

# Development of Super Food Nutri Rich Bar

M. Niharika, G. Sireesha, D. Madhavi, S. V. Sumalatha

## ABSTRACT

The term "super food" has become a buzzword in the language of food and health. Going for healthy snack is always a wiser choice in comparison to choosing unhealthy and junk food potions. A super food bar was developed by blending the chia seeds, flax seeds, and watermelon seeds with dates and other ingredients in three different variations. The nutrient composition, sensory qualities, and storage characteristics of the product were analyzed. The developed bar was evaluated for sensory attributes, and the keeping quality was evaluated by standardized methods. Organoleptic evaluation showed significant difference between the variations and variation-3 obtained highest score. The nutrient composition of the finalized product as follows: protein 11.7 g, fat 20.8 g, calcium 230.6 mg, iron 5.6 mg,  $\omega$ -3 fatty acids 6.46 mg, and dietary fiber 11.84 g/100 g of bar. Shelf life of the product was about 45 days under normal conditions when stored in refrigeration condition. The work indicates the potential of using of chia seeds, flax seeds, and watermelon seeds develop nutri rich bar for all age groups.

**Keywords:** Chia seeds, Flax seeds, Sensory qualities, Shelf life studies, Watermelon seeds

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## INTRODUCTION

Today's attention to super foods has probably been encouraged by a growing public interest in food and health, particularly in the developed world.<sup>[1]</sup> While use of the term has been recorded as early as the early 20<sup>th</sup> century, it has only recently become popular in ordinary language.<sup>[2]</sup>

However, despite its ubiquity in the media, there is no official or legal definition of a super food. The Oxford English Dictionary, for example, describes a super food as "a nutrient-rich food that is considered especially beneficial for health and well-being." while the Merriam-Webster dictionary omits any reference to health and defines it as "a super nutrient - dense foods, loaded with vitamins, minerals, fiber, antioxidants, and/or phytonutrients." There is no exact definition of what makes a "super food." However, super foods are considered to be nutrient powerhouses that provide large quantities of antioxidants, phytochemicals (chemicals in plants responsible for colors and smells), vitamins, and minerals. The most super foods are plant-based, but some fish and dairy also make the cut.<sup>[3]</sup>

The modern diet is often not as nutritious as it should be. There is an abundance of unhealthy foods available, which are often easier to prepare and quicker to eat than their healthy counterparts. However, unhealthy eating is not good for your body, your skin, your hair, and your immune system - it even impacts your emotional state. Whereas a daily diet that includes super foods give your body everything it needs to run smoothly and stay healthy. Chia seeds<sup>[4]</sup> were used by Aztec tribes in the early history of Mesoamerica. This cereal harvest was important not only for food, but also for medicines and paints. Chia oil is a centuries-old ingredient that has been rediscovered for today's cosmetic and nutritional applications.<sup>[5]</sup> Chia oil is extremely rich in polyunsaturated fatty acids, particularly  $\omega$ -3 linolenic acid. The main components are linoleic acids (17–26%) and linolenic (50–57%) (Ting IP). Chia seeds exhibit high antioxidant activity that is associated with polyphenolic compounds and the presence of tocopherols.<sup>[6]</sup> Epidemiological and scientific evidence has shown a strong relationship between total fat intake and composition and cardiovascular disease, cancer, diabetes, and depression.<sup>[7]</sup> However, populations that consume higher amounts of fats rich in-3 fatty acids have been shown to have a much

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lower incidence of coronary heart disease than populations that consume primarily-6 fatty acids.<sup>[8]</sup>

The use of flaxseed as a dietary supplement is increasing in parallel with research on its multiple effects on human health<sup>[9]</sup> and designer feeds for poultry feeding.<sup>[10]</sup> It has been reported that flaxseed detoxified by a simple toxic removal technique can be used to enrich omega-3s in chapatti made from wheat flour.<sup>[11]</sup> Flaxseed contains functional components such as dietary fiber, oil, protein, and phenolic compounds, which are responsible for a number of health benefits. Flax has a unique fatty acid profile. It is high in polyunsaturated fatty acids and low in saturated fatty acids. Linoleic acid, an omega-6 fatty acid, makes up about 16% of total fatty acids, while  $\alpha$ -linolenic acid makes up about 57%, the highest of any seed oil.<sup>[12]</sup> Flaxseed protein has been found to be effective in lowering plasma cholesterol and triacylglycerides.<sup>[13]</sup> Flaxseed fiber, both soluble and insoluble, is considered to lower blood glucose and cholesterol levels.<sup>[14]</sup> Furthermore, flaxseed is one of the best sources of lignans that has the ability to bind to estrogen receptors in the body and act as an anticancer agent and helps prevent prostate, breast and endometrial cancers. Flaxseed supplementation improves lipid profiles but has no effect on biomarkers of bone metabolism in postmenopausal women.<sup>[15]</sup>

Dates are staple edible sweet fruits. Dates are a very good source of carbohydrates, fats, proteins, crude fiber, minerals, and vitamins that provide health benefits. Dates contain energy from

157 calories/100 g.<sup>[16]</sup> Dates are useful for reducing cholesterol level, improving bone health, strengthening the nervous system and improving digestion since dates are rich in fiber.

Watermelon can be used as fresh salad, dessert, snack, and for decorations. Drinks can also be made from the juice. Watermelon seeds are known to be highly nutritional; they are rich sources of protein, vitamins B, minerals (such as magnesium, potassium, phosphorous, sodium, iron, zinc, manganese, and copper) and fat among others as well as phytochemicals.<sup>[17]</sup> The seeds are for instance used to prepare snacks, milled into flour and used for sauces.

There is a need to develop the healthy and nutritious products for Children<sup>[18]</sup> Adolescents, Adults and all the population groups. Because majority are suffering with micronutrient deficiencies,<sup>[19-21]</sup> to mitigate this deficiencies, there is a need to develop nutrient quality dense foods such as instant muffin mix enriched with calcium,<sup>[22]</sup> mulberry products<sup>[23]</sup> like that.

Taking into account the health benefits of food products, quality and consumer demand, the main objective of this study was to develop and standardize the super food nutri rich bar with the use of chia seeds, flax seeds, watermelon seeds, dates and honey dates, and study of different analyzes that include organoleptic, proximal analysis, and self-life for the product acceptance. The study also aims to formulate products with the use of plant resources and conversion into a nutritious vegan food product without additives.

## MATERIALS AND METHODS

### Raw Materials

Ingredients for the production of super food nutri rich bar such as chia seeds, flax seeds, watermelon seeds, dates, and honey [Figures 1-5] were procured from the Local supermarket, Tirupati.

### Methods

#### *Processing methods and preparation of super food nutri rich bar*

Preparation of super food nutri rich bar was carried out according to the formulations given in the Table 1. The good quality ingredients were selected for the development of the product. Cleaning was carried out to remove the foreign material.

Nuts and edible seeds were roasted in open pan on the slow flame of gas burner for 5–6 min.<sup>[24]</sup> According to the recipe, ingredients were weighed and put it into separate plates. Roasted edible seeds were coarsely grinded in mortar and pestle. The seeds were removed from the dates the known amount of dates blended together with the coarsely grinded material, mixed with each other, and converted into one uniform mixer. Finally, honey was added to

this mixer. The prepared mix was spread into a tray on butter paper and then sheet formed of the 1.5 cm height with the help of rolling pin. The tray was kept in freezer for 1 h then with the help of scale and cutter the sheet was cut into desired shape of 8 cm length, 2 cm width and 1.5 cm height [Figure 6]. Figure 7 shows the processing of the super-food nutri rich bar. Packaging of bar was done in paper aluminum foil and secondary packaging done by polypropylene.<sup>[25]</sup> The prepared bars were stored at refrigerated condition.

### Sensory Evaluation of Product by Panel Judges

Nine point hedonic scales were chosen to test acceptability. Hedonic rating scale was the test where judges express their evaluation scores according to the scores given for each sensory attributes on the score card provided. Separate column was given to write the remarks, based on which modifications were made in the product. For each trail, the product was subjected to sensory



**Figure 1:** Chia seeds



**Figure 2:** Flax seeds



**Figure 3:** Watermelon Seeds

**Table 1:** Formulation of super-food nutri rich bar with three different ingredient compositions

Ingredients	Trial-1	Trial-2	Trial-3
Chia seeds	30 g	35 g	30 g
Flax seeds	10 g	10 g	10 g
Watermelon seeds	20 g	15 g	25 g
Dates	20 g	20 g	15 g
Honey	20 ml	20 ml	20 ml

evaluation to the panel members by giving instructions before evaluation. The score cards were given for each trial separately.

**Nutrient Analysis**

The analysis of the nutrients was done for the standardized product. The analysis was done and calculated based on the standard procedures.



Figure 4: Dates



Figure 5: Honey



Figure 6: Variations of nutritious bar

**Packaging and Labeling**

The role of packaging and labeling has become quite significant as it helps to grab the attention of the audience.

- Labeling and packaging can be used by marketers to encourage potential buyers to purchase the product
- Packaging is also used for convenience and information transmission. Packages and labels communicate how to use, transport, recycle or dispose of the package or product.

Packing was done carefully to preserve the product for a long duration. Labeling of concerned product illustrate the necessary information needed to the consumer. Figure 8 shows the packaging and labeling of the developed product.

*Packaging*

Packaging was done carefully to preserve the product for a long duration, air tight food grade plastic were chosen for premix

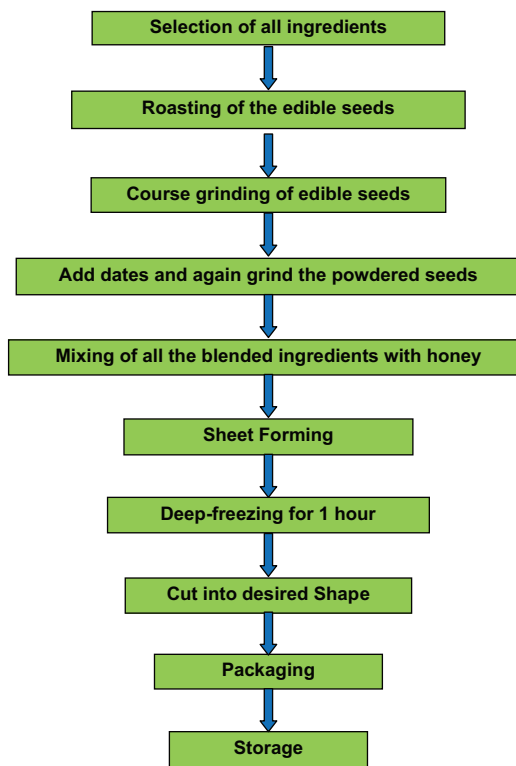


Figure 7: Process flow chart of super-food Nutri rich bar



Figure 8: Labeling of the super-food nutri rich bar

storage as it was the suitable materials to avoid moisture and external contamination.

### Labelling

After packaging was done properly, the product was labelled with the following specifications.

### Cost evaluation

The term "cost" means the amount of expenses incurred on or attributable to specified thing or activity. Cost evaluation was done by calculating the cost of ingredients used for preparation of premix powder, and it also includes cost of packaging material and labor.

### List of Costs Considered for the Cost Analysis of Premix

#### Cost category

Raw materials, Preproduction logistic cost, and Production cost.

#### Cost description

Purchasing cost of raw material, transportation and storage cost, direct and indirect cost, machine operating cost, energy cost, packaging cost, preventive outages, postproduction logistic cost, handling cost, and transportation and storage cost.

## RESULTS AND DISCUSSION

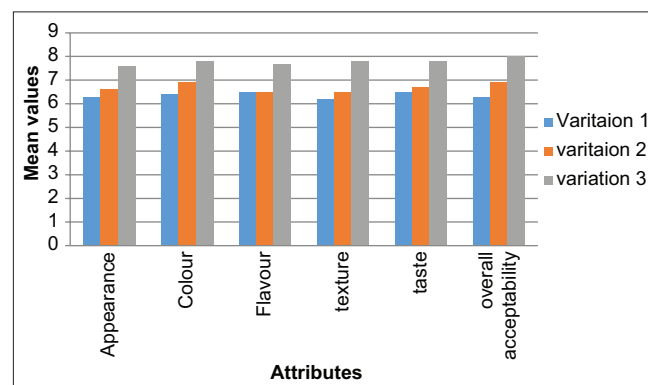
The formulated product has been standardized by repeated trials in the laboratory and by checking the organoleptic characteristics through semi trained panelmembers.V-3 was the final product suggested by the panel members.

The average score for each attribute the product were calculated and presented in Table 2. Figure 9 depicts organoleptic evaluations and mean scores for the developed nutritious bar. There are several steps involved in a new product development among which taste panel stage is most. In taste panel stage, various attributes of the product such as appearance, color, flavor, texture, and taste. The appearance, color, flavor, texture and taste, overall acceptability of the variation -3 is higher than other two variations. The variation-3 showed the highest score, appearance ( $7.6 \pm 0.51$ ), color ( $7.8 \pm 0.42$ ), taste ( $7.8 \pm 0.42$ ), flavor ( $7.7 \pm 0.48$ ), texture ( $7.8 \pm 0.42$ ), and overall acceptability ( $8.53 \pm 0.21$ ). The bar, with added chia seeds and watermelon seeds, has the proper taste. It was narrated that with the increasing and decreasing the level of these seeds.

Borneo *et al.*,<sup>[26]</sup> reported that the chia gel can replace as much as 25% of oil or eggs in cakes while yielding a more nutritious product with acceptable sensory characteristics. Krishna *et al.*,<sup>[27]</sup> referred that the flaxseed is emerging as one of the nutritive and functional ingredient in food products. This encourages development of new branded healthy and functional foods using flaxseeds, oil, and cakes. ALA (omega-3 fatty acid), dietary fiber, and Lignan (specifically SDG) content attracts food technologists to explore its abilities at fullest extent in commercial food processing sector. Today a major portion of world is suffering from disorders such as cardiovascular diseases, diabetes, hypertension, and

**Table 2:** Organoleptic evaluations of developed variations

Attributes	Nutritious bar		
	Mean $\pm$ SD scores		
	Variation 1	Variation 2	Variation 3
Appearance	6.3 $\pm$ 0.48	6.6 $\pm$ 0.51	7.6 $\pm$ 0.51
Color	6.4 $\pm$ 0.51	6.9 $\pm$ 0.31	7.8 $\pm$ 0.42
Flavor	6.5 $\pm$ 0.52	6.5 $\pm$ 0.52	7.7 $\pm$ 0.48
Texture	6.2 $\pm$ 0.42	6.5 $\pm$ 0.52	7.8 $\pm$ 0.42
Taste	6.5 $\pm$ 0.52	6.7 $\pm$ 0.48	7.8 $\pm$ 0.42



**Figure 9:** Bar diagram showing comparison between different variations

neurological disorders; hence, there is a need to cure the people by adopting natural strategy. Flaxseed is one of the emerging foods which have the potential of curing these disorders Apart from being an excellent oil seed, flaxseed can be used in food, skin care, hair care, and other health care products Alonso-Calderon *et al.*,<sup>[28]</sup> studied that chia seed had a higher concentration of phytosterols which have cancer and cardio protective effect with antimicrobial activities. Jacob *et al.*,<sup>[29]</sup> stated that melon seed flour is a good source of important nutrients such as fat, protein, fiber, and minerals.

Date fruit contains rich amounts of antioxidants such as coumaric acid and ferulic acid. Moreover, it contains flavonoids, sterols, procyanidins, carotenoids, anthocyanins, sugar (glucose, sucrose and fructose) with low glycemic index, dietary fibers, less protein and fats, vitamins such as riboflavin, biotin, thiamine, ascorbic acid and folic acid and minerals for example calcium, iron, copper, cobalt, magnesium, phosphorous, potassium, sodium, boron, zinc, and selenium within the date palm itself.<sup>[30]</sup> Kenjeric *et al.*,<sup>[31]</sup> stated that honey has high levels of monosaccharide's, fructose, and glucose, and it contains about 70–80 percent sugar, which provides its sweetness. Honey also has antiseptic and antibacterial properties. Due to this selected food composition in variation, 3 showed high acceptable sensory score in the present research.

The data from the Table 3 reveals that the nutrient composition of the developed super food nutri rich bars, the higher nutrient content was observed in Variation-3 that is energy-453.89 (K cal), carbohydrates-40.96 (g), protein-15.59 (g), fat-26 (g),  $\omega$ -3 fattyacid-1302 (mg), dietary fiber 13.92 (g), iron 4.98 (mg), and calcium 243.36 (mg).

Chia seed contains between 34 g and 40 g of dietary fiber per 100 g, equivalent to 100% of the daily recommendations for the adult population; the defatted flour possesses 40% fiber, 5–10% of which is soluble and forms part of the mucilage.<sup>[32]</sup> This fiber content is higher than quinoa, flaxseed and amaranth,

**Table 3:** Nutrient compositions of super food nutri rich bar variations

Ingredients	Quantity g	Protein/g	Fiber/g	CHO/g	Energy/K.cal	Ca/mg	Iron/mg	Fat/g	w-3 fatty acid/mg
Variation-1	100	13.94	14.4	44.13	436.8	239.15	4.66	23.39	1303.28
Variation-2	100	13.07	16.08	46.01	429.7	265.7	4.67	22.3	1304.17
Variation-3	100	15.59	13.92	40.96	453.89	243.36	4.98	26	1302.6

**Table 4:** Microbial analysis of super-food Nutri rich bar at different storage periods

Parameter	Initial day	15 <sup>th</sup> day	30 <sup>th</sup> day	45 <sup>th</sup> day
Total plate count	Nil	Nil	Nil	16 cfu/g
Total yeast and mould count	Nil	Nil	Nil	Nil

even greater compared with the dried products. Therefore, chia seed can be used in the prevention of many cardiovascular diseases and diabetes.

Chia seeds slow down the digestion and absorption of carbohydrates and avoid peaks in blood sugar levels thus leaving you feeling satisfied for longer. Chia seeds are covered with a layer of water-soluble fiber that swells up when wet, adding "volume" to meals without adding more calories to body. These explain why eating chia satisfies longer and feel full for long time. These fibers also help to rinse intestines of toxins and allow body to detoxify. The conclusion is that chia seeds are excellent for weight loss.

Vertommen *et al.*,<sup>[33]</sup> was reported that the effect of feeding chia seeds that result in diastolic blood pressure decreased with significant decline in serum triglycerides and there is no side effect, greatly decreased the visceral adiposity decreases triglycerides and LDL cholesterol level.

### Shelf Life Studies

Microbial estimation of food may provide information concerning the quality of the food material.

30 g of super food nutri rich bar are packed and sealed in aluminium foil. The bar was drawn for analysis at initial day, 15 days, 30 days, and 45 days. The samples were analyzed for yeast and mould, total plate count. The results of the analysis are presented in Table 4. In the Table 4, the total plate count was performed for developed nutritious bar of regular interval of 15<sup>th</sup> day of period up to 45<sup>th</sup> day of storage period. The total plate count were nil at initial day to 30<sup>th</sup> day of storage period. The total plate count was 16 cfu/g at 45<sup>th</sup> day of storage period. The yeast and mould count was performed for developed super food nutri rich bar of regular interval of 15<sup>th</sup> day of period up to 45<sup>th</sup> day of storage period. The total plate count were nil up to end of the storage period. The results of shelf life studies showed that nutritious bar does not have no microbial contamination, and it is considered acceptable in the shelf life of a product and the count did not exceed the levels during storage throughout the storage period.

Super foods contain a variety of nutrients, such as antioxidants, that are believed to prevent cancer. They also contain healthy fats, which are believed to prevent heart disease; fiber, which is believed to prevent diabetes and digestive problems; and phytochemicals - the plant chemicals responsible for deep colors and smells, which can have numerous health benefits. Eating foods that are packed with nutrients (such as many so-called super foods) is certainly a good idea, Hyde told Live Science. These types of bars are very useful for all age groups and disease conditions.

### CONCLUSION

The study revealed that chia seeds, flax seeds, and watermelon seeds are using to prepare a super food nutri rich bar. The super food nutri rich bar contained adequate amount of protein, omega-3 fatty acids, and minerals and was found suitable for feeding children and also people of all age groups. The production methodology is economical and can be easily adopted in home to industrial scale using locally available underutilized grains. Sensory analysis and storage studies revealed that the product prepared from chia seeds, flax seeds and watermelon seeds exhibited good overall acceptability with a shelf life period of 45 days. When it comes to ensuring a balanced intake of nutrients for good health, we need to increase the variety of nutritious foods in our diets rather than just focusing on a handful of foods that are said to be "super". Importantly, this should include a greater quantity and variety of fruits and vegetables. Hence, these developed bars are good, because incorporation of the Chia seeds, flax, pumpkin seed powder and dates and honey for the people suffering from diabetes, cardiovascular diseases, and obesity.

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