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Formulation and Standardization of Kodo Millet Flour Incorporated Honey Candy

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Abstract
The aim of the study is to formulate and standardize kodo millet flour incorporated honey candy. The objective of the study is to formulate and standardize kodo millet flour incorporated honey candy, selection of most acceptable proportion, nutrient analysis, shelf life analysis the product packed in polythene bag, cost analysis and popularization of the developed product among school children. Kodo millet was purchased from the local market, cleaned and dried and made up into a flour and stored in an air tight container. The processed powder was incorporated in honey candy by substituting the main ingredients at different levels such as 5%, 10%, 15% and 20%. Using sensory analysis, the best product was selected and subjected to nutrient analysis, shelf life study, cost analysis and finally the product was popularized among school children. The result of the study shows that the kodo millet flour incorporated honey candy at 10% level was accepted. The prepared product is high in Fiber and protein when compared to the standard. The prepared product is acceptable till 5th day without any microbial deterioration. The cost of the prepared best product was slightly higher (Rs.18) than standard (Rs.16). In the popularization study the entire participants accepted the product. The study concludes that the kodo millet flour which is a rarely used millet has high nutritional value and many health benefits were unnoticed and the study creates the awareness to use underutilized millet to improve the health status.

Keywords
Kodo millet, Formulation, Nutrient Content, Popularisation

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INTRODUCTION:
The new product development involves creating a new product from concept to the market. The new product development process is a complex task that becomes even more challenging in terms of the global market.
Kodo millet, one of the ancient grains of the world, originated from Africa and domesticate in India years ago is a draught resistant plant. This millet crop is grown in arid and semi-arid regions of African and Asian countries. In India, Kodo millet grown mostly in the Deccan region and the cultivation extends to the foothills of Himalayas. Kodo millet is rich in dietary fiber and minerals like iron, antioxidant. The phosphorus content in kodo millet is lower than any

other millet and its antioxidant potential is much higher than any other millet and major cereals. Processing like parboiling and debranning affects the mineral content and fibre, however it reduced anti-nutritional factors like phytate. Several traditional Indian food items have been prepared solely from kodo or blended with other cereal and legume flours to enhance the nutritional value, palatability and functionality. [1]

Honey candy is a simple sweet/eatable very famous among kids in Tamilnadu. This sweet which makes everyone go drooling once we start eating. It is a traditional sweet recipe of Tamilnadu which was sold in petty shops. This is popularly called as Thean mittai. In the 21st century, many supermarkets came into existence due to which most small shop keepers lost their business. Slowly these humble sweets started disappearing. When it was almost getting extinct, it made a comeback in super markets. [2]

MATERIALS AND METHODS:

Kodo millet was purchased from the local market, cleaned and dried and made up into a flour and stored in an air tight container. The processed powder was incorporated in honey candy by substituting the main ingredients at different levels such as 5%, 10%, 15% and 20% instead of main ingredient in the standard recipe. Using 9-point hedonic scale the best variation was selected. The selected best product and the standard were subjected to nutrient analysis, shelf life study, cost analysis and finally the product was popularized among school children.

Preparation of Kodo Millet Flour:

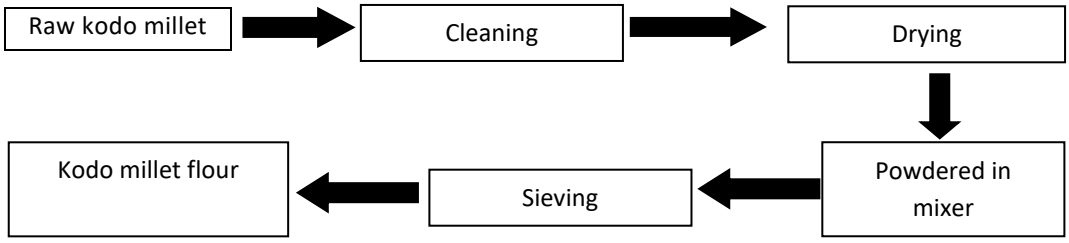


Figure 1 - KODO MILLET FLOUR

Preparation of Honey Candy:

Soak the rice and urad dal in water for 3 hours. Then drain the water and grind it to make a fine paste. Add the permitted food color with a little salt and mix it well together. Take a pan, add in sugar and water to make a sugar syrup. In a pan, heat the oil, once it's heated, make small ball shapes of the paste and fry them but don't allow them to turn brown in colour. Immediately dip these balls into the syrup and allow it to stand for 2-3hours. Then transfer into a plate with sugar crystals, now pour the sugar on top of the candy.

Figure 2 - PREPARED HONEY CANDY

Sensory Evaluation:

Sensory evaluation is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purposes of evaluating consumer products. The prepared products and standard were under went sensory evaluation to select the best sample by semi-trained panel members from the Department of Foods and Nutrition. A score card was prepared using nine point hedonic scales for the criteria like appearance, colour, flavor, texture and taste and the same was used for sensory evaluation.

Nutrient Analysis:

Nutrient analysis is done for the best sample of kodo millet flour incorporated honey candy and standard. Nutrient analysis was carried out in Alpha lab. Protein is analyzed by using micro kjeldahl method and Fiber was analyzed.

Microbial Analysis

Microbial test was done every third day of the study for both standard and the selected product by using spread plate technique.

Popularization:

The prime aim of the popularization program was to create awareness among the public about the beneficial effect of kodo millet flour incorporated honey candy and their contribution to health. The popularization was done among school going children

RESULT AND DISCUSSION:

Mean Sensory Scores of Standard and Kodo Millet Flour Incorporated Honey Candy:

Table 1: Mean Sensory Scores of Standard and Kodo Millet Flour Incorporated Honey Candy

Products	Appearance Mean ± SD	Color Mean ± SD	Texture Mean ± SD	Flavor Mean ± SD	Taste Mean ± SD
Standard	5±0	5±0	5±0	5±0	5±0
Sample A	4.16±0.82	4.2±1.01	4±0.98	4.13±0.81	4.06±0.82
Sample B	**4.26±0.78**	**4.3±1.14**	**4.03±0.95**	**4.21±0.85**	**4.16±0.98**
Sample C	4.12±0.87	4.17±1.45	3.9±0.98	3.96±0.86	3.93±1.05
Sample D	4.1±1.04	4.1±0.98	3.76±0.99	3.6±0.92	3.9±1.09

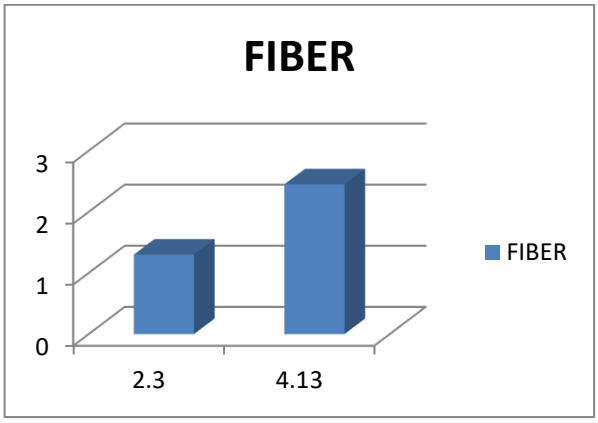
From the above Table 1, it is observed that standard honey candy had a highest mean score of 5±0 for appearance, color, flavor, texture and taste. The scores indicate that there was decrease in the appearance of the product on increasing the incorporation of kodo millet flour in honey candy. The color of the product was not acceptable as when the incorporation of kodo millet flour in honey candy increases. There was detonation in the texture of the product as when increasing the incorporation of kodo millet flour was done in the honey candy. The scores indicate that the flavor of the product was not acceptable as the incorporation of kodo millet flour increases in honey candy. While addition of kodo millet Flour imparted a new taste to the product, inclusion beyond 10% decreased the acceptability of the product. The mean sensory scores for the overall acceptability obtained by standard honey candy and varying proportions of kodo millet flour incorporated in sugar candy with the help of score card. It is clear that among the prepared

products, Sample B had the highest mean score in all the criteria when compared to other samples like sample A, C and D. So **Sample B** was chosen as the **best product** and subjected to further analysis.

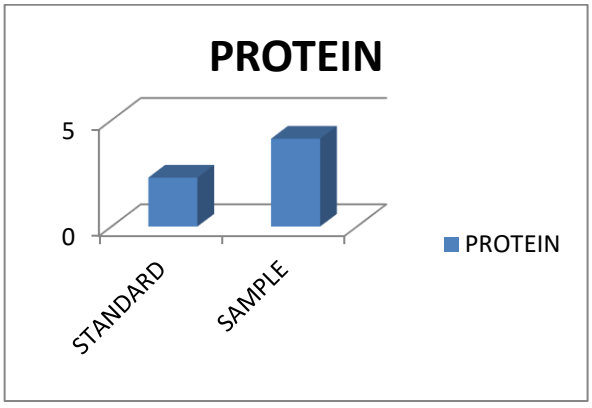
Nutrient Analysis of Selected and Standard Product:

Table 2- NUTRIENT ANALYSIS OF THE PRODUCTS

SI.No	NUTRIENT	STANDARD (per 100g)	SAMPLE (per 100g)
1	Fiber (g)	1.3	2.45
2	Protein (g)	2.3	4.13



Graph 1-Fiber content in selected product and standard product



Graph 2-Protein content in selected product and standard product

From the above Table 2 and graph 1 and 2 it was observed that the Fiber content was 2.45g/100g in selected product and 1.3g/100g fiber in standard product. Protein content was 4.13g/100g in selected product and 2.3g/100g in standard product. From the results, it can be concluded that there is a slight increase in fiber and protein content on incorporation of kodo millet flour.

Microbial Analysis:

Microbial Analysis of the Standard and Selected kodo millet Flour Incorporated honey candy on storage.

Microbiological testing on food products includes presence/ absence of pathogens, total coli form and aerobic plate counts. The service includes: Total Coli Form Count which determines the number of coli form bacteria. These bacteria are commonly found in the intestines of warm blooded animals or in the environment, for example, soil, water and grain. High coli form levels can serve to indicate unsatisfactory processing and sanitation and the possibility of other pathogens proliferating since the conditions for growth are similar.

The details regarding the microbial content in standard and selected proportion of kodo millet Flour Incorporated honey candy on storage is given in **Table 3**.

Table 3: Microbial Load of the Standard Product and Selected Product on Storage

Days	Name of the Product	Indicator Test Result (CFU / gram) and Interpretation/Standard Plate Count. Polythene cover			
		G	M/S	US	P H
1ST day	Standard	✓	-	-	-
	Sample	✓	-	-	-
3rd day	Standard	✓	-	-	-
	Sample	✓	-	-	-
5th day	Standard	✓	-	-	-
	Sample	✓	-	-	-
Remark	On the 5th day after sampling NO contamination was found.				
Organism identified	No Bacterial growth was observed.				

(Good= G; Satisfactory = S; Marginal = M; Unsatisfactory = US; Potentially Hazardous = PH)

From the above table 3, it was clear that there was no microbial growth in both standard and sample immediately after preparation and on 1st, 3rd and 5th day. So, from the result we can conclude that the product is safe for consumption microbially on storage in polythene cover.

Cost Analysis:

The results revealed that the cost of 100g kodo millet Flour incorporated honey candy was Rs.14 whereas the cost of standard was Rs.18. Incorporation of kodo millet flour increased the cost of honey candy by Rs.2.

Popularization:

About 30 school going participants were selected randomly for the study and they were given a set of ten questions before popularization and the same questions were given after popularization and it was found that after popularization they were aware about the importance of nutrient and health benefits of kodo milet there was a positive effect among the selected population of the study.

CONCLUSION:

The aim of the study was achieved and it was concluded that the kodo millet Flour incorporated honey candy with 10% of the kodo millet Flour was accepted in studies. The prepared product is high in Fiber and protein when compared to the standard product. The prepared product is acceptable till 5th day without any microbial deterioration if it is stored in polythene cover properly. The cost of the prepared best product was slightly higher than standard. In the popularization study the entire participants accepted the product

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