



DEVELOPMENT OF NUTRI BAR USING GERMINATED MILLETS AND LEGUME

¹Shruti Saumya Toppo, ²Sachin Suse, ³Shweta Jain

^{1,3}Master Scholar, ²Assistant Professor,

¹Department of Food Technology,

¹Parul Institute of Applied Sciences, Parul University, Vadodara, 391760, India.

Abstract : In present era, due to globalization, increased population and busy schedule, consumer prefer ready-to-eat and ready-to-cook food product. Furthermore, an individual's health consciousness, nutritional value of the product, demanding move to trends and interest towards in new products had been increased the global market size. This study focused on developing a Nutri bar using germinated millets and legumes. To enhance the nutritional value of nutri bar different formulations were created according to different materials. Based on sensory evaluation, ideal nutri bar was selected and then biochemical properties were evaluated. The developed nutri bar had the calorific value of 394.62kcal/100g with protein content of 7.36%, fat 7.7%, dietary fibre 3.61% carbohydrate 73.97% and calcium content 78.545mg/100g. This study promotes the utilization of underutilized crops and the agricultural diversity and spreads awareness about their nutritional benefits and awareness related to use in their diet.

Keywords - Nutri bar, millets, legume, germination, functional food, sensory evaluation.

1. INTRODUCTION

Snack foods or snack bar is defined as a food which is consumed between the meals to satisfy hunger and achieve satiety. It is also called nutri bar or granola bar which comes under the functional food and Ready-to-eat snacks^[2]. The nutri bar can be used as stress buster, weight loss, weight gain, athletes, undernutrition, for the proper balance of fats, carbohydrate, protein, fibres etc.

The potential source of starch up to 70% is pearl millet, also known as bajra, belongs to the Poaceae family^[4]. Lysine is the first primary amino acid found in pearl millet which become deficient in daily diet. The amino acid composition of pearl millet protein shows elevated levels of cystine, lysine, threonine, and methionine, which are considered essential. Additionally, pearl millet exhibits higher tryptophan content^[5]. Among cereals and millets, finger millet, also known as Ragi millet, exhibits the highest levels of calcium, measuring 344 mg%, and potassium, measuring 408 mg%. In contrast to white rice, the predominant staple grain in India, finger millet offers superior nutritional fibre, minerals, and amino acids containing sulphur^[3].

Germination emerged as a popular method for enhancing both the flavour and nutritional values of cereals and legumes by breaking down certain anti-nutritional compounds like phytates, tannins, and cyanogenic agents, which prevent the absorption of nutrients and affect the digestion of proteins and carbohydrates. During germination, enzymes such as α -amylase and β -amylase are produced, providing additional energy. Notably, the sprouting of grains and legumes leads to a 1.5-fold increase in ascorbic acid content, a crucial nutrient^[6]. The effects of combining various types of millets (pearl millet and finger millet) with legumes (pigeon pea and chickpea) in a 3:1 ratio, complement the higher essential micronutrients level, improved protein digestibility, and amino acid profiles^[7].

2. MATERIALS AND METHODS

2.1 Materials

All the raw materials were purchased from the nearby market of Vadodara, Gujarat. Chemicals and reagents were acquired from laboratory, Department of Food technology, Parul Institute of Applied Sciences, Parul University, Vadodara, Gujarat. 391760, India.

2.2 The basic composition of the nutri bar

The final Nutri bar was examined on the basic composition comprising moisture, pH, total fat, protein, total carbohydrate, crude fibre, dietary fibre, ash and mineral composition was assessed as per the methods given by AOAC, 2005^[1].

2.3 Formulation of Nutri bar

Different formulations were prepared by using different proportions of all the ingredient to obtain an ideal nutri bar.

Table 1: Formulation of Nutri bar

For 100gms of BAR					
Sr no.	Ingredients	T0(gms)	T1(gms)	T2(gms)	T3(gms)
1	pearl millet	0	12	12	12
2	finger millet	0	12	12	12
3	Quinoa	12	16	10	8

4	Oats	16	8	0	8
5	pigeon pea	16	8	8	8
6	jaggery	35	35	47	40
7	Dates	0	0	0	60
8	Nuts	16	8	8	8
9	dark chocolate	0	0	0	30
10	cocoa powder	6	5	3	0

2.4 The procedure of making Nutri bar

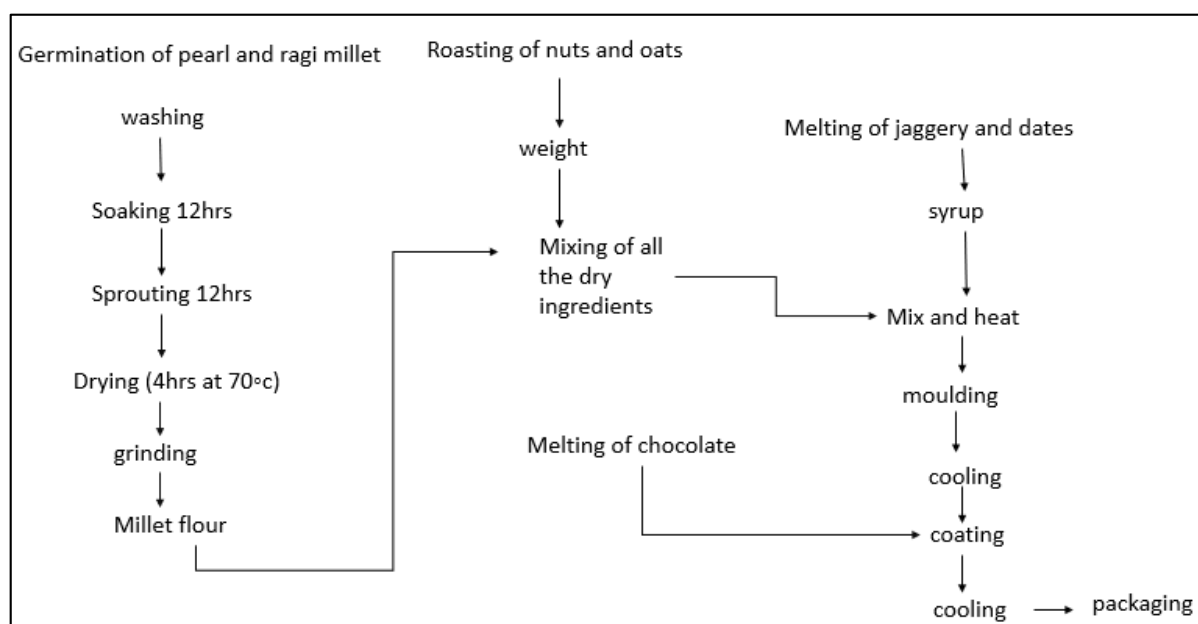


Figure 1: A Flowchart illustrating the steps involved in making a Nutri Bar



Figure 2: Final product (Nutri bar)

3. RESULTS AND DISCUSSION

The Nutri bar was prepared weighing 50gms each. The nutritive value of the millet bar is described in table 2. The Proximate analysis and Consumer acceptability studies were also done.

Four different samples of Nutri bars were prepared in which T0 sample was denoted as control bar whereas in T1, T2, T3 samples, proportion of millets and legume were constant and variations were done on the other ingredients according to the organoleptic attributes. Based on 9 points Hedonic scale final product had been formulated. The dates had been added in T3 sample (final product) to increase its texture and chewable property. By incorporating of Millets, Oats and Quinoa, it enhances the nutritional properties and also imparts nutty flavor to final product. The inclusion of Millets, Oats and Quinoa, it enhances the nutritional properties and also imparts nutty flavor to final product. The inclusion of pigeon pea and popped quinoa significantly augmented the protein content, rendering the nutri bars an excellent vegetarian protein source. Oats, a source of dietary fibre, enhanced the bars digestive benefits and provided sustained energy release. The varied assortment of nuts contributed to the bars' protein content and

provided essential fatty acids, vitamins, and minerals. The natural sweetness from dates and jaggery enhanced the palatability without the need for excessive refined sugars which also acts as a binder.

3.1 Physio-Chemical analysis of Nutri bar

Table 2: Nutritional composition of Nutri bar(T3)

Energy (Kcal/100g)	Carbohydrates (%)	Protein (%)	Fat (%)	Dietary Fibre (%)	Crude Fibre (%)	Calcium (mg/100g)	Moisture (%)	Ash (%)	pH (%)
394.62	73.97	7.36	7.7	3.61	2.4	78.55	15.82	2.3	4.7

Results given in above Table 3 indicates the nutritional composition of the final Nutri bar which was concluded by the evaluation of organoleptic properties. The final nutri bar had the calorific value of 394.62kcal/100g with protein content of 7.36%, fat 7.7%, dietary fibre 3.61% and carbohydrate 73.97%. Calcium content obtained was 78.545mg/100g, moisture 15.82%, Ash 2.3% and pH was noted 4.7 which is acidic in nature.

3.2 Sensory analysis of nutri bar

The sensory assessment of nutri bars was conducted, and the resulting data is displayed in Table 3.

Table 3: Evaluation of the sensory attributes of the nutri bar

Sr. No.	Sample Code	Color	Aroma	Taste	Flavor	Appearance	Overall Acceptability
1	T0	8	6	7.5	8	8.5	7.6
2	T1	8	7	6.5	7	6	6.9
3	T2	7	6	7	8	7.5	7.1
4	T3	8.5	8	9	9	8	8.5

The sensory evaluation conducted on the nutri bars shows positive results. The bars exhibited a pleasing texture, combining the crunchiness of popped quinoa and nuts with the chewiness from dates. The natural sweetness from dates and jaggery created a well-balanced flavour profile, eliminating the need for artificial sweeteners. In the T3 sample (8.5), the nutri bar received the highest sensory score for overall acceptability.

4. CONCLUSION

The final Nutri bar was evaluated for physio-chemical properties and sensory attributes. Among the developed products, bars made with the combination of dates and jaggery as binder was accepted by majority of the panel members in comparison to bars made with only jaggery.

This research aims to combine a diverse range of ingredients, each chosen for its unique nutritional benefits, to formulate a holistic food product that addresses both taste and health considerations. The germination process applied to pearl millet and ragi millet increased its nutritional density, highlighted the importance of processing techniques in enhancing bioavailability. Furthermore, it promotes the utilization of underutilized crops and the agricultural diversity and spreads awareness about their nutritional benefits.

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