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ACCEPTABILITY OF MILLETS BASED VALUE ADDED ENERGY BARS

Home Science

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ABSTRACT

Energy bars were specifically developed for astronauts as non-frozen, easy to handle and ready to eat items to give them both energy and nutrition. Later, the energy bars became popular among sportsmen, athletes, and women for providing instant energy and fulfilling their nutrient requirements. These bars contain a balanced amount of essential nutrients which are required for a human body. The present study was carried out with the main objectives to formulate and standardize control and experimental variations of energy bars using millets and to conduct sensory evaluation to ascertain their acceptability. The experimental variations of energy bars were formulated using millet flours- ragi, jowar, bajra and rajgira. These variations were compared with the control sample of energy bars which was prepared using oats. Various nuts and seeds were utilized for value addition in all the samples. Acceptability of these energy bars was observed by carrying out sensory evaluation and the data obtained was statistically analyzed which depicted the millet based value added energy bars were well accepted and nutritionally wholesome.

KEYWORDS

Energy Bar, Millets, Jowar, Bajra, Rajgira, Ragi

INTRODUCTION

Energy bars has become the food of choice for many people having busy schedule. The bars are easy to carry and eat and also a convenient food source that requires no preparation, with long shelf life and no refrigeration needed. Thus, many consumers grab them as quick snacks or meal replacements, assuming it healthy alternatives compared to other food choices available in market. Energy bars are typically made with a variety of nutritious ingredients, including cereals, rolled oats, dried fruits, nuts, seeds, and more. They provide a well-rounded mix of essential nutrients such as carbohydrates, proteins, fiber, healthy fats, vitamins, and minerals, making them an excellent option to help fill nutritional gaps that may be missing from daily diets. However, not all energy bars are created equally in terms of health benefits. It's important to differentiate between them, as some bars may contain higher levels of fats and sugars, similar to candy bars In the market, these products are often referred to as Energy Bars, Protein Bars, Granola Bars, Power Bars, or Nutri Bars. Nutrition bars have gained popularity as a quick and convenient food choice, especially for those on the go. Offering a no-preparation, long shelf life, and no refrigeration needed, they are frequently chosen as snacks or meal replacements, with the assumption that they are healthier options compared to other foods. A typical energy bar weighs between 40 and 60 grams and provides around 200 to 300 calories, 15 to 18 grams of fat, 7 to 15 grams of protein, and 20 to 40 grams of carbohydrates – the three primary sources of energy in food.

Samuel KS and Peerkhan N (2020) developed pearl millet-based protein bars with 25%, 27.5%, and 30% millet content, evaluating their proximate, mineral, and textural properties. The bars provided 15.74–18.32 g of protein and 332–379 kcal per 100g, with increased millet content improving textural properties. **Dharshini S (2020)** created high-calorie snack bars using millets, nuts, and oilseeds, enriched with inulin. These bars had 402–430 kcal, 11% protein, and 13-14% fat per 100g. The incorporation of millets enhanced both the nutritional content and health benefits, making them suitable for addressing malnutrition.

Bhavani B et al. (2018) conducted an experiment to develop energy bars by incorporating popped amaranth seeds, using puffed rice as the control and varying the proportion of popped amaranth in other formulations. The analysis revealed that increasing the amaranth proportion enhanced protein, crude fiber, iron, phosphorus, and calcium contents while reducing fat and carbohydrate levels. Microbial analysis confirmed that the bars remained within acceptable limits for three months, and sensory evaluation showed that the best formulation contained 55% popped amaranth**. Verma S et al. (2018)** prepared sorghum-based protein-rich cereal bars, which were not only nutritious but also offered dietary fiber and high polyphenol content with antioxidant properties. The researchers commended these bars for all age group, and for inclusion in nutrition programs like ICDS and Mid-Day Meal to combat protein-energy malnutrition among children. Additionally, the researchers suggested sorghum-based cereal bars can stimulate entrepreneurship among sorghum growers. **Bhargavi M et al. (2022)** developed nutrient-rich bars using Bajra and Jowar flakes, which were accepted by the sensory panel, with the Bajra-based variation scoring the highest in appearance, color, flavor, texture, taste, and overall acceptability. These bars provided 357g of energy, 80g of carbohydrates, 8g of fat, and 10g of protein per 100g.

Sunita Mishra and Sonam Gupta (2018) developed an energy bar using Brazilian cassava flour, Ragi flour, honey, and jaggery, with stability monitored for 90 days to ensure its safety. The energy bar, enriched with additional flours like wheat, Ragi, and sattu, is suitable for athletes requiring high energy intake. **Verma A. et.al (2022)** formulated energy bars with dried fruits, seeds, dates powder, and jaggery powder, evaluating them for texture, color, nutritional quality, sensory attributes, and microbial load. Bars with 15% flaxseed and 45% sweeteners had the highest omega-3 fatty acid content and other nutrients, making them ideal for commercial production of omega-3-rich energy bars.

MATERIALS AND METHODS

The study followed an experimental research design which compares the control sample with experimental formulations. The Control sample of energy bar was prepared using oats and the experimental variations of energy bars were developed using flours of millet Jowar, Bajra, Ragi, and Rajgira. Nuts added in energy bars were almonds, cashews, pistachios, and the different seeds added were flax deeds, melon seeds, sesame seeds, poppy seeds and piyal seeds. Raisins and dates were also added along with the nuts and seeds and all together they comprised of 50 per cent of the ingredients used. In all the control and experimental variations, the quantity of different nuts and seeds were kept same. The proportion of millet flours, oats and nuts and seeds was 40:10:50 in all the experimental variation whereas for control it was oats and nuts and seeds 50:50. Instead of sugar or any other sweetening agent honey (5 ml) was added and also ghree (5 ml) for binding and smoothness in texture.

The formulated energy bars were standardized and presented before the panel of ten judges for sensory evaluation in which the judges evaluated the sensory attributes of the developed energy bars like appearance, texture, size and shape, taste, flavour, mouthfeel and overall acceptability with the help of numerical scoring test. A score card was designed with the description of each sensory attribute and scores assigned and given to the judges. Each control and experimental variation of energy bar was evaluated three times and the scores acquired were averaged. The mean score obtained for each sensory attribute was then subjected to statistical analysis 't" test to see any significant difference between the means of the sensory properties. Nutritive Value for the developed control and experimental energy bars was calculated using Indian Food Composition Tables (2017) ICMR National Institute of Nutrition. Hyderabad, India. The nutrients

calculated were protein, fat, carbohydrates along with the energy and fibre content.

RESULTS AND DISCUSSION

The mean scores obtained for each sensory attribute of the control and the experimental variations of the energy bar are presented in the table 1.

Table 1: Mean Scores Of Control And Experimental Energy Bars

S N	Sensory Attributes	Mean Scores				
		Control Sample (With Oats)	Experimental Variation 1 (With Ragi Flour)	Experimental Variation 2 (With Jowar Flour)	Experimental Variation 3 (With Bajra Flour)	Experimental Variation 4 (With Rajgira Flour)
1.	Appearance	9.6	9.4	9.2	9.6	9.2
2.	Texture	9.4	9.6	9.6	9.6	9.2
3.	Shape & Size	9.6	10	9.2	9.8	9.6
4.	Taste	9.4	9.6	9.6	9.4	9.2
5.	Flavour	9.6	9.4	9.8	9.4	9.6
6.	Mouthfeel	9.4	9.4	9.6	9.2	9.6
7.	Overall acceptability	9.6	9.4	9.4	9.8	9.6

From the table 1 it is observed that for all the sensory attributes, the control and experimental variations received mean scores ranging from minimum 9.2 to maximum 10.0. Mean scores of each experimental variation was compared with the control using 't' test and the calculated 't' value was found less than the table value at 0.05 and 0.01 level of significance denoting no significant difference between mean scores of experimental and control sample which means all the experimental variations developed with millet flours were well acceptable.

Nutritive Value

Nutritive value of all the Control and Experimental Value added Energy Bar developed by Millets was calculated by referring Indian Food Composition Tables (2017) ICMR National Institute of Nutrition. Hyderabad, India.

Table 2: Calculated Nutritive Value Of Control And Experimental Energy Bars

Sample	Energy (Kcal)		Carbohydrate (g)		Protein (g)		Fat (g)		Fibre (g)	
	Per serving (25g)	Total (100 g)	Per serving (25g)	Total (100 g)	Per serving (25g)	Total (100 g)	Per serving (25g)	Total (100 g)	Per serving (25g)	Total (100 g)
Control Sample (With Oats)	325	1340	46.6	186.4	13.4	53.6	24.1	96.4	6.7	26.8
Experimental Variation 1 (With Ragi Flour)	313	1252	47.4	189.4	12.1	48.4	23.03	92.12	8.4	33.6
Experimental Variation 2 (With Jowar Flour)	325	1300	47.5	190	12.6	50.4	23	92	8.2	32.8
Experimental Variation 3 (With Bajra Flour)	320	1280	46.4	185.6	12.8	51.2	23.7	94.8	8.4	33.6
Experimental Variation 4 (With Rajgira Flour)	422	1688	46.05	184.2	13.6	54.4	23.8	95.2	7.5	30

It is observed from the table 2 that the experimental variation developed with rajgira flour had the highest energy value and protein content among all the variations whereas variation with ragi flour had least energy value and protein content. Regrading carbohydrate content, vaiation with jowar flour had high and variation with ragi had low carbohydrate content. For fat, control sample with oats had high whereas variation with jowar flour had minimum fat content among all samples. It was also noticed that variation with ragi flour and bajra flour had high fibre conent and the control sample with oats had less fibre content.

Overall, the control and experimental variations found to be packed with all the major nutrients and considering the value addition of nuts and seeds, the nutritional profile of the developed energy bars reflects the array of micronutrients too.

CONCLUSION

The control and experimental variations of value added energy bars developed using millets were well acceptable and nutritionally rich. Millets are utilized instead of the refined flour and processed ingredients which are healthy and has therapeutic value also. These value added energy bars are easy to prepare and can be promoted amongst children of growing age and malnourished population as a health food. These millet based value added bars are better alternative to commercially available energy bars.

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