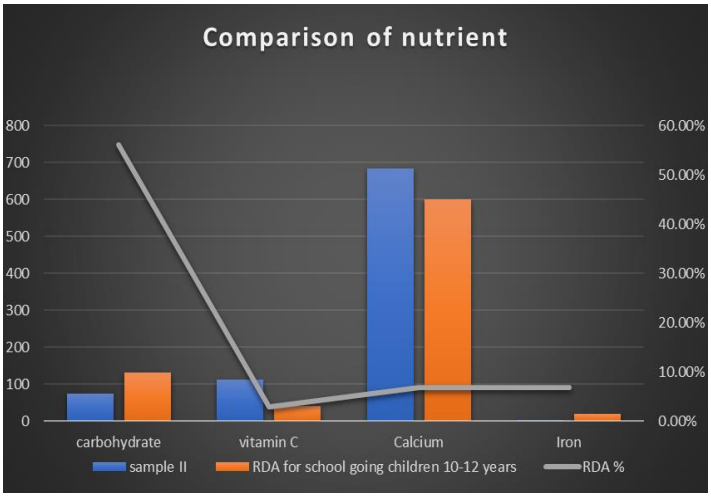
***Table-4.4.2**

Comparison of nutrient content of the product fruit bar sample II with RDA (School going children girl)

Nutrient(100g)	**Fruit bar (sample II)**	**Actual RDA for school going children girl (10-12 years)**	**RDA %**
Carbohydrate(g)	73	130	56.1 %
Vitamin C(mg)	112	40	2.8%
Calcium(mg)	683	600	6.83 %
Iron(mg)	1.3	19	6.8%

The table results of the analysis shows that, the formulated fruit bar sample II provide 56.1% of carbohydrate, 2.8% of vitamin C, 6.83% of calcium and 6.8% 0f iron recommended levels of intake for school going children g

Table-4.4.2



4.5 Cost calculation of the formulated products:

The cost of every product is essential to find out the consumer acceptability. The low-cost nutritious foods increase the availability and intake those foods in higher frequency. The low-cost foods decrease the incidence of various deficiency diseases. Hence the present study aims to calculate the cost of the formulated product and the results of the analysis presented in the chapter 4.7

Table-4.5.1

Cost calculation of the Fruit bar sample I Ingredients

Ingredients	**Actual price (1kg)**	**Required quantity for making Fruit bar Sample I (g)**	**Cost for develop Fruit bar (N=15)**
Papaya	12	500	6
Jackfruit	60	500	30
Sugar	34	250	8.5
Citric acid	666	0.6	0.39
Total	772	1250.6	RS.44.89(15 Bars)

The above table exhibits the cost of the formulated fruit bar sample I, the following ingredients used to formulate fruit bars. RS.44.89 is required to produce 15 numbers of bars. Each fruit bar cost is Rs.3 with 15 grams weight.

Table-4.5.1

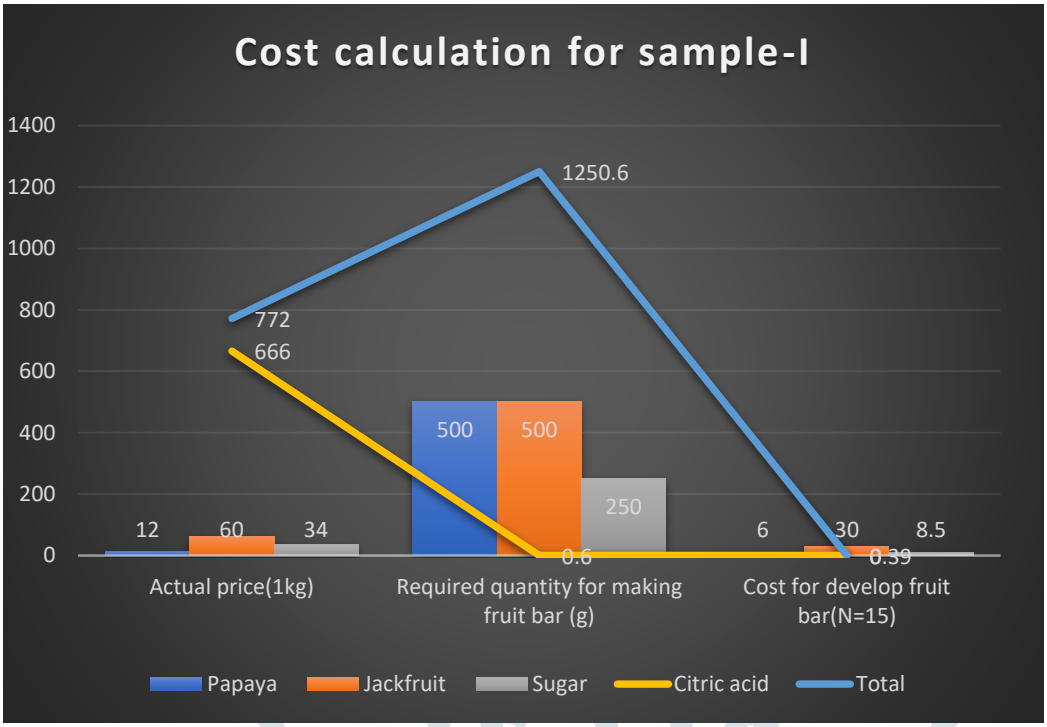


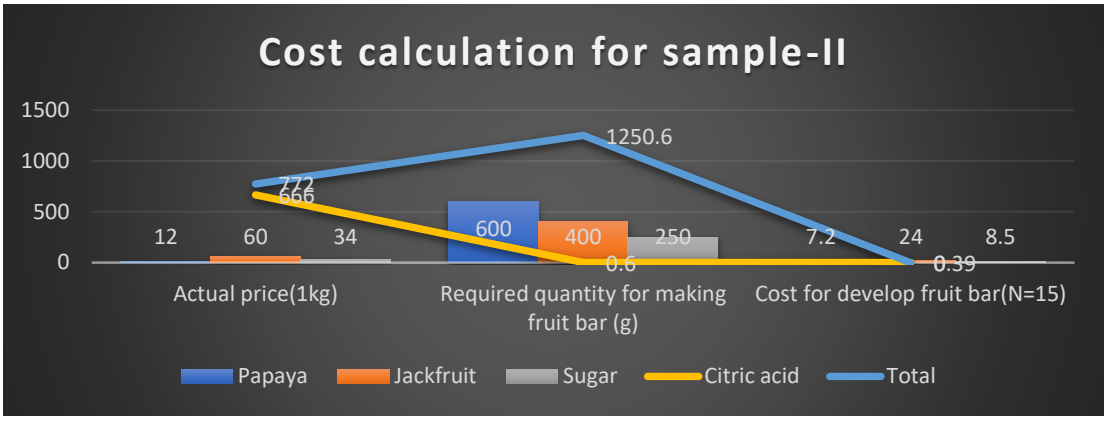
Table-4.5.2

Cost calculation of the Fruit bar sample II Ingredients

Ingredients	**Actual price (1kg)**	**Required quantity for making Fruit bar (g)**	**Cost for develop Fruit bar (N=15)**
Papaya	12	600	7.2
Jackfruit	60	400	24
Sugar	34	250	8.5
Citric acid	666	0.6	0.39
Total	772	1250.6	RS.40.09(15 Bars)

The above table exhibits the cost of the formulated fruit bar sample II, the following ingredients used to formulate fruit bars. RS.40.09 is required to produce 15 numbers of bars. Each fruit bar cost is Rs.2.50 with 15 grams weight.

Table-4.5.2



Chapter-5

Summary and conclusion

The present study entitled on "**Formulation of papaya and jackfruit fruit bar and its nutrients and sensory evaluation".**

The present study was carried out with the objective to formulate papaya jackfruit fruit bar, to find out the acceptability of the products by sensory evaluation, nutrients assessed, experimental research design was used for this study. The nutrient estimation was done by analysis which was carried out in **Excellence Laboratory, Madurai.** The findings of the study are summarized below.

- Papaya and jack fruit was used for the preparation of product development of this study.
- The nutrient content of the formulated product reveals that fruit bar (50:50) contain 75g of carbohydrate, 120mg of vitamin C, 1.6mg of iron and 787mg of calcium.
- The nutrient content of the formulated product reveals that fruit bar (60:40) contains 73g of carbohydrate, 112mg of vitamin C, 1.3g of iron and 683mg of calcium.
- The sensory evaluation of the developed product was evaluated with help of hedonic scale method finally the results concluded that the fruit bar sample I and sample II.
- The numerical score of the formulated products shows that 56 percent of the respondents gave an 'excellent score (90)' for sample I. The majority 68 percent gave an 'excellent score (above 90)' for sample II.
- Cost of the formulated fruit bar sample I, the following ingredients used to formulate fruit bars. RS.44.89 is required to produce 15 numbers of bars. Each fruit bar cost is Rs.3 with 15 grams weight.
- Cost of the formulated fruit bar sample II, the following ingredients used to formulate fruit bars. RS.40.09 is required to produce 15 numbers of bars. Each fruit bar cost is Rs.2.50 with 15 grams weight.

Conclusion

The present study concluded that the fruit bar contains good sources of carbohydrate, vitamin C, iron and calcium in a low cost. The nutrient rich fruit-based fruit bar was highly acceptable by organoleptic evaluation. This product may provide a sufficient quality of nutrients especially vitamin A and calcium and also recommended for school going children.

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