International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

Quality Characteristics of Multigrain Nutri Bar

M.Thamarai Selvi
Assistant Professor, Department of Food Processing Technology
PSG College of Arts and Science, Coimbatore – 641 014

Dr.S.Radhai Sri
Associate Professor and Head, Department of Nutrition and Dietetics
Head, Department of Food Processing Technology
PSG College of Arts and Science, Coimbatore – 641 014

Abstract

The consumption of fast food and snacks increased significantly in recent years, revealing a trend of change in lifestyle of the population. The new trend for consumption of healthy and innovative food product has leaded the market of cereal-bars to a gradual growth. The consumption of cereal bars has increased mainly among young consumers. Multigrain nutri bars are a popular and convenient food and therefore would be an ideal food format to deliver essential nutrients. Combined use of cereal, millets and legume proteins overcome their individual deficits and increases the nutritional quality of products. These energy bars are prepared in the form of tablets either using compression technology or using different binders of choice. Nutri-bar provides greater reduction in hunger and increase in fullness than conventional low-calorie foods. The study was focused on formulation of multigrain nutri bar and to assess the sensory acceptability, physicochemical and nutrient quality of the developed bars. Sensory scores of the product revealed that color, taste, texture, aroma, appearance and overall quality were in acceptable range with mean score of 7.5. The moisture and ash content of the formulated bar were 9.12 per cent and 1.8 per cent respectively. The formulated multigrain nutri bar provides 475Kcal energy, 73.55g carbohydrate, 8.26g protein and 7.7g fat. The results confirmed that the multigrain nutri bar attained comparable quality characteristics which are convenient and cost effective. The results indicated the suitability of coarse cereals and legumes for formulation of healthy nutri bar to improve the health status of young adults.

Key words: Cereal, multigrain, millet, breakfast, nutri bar

Introduction

In the recent past, food has become westernized with fusion of cultures all over the world. Instant meals, fast foods, breakfast foods and other such mass produced packaged and branded foods are available even in small metropolitan urban outlets of India. The changing demography, increasing purchasing power, increasing women work force and staying away from home have led to increased demand for more convenient ready to eat (RTE) and ready to cook (RTC) products. From a people mind set, where home cooked fresh food was the dictum, today's

Received: 8 August Revised: 15 August Accepted: 20 August
Index in Cosmos
September 2018 Volume 8 Number 9
UGC Approved Journal

International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

convenience foods viz., RTE or RTC are becoming more popular even in a traditional food culture of India.

New food products are routinely released in the world market, with fast meal characteristics in the category of snacks, light meals such as extruded biscuits, breakfast cereals, granolas and cereal bars. There is a growing demand for ready-to-eat (RTE), low-fat and multigrain based snacks as RTE cereals. These products, in addition to consumption practicality, meet a considerable part of the daily nutrient requirements of the individuals (Freitas and Moretti, 2006).

Cereal bars are ready to eat sweet products, providing nutritional value without sacrificing the taste or flavour, as well as possess a reasonable shelf life during which the texture remains chewy without being sticky, hard or crumbly. They can be fortified with vitamins, minerals and dietary fibre to make them into a wholesome food. Also, other ingredients like dry fruits, fruit concentrates, oat products, wheat flakes etc. could be incorporated to prepare a variety of cereal bars.

Coarse cereals include maize, sorghum, oats, barley, pearl millet and other minor millets such as Finger millet, Kodo millet, Proso millet, Foxtail millet, little millet and barnyard millet. They are rich in dietary energy, vitamins, several minerals (especially micronutrients such as iron and zinc), insoluble dietary and phytochemicals with antioxidant properties (Bouis, 2000). In view of these nutritional properties these coarse cereals have of late been also designated as nutri cereals (Jones et al, 2000).

The combination of thermally-processed cereals and legumes is recognized by the improved quality of proteins in plant foods (Maia et al, 2000). In cereal bars, texture has a significant effect on its acceptance by consumers because texture perception influences overall sensory appreciation (Wilkinson et al, 2000).

The increased demand for healthy food, the market for cereal bars, has yielded benefits to the food industry (Villavicencio et al, 2007). The introduction of an ingredient in a formulation can cause interactions with other components influencing the physical and sensory characteristics of the final product. In new product development, obtaining an optimal formulation may take a long time and entail high costs. A study was undertaken to formulate well acceptable cereal bars with a blend of millets, pulses, oilseeds and to evaluate the physico-chemical and nutritional characteristics of the products.

Methods

Flaking of grains is a thermo-mechanical process. The preparation of RTE flakes involves steeping the grains in warm water to about 20% moisture, tempering, flaking and toasting (Robie & Hilgendorf, 2001). Flakes of Wheat, Sorghum, Bajra, Finger millet and coarse flour of Green gram dhal, Roasted Bengal gram dhal, Soya flour, groundnut and sesame seeds were selected for cereal bar formulation. In addition, jaggery and butter obtained from local market were used as

Received: 8 August Revised: 15 August Accepted: 20 August
Index in Cosmos
September 2018 Volume 8 Number 9
UGC Approved Journal

International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

binders. Flakes were subjected to four different treatment such as Roasting (T_1), Grinding (T_2), Steaming (T_3) and Soaking (T_4).

The process was carried out in three stages: weighing of the dry ingredients (Wheat, Sorghum, Bajra, Finger millet flakes, Green gram dhal, Roasted Bengal gram dhal, Soya flour, groundnut and sesame seeds - 50%); heating of the syrup (jaggery – 50% and butter) to 95 °C; and mixing of the dry ingredients with the syrup. The mixture was then placed in stainless steel mold which was covered with low-density polyethylene film, and a rolling pin was used to flatten the mixture. The mold was left to cool for 1 hour, and the mixture was then packed in low-density and heat-sealed polyethylene bags. The standardized bars were 10 cm long, 3 cm wide, and 1.50 cm thick weighing about 75g each.

Sensory evaluation for the formulated bars was approved by the Institutional Human Ethics Committee (IHEC), PSGIMSR, Coimbatore. It provides an index of overall acceptability of foodstuffs, which depends on its appearance, flavour, taste, texture, aftertaste and overall acceptability. It was performed by a group of 30 semi-trained panelists (aged 18-30 years), who assessed texture, flavour, taste and overall appearance using a nine-point hedonic scale, ranging from 1 "dislike extremely" to 9 "like extremely". A three-point hedonic scale was used to assess purchase intention of developed bar ranging from 1 "certainly would not buy" to 3 "certainly would buy". The tests were conducted in individual booths, under white light, and the samples were presented to the consumers in balanced order.

Moisture was determined by moisture analyzer (Shimadzu Moisture Analyzer Model – MOC 63 U, Japan). Standard methods of AOAC were used to determine fat by Soxhlet extraction, ash by combustion, carbohydrate by Anthrone method and protein content (Nx6.25) by micro Kjeldahl method. Energy was determined using Bomb calorimeter. Mineral analysis was carried out on bars digested with hydrochloric acid. The chemical analyses were carried out in triplicate.

Results and Discussion

The overall acceptability score for formulated bars was 7.48 ± 0.20. Scores for each of the individual attributes for formulated bars ranged from 6.11 ± 1.08 to 7.61 ± 0.45. The sensory evaluation of formulated bars revealed that it was more acceptable and preferable by the consumers.

Table 1
Mean sensory scores of formulated multigrain nutri bar

Variation	Colour (Mean ± SD)	Texture (Mean ± SD)	Flavour (Mean ± SD)	Taste (Mean ± SD)	Overall Acceptability (Mean ± SD)
T1 (Whole)	7.44 ± 0.59	6.11 ± 1.08	6.95 ± 0.46	7.00 ± 0.39	6.88 ± 0.37
T2 (Ground)	7.23 ± 0.41	7.24 ± 0.39	7.55 ± 0.48	7.30 ± 0.37	**7.48 ± 0.20**
T3 (Steamed)	7.39 ± 0.45	7.61 ± 0.45	7.38 ± 0.48	7.52 ± 0.39	7.18 ± 0.18
T4 (Soaked)	6.95 ± 0.85	7.09 ± 0.83	6.92 ± 0.89	6.92 ± 0.86	6.97 ± 0.56

Received: 8 August Revised: 15 August Accepted: 20 August
Index in Cosmos
September 2018 Volume 8 Number 9
UGC Approved Journal

International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

The result of sensory acceptance test has ensured the choice of the most accepted formulation for the cereal bar. Subsequently, the analysis of the physicochemical and nutrient composition of the formulated cereal bar (T2) one which is most acceptable was carried out. The results of physicochemical composition are shown in Table 2.

Table 2
Moisture and ash content of formulated multigrain nutri bar

Variation	Moisture (%)	Ash (%)
T1 (Whole)	9.54	1.6
T2 (Ground)	9.12	1.8
T3 (Steamed)	11.40	1.2
T4 (Soaked)	15.12	0.9

The moisture content of the bars varied from 9.12 to 15.12 g percent. Gutkoski et al(2007) mentioned that the moisture content of oat-based cereal bar as 13.42 g per 100. Freitas & Moretti (2006) analyzed the cereal bars prepared with soy protein and wheat germ reported the average moisture content as 9.73 g and 9.42 g per 100g respectively. Ash content of the formulated bar was 1.8% but they were higher than the values reported by Brito et al (2004), Guimarães & Silva (2009) who reported the ash content from 1.15 to 1.38 g percent in cereal bars made with dried fruit and dried buriti in different concentrations.

Macro nutrient content of the formulated bar is tabulated in Table 3. The protein content of the formulated bar was 8.26 g per 100 g. Studies of Dutcosky et al(2006), Guimarães & Silva (2009) and Gutkoski et al(2007) showed the protein content of bars ranged between 4.34 to 5.36 g; 5.58 to 6.15 g and 6.18 to 12.37 g respectively. These differences depend up on of quantities and ingredients used in bars and type of bars produced, since bars are produced with different goals or purposes. Increase in protein content in this study was due to the addition of soy protein, other pulses and oilseeds which form the part of the multigrain nutri bar.

Table 3
Macro nutrient content of formulated multigrain nutri bar

Nutrient / 100 g	T 2
Energy (K Cal)	475
Carbohydrate (g)	73.55
Protein (g)	8.26
Fat (g)	7.7

The fat content was 7.7 g per 100 g which was higher than lipid content of the rice bran bar developed by Garcia et al(2012) who reported it to be 7.43 to 9.47 g. Addition of butter and oilseeds form the major source for lipid content of the formulated bar.

Received: 8 August Revised: 15 August Accepted: 20 August
Index in Cosmos
September 2018 Volume 8 Number 9
UGC Approved Journal

International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

Carbohydrate and Energy content of the formulated multigrain nutri bars was found to be 73.55 g and 475 Kcal respectively. The bars had high carbohydrate content due to the high percentage of starch in the multigrain and jaggery in the formulation. A wide range of variation for energy levels of cereal bars (72.8 to 321.70 kcal per100g) has been reported by Dutcosky et al (2006).

Conclusion

Substitution of traditional millets for regular oats in the preparation of the cereal bars led to improvements in sensory attributes (colour and appearance, texture, flavour, overall appearance and purchase intention) and consumer preference. Apart from value addition to traditional millets, development of such bars offers variety, convenience, quality, cost efficiency and scope for increasing the nutritive value. Acceptability of the bars showed the commercial viability of product. In addition to their nutritional significance and acceptability, formulated multigrain nutri bars have potential for commercial production, as this kind of product could be more popular among young adults in the form of a Ready-To-Eat (RTE) nutri bar.

Bibliography

1. Bouis H E (2000), Enrichment of foods staples through plant breeding: a new strategy for fighting micronutrient malnutrition, Nutrition, 1 (6), pp 701 – 704.
2. Dutcosky, S. D. et al. (2006) Combined sensory optimization of a prebiotic cereal product using multicomponent mixture experiments. Food
3. Freitas D.G.C.F and Moretti R.H (2006), Caracterizacaoe avaliacao sensorial de barras de cereais functional de alto teor proteico e vitaminico, *Ciencia e Tecnologia de Alimentos,* Campinas, 26 (2), pp 318 – 324.
4. Garcia, M. C., Lobato, L. P., Benassi, M. de T., & Soares Júnior, M. S. (2012). Application of roasted rice bran in cereal bars. *Food Science and Technology (Campinas)*, *32*(4), 718–724.
5. Guimarães, M. M., & Silva, M. S. (2009). Qualidade nutricional e aceitabilidade de barras de cereais adicionadas de frutos de muricipassa. Revista do Instituto Adolfo Lutz, 68(3), 426-433
6. Gutkoski, L. C.; 2007. Desenvolvimento de barras de cereais à base de aveia com alto teor de fibra alimentar. Ciência e Tecnologia de Alimentos, v. 27, n. 2, p. 355-363.
7. Jones J M (2006), Grain based foods and health cereals, Cereal Foods World, 51, pp 108 – 113.
8. Maia L H (2000), Caracteristicas quimicas dos mingaus desidratados de arroz e soja, *Ciencia e Technologia de Alimentos,* Campinas, 20 (3), pp 416 – 423.
9. Villavicencio A L C H *et al*, (2007), Sensorial analysis evaluation in cereal bars preserved by ionizing radiation processing, Radiation physics and chemistry, 76 (11 - 12), pp 1875 – 1877.
10. Wilkinson C, Dijksterhius G.B, Minekus M (2000), From food structure to Texture, Trends J Food Sci Technol, 11 (12), pp 442 – 450.

Received: 8 August Revised: 15 August Accepted: 20 August
Index in Cosmos
September 2018 Volume 8 Number 9
UGC Approved Journal