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Studies on utilization of papaya peel powder in the preparation of cookies

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Abstract

The present investigation on “Studies on utilization of papaya peel powder in the preparation of cookies” was undertaken to explore the underutilized or neglected but highly nutrient rich papaya peel powder in bakery products. Papaya peel powder is a rich source of crude fibre, Potassium, β -carotene and can be utilized in bakery products such as cookies. The prepared cookies were analyzed for nutritional composition. The changes occurred during storage of cookies were also studied. Preliminary experiments were conducted to find out optimum level of papaya peel powder for preparation of quality cookies. The quality cookies were prepared from 30 g papaya peel powder and 970 g maida. Chemical composition of papaya peel powder showed that the moisture content was 8.02%, carbohydrates 64.41%, protein 5.25%, fat 2.29% and crude fiber 12.21%, Potassium 79.40 mg/100g and β -carotene 15.36 μ g/100g. The physical properties of papaya peel powder has yellow colour, bulk density 0.47kg/cm³. The fresh cookies had 4.16% moisture, 11.89% protein, 23.70% fat, 0.65 mg/100g crude fibre, 58.25% carbohydrates, 364.44 μ g/100g β -carotene and 203.2 mg/100g Potassium. The sensory evaluation of cookies was carried out regularly at a interval of one month. The mean score for colour and appearance was 8.60, texture 8.33, flavour 8.30, taste 8.36 and overall acceptability was 8.40 on 9 point hedonic scales. Storage study of cookies showed that the cookies prepared by incorporation of 30 g papaya peel powder and 970 g maida packed in polypropylene (PP) and low density polyethylene (LDPE) can be stored up to 3 months in good condition with minimum losses in sensory, nutritional and textural characteristics.

Keywords: Utilization, papaya, preparation, cookies

Introduction

Papaya (*Carica papaya*) is recognized for nutritional and medicinal properties all over the world. From the times immemorial, all parts of papaya plant including its leaves, unripened and ripened fruits, seeds, peel and their juice is utilized as traditional medicine. Today, papaya fruit is considered as nutraceutical fruit due to its multifaceted medicinal properties. Papaya has anti-fertility, diuretic, ureteric, antihypertensive, hypolipidemic, anti-helminthic, wound healing, antifungal, antibacterial and anticancer characteristics as well as free radical scavenging properties. Enzymes (papain), carotenoids, alkaloids, monoterpenoids, flavonoids, minerals and vitamins are all present in the whole plant (Mahendra and Amnerkar, 2016)^[8].

Currently papaya peel is wasted and this wasted peel polluting the environment. Bioactive compounds can be observed in agro based industries by-products and exploitation of these abundant and cheap reusable sources can be utilized to generate new products for medicinal, food and cardio industries (Brasi *et al.*, 2014)^[5]. Minerals, fiber and phenolic chemicals having antiviral and antibacterial activities are abundant in them. Phytochemicals are antioxidants and anti-inflammatory substances that aid in the removal of toxic and damaging compounds from the human body (Djilas *et al.*, 2009)^[6].

Peels and seeds are by-products of papaya processing that account for 20 to 25% of the fruit weight. It can be utilized for animal feed, but they are frequently dumped into the environment, that causes organic pollution. The peel of a papaya contains a variety of beneficial substances, including proteins and phytochemicals such as phenolic compounds (Koubala *et al.*, 2014)^[7].

In India one of the most important segments of the food processing business is baking. People in society likes bakery product because they are readily available, convenient to eat as well as has a long shelf life (Vijayakumar *et al.*, 2013)^[11]. Since the earlier times, bakery products have become more popular in India. Cookies are the most popular of all bakery items. Cookies were invented very early. Because their moisture content is so low, they can be stored for a long period. Cookies are a chemically leavened baked product with a higher amount of fat as well as sugar content (Navy, 1980)^[9]. The market of cereals and bakery products is worth \$1 billion in India and is increasing day by day (Bhise and Kaur 2013)^[10]

Cookies are the popular bakery product and this is consumed nearly by all levels of society. This is mainly due to its ready-to-eat nature, good nutritional quality and availability in different variety and affordable cost. Most of bakery products are utilized as a source for incorporation of different nutritionally rich ingredients for their diversification.

Materials and Methods

The experiment was conducted in the laboratory of Department of Food Science and Technology, Post Graduate Institute at Mahatma Phule Krishi Vidyapeeth, Rahuri during the year 2020-2021. Papaya peel powder was prepared in laboratory.

Packaging material

The packaging materials like low density polyethylene (LDPE) and polypropylene (PP) were purchased from the local market.

Ingredients: The major ingredients for the preparation of cookies such as maida, sugar and Vanaspati ghee were purchased from local market.

Method

Procedure for preparation of cookies by incorporating papaya peel powder: The procedure for preparation of cookies by incorporating papaya peel powder is shown in Fig 1.

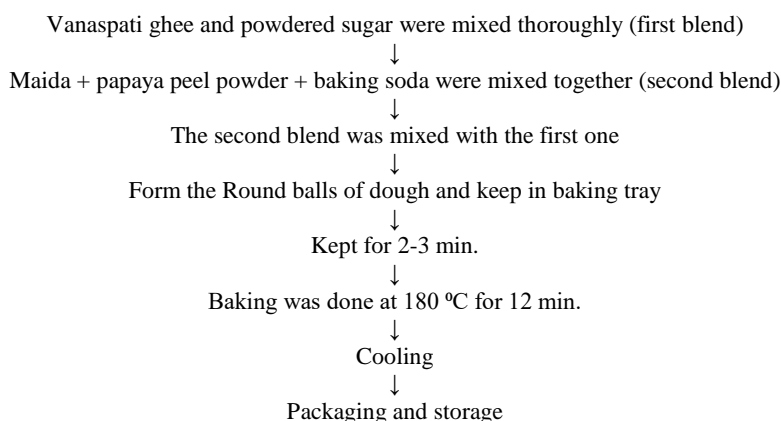


Fig 1: Flow sheet for preparation of cookies

Table 1: Treatment details

Treatments	Maida (g)	Papaya peel powder (g)
T ₀ (Control)	1000	00
T ₁	990	10
T ₂	980	20
T ₃	970	30
T ₄	960	40
T ₅	950	50

Physico-chemical analysis of raw material and cookies

The method described in A.A.C.C. (2000) [1] for determining moisture was used. The protein content of cookies was estimated by determining total nitrogen content using standard Micro-Kjeldhal method and fat content of the cookies estimated by the soxhlet method A.A.C.C (2000) [1]. The crude fiber content in the product was estimated by A.A.A.C. (2000) [1]. The carbohydrate content in the selected cookies were obtained by subtracting from 100, the sum of values of moisture, protein, fat and ash content per 100 g of the sample (Raghuramulu, *et al.*, 1993) [10]. β -carotene content of the selected samples was determined by the method of A.O.A.C. (1980) [2]. Potassium is estimated by flame photometer

Packaging and storage of cookies

The selected treatment (T₃) i.e. 30 g papaya peel powder and 970 maida blended cookies was packed in low density polyethylene (LDPE) and polypropylene (PP) and stored for 90 days. The cookies were drawn at an interval of 30 days and evaluated for chemical and sensory quality.

Sensory evaluation of cookies prepared by incorporation of papaya peel powder

Sensory evaluation of cookies prepared by incorporation of papaya peel powder was carried on by 9 point hedonic scale. The average scores of the ten judges for different quality characteristics *viz.* Colour and appearance, flavour, texture, taste and overall acceptability were recorded.

Statistical analysis

All experiments were carried out by using Completely Randomized Design (CRD) and Factorial Completely Randomized Design (FCRD). The data obtained in the present investigation were analyzed for the statistical significance according to the procedure given by Rangaswamy (2010) [10].

Results and Discussion

Table 2: Physico-chemical composition of raw materials used in the preparation of cookies

Sr. No.	Physical and Chemical constituents	Mean value (Papaya peel powder)	Mean value (Maida)
1.	Color	Yellow	White
2.	Bulk density (g/cm ³)	0.47	0.49
3.	Moisture (%)	8.02	13.20
4.	Protein (%)	5.25	12.10
5.	Fat (%)	2.29	0.80
6.	Crude fiber (%)	12.21	0.40
7.	Carbohydrates (%)	64.41	73.80
8.	β -carotene (μ g/100g)	15.36	379.11
9.	Potassium (mg/100 g)	79.40	150.00

Each value represents the average of three determinations

Table 3: Sensory evaluations of fresh cookies prepared by incorporation of papaya peel powder

Treatments	Colour and appearance	Texture	Flavour	Taste	Overall acceptability
T ₀	8.2	8.1	8.0	8.3	8.1
T ₁	8.4	8.3	8.3	8.3	8.3
T ₂	8.5	8.5	8.4	8.5	8.5
T ₃	9.0	9.0	8.5	9.0	8.9
T ₄	8.1	8.5	8.0	8.1	8.2
T ₅	7.5	8.1	7.3	7.9	7.7
Mean	8.3	8.4	8.0	8.4	8.3
SE±	0.05	0.04	0.04	0.06	0.05
CD@5%	0.15	0.11	0.12	0.02	0.02

Maximum score out of 9

Whereas;

T₀ = Cookies with 1000 g maida and 00 g papaya peel powder

T₁ = Cookies with 990 g maida and 10 g papaya peel powder

T₂ = Cookies with 980 g maida and 20 g papaya peel powder

T₃ = Cookies with 970 g maida and 30 g papaya peel powder

T₄ = Cookies with 960 g maida and 40 g papaya peel powder

T₅ = Cookies with 950 g maida and 50 g papaya peel powder

The organoleptic evaluation of cookies prepared by different combination of papaya peel powder and maida were carried out. The cookies were prepared and presented to panel of ten judge for assessing the quality and acceptability of product. Organoleptic evaluation of cookies was carried out using a 9 point hedonic scale of sensory characteristics such as colour, texture, taste and overall acceptability.

Treatment T₃ i.e. 30 g papaya peel powder and 970 g maida was selected and kept for 3 months for storage study. Chemical analysis and sensory evaluation was done at interval of 30 days.

Changes in Chemical parameters of papaya peel powder and maida blended cookies during storage

Table 4: Chemical analysis of papaya peel powder and maida blended cookies during storage

Parameters	Initial				Final			
	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂
Chemical constituent	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂
Moisture (%)	4.14	4.17	4.17	4.20	4.17	4.20	4.22	4.24
Protein (%)	12.25	11.95	11.78	11.57	11.80	11.61	11.31	11.25
Fat (%)	23.59	23.57	23.68	23.65	23.50	23.47	23.59	23.57
Crude fiber (%)	0.27	0.26	0.64	0.63	0.22	0.61	0.58	0.57
Carbohydrate (%)	57.91	57.89	58.22	58.20	57.83	57.79	58.13	58.11
β-carotene (µg/100g)	375.12	375.01	364.35	364.29	374.89	374.81	364.17	364.05
Potassium (mg/100g)	201.47	201.45	201.99	201.97	201.36	201.33	201.88	201.85

Whereas

T₁ - 1000 g maida (Control treatment)

T₂ - 970 g maida and 30 g papaya peel powder

P₁ - Low density polyethylene (LDPE)

P₂ - Polypropylene bag (PP)

The data in Table 4 shows that protein and β-carotene contents decreased in T₂ with increasing papaya peel powder concentration, this is due to replacing the maida which is major source of the protein and fat. On the other side, moisture, crude fibre and potassium increased in T₂ by increasing the level of papaya peel powder, as from the proximate composition of the papaya peel powder it is clear that peel powder is a major source of the crude fibre,

potassium and fat. Except moisture all other parameters found decreased in final analysis as compared to initial analysis. Cookies stored in low density polyethylene (LDPE) shows better quality than polypropylene (PP).

Changes in sensory parameters of papaya peel powder and maida blended cookies during storage

Table 5: Sensory evaluation of papaya peel powder and maida blended cookies during storage

Parameters	Initial				Final			
	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂	T ₁ P ₁	T ₁ P ₂	T ₂ P ₁	T ₂ P ₂
Colour and appearance	8.34	8.14	8.79	8.61	8.00	7.85	8.55	8.41
Texture	8.01	7.92	8.45	8.30	7.80	7.65	8.33	8.14
Flavour	8.30	8.04	8.55	8.33	7.80	7.67	8.23	8.20
Taste	8.35	8.14	8.56	8.45	8.21	7.90	8.45	8.05
Overall acceptability	8.25	8.06	8.59	8.42	7.95	7.94	8.33	8.21

Maximum score out of 9

Whereas;

T₁ - 1000 g maida (Control treatment)

T₂ - 970 g maida and 30 g papaya peel powder

P₁ - Low density polyethylene (LDPE)

P₂ - Polypropylene bag (PP)

The data in table 5 show that papaya peel powder and maida blended cookies (30 g papaya peel powder and 970 g maida) remained in good condition at ambient temperature during the entire storage period of 3 months. The cookies stored in low density polyethylene bags (LDPE) showed good quality than polypropylene (PP) during 3 months of storage. The overall acceptability score of papaya peel powder and maida blended cookies was decreased from 8.59 to 8.33 in LDPE and 8.42 to 8.21 in LDPE.

Conclusion

Papaya peel powder and maida blended cookies prepared with combination of 30 g papaya peel powder and 970 g maida was best and it was fairly stable to storage period for chemical composition. The cookies remained in good condition during storage period of 3 month. The cookies stored in LDPE bags showed good quality than polypropylene (PP) during 3 month storage.

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