Development Of Calcium Rich Candy From Fish Bone Powder

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***Abstract*-** Candy, known also as sweets and confectionery, has a long history as a familiar food treat that is available in many varieties. It is influenced by the size of sugar crystals, aeration, sugar concentrations, color and flavors. People usually prefer food items that fulfill their taste buds rather than healthy ones. So in order to make them healthy and free from diseases we have incorporated calcium rich fish bones, specifically Mackerel fish, to develop sweet and attractive candies. Besides being a calcium rich (18-22g/100g) matter, product development from the powdered fish bones can also bring down pollution caused due to kitchen wastes. It is also complemented by high levels of vitamin A, omega 3 fatty acids, iron and zinc. Along with this, palm sugar, which fights against anaemia and diabetes, is added as a substitute for sugar. Therefore it is hoped that this product would gratify the consumers with its abundant health benefits along with its flavors and allurance.

***KEYWORDS*:** Calcium rich candy, Nutritional composition, Storage studies and sensory evaluation

I. INTRODUCTION

Candy is a confection made from concentrated solution of sugar in water to which various flavorings and colorants are added to promote sumptuousness. Various types of candies include caramels, gummies, hard candies, lollipops, rock candy, chewing gums and licorice. From a very young age people are drawn to candies due to their attractive shape and colors.Certain research has also shown that eating candy and other sugary treats can have a positive effect on our mood. Even the act of licking a lollipop or crunching a piece of chocolate can reduce stress. Due to excessive sugar and synthetic additives in candies they are considered to be unhealthy. It increases the risk of asthma and causes certain allergies. Therefore indulgence in nutritious candies can control the risks as well as give them delight. Processing of fish bone powder is one way to reduce environmental pollution and provide added value. It is used as a fortification source of calcium in food products. Mackerel fish has reported to improve bone density in both men and women and omega 3 amplifies the effects of vitamin D. Since palm sugar is an unrefined sugar, it is known to be rich in vitamins and minerals. As a result, it has become increasingly popular as a substitute to white and brown sugar. Researchers have found that the GI of palm sugar is 35, compared to table sugar at 68. Orange peel extract as flavoring agent is beneficial as the peel has high nutrients content and antioxidant. It is also recommended by nutritionists and dieticians to reduce health related issues and cholesterol. Fish bone and orange peels are primary kitchen wastes which are recycled to make this candy.

II. MATERIALS AND METHODS

A. Preparation of fish bone powder

The first step in the procedure of making candy is the powdering of fish bones. The fresh bones were collected and cleaned thoroughly. They were soaked in NaOH and ethanol solution in the ratio 1:5 for about 10 hours to remove the odour. It was then weighed and found to be 423g before heating. The bones were pre heated in hot air oven at 50ºC for half an hour. Mass of the sample was determined during 15 minutes interval of time to test the moisture. For the complete removal of the moisture it was again placed in hot air oven at 100ºC for two hours and ground at low RPM into fine powders. After completing the whole procedure the powders weighed 315g.

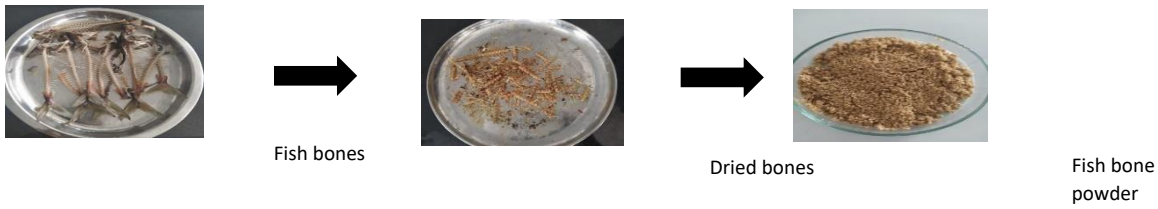
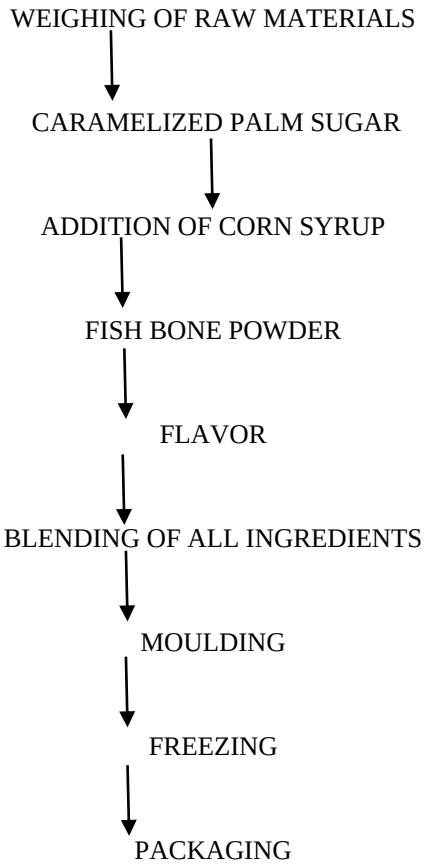


Figure 1:Processing of fish bone powder

B. Preparation of candy



Candy was prepared using palm sugar, corn syrup , fish bone powder , orange flavor and vanilla essence. Fish bone powder was added in three different proportions (0.5g, 0.8g, 1g) to obtain the best one. Palm sugar weighing 100 g was added to 150ml of water and stirred well. 6g of corn syrup complemented to the slimy nature of the solution. To this fish bone powder of the above mentioned proportion was added to make 3 different candies. Flavoring using orange flavor essence was added as 5ml, 7ml and 10 ml respectively. To each sample 2 drops of vanilla essence was introduced to enhance the flavor. It was boiled until desired concentration was acquired. After completion of caramalization it was cooled and poured into molds of different shapes. Finally the hardened candies were taken for nutritional and sensory analysis.

Caramelization Orange flavor Fish bone powder Molding Candy Corn Syrup

Figure 2: Preparation of candy

C.Analysis

Fresh mackerel fish bones were analyzed for moisture content, sensory evaluation and nutritional content..The moisture content of fish bones were determined using the hot air oven method. The candy samples were dried at 100°C for 2 hours. The moisture content was calculated from the weight difference between the original and dried sample and expressed in percentage. The weight was calculated on 15 minutes interval of time. Nutritional analysis was done using FSSAI method. Organoleptic testing was done by 5 panelists on 9 hedonic scale.

D.Sensory analysis

Sensory evaluation of prepared fresh and stored candies was done by taste testing panel. The panel consisted of 5 panelists. They were asked to evaluate for appearance, taste, texture, colour and overall acceptability on a 9-point hedonic scale; 9=Like extremely, 8=Like very much, 7=Like moderately, 6=Like slightly, 5=Neither like nor dislike, 4=Dislike slightly, 3=Dislike moderately, 2=Dislike very much and 1=Dislike extremely. The difference preferences as indicated by scores were evaluated by statistical methods (ANOVA). The analysis of variance method was used for this evaluation. The difference was quantified by Duncan's Multiple Range Test (DMRT).

IV. RESULTS AND DISCUSSIONS

A.Sensory analysis

- The sensory evaluation was carried out by organoleptic testing from each combination of samples by 5 panellists.
- The samples were evaluated for their Appearance, Colour, Texture, Taste and their overall acceptability was found**.**

Table 1: Sensory Analysis on 9 point hedonic scale

PARAMETERS	**APPEARANCE**	**TEXTURE**	**TASTE**	**COLOUR**	**OVERALL ACCEPTABILITY**
SAMPLE 1	8.3	7.6	7.8	8.1	7.8
SAMPLE 2	8.5	8.3	8.5	8.4	8.4
SAMPLE 3	**7**	7	7	8.2	7

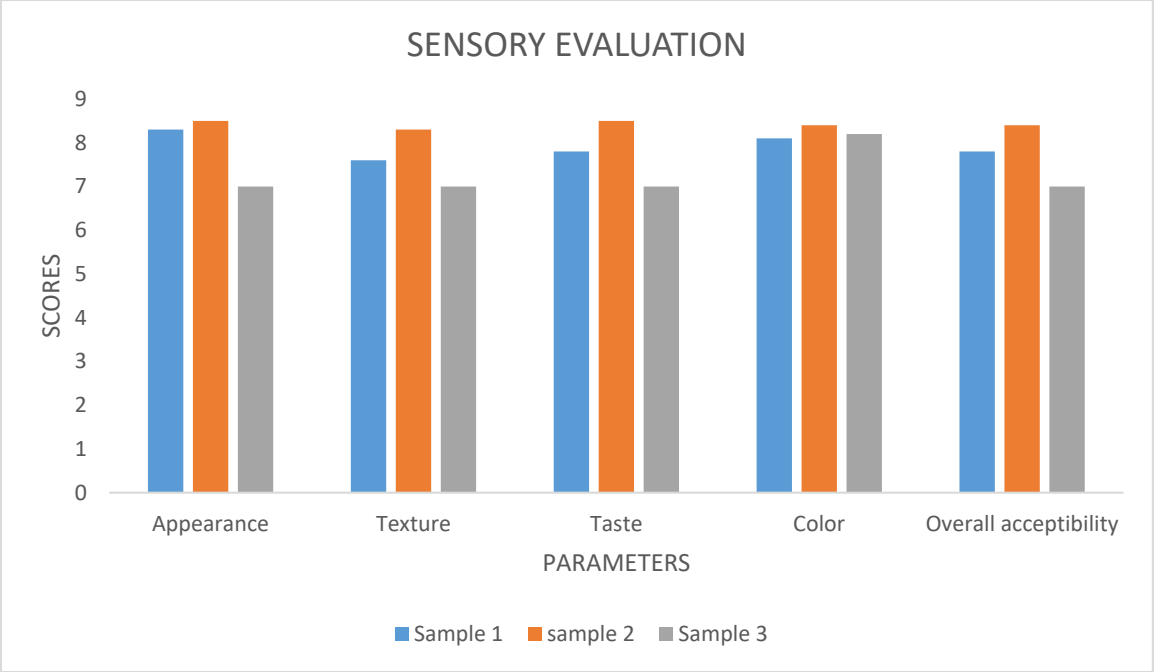


FIGURE 3: Graphical representation of sensory evaluation

Sample 2 was found to have high acceptability with correspondence to sensory evaluation

B. Nutritional analysis

The samples were tested for their nutritional value specifically calcium at Green link Analytical and Research Laboratory

Table 2: Nutritional Analysis of Calcium Rich Candy

S.NO	TEST PARAMETER	Method	Result per 100g
1.	CALCIUM	FSSAI	29mg
2.	PROTEIN	Kjeldahl	12mg
3.	FAT	Acid value	1mg
4.	TRANS FAT	Gas chromatography	0g
5.	SATURATED FAT	GC	2g
6.	CARBOHYDRATE	Anthrone test	34mg

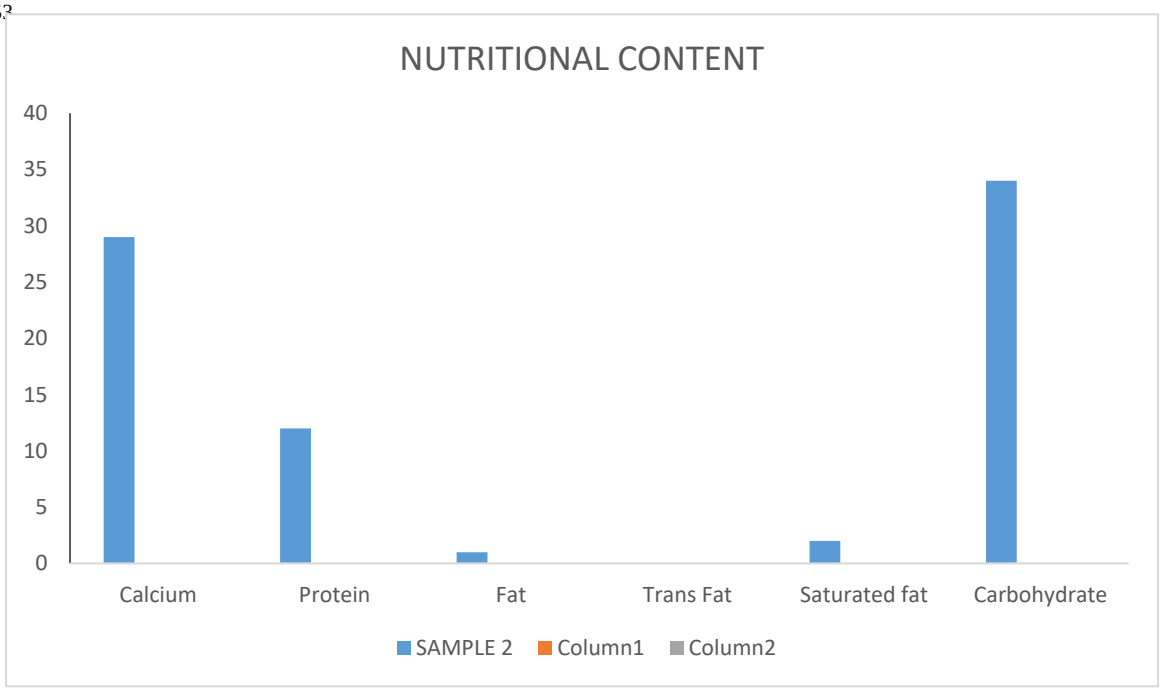


Figure 4: Nutritional content of sample 2

C.Shelf life testing

The shelf life of the sample optimized after the sensory analysis is checked for its shelf life. The sample was kept in room temperature and microbial count was checked regularly on certain interval of time.

Table 3: Microbial and total plate count of sample 2

SAMPLE	COLIFORM (CFU/µg)	TOTAL PLATE COUNT (CFU/µg)
Sample 2 (0^{th} day)	Ab	$1* 10^2$
Sample 2 (7^{th} day)	Ab	$2*10^2$
Sample 2 (14^{th} day)	Ab	$2*10^3$

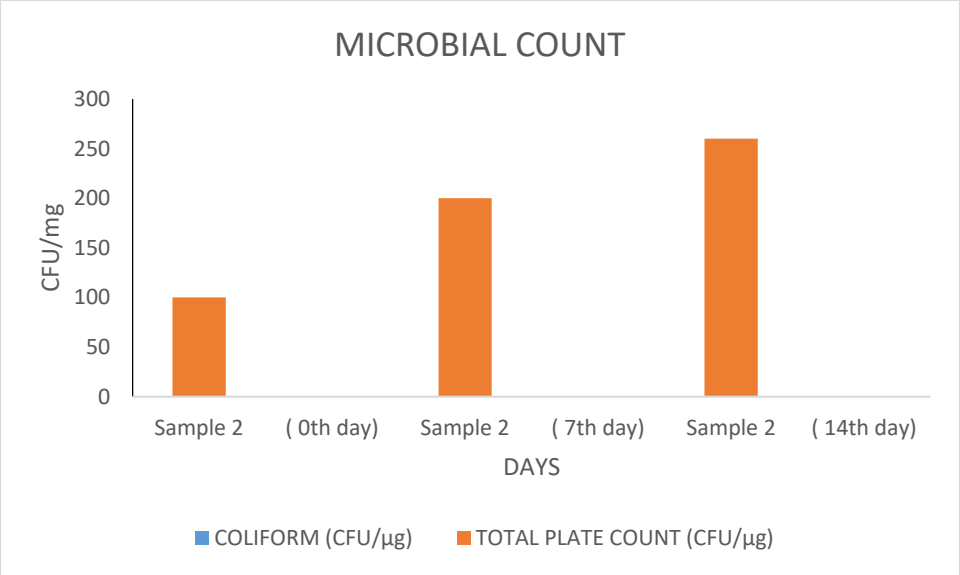


Figure 5: Graphical representation of microbial testing in sample 2

V. CONCLUSION

The candy fortified with calcium from fish bone powder showed to have high nutritional value due to relatively greater content of calcium as compared to the normal candy. Research shows that the combination of ingredients such as palm sugar, home made corn syrup and orange peel extract used for the development of the candy has brought about suitable taste, flavor and smell. The optimization process was carried out to find out the best combination of calcium powder and the corresponding flavoring. It was confirmed that the sample comprising of 0.8g calcium powder and flavors added accordingly produce most satisfactory savor. The sample was also subjected for shelf life testing for two weeks and the study is undergoing. The study is to be continued for three months and an estimated shelf life is then computed.It can be concluded that this candy is an adequate mode for intake of supplement calcium especially for children.

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