RESEARCH ARTICLE

PHYSICOCHEMICAL AND ORGANOLEPTIC PROPERTIES OF COOKIES MADE USING TENDER COCONUT PULP AS A FAT REPLACER

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ARTICLE INFO	ABSTRACT
	The present study was conducted to understand the effect of substitution of butter with tender coconut pulp in cookies in terms of its physicochemical and organoleptic properties. Three variations of the cookies were formulated; (a) Control (100% butter), (b) Variation 1 (25% tender coconut pulp + 75% butter), (c) Variation 2 (50% tender coconut pulp + 50% butter). The physicochemical analysis of the cookies showed a significant reduction in the fat content and a significant increase in the moisture, protein, fibre and ash content in the cookies made with tender coconut pulp. The control cookies were found to have the highest diameter and spread ratio. The organoleptic properties of the variation cookies were studied through sensory evaluation carried out by semi-trained panellist and the results were found similar for both the variations. The cookies made with tender coconut pulp had a good acceptability.

INTRODUCTION

Snack food consumption has been on the rise because of urbanization and increase in the number of working women. Food based industry can exploit this development by fabricating nutritious snack foods. Among ready-to-eat snacks, cookies possess several attractive features including wider consumption base, relatively long shelf-life, more convenience and good eating quality (Tsen *et al*. 1973; Akubor 2003; Hooda and Jood 2005). The growth of bakery industry is about 10% per annum and the products are increasingly becoming popular among all sections of people (Indrani *et al*. 1997). The coconut pulp is the major edible portion of coconut that has been used in the extraction of oil, coconut milk, cream, in bakeries, cooking and so on. Coconut oil can be used both for edible as well as industrial applications. The coconut pulp contains amino acids, minerals, antioxidants like phenolics and tocopherols (Abdul and Zafar 2011). It has 50–60 % fat. Coconut oil is rich in medium chain fatty acid (MCFA) (59.7 %) having 92.7 % saturated fatty acids (SFA), 6.1 % monounsaturated fatty acids (MUFA) and 1.2 % polyunsaturated fatty acids (PUFA). Lauric acid is the main fatty acid in coconut oil (49.1 %) (Bhatnagar *et al*. 2009).

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MCFA is easily burnt for the energy production rather than storing in the body (Kiyasu *et al*. 1952). The replacement of butter with tender coconut pulp will upgrade the nutritional quality of cookies. It would provide nutritionally balanced food because of the expected improved protein quality and reduced fat content. Therefore, in the current study the feasibility of partially replacing butter with tender coconut meal for cookie production was investigated.

MATERIAL AND METHODS

Materials

Ingredients for the cookies that include refined wheat flour, Cooking Butter, Sugar, Baking Powder, Baking Soda, Water and Vanilla Essence were procured from the local market in Chennai, Tamil Nadu. Tender Coconut meal was obtained from the tender coconut purchased from the local market in Chennai, Tamil Nadu. The tender coconut meal was separated from the nut and blended using a waring blender to achieve smooth, butter-like consistency.

Methods

Formulation of Cookies

The cookies recipe used in this study is given in Table 1. Tender coconut meal was used to replace a part of the butter

(0%, 25% and 50%) in the standard recipe. Refined wheat flour was sieved along with baking soda and baking powder. Butter, tender coconut meal and sugar were creamed together till light and fluffy. Vanilla essence and water was added. The flour mixture was worked in to form a dough which was then cling wrapped and chilled in the refrigerator for 15 minutes. Once removed, the dough was divided into balls of 9 grams each which were rolled to a diameter of 3.5 cm. The moulded dough was then arranged on a lightly greased baking tray. The control cookies, 25% tender coconut meal and 50% tender coconut meal were baked at the temperature of 170°C for 13 minutes, 165°C for 15 minutes and 150°C for 18 minutes, respectively. The baked cookies were removed from the baking pan and cooled to room temperature before the analysis.

Table 1. Formulation of cookies

Ingredients	Control	Variation 1	Variation 2
Butter (g)	120	90	60
Tender Coconut Meal (%)	0	25%	50%
Sugar (g)	110	110	110
Refined Wheat Flour (g)	180	180	180
Baking Powder (g)	2.5	2.5	2.5
Baking Soda (g)	2.5	2.5	2.5
Vanilla Essence (mL)	5	5	5
Water (mL)	7.5	7.5	7.5

Chemical Analysis

Moisture content: 5g of ground cookies was weighed into a moisture dish. It was kept in hot air oven at 105ºC for 4 hours. The weight of the dish before and after drying was noted. (AOAC, 2005). Ash content: 5g of the ground cookies was weighed into a crucible and charred over Bunsen burner till fumes cease. It was then burnt in a muffle furnace at 500ºC for 4 hours. The empty weight and the final weight of the crucible were noted. (AOAC, 2006). Fat content: Fat was determined by Soxhlet Method (AOAC, 1990). Carbohydrate: Carbohydrate was estimated by 'Total Carbohydrates by Difference' method. Formula – 100 - (% Protein + % Ash + % Fat + % Moisture). Protein: Protein in the sample was estimated using Micro-Kjeldahl Method. (AACCI Method 46-13.01). Crude fibre: Crude fibre was estimated by giving acid and alkali wash to the ground cookies. The residue was collected and burnt in a muffle furnace 500ºC for 4 hours. The empty weight and the final weight of the crucible were noted. (AOAC, 962.09).

Physical Analysis

Weight: The cookies were weighed using an analytical balance. Diameter: To measure the diameter of cookies, four samples were placed next to one another and the total diameter was measured using a Vernier Calliper. All the cookies were then rotated at 90⁰ and the new diameter was measured. The average of the two measurements divided by four was taken as the final diameter of the cookie. Thickness: Thickness was also measured using a Vernier Calliper by stacking the cookies one above the others and restacking four times. Spread Ratio: The spread ratio was calculated using the formula: Diameter divided by Thickness of cookies. (Noor Aziah *et al.*, 2011). Bulk Density: Bulk density of cookies was determined using the formula: Weight divided by Bulk volume of cookies. (Anu Bala *et al.*, 2015)

Sensory Analysis

A ten-membered semi-trained panel comprising of students from the Food Science Department evaluated the samples using the 9 points hedonic scale method: 9 (excellent) to 1 (very poor). Sensory testing was done on Variation 1 and Variation 2 cookies. Each sample was replicated twice. Each panellist was presented with 4 samples. The samples were coded with random three-digit numbers and the positions of the samples were randomized. The score was analysed by ANOVA. (Noor Aziah *et al.*, 2011)

RESULTS AND DISCUSSION

Cookie Composition

The proximate composition of the cookies found through analysis is shown in Table 2. The fat content and the carbohydrate content were found highest in Control Cookies followed by Variation 1 and then Variation 2, whereas, the moisture content, protein content, ash content and crude fibre were found highest in Variation 2 followed by Variation 1 and then control.

Table 2. Proximate Composition of Three Types of Cookies

Parameter	Control Cookies	Variation 1	Variation 2
Fat	22.26%	16.62%	12.387%
Moisture	0.599%	2.49%	4.21%
Protein	1.8%	5.95%	11.8%
Ash	1.397%	4.235%	6.205%
Carbohydrates	73.944%	70.705%	65.398%
Crude Fibre	0.6%	3.7%	7.2%

Physical Analysis

The physical characteristics of the three types of cookies are shown in Table 3. The results indicate that the weight, diameter, bulk density and spread ratio were highest in Control cookies followed by Variation1 and then Variation 2, whereas, the thickness was least in Control cookies followed by Variation 1 and then Variation 2.

Table 3. Physical Characteristics of Three Types of Cookies

Parameter	Control Cookies	Variation 1	Variation 2
Weight	8.395g	7.89g	7.544g
Thickness	1.26cm	1.32cm	1.43cm
Diameter	4.88cm	4.7cm	4.53cm
Bulk Density	0.652 g/m³	0.625 g/m³	0.588 g/m³
Spread Ratio	3.87	3.56	3.167

Sensory Evaluation

The sensory scores of Variation 1 and Variation 2 cookies are shown in Table 4. The Variation 1 cookies were rated higher in flavour, aroma, taste, after taste and overall acceptance with a significant difference ($p<0.05$) as compared to Variation 2 cookies. Whereas, Variation 2 cookies were rated higher in texture with a significant difference ($p<0.05$).

Table 4. Results of Sensory Evaluation of the Variation Cookies

Parameter	Variation 1	Variation 2
Flavour	8.17 ± 0.62	7.8 ± 1.46
Aroma	8.17 ± 0.70	7.61 ± 0.99
Texture	8.28 ± 0.67	8.5 ± 0.51
Taste	8.44 ± 0.61	7.83 ± 0.87
After Taste	7.83 ± 0.98	7.39 ± 1.44
Overall Acceptance	8.28 ± 0.67	7.78 ± 0.98

Conclusion

Cookies prepared with Tender Coconut Pulp as a fat replacer were found to have reduced fat and carbohydrate content, whereas increased protein and crude fibre content. Variation 1 Cookies (25% Tender Coconut Pulp) had a better acceptance than Variation 2 Cookies (50% Tender Coconut Pulp).

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