International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 3 Issue 7, June 2016

ISSN: 2394-4404

Physical, Sensory And Nutritional Evaluation Of Biscuits Prepared By Using Beetroot (Beta Vulgaris) Powder

Shikha Srivastava
Era's Lucknow Medical Collage & Hospital Lucknow

Kanchan Singh
Babu Banarasi Das University, Lucknow

Abstract: ***Beetroot biscuits were prepared with the incorporation beetroot powder from 5 per cent, 10 per cent and 15 per cent from standard biscuit making method. These biscuits were then evaluated for their physical, sensory and nutritional, characteristics. The data indicates that 5 per cent beetroot powder incorporated biscuit had better physical and sensory properties (colour, appearance, aroma, texture, taste etc.). The beetroot biscuits prepared by beetroot powder is more nutritious than control biscuit.***

Keywords: Beetroot Powder, BRP, Proximate Composition, biscuit, betanin.

I. INTRODUCTION

Baking is a method of cooking foods that uses prolonged dry head, normally in an oven, but also in hot ashes, or on hot stones. Biscuit is a term used for a diverse variety of baked, commonly flour- based food products. but may contain fat, sugar and other ingredients mixed together into dough for making biscuits. It is most popular world wide baking product. It is flat crisp and may be sweetened or unsweetened according to preference. It is high in carbohydrates, fat and calories but low in fiber, vitamins and minerals which make it unhealthy for daily consumption. Due to its high acceptability in all age groups long self life and better taste it is required to improved nutritional quality of biscuits. Enriched or fortified biscuits have better nutritive value and have healthy choice for consumption Beetroot is cultivated from June to November it is the taproot portion of the beet plant. It is the crop belonging to the chenopodiaceae family and has several varieties of bulb. Its colours ranging from yellow to red. Deep red coloured beetroot are the most popular for human consumption. The nutritional importance of beetroot is that it contains no fat, very few calories and beet is a great source of folate, fiber and several antioxidants (Carotenoids and flavonoids). Beetroot contains the significant amount of vitamin C and vitamin A in the form of beta carotene and it also contains small amounts of vitamins $B_{1,}$ B_2, $B_{3,}$ Calcium, magnesium, potassium and sodium, etc. The unique red colour (Crimson red) is due to betanin pigments and yellow varieties are rich in betaxanthin pigment. It is the antioxidant hepatoprotective and also act as anti-cancer agent etc.

The objective of this study are:

- ✓ To develop biscuits fortified with beetroot powder.
- ✓ Sensory evaluation of biscuits fortified with beetroot powder.
- ✓ To identify the physical property and nutritional evaluation of beetroot biscuits.

II. MATERIALS AND METHODS

A. PROCUREMENT OF RAW MATERIALS

Beetroots were procured from Ghala farm, Hardoi by pass road, Lucknow (U.P.) whereas wheat flour, fat, sugar, baking powder vanilla essence and Curd were purchased from local market in Aminabad, Lucknow.

B. PROCESSING OF BEETROOT POWDER

Beetroots were first washed with tap water, chopped into small pieces. They were dried in an air-circulated oven at 60 ^{0}C to complete dryness for about 11-12 hours .The dried beetroots were grinded in grinder. The ground materials were

ISSN: 2394-4404

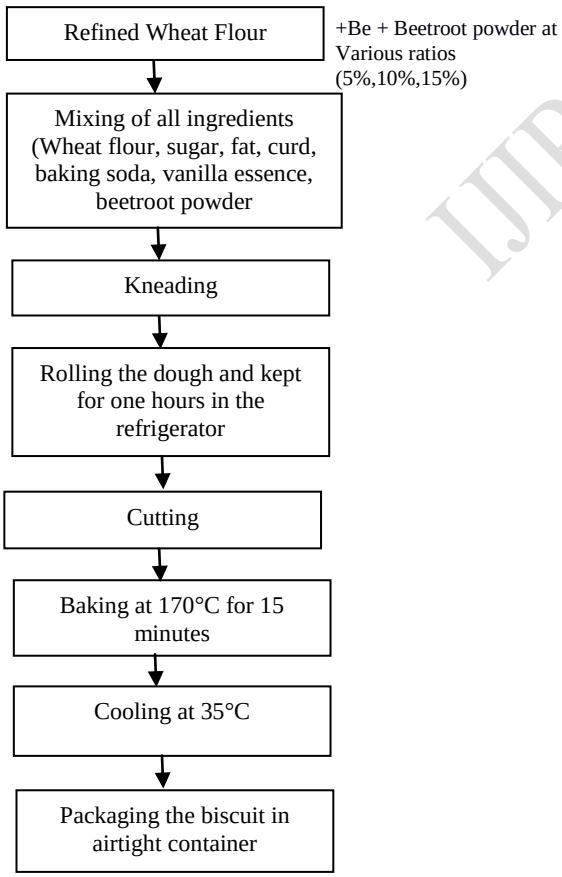
passed through 65 mesh size of ASTM standard and packed in air tight coloured glass bottles for further use.

C. PRODUCT FORMULATION

Beetroot biscuits were prepared by replacing refined wheat flour with beetroot powder (BRP) .Three types of biscuits were developed by standard method of cookies preparation with slight modifications. All the ingredients used for the preparation of biscuits were given in table(1).

Ingredients	Control Biscuit	Beetroot powder incorporated biscuit		
		Refined wheat flour; Beetroot powder		
	100:00	95:5	90:10	85:15
wheat flour	100	95	90	85
Sugar	50	50	50	50
Fat	15	15	15	15
Curd	25	25	25	25
Baking soda	2.5	2.5	2.5	2.5
vanilla essence	1	1	1	1
Beetroot Powder	-	5	10	15

Table 1: Composition Of Biscuits Prepared By Using Beetroot Powder



Flow Diagram For Biscuits Preparation

III. PHYSICAL PARAMETERS

Physical parameters were studied after cooling of biscuits at room temperature for after 30 minutes. The weight of the biscuits were measured by weighing on a weighing balance with an accuracy of 0.02 mg.

Physical parameters of biscuits were measured with a digital micrometer screw gauge while spread ratio was calculated by AACC, 1967 method as follows:

$$\text{spread Ratio} = \frac{\text{Width}}{\text{Thickness}}$$

IV. SENSORY CHARACTERISTICS

The sensory characteristic of biscuits were judged by the panel of ten semi-trained members by using Nine-Point Hedonic Scale from the ERAS Lucknow Medical Collage & Hospital Lucknow. The panelists were asked to evaluate the product for different sensory attributes namely color, appearance, Aroma, Texture, Taste, and overall acceptability (Amerine et al.,1965)

V. NUTRITIONAL COMPOSITION

Beetroot Biscuits were analyzed for proximate composition (AOAC, 1995) The carbohydrates were determined by subtracting the sum of the values (per 100 g), total ash, crude fat, fiber and crude protein from hundred . The energy value of biscuits were calculated by summing up the product of multiplication of per cent crude protein, crude fat and carbohydrates present in the biscuits by 4,9 and 4 respectively (Mudambi et al., 1989). The beetroot biscuits were a analyzed for betanin pigment by using AOAC, 1995 method.

VI. RESULTS AND DISCUSSIONS

Beetroot biscuits were developed by different proportion of wheat flour and BRP (5 per cent, 10 per cent, 15 per cent). The acceptability of beetroot biscuits were judged by panel of twenty semi-trained members,. The biscuit developed by utilizing 5 per cent BRP was highly acceptable. The mean score for acceptability ranged from 8.65 (Color) to 8.10 (texture). Overall sensory scores of beetroot biscuits revealed that biscuits prepared with 5 per cent of incorporation of BRP were highly acceptable among other two beetroot biscuits. It was observed that the sensory characteristics of beetroot biscuits were decreased gradually while increasing the per cent of BRP 5 per cent to 15 per cent. While formulating the beetroot biscuits incorporating 15 per cent BRP having hard texture that was not desirable for biscuits. The color of biscuits becoming very dark that was not pleasant and taste of biscuits was not good having some bitterness while increasing BRP.

Sensory Attributes	Biscuits Refined wheat flour : Beetroot Powder					
	100:00	95:5	90:10	85: 15	CD at 5%	S.E. m±
Colour	9.05±0.	8.65±0.	6.50±0.94	5.10±0.	0.564	0.610

	686	745	6	718		
Appearance	8.80±0.696	8.35±0.587	6.70±657	4.95±0.945	0.530	0.538
Aroma	8.95±0.686	8.35±0.587	6.85±0.813	5.00±0.725	0.512	0.501
Texture	8.80±0.696	8.10±0.718	6.70±0.733	5.40±0.883	0.550	0.580
Taste	9.10±0.641	8.15±0.671	6.60±0.754	4.90±0.788	0.518	0.513
Overall Acceptability	8.90±0.641	8.25±0.550	6.65±0.671	5.05±0.999	0.531	0.540

Table 2: Mean Sensory Scores Of Beetroot Powder Incorporated Biscuits Using Nine-Point Hedonic Scale Method

Average of 20 values reported one way ANOVA (f test) was used to find out significant difference among samples (Snedecor and Cochran, 1967)

Types of Biscuits	Diameter (cm)	Thickness (cm)	Spread Ratio	Weight (g)
Control	18.23	1.20	15.19	30.00
5 % (BRP)	18.10	1.25	14.48	30.08
10 % (BRP)	17.92	1.32	13.57	30.19
15 % (BRP)	16.82	1.43	11.76	30.32

Table 3: Physical Characteristics Of Beetroot Powder Incorporated Biscuits

Significant reduction in expansion diameters with increasing levels of beetroot powder in all three types of biscuits may be due to increase fiber content in the samples. But expansion in thickness and weight was slightly increased with increasing level of beetroot powder.

The Nutritional composition of biscuits incorporated with beetroot powder were analyzed and presented in table 4. The data indicates that the protein content was increased from 6.7 to 7.83 (g/100g) as the level of BRP increased from 0 to 15 per cent .The value of fiber was increased from 0.1 to 2.10 (g/100g) by increasing the amount of BRP gradually from 0 to 15 per cent. The value of calcium, Iron, Phosphorus and magnesium (mg/100g) was increased form 1.7 to 6.21, 0.0 to 1.31, 26.0 to 57.10 and 0.25 to 13.21 as the amount of BRP was increased from 0 to 15 per cent. The control biscuits having zero nutritive value of folate, vitamin c, betanin and choline but while increasing the amount of BRP from 0 to 5.21, 0.0 to 4.73, and 0.0 to 0.81.

Nutritional Parameters	Biscuits			
	Refined wheat flour : Beetroot Powder			
	100:0	95:5	90:10	85:15
Protein (%)	6.7	6.8	7.00	7.83
Fat (%)	1.5	13.23	13.75	14.25
Total Ash (%)	0.23	0.46	1.25	2.72
Carbohydrate (%)	78.2	67.14	70.0	67.35
Energy (Kcal/100g)	451	443.52	460.52	487.43
Fiber (%)	0.6	1.72	1.94	2.10
Calcium (mg/100g)	1.7	5.6	5.70	6.21
Iron (mg/100g)	0.0	0.24	0.51	1.31
Phosphorus(mg/100g)	26.0	56.0	56.87	57.10
Magnesium(mg/100g)	0.25	12	12.50	13.21
Folate	0.0	4.6	4.10	4.73
Vitamin -C	0.0	3.90	4.10	4.73
Betanin	0.0	6.7	6.93	7.23
Choline	0.0	0.26	0.30	0.81

Table 4: Nutritional Composition of beetroot powder incorporated biscuits

VII. CONCLUSION

From this study it may be concluded that biscuit prepared with 5 percent beetroot powder incorporation had better physical and sensory properties (colour, taste, texture etc.) and it also improved the nutritional profile over control biscuit. It is a healthy biscuit which has many therapeutic property. So , it is advice to include this biscuit in daily routine diet for health benefit.

ACKNOWLEDGEMENT

Firstly I thanks faculty of ELMC&H and BBDU, Lucknow for cooperating in sensory evaluation of my developed product.

Then I ALSO want to thanks to Regional Food Research And Analysis centre, Lucknow for allowing to analyzing nutritional composition in their center.

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