International Journal of Current Science Research
www.drbgrpublications.in

Volume: 3; Issue: 4; April-2017; pp 1229-1237. ISSN: 2454-5422

Formulation and Standardization of Protein Rich Herbal Biscuits

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Abstract

Snacking has infact become way of life for both adult and children in most parts of India. Grains are relatively low in the amino acid lysine and supplementation with legumes will provide excellent protein. Cereal and pulse mixture complement each others deficiency in mutual supplementation. The project involved the preparation of biscuits with herbs and analysing its acceptability, nutrient composition and shelf-life. All products were subjected to organoleptic evaluation in order to find its acceptability. The product with highest mean score of 4.02 and 3.65 and 3.88 were chosen for carrying out nutrient analysis. Nutrient analysis indicated higher nutrient content in the standardized biscuits. The nutrients analyzed were energy, protein and fibre. The standardized biscuits were stored in polyethylene sheets at room temperature and shelf- life studies were carried out for a period of one month. Storage study proved that the biscuits were acceptable for human consumption after storing it for one month. Statistically it was proved that on storage it was acceptable.

Keywords: Snacking, Lysine, Nutrients, Organoleptic, Protein, Fibre, Herbal Biscuit.

Introduction

In today's world, the pace of life is fast and it has become virtually impossible to follow the three or four meal pattern that was traditionally accepted. Now the emphasis has shifted to more "*snacks*" in the meal pattern. It has been found to be more convenient to prepare a snack which can meet the nutritional needs of the family. Children and adolescents who seem to be always hungry can satisfy their appetite by eating nutritious snacks (Shubangini and Joshi, 2003), Cereal grain plays an important role in supplying the nutrients as well as over 70 percent of the daily energy requirements, of over one third of the world's population (Edward *et al.,* 1971).

Wheat products comprise about 82 percent of flour and cereal products consumed by the civilian population. They make important contributions towards the nutrients of the national food supply, including approximately 15 percent of the protein and calories, 30 percent of the carbohydrates (Bakhru, 2001). Lysine is the limiting essential amino acids in cereals. To assure an adequate supply of lysine, baked products made solely from grain should be consumed in combination with milk products, meat, nuts and legumes (Thomas, 1996).

Cowpea is one of the commonly used pulses in India, but is not extensively grown. It is one of the pulses used from ancient times. In India, cowpea is used as whole or as dhal. It is also used as flour after husking or with the husk (Manay, 2003). Cowpeas have all the virtues of pulses – low fat, no cholesterol, high protein and the presence of fibre.

To the health and nutrition conscious people sprouting means growth, good growth means good health and good health signifies good nutrition (Aykroyd, 1990).

Methodology

Formulation of Protein Rich Biscuits

Standard Biscuit were prepared using 100 gm maida and with other ingredients (sugar, butter, baking powder, skim milk powder, essence and water). The preparation method was from Dubby, (1998). Protein rich biscuits were prepared in different proportions -5 percent, 10 percent, 15 percent and 20 percent, with germinated cowpea flour (C).

The different proportions were- C_1- 47.5: 47.5:5; C_2 – 45: 45: 10, C_3- 42:5: 42.5: 15; C_4- 40:40: 20.

Sensory Analysis of the Formulated Cowpea Biscuits

Sensory analysis plays a key role in the development of foods and beverage for consumption (Moskowitz, 1984). Sensory evaluation of the biscuits was carried out by panel of 30 person (students and staff) to whom the score cards were given. The different characteristics which were used for evaluating biscuits were appearance, taste, texture, flavour and colour. The scores of the score card ranked from five to one.

Incorporation of Herbs (Oregano and Thyme) in the Acceptable Biscuits

In the best proportion selected among cowpea incorporated biscuits, oregano and thyme were incorporated in different proportions ranging from 2, 4, 6 and 8 percent which were again subjected to sensory analysis to choose the best accepted percentage.

Nutrient Analysis of the Selected Biscuits

The selected biscuits using sensory analysis were analyzed for protein, fibre and iron using Kjeldhal method (1995), Extraction method (1995) and Wong's method (1929) respectively.

Shelf – life Studies

The selected biscuits were stored at room temperature in polyethylene bags and its shelf-life studies were carried-out for a period of one month at 15 days interval. The parameters included the following:

Moisture Content

Moisture generally refers to the presence of water often in trace amounts. The moisture content is often an importance aspect because its presence in excess amount can promote bacterial growth, decay, moulding or rotting over time (Atlant, 2006). Hence, moisture content of the selected biscuits were analyzed using standard procedure given by BIS 2002.

Peroxide Value

Peroxide values of the selected products were analyzed by Idometric method (2002).

Microbial Analysis

Microbial study was done to check the growth of micro-organism after a period of storage. Pour plate technique spread plate techniques were carried-out to find the total plate count at room temperature.

Results and Discussion

Sensory Analysis of Standard and Protein Rich Biscuits

In order to study the acceptability and preferences, organoleptic evaluation of the formulated products were done. A five point hedonic scale was used with scores ranging from one to five. The mean scores of the protein rich biscuits with cowpea flour is given in Table - I.

Table I: Mean Score of Standard and Cowpea Flour Biscuits

Group	Appearance	Colour	Texture	Flavour	Taste	Mean Total
Standard	4.13	4.23	4.23	4.16	4.30	4.21
C_1	3.90	4.13	4.03	3.70	3.90	3.89
C_2	4.03	3.73	4.13	3.60	3.66	3.83
C_3	4.10	4.00	4.00	3.96	4.06	4.02
C_4	4.00	4.13	3.93	3.46	3.83	3.87

C_1 - 5 Percent C_2 - 10 Percent, C_3 - 15 Percent, C_4 - 20 Percent

From Table I, it is clear that only C_3 had score close to standard and also higher than the other scores. Hence, C_3 (15 percent) was selected for further preparation of protein rich herbal biscuits.

Sensory Analysis of the Protein Rich Herbal Biscuits

The sensory qualities of the biscuits with herbs were evaluated. The evaluation was done by a panel of 30 semi- skilled person which included staff and students, by using a five point hedonic scale for different sensory parameters like appearance, colour, flavour, texture and taste.

Table- II and III give the mean organoleptic score for protein rich herbal biscuits.

Table II : Mean Score of Biscuits with Cowpea Flour and Oregano

Group	Appearance	Colour	Texture	Flavour	Taste	Mean Total
CO_1	3.73	3.70	4.03	3.60	3.36	3.68
CO_2	3.66	3.76	4.00	3.60	3.26	3.65
CO_3	3.40	3.50	4.23	3.23	3.30	3.53
CO_4	3.03	2.86	4.10	2.60	2.33	2.98

CO_1- 2 Percent Oregano CO_2- 4 Percent Oregano CO_3- 6 Percent Oregano CO_4- 8 Percent Oregano

Table II shows the mean values of the biscuits formulated with most acceptable cowpea flour biscuits (C_1) with the herb oregano. The most acceptable herbal biscuit among the four cowpea flour biscuits incorporated with oregano was the incorporation at 2 percent level.

Table III: Mean Score for Biscuits with Cowpea Flour and Thyme

Group	Appearance	Colour	Texture	Flavour	Taste	Mean Total
CT_1	3.39	3.96	4.16	3.76	3.60	3.77
CT_2	4.13	3.83	4.16	3.66	3.63	3.88
CT_3	3.76	3.10	3.80	3.16	3.13	3.39
CT_4	3.73	2.86	3.86	3.03	2.40	3.17

CT_1- 2 Percent; Thyme CT_2- 4 Percent Thyme CT_3- 6 Percent Thyme CT_4.8 Percent Thyme

From Table III, it is clear that CT_2 (4 percent) has a mean score higher ie. 3.88 compared to other percentages which was hence chosen. The mean score for biscuits with cowpea flour with oregano and thyme is given in **Figure – I and II.**

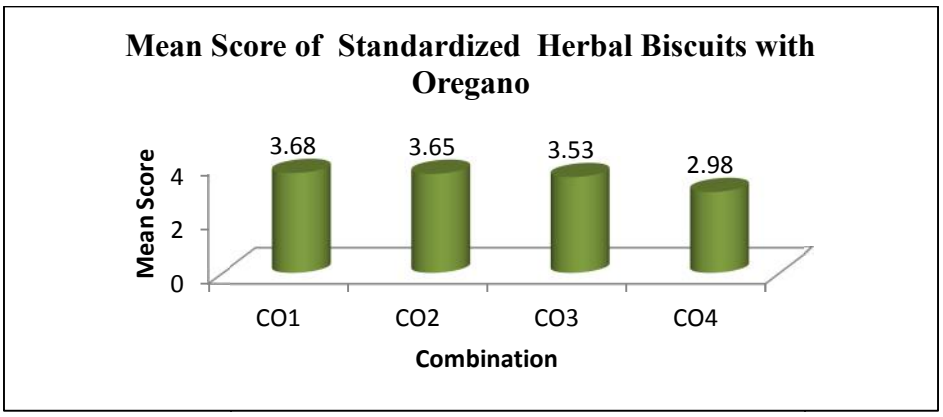

Figure – 1

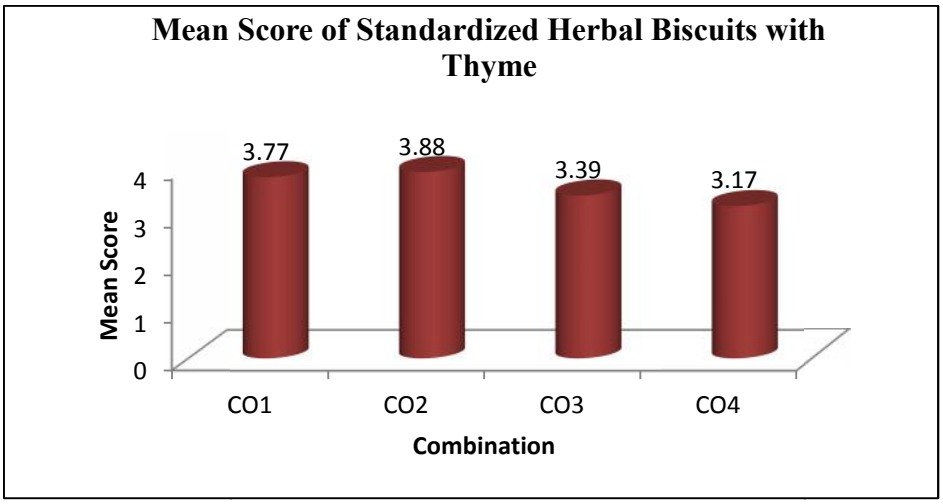

Figure – II

Nutrient Content of the Standard and Standardized Biscuits

Nutrients are the chemical substances supplied by food that the body needs for growth, maintenance, and repair. Nutrients includes carbohydrate, proteins, minerals, vitamins and water. (Carroll Lutz and Karen Przytulski, 2010),

Energy Content of Standard and Standardized Biscuits

Snack provide about one-third of all the major nutrients and energy. One can obtain many nutrients from snacks. By choosing wisely and eating in moderations, one can consume a very healthful diet (Swadiar, 2004). Table IV gives the energy content of the standard and standardized biscuits.

Table IV:Energy Content of Standard and Standardized Herbal Biscuits

S.No.	Biscuit Type	Energy Content (Kcals / Biscuits)
1	Standard Biscuits	52.40
2	Biscuits with Cowpea flour and Oregano	52.59
3	Biscuits with Cowpea flour and Thyme	52.85

From Table IV, it is clear that the formulated biscuits had energy content almost similar to standard biscuit.

Protein Content of the Standard and Standardized Biscuits

Table - V depicts the protein content of standard and standardized biscuits.

Table V:Protein Content of Standard and Standardized Biscuits

Sl. No	Biscuit Type	Protein Content (gm) Mean ±SD
1	Standard Biscuits	0.9680± 0.01
2	Biscuits with Cowpea Flour and Oregano	1.092±0.05
3	Biscuits with Cowpea Flour and Thyme	2.262±0.01

Herbal biscuits with Thyme had a higher protein content compared to biscuits with oregano and standard.

Fibre Content of Standard and Standardized Biscuits

Fibres has been defined as the plant polysaccharides and lignin which are resistant to hydrolysis the digestive enzymes in human being(Swaminathan, 2009). Table- VI gives the fibre content of standard and standardized biscuits.

Table VI: Fibre Content of Standard and Standardized Biscuits

Sl. No	Biscuit Type	Fibre Content (gm) Mean ±SD
1	Standard Biscuits	0.0820± 0.01
2	Biscuits with Cowpea Flour and Oregano	0.1080±0.01
3	Biscuits with Cowpea Flour and Thyme	0.2140±0.01

From the Table - VI, it is clear that the herbal biscuit with cowpea flour and thyme had higher fibre content.

Shelf- life Study of Standard and Standardized Biscuits

Biscuits were prepared with standardized recipe and were subjected to shelf life studies. The biscuits were stored under the ambient condition of average temperature at 29.5^0C and RH-73.5%. During storage moisture contain, peroxide value and free fatty acid content of biscuits increased were as hardness, crispness and overall sensory acceptability scores of biscuits decreased gradually. The shelf- life of the biscuits could be increased further by storing them under low RH conditions (Singh *et al.,* 2000).

Shelf-life of any processed food stuffs depends on the nature of food, its moisture content, preparation method, preservatives added and packing material (Dessrosier, 1998). The microbial level of the formulated herbal biscuits were within the permissible levels specified by BIS for a period of one month.

Moisture Content of Standardized Biscuits on Storage

According to Hotchkiss (1996), excessive moisture pickup or loss causes substantial detoriative changes in foods. Moisture is required for chemical reaction and for micro-organisms growth; excessive moisture can accelerate these type of detoriation.

The standard specified by BIS is 5 percent. The formulated herbal biscuits had a moisture content within the specified limit throughout the period of study.

Peroxide Value Content of Standardized Biscuits on Storage

The degree of oxidation that takes place in oil or fat can be expressed in terms of *"peroxide value"*. When the double bonds of unsaturated fats become oxidized, peroxides are among the oxidation products formed. Oxidative rancidity results from the liberation of odorous products during break down of unsaturated fatty acids (Hotchkiss, 1996).

Table VII :Peroxide Value of Standard and Standardized Herbal Biscuits

S.No.	Biscuit Type	Peroxide value (milli eq/kg)
1	Standard Specified	10
2	Biscuits with Cowpea flour and Oregano (30^{th} Day)	7
3	Biscuits with Cowpea flour and Thyme (30^{th} Day)	7.5

The standardized biscuits were stored for a period of one month at room temperature and was analyzed for peroxide value content at 15 days interval. The values of peroxide value were within the range (BIS standard is 10 milli eq/kg of oil) throughout 30 days of storage.

Conclusion

Supplementary foods employing malting methods were developed. Developed herbal biscuits were stored under ambient temperature (24-32^{0}C) and RH (70-80%) for a period of 30 days and analyzed for moisture, peroxide value and microbial load. The values of moisture, peroxide value and microbial load of stored herbal biscuits were within the range of prescribed specifications.

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