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Formulation and Shelflife Analysis of Germinated Horse Gram Flour Incorporated Murukku

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Abstract — *Aim:* The aim of the study is to formulate and standardize germinated horse gram flour incorporated murukku. *Objective:* The objective of the study is to formulate and standardize germinated horse gram flour incorporated murukku, selection of most acceptable proportion, nutrient analysis, shelf life analysis of standard and the best product packed in polythene cover, cost analysis and popularization of the developed product among adolescent girls. Materials and methods: Horse gram was purchased from the local market, cleaned, soaked in water, drained the water and kept for germination. After germination horse gram was dried in sunlight and made up into flour and stored in an air tight container. The processed powder was incorporated in murukku by substituting the main ingredients at different levels such as 10%, 20%, 30% and 40% 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 adolescent girls. Results: The prepared products along with the standard were subjected to sensory analysis and most acceptable proportions are selected for shelf life study and nutrient analysis. From the study, it was concluded that the 10% germinated horse gram flour incorporated murukku was accepted when compared to other variations. The selected variation was analysed for nutrient content such as protein and iron. The protein in the selected variation (A) was 25.1/100gm whereas the protein content of standard is 15g/100g and iron content of selected sample 8.36g/100g and standard was 3.1mg/100g. The shelf life study shows that 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 (Rs.100/-) than the standard (Rs.80/-). In the popularization study the entire participants accepted the product. Conclusion: The study concludes that the germinated horse gram flour which is a rarely used gram has high nutritional value and many health benefits which were unnoticed and the study creates the awareness to use pulse in any form to improve the health status.

Keywords: *Germinated Horse Gram Flour; Formulation; Nutrient Content; Popularization.*

1. Introduction

The design of various food products focuses on identification of the structure and composition of food ingredients that have the desired characteristics. A thorough understanding of the functions and properties of the various ingredients is the basic key to formulating for the desired attributes. The revealing of structural properties of a food product is the main task of food formulation problem (Kather2012).

The horse gram (Dolichosbiflorus L.) commonly known as kulthi is a traditional unexploited tropical grain legume and well known for its hardiness, adaptability to poor soil and adverse climatic conditions. The horse gram is a cheapest source of protein. Further it is also rich in minerals such as calcium. The chemical composition is comparable with commonly cultivated legumes. Like other legumes, this is deficient in methionine and tryptophan. Horse gram is an excellent source of iron and molybdenum. Comparatively, horse gram seeds have higher tryps in inhibitor and hemagglutin in activities and poly phenols than moth bean seeds. Dehusking, germination, cooking, and roasting have been shown to produce beneficial effects on nutritional quality of the legume. The germination is a simple method of food processing that result in increased nutritive value and decreases the phytates, tannin level and increases the availability of iron and calcium. Horse gram is considered to have curative properties in helping with menstruation problems. Especially women with irregular periods and excess bleeding can benefit by taking horse gram water regularly or adding horse gram soup or sprouts to daily diet. It is recommended in stopping heavy bleeding after pregnancy. In Ayurvedic medicine, women are recommended to take 1 teaspoon of horse gram powder every morning. This considering the medical properties of horse gram the topic “Germinated horse gram flour” was undertaken with the following objectives (Jones,2004). Murukku is thin, round, shaped food from the Indian subcontinent; Murukku is typically made from rice flour and urad dal In India, Murukku is especially popular in the states of Tamil Nadu, Kerala, and Andhra Pradesh. It is also popular in countries with substantial presence of Indian and Sri Lankan diaspora, including Singapore and Malaysia. In certain parts of India murukku which have been fried (Fowke, 2012).

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2. Materials and Methods

Horse gram dhal 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 murukku by substituting the main ingredients at different levels such as 10%, 20%, 30% and 40% 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, and cost analysis and finally the product was popularized among adolescent girls.

2.1 Treatment of Horse Gram

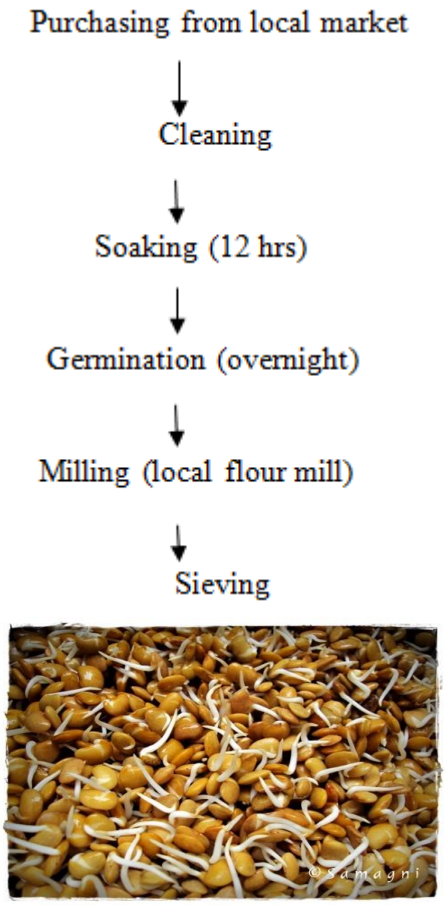

Fig.1: Horse Gram

2.2 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 discipline requires panels of human assessors. On whom the products are tested and recording the responses made by them (Leo, 2007).

2.3 Nutrient Analysis

Nutrient analysis is done for the best sample of germinated horse Gram flour incorporated murukku and standard. Nutrient analysis was carried out in Alpha lab.

2.4 Microbial Analysis

A method for analyzing, identifying, and enumerating microorganisms that utilizes genetic analysis via gene tracing and identification. Utilizing genetic analysis techniques to help profile and identify the bacterial and fungal diversity in a variety of different clinical and environmental samples allows for fastidious and anaerobic bacteria strains to be easily studied (Jelen, 2009). Microbial test was done every 5thday of the study for both standard and the selected product by using spread plate technique.

2.5 Popularization

The prime aim of the popularization program was to create awareness among the public about the beneficial effect of Germinated horse gram flour powder incorporated Murukku and their contribution to health. The popularization was done among adolescent g

3. Result and Discussion

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

Table 1. Standard murukku features

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	4.6±0.4	4.1±0.5	4.7±0.4	4.5±0.5	4.4±0.4
Sample B	**4.6±0.4**	**4.6±0.5**	**4.5±0.5**	**4.5±0.5**	**4.5±0.5**
Sample C	4.6±0.4	3.9±0.7	4.6±0.4	4.6±0.4 8	4.4±0.1
Sample D	4.4±0.4	3.7±0.8	4.8±0.4	4.3±0.5	4.4±0.5

From the above Table I, it is observed that standard murukku 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 Germinated horse gram flour in murukku. The color of the product was not acceptable as when the incorporation of Germinated horse gram flour in murukku increases. There was detoration in the texture of the product as when increasing the incorporation of germinated horse gram flour was done in the murukku. The scores indicate that the flavor of the product was not acceptable as the incorporation of

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Germinated horse gram flour increases in murukku. While addition of Germinated horse gram 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 murukku and varying proportions of Germinated horse gram flour incorporated in murukku 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.

3.2 Nutrient Analysis of Selected and Standard Product

Table 2. Nutrient Analysis of the Products

SI. No	NUTRIENT	STANDARD (per 100g)	SAMPLE (per 100g)
1	Protein (g)	15	25
2	Iron(g)	3.1	8.3

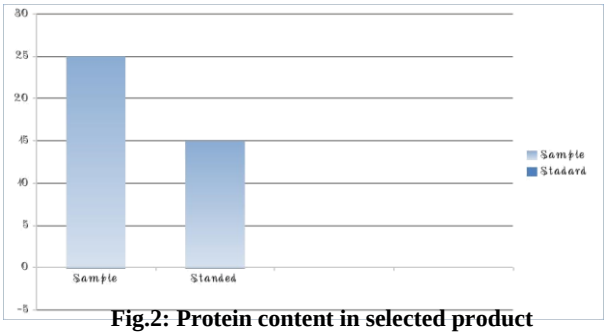

Fig.2: Protein content in selected product and standard product

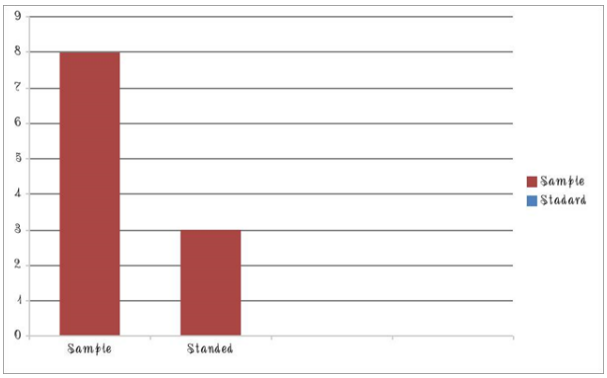

Fig.3: Iron content in scroduct and standard product

3.3 Microbial Analysis

Microbial Analysis of the Standard and Selected Geminated horse gram dhal Flour Incorporated Murukku 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 test 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 from levels can serve to indicate unsatisfactory processing and sanitation and the possibility of other pathogens proliferation since the conditions for growth are similar. (Abadias, 2010). The details regarding the microbial content in standard and selected proportion of germinated horse gram flour incorporated murukku on storage is given in Table III

Table 3, 4: 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 III 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 microbial on storage in both polythene cover and Air tight container.

3.4 Cost Analysis

The results revealed that the cost of 100g Geminated horse gram dhal Flour incorporated murukku was Rs.100 whereas the cost of standard was Rs.80 Incorporation of germinated horse gram dhal flour increased the cost of murukku by Rs.20.

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3.5 Popularisation

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4. Conclusion

The aim of the study was achieved and it was concluded that the Germinated horse gram dhal Flour incorporated Murukku with 10% of the Germinated horse gram dhal Flour was accepted in studies. The prepared product is high in Iron 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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