

Organoleptic Evaluation of Product by Using Natural Color in Food Product (Cookies)

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Abstract: *The present study is carried on "use of natural color in food product, cookies". The use of natural color in food product in the place of synthetic color is a good option for the food industry. Color is one of the most important quality attributes present in food for attract the consumers acceptance level of food. At present time the demand of natural color in food product in the place of synthetic color is increasing worldwide due to increased awareness on medicinal properties and their benefits for health among the public and also for the recognized profound toxicity of synthetic colors. Natural colors are those pigments which are derived from naturally occurring sources such as plants, insects, animals and minerals. Among all the natural pigment, plant-based pigment are mostly preferred due to their medicinal values. To balance health among consumers and preserve the quality of food, it is important to organoleptic evaluation or sensory properties like taste, flavor, texture, mouth feel, appearance, aroma and color in food product and increase the growth of natural color in food market. In this study the natural color was extracted from beetroot (*Beta Vulgaris*). Beetroot is a good source of fiber, nutrition and minerals etc. Beetroot also have antioxidant property.*

Keywords: Natural color, Pigment, Beetroot, Synthetic color, Organoleptic properties, Sensory evaluation

1. Introduction

Cookies are the largest part of snack item in the bakery products. It is acceptable for both rich and poor person and also for young and elderly people as a snack due to their low price, shelf-life, easy to eat and also for their nutritive value. Cookies are a baked product and it is easy to digestion and it is easy to carry in the traveling as a snacks. According to a statistical study cookies at a 17.3%, are the second most consumed baked food product after bread. Cookies are widely accepted for all profiles of people from many countries and also a good source for nutritional components. At this time food product company produce different types of cookies like sugar free cookies, protein enrich cookies, wheat germ cookies, oats cookies etc.

In the production of cookies mainly three major ingredients are used such as refined flour, sugar and fat and some minor ingredients such as flavonoids, additives. The use of synthetic color in cookies for different color is harmful for the health but at the present time food industries are focused on the natural color use in their food product on the demand of the public. Natural color are beneficial for human health and have a wide variety of vitamins, minerals, nutritional value and antioxidant property.

Color is one of the most important part of the food, being considered as a quality indicator and determining or presenting the food. Many other synthetic colored foods are submitted to color losses during processing and then they require colorants to restore their color. Beetroot is a good source for natural red color. Beetroot is belonging to the family of Cactaceae and order of Caryophyllales. Belonging to the same family as chard spinach, both the leaves and root can be eaten.

Deep color and a whole lot of crunch define beetroot. Its overpowering color can turn any recipe shocking pink. The

vegetable owes its color to a pigment called betanin which is often extracted to create natural food coloring and dyes. Interestingly, beets were also used to add color to wines back in the day.

In previous research work was to obtain identify and characterize the pigments obtained from the red beet (*Beta Vulgaris L.*), and using of these pigment as alternative natural red colorants in some processed foods (i.e. jelly and Ice. sherbet). Also, to investigate the antioxidant activity of the extract through the addition to oil. Also, sensory evaluation was determined in jelly and ice sherbets after using the red beet extract as food colorant. (Attia, Gamila, Y.M. et. al., 2013) Beetroot pigment is used commercially as a food dye and has no known allergic side-effects. Betalains have several applications in foods, such as desserts, confectioneries, dry mixes, dairy and meat products. Betanin (C₂₄H₂₇N₂O₁₃) makes up 75-95% of the total coloring matter found in the beetroot, therefore it is used as a natural food coloring agent (Azeredo et. al., 2007). As a powerful antioxidant pigment, betalain may provide protection and reduce risk of cardiovascular disease and cancer. Beetroot is of remarkable biological process value; particularly the greens, that area unit wealthy in iron and vitamins A and C. Beetroot are an excellent source of folic acid and a very good source of fiber, manganese and potassium. The greens should not be overlooked; they can be cooked up and enjoyed in the same way as spinach. (Lucarini M, et. Al. 2006)

Beet root is a popular root crop grown for its fleshy roots which are used as cooked vegetable, salad and for pickling and canning. The young plants along with the tender leaves are also used as herbs in very long period. It is very popular in USA. Beet root is a rich source of protein (1.7 g/100 g/100 g), carbohydrates (88 mg), calcium (200 mg), phosphorus (55 mg) and vitamin C (88 mg). Leaves are rich

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in iron (3.1 mg), vitamin A (2100 I.U.), thiamine (110 μ g) and ascorbic acid (50 mg/ 100 g).

Organoleptic Properties or Sensory Evaluation: Food Manufacturing Company and retailers often use sensory evaluation because according to test and texture, they know about the food product and what consumer thinks about their product. Organoleptic evaluation is an analysis method in which the human senses as a measurement tool to determine the quality and to describe the condition of a food product. It is a scientific discipline that analyses and measures human responses to the composition of food and drink, e.g. appearance, touch, odour, texture, temperature, taste and smell. This discipline requires panel of human assessors by whom the product are tested and responses are recorded by them. By applying statistical techniques to the results it is possible to make inferences and insights about the product under test. Food quality can be evaluated by sensory evaluation. Sensory quality is the combination of different sense of perception coming into play in choosing and eating a food. Appearance, flavour and mouth feel decides the acceptance of the product.

2. Objective

- To prepare cookies using natural color extracted from beetroot.
- To find out the sensory evaluation of prepared food product.

3. Methodology

- **Materials:** Beetroot was purchased from a local wet market of Lucknow city. The betalain pigment was then extracted as described in next section. Bakery ingredients such as refined flour, sugar, butter, milk or egg, baking powder, sodium chloride salt were procured from local grocery store of the Lucknow city.
- **Extraction of betalain pigment:** Washed the beetroot from the tap water and chopped it very fine and small pieces it. Then, about 300g of red beet was mixed in blender with 1.5 liter of ethanol. Ethanol was acidified with 2% citric acid. The content was mixed for 15 minutes and then was allowed to set for 25 hours. After this the extract was filtered and the liquid pigment was obtained. The obtained pigment was concentrated under vacuum by a rotary vacuum evaporator at 40 C as reported by Francis (2000) and in the last HPLC was used for the identification of pigment.
- **Cookies preparation:** Cookies were prepared according to the normal method with slight modifications. The formula used to produce the cookies is shown in table 1. Betalain pigment replaces the synthetic color.

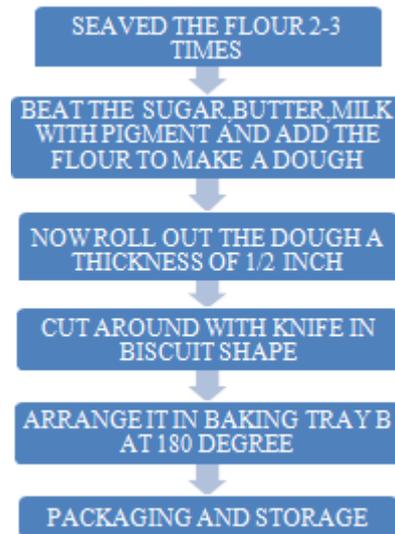


Figure 2: Flow chart of techniques used in cookies preparation

4. Method for evaluation

The prepared product was further evaluated by faculty members according to certain parameters mentioned in the 9-point hedonic scale i.e. taste, texture, appearance, aroma, color, flavour, mouthfeel and overall acceptance and then marking were given according to them. At the end of this phase marking of individual products were calculated and the best acceptable product was put forth for the study.



Figure 3: Flowchart representing method of evaluation

5. Results and Discussions

The experimental snacks products of refined wheat and betalain pigment were characterized as developed product in the present study. The various parameters were incorporated for product development to reach acceptability & edible for human population. For that sensory evaluation process was done by set of panelist expertise field of nutrition. For evaluation, a 9-point hedonic scale which is one of the sensory evaluation methods used to evaluate any product. Many parameters were used to analyses the acceptability of developed product these are as Taste, Texture, Appearance, Aroma, Color, Flavor, Mouth feel, Overall acceptance

The total average and standard deviation of individual product was calculated and the best of the five products was for further put forth for the next phase. Individual marking from each of the panel members for different parameters have been mentioned below-

Parameter 1: Taste

Panelist	T1	T2	T3	T4
Member 1	8	7	8	9
Member 2	7	6	6	9
Member 3	8	6	7	8
Total	23	19	21	26

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of taste the minimum average scored is 19 by T2 while maximum is of T4 with an average of 26, which shows the highest acceptability of sample T4 in respect of taste.

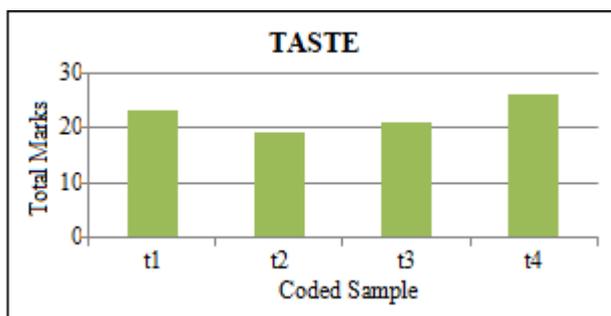


Figure 4: Graphical representation of score for taste

Parameter 2: Texture

Panelist	T1	T2	T3	T4
Member 1	7	7	8	9
Member 2	8	5	8	8
Member 3	6	6	6	7
Total	21	18	22	24

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of texture the minimum average scored is 18 by T2 , while maximum is of T4 with an average of 24 , which shows the highest acceptability of sample T4 in respect of texture.

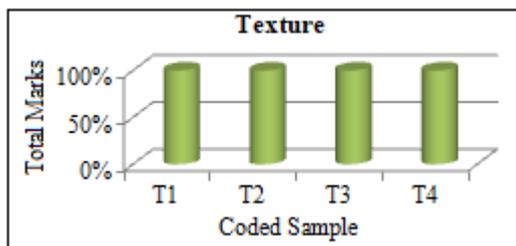


Figure 5: Graphical representation of score for texture

Parameter 3: Appearance

Panelist	T1	T2	T3	T4
Member 1	7	6	6	7
Member 2	6	7	5	8
Member 3	5	6	5	9
Total	18	19	16	24

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of appearance the minimum average scored is 16 by T3 , while maximum is of T4 with an average of 24 , which shows the highest acceptability of sample T4 in respect of appearance.

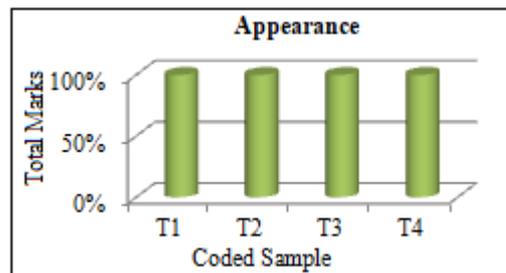


Figure 6: Graphical representation of score for appearance

Parameter 4: Aroma

Panelist	T1	T2	T3	T4
Member 1	7	7	6	9
Member 2	6	7	7	7
Member 3	6	7	7	8
Total	19	21	20	24

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of aroma the minimum average scored is 19 by T1 , while maximum is of T4 with an average of 24 , which shows the highest acceptability of sample T4 in respect of aroma.

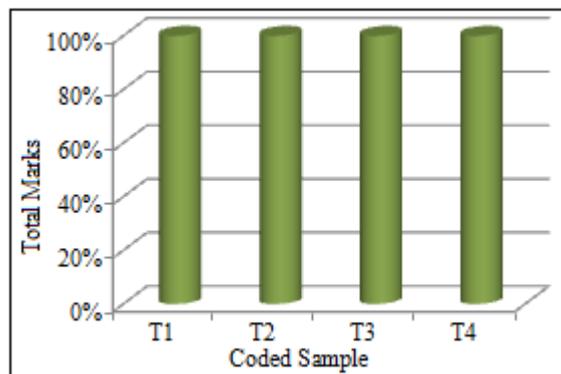


Figure 7: Graphical representation of scored for aroma

Parameter 5: Color

Panelist	T1	T2	T3	T4
Member 1	7	6	8	9
Member 2	8	7	8	9
Member 3	7	6	8	9
Total	22	19	24	27

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of color the minimum average scored is 19 by T2 , while maximum is of T4 with an average of 27 , which shows the highest acceptability of sample T4 in respect of color.

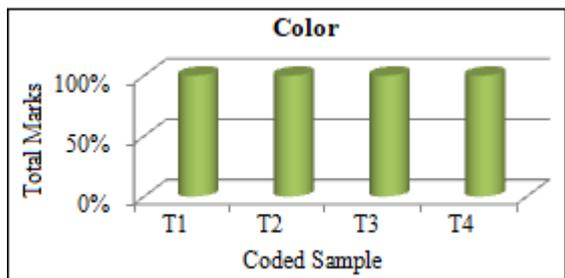


Figure 8: Graphical representation of score for color

Parameter 6: Flavor

Panelist	T1	T2	T3	T4
Member 1	7	7	8	8
Member 2	8	8	8	9
Member 3	8	7	9	9
Total	23	22	25	26

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of flavor the minimum average scored is 22 by T2 , while maximum is of T4 with an average of 26 , which shows the highest acceptability of sample T4 in respect of flavor.

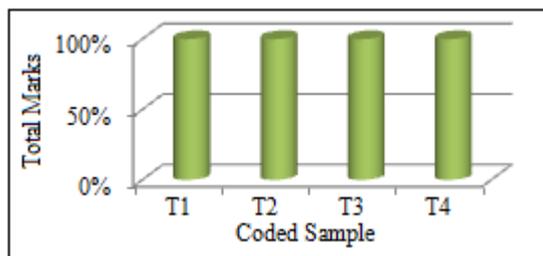


Figure 9: Graphical representation of score for flavor

Parameter 7- Mouth feels

	T1	T2	T3	T4
Member 1	8	7	8	8
Member 2	8	6	8	9
Member 3	8	7	7	9
Total	24	20	23	26

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of mouth feel the minimum average scored is 20 by T2 , while maximum is of T4 with an average of 26 , which shows the highest acceptability of sample T4 in respect of mouth feel.

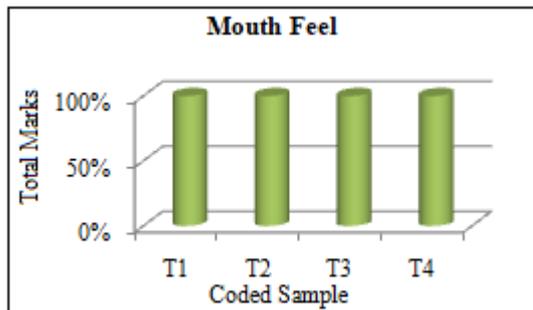


Figure 9: Graphical representation of score for mouth feel

Parameter 8- Overall acceptability

Panelist	T1	T2	T3	T4
Member 1	8	8	7	9
Member 2	8	7	8	9
Member 3	8	6	8	9
Total	24	21	23	27

Note- T1= Betalain pigment cookies (99.8:0.2%), T2= Betalain pigment cookies (99.8:0.3%), T3= Cookies (100 gm), T4= Betalain pigment cookies (99.8:0.5%)

The above mentioned table represent score of individual marking by 3 panelist member on the basis of overall acceptability the minimum average scored is 21 by T2 , while maximum is of T4 with an average of 27 , which shows the highest acceptability of sample T4 in respect of overall acceptance.

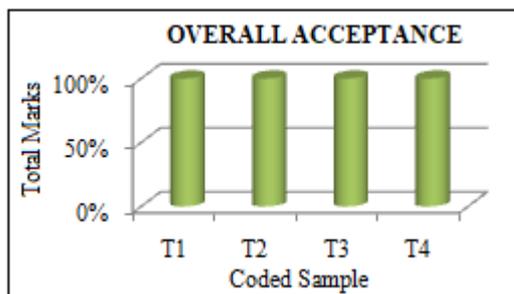


Figure 10: Graphical representation of score for overall acceptance

Table: Overall calculation

	A	B	C	D
P1	23	19	21	26
P2	21	18	22	24
P3	18	19	16	24
P4	19	21	20	24
P5	22	19	24	27
P6	23	22	25	26
P7	24	20	23	26
P8	24	21	23	27
Overall sum	174	159	174	204
Average	21.75	19.875	21.75	25.5
S.D.	2.1	1.27	2.63	1.23

The respective table which is drawn above shows the overall calculation of average marks given by each panelist in each parameter, with calculated average values & S.D. of each sample on the basis of each parameter.

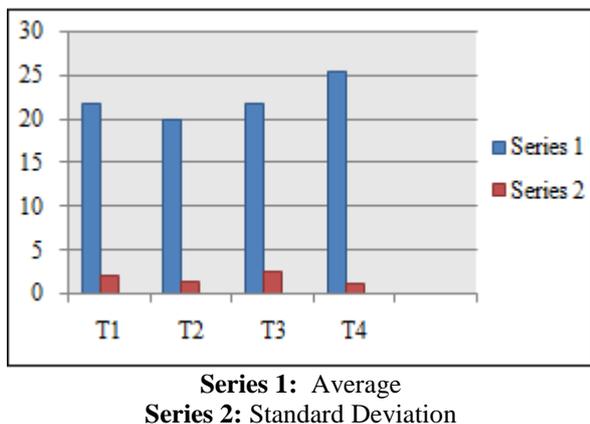


Figure 11: Graphical representation of average score and standard deviation for overall calculation

6. Summary and Conclusions

The sensory evaluation of the “use of natural color in food product, cookies” products was done by using 9- point hedonic scale by a panel of 9 members. The scoring for all cookies were various parameters i.e. taste and flavour, texture and mouth feel, appearance, aroma, colour and overall acceptance. As compare to normal cookies people where like to eat natural color enrich cookies because they like taste and color of the cookies. The natural color enrich cookies are attractive in look and high in nutrition value. Overall acceptance of the natural color enrich cookies are more like by the people in the place of normal cookies and synthetic color cookies.

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