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Standardization and quality evaluation of papaya seed powder incorporated cookies

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Abstract

The present study was aimed to develop cookies with papaya seed powder, butter, all-purpose flour etc. and to evaluate the nutritional and organoleptic qualities of the developed products. Recipes were standardized in 5 different combinations based on papaya seed flour. The treatments were evaluated for organoleptic qualities. Based on the organoleptic scores, C₄ (50% papaya seed flour + 50% wheat flour) were selected for further studies. The selected recipes were prepared and packed in polyethylene bags. The energy value of the cookie (C₄) prepared by 50% wheat flour and 50% papaya seed flour was found to be 390 kcal per 100 g. And it contains 58.4 g carbohydrates, 9.4g of protein, 15.1 g of fat, 7.7 g of fiber, 17.0 mg of calcium and 2.1 mg of iron. The mean scores for overall acceptability of the cookies varied from 7.7 to 8 with mean scores from 2.75 to 3.45. Maximum mean score (8) was found to be on sample C₄ and minimum (7.7) was found to be on samples. The cost of production of papaya seed cookies is very much less than the similar products available in the market.

Keywords: Papaya seeds, cookies, sensory evaluation, standardization

Introduction

Papaya fruit is commonly consumed fresh as a dessert or juice. Papaya seeds are black in color and embedded in the fruit pulp. In general, the seed from ripe papaya represents about 16% of the fresh fruit weight and is considered as a by-product. The abundant availability throughout the year and less economic value of papaya seed has encouraged the nutritionists to exploit such by-product as a protein-rich feed ingredient as well as functional feedstuff for poultry.

The seeds account for about 16% of the fresh fruit weight and each seed is made up of sarcotesta and endosperm (Pungasari *et al.*, 2004) ^[1]. Pawpaw seed extracts had been shown to have several medicinal as well as nutritional properties. Several Species of Caricaceae have been used as medication against a variety of diseases. All parts of a pawpaw plant, including the Seeds, roots, rinds, and fruits have positive effects on general health preventing diseases (Seigler *et al.*, 2002) ^[2]. Important use of the papaya seed could prevent or possibly even treat food poisoning. The seeds of papaya are believed to have strong anti-bacterial and anti-inflammatory effect on our digestive system. Studies have shown that an extract made from papaya seed is effective in killing E. coli, Salmonella, Staphylococcus and other dangerous bacterial infections. There are even reports of using papaya seeds to successfully treating viral infections such as Dengue fever.

Furthermore, papaya seed do not contain toxic compounds and gluten, thus making seeds a safe ingredient also for gluten free diets (Tao Zhang, *et al.*, 2017) ^[7]. Considering the nutritional deficiencies and health problems among people in India, the current study is designed to develop food products with incorporation of papaya seed for nutritional enhancement. Papaya seed oil had a high oxidative stability (Minh, *et al.*, 2020) ^[8]. Moreover, lipids with high monounsaturated fatty acids content, such as papaya seed oil, are used in emollient skin care products, bath oils, hair conditioners, and makeup.

Papaya seed flour was better in protein, lipid, and the minerals calcium, iron, magnesium, and zinc content. Papaya seeds are rich in oil content, which mainly consists of monounsaturated fatty acids and nutraceuticals, such as phenolics, tocopherol and carotenoid (Maulidila, *et al.*, 2017) ^[6]. Furthermore, papaya seed oil was reported to be persistent towards oxidation. Due to their rich lipid content, papaya seeds could be economically engaging for industrial utilization.

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Methodology

Collection of raw materials

The ripe papaya seeds were collected from fruit stalls and locally. Other ingredients like Maida, Butter, sugar, Baking powder were collected from local market.

Preparation of papaya seed powder

The local varieties of papaya seeds were collected from Kitchen waste and also from fruit stalls and the seed was separated from the pulp. Seeds were washed with water, dried, powdered and kept in an airtight container (plate 1). The process of preparation of papaya seed powder is given in (figure 1).

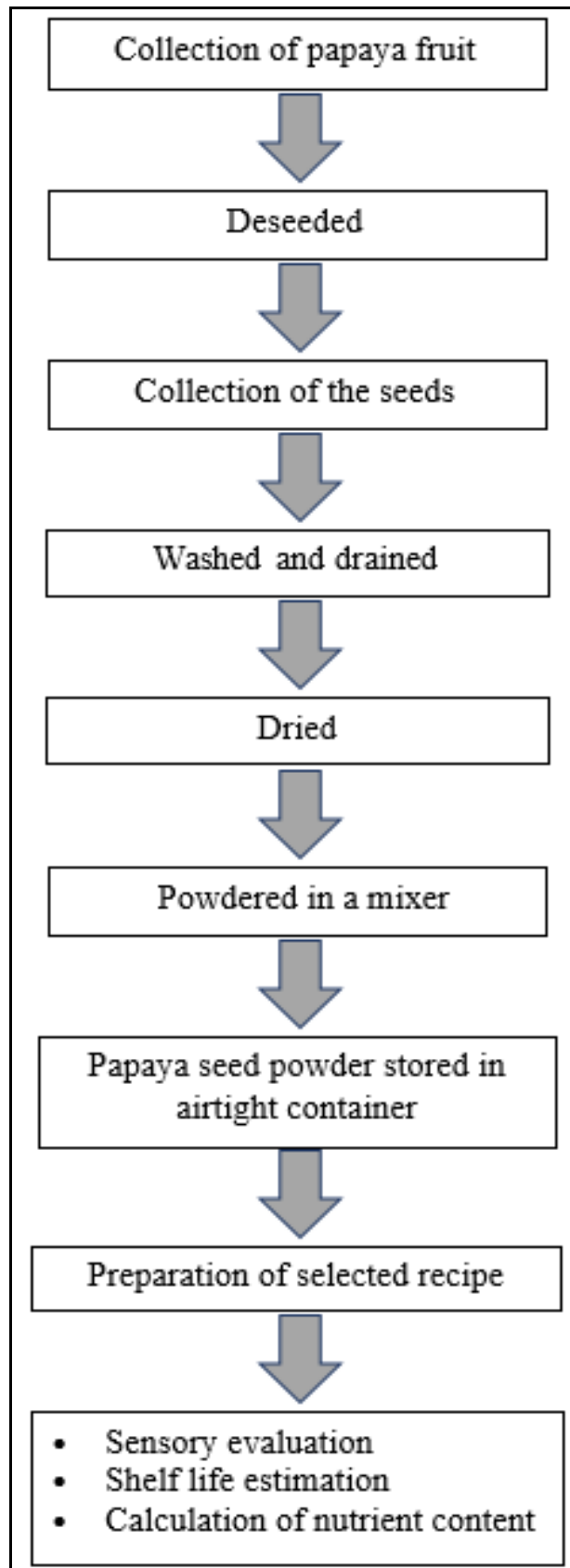


Fig 1: Processing of papaya seed powder



Deseeding of papaya fruit



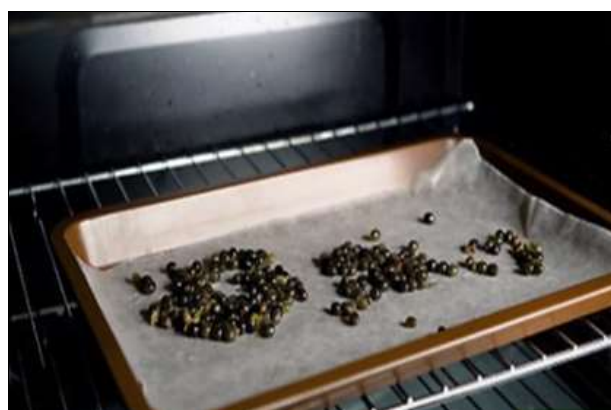
Dried papaya seed



Collecting papaya seed



Powdered papaya seed



Drying of papaya seed



Stored in an airtight container

Plate 1: Preparation of papaya seed powder

Development of papaya seed cookies

For the development of papaya seed cookies, prepared papaya seed powder was used. Various blends were prepared with wheat flour and cocoa powder in the ratio C₀- 100:0, C₁-

80:20 C₂- 70:30, C₃- 60:40, C₄- 50:50 along with a control recipe C₀ were made for standardization. The standardized quantities of different ingredients used for the cookies are given in table 1.

Table 1: The ingredients used for the preparation of papaya seed cookies.

Treatments	Papaya seed flour (g)	Wheat flour (g)	Cocoa powder (g)	Butter (g)	Sugar (g)	Honey (g)
C ₀	—	100	10	5	10	5
C ₁	20	80	10	5	10	5
C ₂	30	70	10	5	10	5
C ₃	40	60	10	5	10	5
C ₄	50	50	10	5	10	5

C₀ –100% wheat flour

C₁ – 80% wheat flour+20% papaya seed flour

C₂ –70% wheat flour +30% papaya seed flour

C₃ – 60% wheat flour+40% papaya seed flour

C₄ – 50% wheat flour +50% papaya seed flour

Preparation of cookies

The prepared papaya seed powder was used for the preparation. The dough was prepared by combining papaya seed powder along with Maida flour in various variations. The Other ingredients used for the cookies were butter, sugar, and

baking powder, salt and vanilla essence. The cookies were prepared by pressing the dough into sheets and then cutting into different shapes. It was baked in oven at 180⁰ Celsius for 20 minutes. The method of preparation of cookies is given in figure 2.

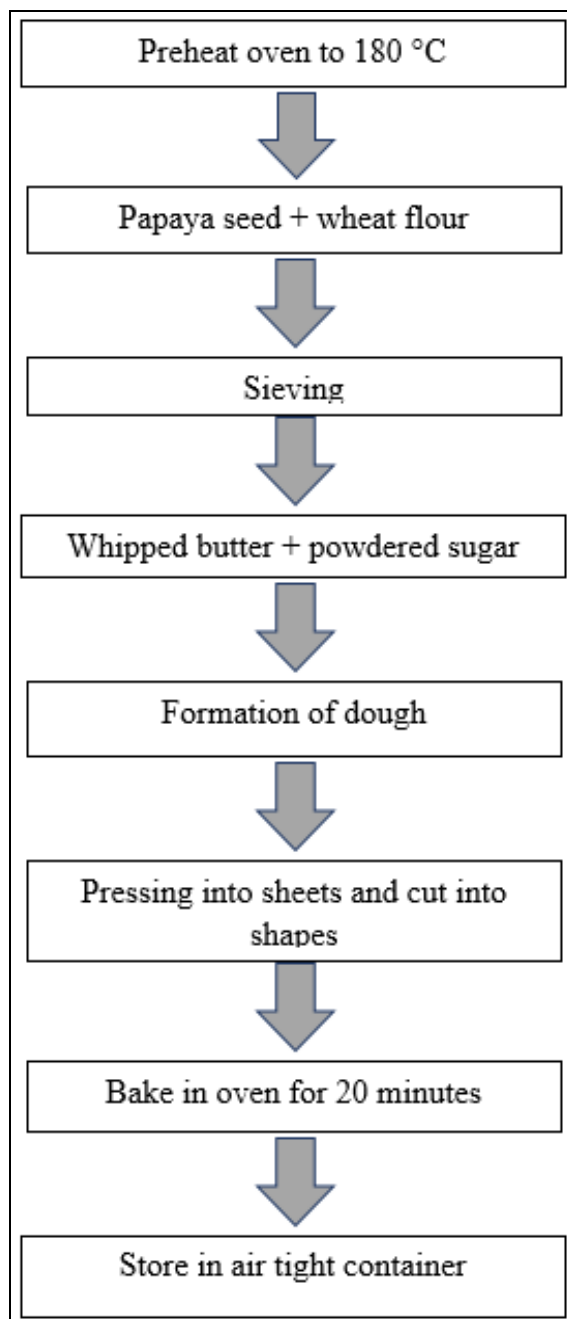


Fig 2: Preparations of papaya seed cookies..

Organoleptic evaluation

The organoleptic evaluation of the products was conducted in 9 point hedonic scale with a panel of ten judges.

Selection of most acceptable papaya seed products

Five treatments of papaya seed cookies were made (C₀ to C₄) and C₀ was taken as the control. The Papaya seed cookies were wrapped in butter paper and packed in polyethylene pouches, sealed, and stored at room temperature.

Cost analysis of the products

Cost of the products was done to assess the expense for the preparation of each of the products. It was done based on the market price of different ingredients used for the preparation

of the product. The cost was calculated for 100 g of the product and compared with the price of similar products available in the market.

Statistical analysis

The results of the study analyzed statistically to know its significance. Hence suitable statistical method was used for data obtained the present study. The scores of organoleptic evaluations were assessed by Kendall's coefficient of concordance.

Result and Discussion

Papaya seed cookies

The data on the organoleptic evaluation of papaya seed

cookies are given in Table 2. The mean scores obtained for the appearance of the cookies varied from 7.3 to 8.2 with mean rank scores 2.55 to 3.30. Among these highest mean scores was for C₂ prepared with 70% papaya seed powder and 30% wheat flour, lowest for C₀ prepared with 100% wheat flour. The mean scores obtained for the color of samples C₀, C₁, C₂, C₃ and C₄, are 7.9, 7.9, 7.8, 8.2 and 7.6 With mean rank scores 3.05, 2.95, 2.95, 3-60,2.45 respectively. Among

these the maximum mean score was found on sample C₃ prepared with 60% papaya seed powder and 40% wheat flour. Minimum mean score was found on C₄ (50% papaya seed flour +50% wheat flour). The cookie prepared out of 100% wheat flour was slightly whitish color and all the other treatments have brown color. The acceptability, sensory characteristics, safety, and aesthetics of food are all affected by color (Edelstein, 2013) [3].

Table 2: Mean score for organoleptic evaluation of papaya seed cookie

Treatments	Appearance	Colour	Flavour	Texture	Taste	Overall acceptability
C ₀	7.3 (3.05)	7.9 (3.05)	7.6 (3.35)	7.2 (2.70)	7.3 (3.0)	7.8 (2.95)
C ₁	7.9 (2.55)	7.9 (2.95)	8.3 (3.60)	7.1 (2.50)	7 (2.70)	7.7 (2.65)
C ₂	8.2 (3.30)	7.8 (2.95)	7.7 (3.10)	7.4 (3.10)	7 (2.25)	7.9 (3.20)
C ₃	8.1 (3.30)	8.2 (3.60)	7.5 (2.75)	7.3 (2.75)	7.3 (3.25)	7.7 (2.75)
C ₄	8 (2.80)	7.6 (2.45)	7.5 (2.20)	7.8 (2.20)	7.1 (3.70)	8 (3.45)
Kendall's (W) value	0.081 ^{NS}	0.098 ^{NS}	0.176 ^{NS}	0.174 ^{NS}	0.161 ^{NS}	0.082 ^{NS}

Figures in the parenthesis indicate mean rank scores NS = Non-significant

C₀= 100% wheat flour

C₁ = (80% wheat flour +20%papaya seed flour)

C₂ = (70% wheat flour+ 30% papaya seed flour)

C₃ = (60% wheat flour +40%papaya seed flour)

C₄ = (50% wheat flour +50% papaya seed flour)

The mean scores for flavor of the samples ranged from 7.5 to 8.3 with mean rank scores 2.20 to 3.60. Samples C₃ and C₄ prepared with 40% papaya seed flour and 50% papaya seed flour respectively have the lowest mean score.

While taste relies on the sensation produced through the stimulation of the taste buds, flavour is broader concept. Flavor is the combined senses of taste, aroma, and mouth feel. Mouth feel encompasses textual and chemical sensations such as astringency, spice heat cooling, and metallic flavor (Muhimbula *et al.*, (2011) [4]. Sample C₄ (50% wheat flour+ 50% papaya seed flour) had scored highest mean score (7.8) for texture and lowest (7.1) was found on sample C₁ prepared with 80% wheat flour and 20% papaya seed flour. The mean rank scores obtained for the samples C₀ to C₄ are 2.70, 2.50, 3.10, 2.75, and 3.95 respectively. The mean rank scores recorded for the taste of the cookies C₀ to C₄ are 3.00, 2.70, 2.25, 3.35, and 3.70. Sample C₂ (70% wheat flour + 30% papaya seed flour) had recorded lowest (6.9) mean score whereas highest (7.3) mean score was found to be on sample C₃.

Taste or the perception of gustatory input, is the most influential factor in a person's selection of a particular food. Taste is perceived by the taste buds, which are primarily on the surface of the tongue, by the mucosa of the palate, and in areas of the throat. Taste is an important parameter when evaluating sensory attribute of food. The product might be appealing and having high energy density but without good taste, such a product is likely to be unacceptable (Aswathi *et al.*, 2000) [7]. The mean scores for overall acceptability of the cookies varied from 7.7 to 8 with mean scores from 2.75 to 3.45. Maximum mean score (8) was found to be on sample C₄

and minimum (7.7) was found to be on samples C₃.

Selection of most acceptable products

From the five treatments C₀, C₁, C₂, C₃, and C₄ of papaya seed cookies, C₄ is found to be highly acceptable and it was selected for further studies. C₄ was made of 50% wheat flour and 50% papaya seed flour.

Nutritional characteristics of papaya seed products

Papaya seed cookie

The energy value of the cookie (C₄) prepared by 50% wheat flour and 50% papaya seed flour was found to be 390 kcal per 100 g. And it contains 58.4 g carbohydrates 9.4g of protein, 15.1 g of fat, 7.7 g of fiber, 17.0 mg of calcium and 2.1 mg of iron.

Table 3: Nutritive value of the papaya seed cookies C₄ (50% wheat flour+ 50% papaya seed flour) per 100

Nutrients	Amount
Energy	390 kcal
Carbohydrate	58.4 g
Protein	9.4 g
Fat	15.1 g
Fibre	7.7 g
Calcium	17.0 mg
Iron	2.1 mg

Cost analysis of the products

The cost of production of papaya seed cookies is very much less than the similar products available in the market. A comparison between cost of commercially available and developed products are furnished in Table 4.

Table 4: Cost of commercially available and the developed products

Commercially available products	Cost (per 100 g) in rupees	Developed products	Cost (per 100 g) in rupees
Chocolate cookie	57	Papaya seed cookie	35.514

Commercially available chocolate cookies cost 57 rupees per 100 g which is very much higher than the developed papaya seed cookie, which cost only 35.514 rupees per 100 g. There is a difference of 22 rupees when the two products are compared.

This difference in costs between the commercially available products and the developed products indicates that the papaya seed products are more economical.

Conclusion

Papaya seed flour was characterized by having high content of protein and fiber, which can be considered an excellent source to nutritionally enhance the products in which it is added. It also allows the improvement of the nutritional and technological quality of the products but can also effective to reduce the environmental impact caused by the improper disposal of industrial waste.

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