DEVELOPMENT AND STANDARDIZATION OF IRON AND VITAMIN C RICH BISCUITS

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ABSTRACT

The prevalence of iron- deficiency anaemia is more among the adolescent girls. Anaemia is occurred due to the low dietary intake, poor availability of iron and chronic blood loss due to lukewarm infestation and malaria, while anaemia has well known adverse effects on physical performance of individuals. To overcome the problem of iron deficiency anaemia, food based approaches have been considered as most acceptable, safe and sustainable approach. So this study on "Development and Standardization of Iron and Vitamin C Rich Biscuits" was carried out to overcome the problem of iron deficiency anaemia.In this study, we have developed sample A , sample B, sample C and sample D in different ratios and control sample was developed without adding ragi flour and then it was subjected to sensory evaluation by using 5 point hedonic scale with the help of 10 panel members. Regarding the sensory attributes of Iron and Vitamin C Rich Biscuits such as colour, flavour, taste, texture and overall acceptability, sample C had more score than sample D, control, sample A and sample B. The selected sample and control were subjected to nutrient analysis.In the nutrient analysis, the moisture content of sample A was 11.4 % and control was 8.4 %. Energy content of control was 60g than sample C was 383.2 Kcal than 281.5 Kcal. Sixty grams of carbohydrate was presented in control than sample C (53 g). Sample C had 3.2 g of protein than control (1.6g). Sample C had 15.2 g of fat

than control (6.3g). Fibre content of sample C had 80 g than control (5.5g). Ash content sample A was 42.8% and control was1.8%. Vitamin C content of sample C was 100 mg than control 80 g. Sample C had 12 g of calcium than control (8g). Sample C had more phosphorus (320mg) than control (240 mg). Iron content of sample was 50 g than control (40g). From the microbial analysis, it was found out that it is safe to consume up to one week.

Keywords: Anaemia, Adolescent, Sensory Evaluation, Standardization, Ragi.

INTRODUCTION

Anemia is a major public health problem worldwide and is often ignored in both developed and developing countries. Preschool children, pregnant women and adolescents constitute vulnerable group of anemia. Adolescents (age 10-19 years) are at high risk of iron deficiency anaemia due to accelerated increase in requirements for iron, poor dietary intake of iron, high rate of infection and worm infestation as well as the social norm of early marriage and adolescent pregnancy.

There are about 1.2 billion adolescents in the world, which is equal to 1/5th of the world's population and their numbers are increasing. Out of these, 5 million adolescents are living in developing countries. India's population has reached the 1 billion mark, out of which 21% are adolescents **(Mathur,2007).**

Iron requirement peaks during adolescence due to rapid pubertal growth with sharp increase in lean body mass, blood volume and red cell mass, which increases iron needs for myoglobin in muscles and haemoglobin in the blood. The continuous increase in the median requirements for absorbed iron for both boys and girls. during adolescence peaks between the ages of 14-15 years for girls 8 and one to two years later for boys. The requirement for iron in fact doubles during adolescence as compared to younger age group **(Ramesh Verma et.al,2013)** . So it is the need of hour to develop the Rgai biscuit using ragi flour, refined flour, sugar, dalda, amla, drumstick leaves and Kalayanamurungai leaves.The developed value-added products can be a good supplement to rectify the problem of Adolescents.

Finger Millet is also known as Ragi. Ragi has a distinct taste and is widely used in Southern Indian and Ethiopian dishes. Ragi is a rich source of Calcium, Iron, Protein, Fiber and other minerals. The cereal has low fat content and contains mainly

unsaturated fat. It is easy to digest and does not contain gluten; People who are sensitive to gluten can easily consume Fnger Millet. Ragi is considered as one of the most nutritious cereals. Ragi is a very good source of natural Iron. Ragi consumption helps in condition of Anaemia **(http://naturopathycure.com/Health-Benefits-of-Finger-Millet-%28Ragi%29.php).**

Drumstick leaves have enormous potential for benefiting humanity. India's ancient tradition of Ayurveda says the leaves of the Moringa tree prevent 300 diseases. Scientific research has proven that these humble leaves are in fact a powerhouse of nutritional value. The micro- nutrient content is even more in dried leaves; ten times the vitamin A of carrots, 17 times the calcium of milk,15 times the potassium of bananas, 25 times the iron of spinach and nine times the protein of yogurt **(Manzoor M., et al.,2007).** Being rich in iron, drumstick green increase the count of corpuscles in the blood and prevent anemia **(www.livechennai.com/ healthnews. asp).**

Gooseberry known as Amla is among the healthiest food due to its high nutrient content. It is a rich source of antioxidants, iron, vitamin A, C, fiber,

potassium, magnesium, calcium, etc. Gooseberry possesses anti anemia property. Due its iron content, it is effective to increase iron level in the blood, Nlong with its unique combination Vitamin C that increases body capacity to absorb nutrients required for blood production **(http://wiki-fitness.com/health-benefits-gooseberry-amla-nutrition/).**

The above said food items are locally available and rich in nutrient spaved the way to conduct the study on"Development and Standardization of Iron and Vitamin C Rich Biscuits." It helps to alleviate iron deficiency anaemia without the risk of antagonistic nutrient interactions or overload.

METHODOLOGY

The methodology adopted for the study consists of three phases. They are

A. Standardization and Development of Iron and Vitamin C Rich Biscuits.

B. Estimation of the Nutrient Content of the Selected Iron and Vitamin C Rich Biscuits.

C. Analyze the Microbial Count of the Selected Iron and Vitamin C Rich Biscuits.

A. Development and Standardization of Iron and Vitamin C Rich Biscuits

Iron and Vitamin C Rich Biscuits are developed by trial and error method. For this study, different variation of Iron and Vitamin C Rich Biscuits were developed in different ratios. Developed Iron and Vitamin C Rich Biscuits were subjected to sensory evaluation to find out the acceptability of the sample **(Srilakshmi,2002).**When the quality of food is assessed by means of human sensory organs, the evaluation is said to be sensory, subjective or organoleptic. To perform sensory evaluation, judges were drawn from the group of faculty members of Home Science Department. Sensory attributes i.e. colour, appearance, texture, taste and flavor and overall acceptability of the developed products were evaluated by using 5 point hedonic scale.

Good quality raw ingredients such as ragi, wheat flour, sugar, dalda, salt, baking powder and vanilla essence were selected for the preparation of Iron and Vitamin C Rich Biscuits. It was purchased from the reputed store in Virudhunagar and stored in an ambient temperature. Drum stick leaves and kalyanamurunkai leaves were collected from local market of Virudhunagar. The leaves were separated and washed under running tap water. After washing, the leaves were spreaded in the tray tied and dried in the cabinet drier for at 2 days to dry green leaves. After that, dry matter was ground by using mixie and packed in air tight container for further use. Amla was also procured from the local market of Virudhunagar. Amla was shredded and dried by using cabinet drier and it was ground into powdered form. Powdered amla powder was stored it in ambient temperature further use.

Three different variations of Iron and Vitamin C Rich Biscuits were developed on trial and error basis with different proportion of ingredients. Sample A was developed with 75g of ragi flour, 25g of refined flour, 40g of sugar, 58g of dalda, 5g of amla powder 5g of drumstick leaves powder,5g of Kalayanamurungai leaves Powder , 0.1.75g 0f salt, 0.25g of baking powder and one drop of Vanilla essence. Sample B was developed with 50g of ragi flour, 50g of refined flour, 40g of sugar, 58g of dalda, 5g of amla powder 5g of drumstick leaves powder,5g of Kalayanamurungai leaves Powder , 0.1.75g 0f salt, 0.25g of baking powder and one drop of Vanilla essence. Sample C was developed with 75g of ragi flour, 25g of refined flour, 40g of sugar, 58g of dalda, 5g of amla powder 5g of drumstick leaves powder,5g of Kalayanamurungai leaves Powder , 0.1.75g 0f salt, 0.25g of baking powder and one drop of Vanilla essence. Sample D was developed with 75g

of ragi flour, 25g of refined flour, 40g of sugar, 58g of dalda, 5g of amla powder 5g of drumstick leaves powder,5g of Kalayanamurungai leaves Powder , 0.1.75g 0f salt, 0.25g of baking powder and one drop of Vanilla essence.

Control was developed with 100g of refined flour, 40g of sugar, 58g of dalda, 0.1.75g of salt, and 0.25gof baking powder and one drop of Vanilla essence. The following table-1 and plate-1displays the Variations of Ragi biscuits.

Table-1
Variation of Iron and Vitamin C Rich Biscuits

Name of the ingredients	Control	Sample A	Sample B	Sample C	Sample D
Refined flour(g)	100	75	50	25	-
Ragi flour(g)	-	25	50	75	100
Sugar(g)	40	40	40	40	40
Dalda(g)	58	58	58	58	58
Amla Powder(g)	-	5	5	5	5
Drumstick leaves Powder(g)	-	5	5	5	5
Kalayanamurungaileaves Powder(g)	-	5	5	5	5
Salt(g)	1.75	1.75	1.75	1.75	1.75
Baking Powder(g)	0.25	0.25	0.25	0.25	0.25
Vanilla essence	1 drop	1 drop	1 drop	1 drop	1 drop

Iron and Vitamin C Rich Biscuits Plate-1 Development of Iron and Vitamin C Rich Biscuits

Sieve the Ragi flour, refined flour, baking powder, salt, drumstick leaves powder, kalyanadrumstick leaves powder, and amla powder separately. Rub the dalda and sugar . Mix it with powdered ingredients . Roll it and cut into desired shape. Bake it at $160^{0}C$. Cool it and store it in an ambient temperature.

B. Estimation of The Nutrients Content of the Selected Iron and Vitamin C Rich Biscuits.

Nutrient analysis refers to the process of determination the nutritional content of foods and food products. The nutrient analysis of a given sample provides information about nutrient composition of the sample**(Singh et al., 2003)**. The process

can be performed through a variety of certified methods.The nutrient content of selected Iron and Vitamin C Rich Biscuits and control were done for moisture, carbohydrate,fiber, protein,fat, fiber,ash, vitamin C, Iron, calcium and phosphorus.

C.Analysis of The Microbial Count of The Selectediron and Vitamin C Rich Biscuits

Quality of the food depends on its physical, chemical, microbiological and sensory quality. The examination of food for the type and number of microbes and their products is required to analyse the enzyme the microbiological quality of food. Microbiological analysis is important to determine the safety and quality of food. In the present study, Total Plate Count was used. It is the most widely used method to know the microbiological quality of the food sample. It is the quick and efficient method, giving valuable count present in the food sample.

RESULTS AND DISCUSSION

The result and discussion of the study on **"Development and standardization of Iron and Vitamin C Rich Biscuits"** is discussed under the following headings; they are

A. Sensory Evaluation of Iron and Vitamin C Rich Biscuits

B. Estimation of the Nutrient Content and Phytochemical compounds of the Selected Standardized Iron and Vitamin C Rich Biscuits .

C. Analysis of the Microbial Count of the Selected Standardized Iron and Vitamin C Rich Biscuits.

A.Sensory Evaluation of Iron and Vitamin C Rich Biscuits

Sensory evaluation is a scientific discipline used to analyse reactions to stimuli perceived through the senses-sight, smell, touch, taste and sound. Sensory evaluation has been defined as a scientific method to evoke measure, analyse and interpret those responses to products as perceived through the senses of sight, smell, touch, taste and hearing**(Stone and Sidel, 1995).** Sensory Analysis is a vital tool for the food Industry to develop new food products.The sensory analyst will be equal to an analytical instrument, and will use his "Iyendrias(senses) as a tool. It is the 'Iyendria Moulya Maapan' only and not referring to personal likes and dislikes.

In this study, Five point Hedonic rating scale was used to find out the overall acceptability of the developed food

products. Hedonic rating relates to pleasurable or unpleasurable experiences. The hedonic rating test is used to measure the consumer acceptability of food products. One or four samples are served to the panelist at a session. He is asked to rate the acceptability of the product on a scale, usually of 5 points, ranging from 'likes extremely' to dislike extremely'. The results are analysed for preference with data from large untrained panels **(Srilakshmi, 2002).**The following are the results obtained from the organoleptic evaluation of developed Iron and Vitamin C Rich Biscuits.

Table-2

Sensory Evaluation of Iron and Vitamin C Rich Biscuits

Attributes	Control	Sample A	Sample B	Sample C	Sample D
Color	4.5	4	4.5	4.9	4.5
Flavor	4.6	4	4.5	4.9	4.5
Taste	4.5	4	4.4	5	4.6
Texture	4.4	4	4.6	4.8	4.7
Over all acceptability	4.5	4	4.5	4.9	4.5

The average score obtained by the samples regarding the attributes of Iron and Vitamin C Rich Biscuits is given table-2. Regarding color, Sample C (4.9) got high score than the sample B (4.5), sample D (4.5), control (4.5)and sample A (4). Pertaining to flavor, Sample C (4.9) got high score than the control (4.6), sample B(4.5) and sample D (4.5) and sample A (4). Relate to taste, Sample C (5) got high score than the sample D(4.6),control(4.6) and sample B (4.4) and sample A(4). Regarding texture, Sample C (4.8) got high score than the sample D(4.7) and sample B (4.6),control (4.4) and sample A(4). Sample C(4.9) got overall acceptability than Sample B(4.5),sample D (4,5),control(4.5) and sample A.

Regarding the sensory attributes of ragi biscuits such as color, flavor, taste, texture and overall acceptability, sample C had more score than sample D, control, sample A and sample B.

B.Estimation of The Nutrient Content of the Selected Standardized Iron and Vitamin C Rich Biscuits .

Selected Iron and Vitamin C Rich Biscuits and control sample were selected for nutrient analysis.In this analysis, the moisture content of sample A was 11.4 % and control was 8.4 %. Energy content of control was 60g than sample C was 383.2 Kcal than 281.5 Kcal. Sixty grams of of

carbohydrate was presented in control than sample C (53 g). Sample C had 3.2 g of protein than control (1.6g). Sample C had 15.2 g of fat than control(6.3g). Fibre content of sample C had 80 g than control(5.5g). Ash content sample A was 42.8% and control was1.8%. Vitamin C content of sample C was 100 mg than control 80 g. Sample C had 12 g of calcium than control (8g). Sample C had more phosphorus(320mg) than control(240 mg). Iron content of sample was 50 g than control (40g).

It can be inferred from the nutrient analysis that except energy, carbohydrate and fat, all other nutrients such as moisture, protein, fibre, ash, vitamin C, and iron content are higher than control.

C. Analysis of Microbial Count of the Selected Iron and Vitamin C Rich Biscuits.

Microbial analysis is important to find out the shelf life the developed product and thereby ensure the safety of the product.

Microbial analysis was carried out in the 1st Day and 15th day for identifying the bacterial colony. During this analysis, microbial growth was minimum in the initial stage afterwards it is slowly increased but at the safe level. So from this analysis , we found out that it is safe to consume for a period of one week.

CONCLUSION

The developed Iron and Vitamin C Rich Biscuits is rich in nutrients necessary to overcome the problem of an Iron deficiency anaemia. The Ingredients used for the development of Iron and Vitamin C Rich Biscuits are the "Magic Bullets" locally available to alleviate iron deficiency anaemia without the risk of antagonistic nutrient interactions or overload.

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