



DEVELOPMENT, ORGANOLEPTIC AND NUTRITIONAL ASSESSMENT OF NUTRI ENERGY BAR

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Abstract:

The present investigation attempts have been made to formulate Nutri energy bar. Energy Bars were prepared by mixing the blend of date, nuts (walnut, almond and cashew nut), dry fig and edible seeds (chia, melon, sesame and flax) with coating of dark chocolate. Ingredients were selected on account of their nutritional and functional characteristics. The method for preparation of nutri energy bar was standardized on the basis of sensory evaluation. Product prepared with the addition of 40g dates was more acceptable. The product contained natural sugars of dates with no any added colour or flavour. Dates being considered as complete food are helpful in weight loss, reducing cardio vascular diseases (CVD), promoting digestive health and having the health beneficial properties. The edible seeds are rich source of vitamins and minerals. Dark chocolate having the good cholesterol profile and useful in cancer prevention. The nutritional studies revealed that the product was rich in energy, fats and proteins. 100g of bar can meet the high value of energy (404.84kcal). Prepared bars having the shelf life of 3 months at refrigerated condition. The prepared nutri energy bar thus can be suggested for vegans, infants, school children, sport person and pregnant women.

Key Words: Energy Bar, Coating, Sensory Evaluation, Cardio Vascular Diseases (CVD), Cholesterol & Nutritional.

1. Introduction:

The food technologist needs an approach towards the innovation, research and newer technologies for the development and formulation of nutritious, healthy and sustainable food commodities to meet the consumers demand with increasing population. In recent market trend consumers have desire with convenient healthy food due to busy life schedule. Energy bars are emerging concept to fulfil the market target so there is need to formulate nutritious and convenience food bars (Izzo M. and Niness K., 2001). In the market wide varieties of bars are present these energy bars have different characteristic and gained popularity in the global market with different purposes. Energy bar is also known as snack bar it comes under the category of RTE food and plays a role like convenience food (Silva *et al.*, 2019). Various types of ingredients are used while preparation of energy bar such as cereals, legumes, nuts, dry fruits, oil seeds, pseudo cereals, milk powder, sweeteners, binders, flavours and honey (Latika Yadav and Vibha Bhatnagar, 2015).

Date (*Phoenix dactylifera L.*) is staple food and known as edible sweet fruit. Dates are source of natural sugars like sucrose, fructose and glucose. Dates are nutritionally very good source of carbohydrate, fat, protein, crude fiber, minerals and vitamins which provides health benefits (Sablaniet *al.*, 2008). Dates contain energy of 157 calories per 100 g (Sulaiman Aljaloudet *al.*, 2020). Dates are helpful in lowering the cholesterol level, improving bone health, strengthening the nervous system and improving the digestion as dates are rich in fiber. Chia seeds (*Salvia hispanica*) are the edible seeds gray in colour. Chia seed are hydrophilic in nature and after soaking develops mucilaginous coating. These seeds are act as egg binder in the various energy snack bars. Chia seeds are helpful in digestion, weight loss and maintenance of blood sugar level.

Almond (*Prunusdulcis*) is comes under the category of drupe fruit. Almonds are good source of energy (575 kcal), monounsaturated fatty acids, plant protein, antioxidant, minerals and vitamins. Almond plays a role in reducing risk of chronic diseases such as coronary heart disease (CHD) and type 2 diabetes and weight loss (David *et al.*, 2009). Almonds are used in the various desserts, bakery products and confectionary. Walnut (*Juglansregia L.*) is edible fruit seed and consumed as nut. 100g of walnut provide 498kcal energy per 100g it is also rich in lipid (50.1g), fiber (5.9g), minerals and vitamin. It is also good source of antioxidants. Consumption of walnut having the beneficial effect on blood lipid, lowering the level of LDL and reducing the level of blood cholesterol. Walnut is appears as small brain so it is helpful in improving the brain functions. Cashew tree (*Anacardiumoccidentale*) produces cashew nut is also known as 'caju'. Cashews are good source of fat, protein, iron and magnesium. Intake of cashew is beneficial for heart health, weight management and bone health. Cashews are mostly used in garnishing sweets, bakery products, curries and snack products.

Flaxseeds (*Linumusatissimum*) are flat golden yellow to brown colour seeds. Flax seed also known as linseed and it is crispy in texture. Fat content of flax seed is 42g and protein 18g per 100g respectively. These seeds are rich source of omega 3 fatty acids (Mohammed M.S., 2015). Flaxseeds have the cholesterol lowering and cancer prevention properties. Sesame seed (*SesamumindicumL.*) is oil seed rich in unsaturated fatty acids and protein and having nutty taste (Kandangath *et al.*, 2010). Potential health benefits of sesame include anti-

oxidative, anticancer, anti-hyper sensitive and anti-immune regulatory actions. Sesame seeds having the potential to use in food products in powder, paste and roasted whole seed form. Melon seeds (*Cucumeropsismannii*) are dried seeds obtained from the musk melon. The melon seeds are rich in protein, linolenicacids, vitamins, fats and other nutrients. These seeds are helpful in improving the metabolism of human body.

Dry fig is obtained from the fresh fig (*Ficus carica*) and also known as ‘anjeer’ comes under the category of dry fruits. Addition of dried fig in the food products gives the texture and consistency. Fig is nutritionally very important and it provides 249 kcal energy, 64g protein, 14g fiber, 3g protein per 100g of serving. It has good potential in weight management, reproductive health, improving digestion and regulation of blood sugar. Dark chocolate is obtained from the plants of *Theobroma cacao* used in the bakery and confectionary food products. It is having the anti-oxidative anti-inflammatory properties. Chocolate is also act as good mood food. Chocolate is useful in the cardio vascular health, improves brain functions and protects the skin (Corina Zugravu and Marina Otelea, 2019). Chocolate coating is done on various fruit bars, snack bars and energy bars it improves the appearance of bar also provides nutrition and increases the shelf life of product.

Keeping in view the health benefits of food products, quality and demand of consumers the main objective of this study was to develop and standardise thenutri energy bar with the utilization of dates, nuts and edible seeds and study of different analysis which includes organoleptic, proximate and physical analysis for the acceptance of product. The study also aims formulation of product with utilization of plant resources and conversion into nutritious additive free vegan food product.

2. Materials and Methodology:

2.1 Raw Materials:

Ingredients for the production of nutri energy bar like dates, walnut, almond, cashew nut, chia seeds, melon seeds, sesame seeds, flax seeds, dry fig and dark chocolate were procured from the Akar super shop Parbhani, Maharashtra. All the used chemicals and reagents of analytical grade were procured from the well reputed chemical distributor companies and used for the chemical analysis as such.

2.2 Methods:

2.2.1 Processing methods and preparation of Nutri Energy Bar:

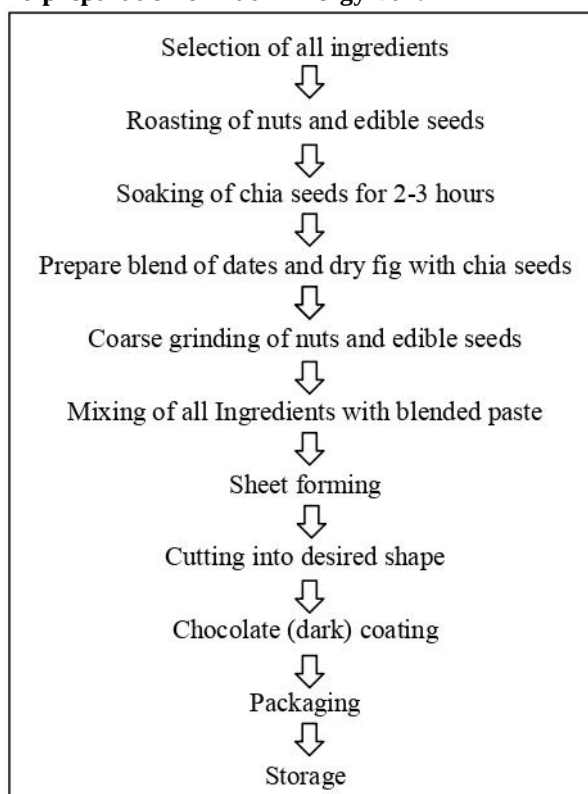


Figure 1: Process Flow Chart of Nutri Energy Bar

Preparation of energy bar was carried out according to the formulations given in Table no 1. The good quality of dates, nuts and edible seeds were selected from the ingredients list. 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 (Shindeet *al.*, 2019). According to the recipe ingredients were weighed and put it into separate name plates. Soaking of chia seeds carried out for 2-3 hrs and soaked chia seeds used for the further process. The seeds were removed from the dates the known amount of dates, dry fig and chia seeds blended together with the

help of mixer. Roasted nuts and edible seeds were coarsely grinded in mortar and pestle. The coarsely grinded material and blended paste mixed with each other and converted into one uniform mass. The prepared mass was spread into a tray on butter paper and then sheet formed of the 1.5cm height with the help of rolling pin. The tray was kept in freezer for 1 hr then with the help of scale and cutter the sheet was cut into desired shape of 8cm length, 2cm width and 1.5cm height (Muhammad Nadeem *et al.*, 2012). The uniform coating of dark chocolate was done by dipping the bar into melted chocolate and allowed it to set at room temperature. Melting of chocolate was done by water bowl heating method (Mary *et al.*, 2004). Packaging of bar was done in paper-aluminium foil and secondary packaging done by polypropylene (Ananthan *et al.*, 2012). The prepared bars were stored at refrigerated condition.

Table 1: Formulation of Energy bars with four different ingredient compositions

Ingredients	Formulations (g/100g)				
	A	B	C	D	E
Dates	35	37.5	40	42.5	45
Chia seeds	2.5	3	5	5.5	6
Dry fig	10	7.5	7.5	10	7.5
Walnut	12.5	10	10	8.5	7.5
Almond	10	12	12	10.5	10
Cashew nut	12.5	12.5	10	7.5	10
Melon seeds	5	5.5	5	5	4.5
Seasame seeds	5	7	5	5	4.5
Flax seeds	7.5	5	5.5	5.5	5

2.2.2 Different Analysis:

2.2.2.1 Organoleptic Analysis:

Organoleptic/sensory evaluations of all 5 samples (A-E) were carried out for the acceptability based on 9 points hedonic scale (Prerana *et al.*, 2018). Samples were evaluated on the basis of appearance, colour, taste, flavour, texture and overall acceptability. Scores were given on hedonic scale represent 9 for like extremely while 1 for dislike extremely. Evaluation was carried out with the help of 25 semi trained panellists by providing respective evaluation sheet to individual member. Small pieces of bar provided along with drinking water and taste breaker. Mean score was selected for the selection of standardised product formulation.

2.2.2.2 Proximate Analysis:

The analysis was carried out to determine the proximate composition of the product. Moisture content of the product was determined by dry oven method (AOAC, 1990). The proximate analysis of the selected sample 'C' carried out. The dry sample (moisture free) used for the further analysis. Proximate constituents like fat, protein, fiber, and ash content were found out as per standard methods (AOAC, 2000). The value of carbohydrate content was obtained by difference method (Asif *et al.*, 2017). Mineral solution prepared by digesting the ash sample then minerals like iron and magnesium determined by the standard process given by (Ranganna S., 1986). Vitamin E is analysed by the standard method given by (S. Suzanne Nielsen, 2009). Total energy was calculated using conversion formula by multiplying carbohydrate, fat and protein by 4, 9 and 4 respectively (Wandhekare *et al.*, 2020). All parameters were analysed in triplicate and average score considered. Analysis was performed in Food Chemistry and Nutrition laboratory at College of Food Technology, Parbhani.

2.2.2.3 Physical Analysis:

The parameters such as weight of bar, length, width, height/thickness and bulk density of chocolate coated bar was studied for the 25 samples. Weight of individual bar was simply calculated by using the weighing balance. Length, width and height were calculated with the help of digital vernier caliper (Pawase *et al.*, 2019). The bulk density was calculated by the formula mass/volume and volume measured with the help of measuring cylinder.

3. Result and Discussion:

3.1 Organoleptic Analysis:

Organoleptic evaluation of energy bar is carried out with respect to the parameters like appearance, colour, taste, flavour, texture and overall acceptability the obtained data of average sensory score is presented in table no. 02. Sensory score study was revealed that the sample 'C' got the high consumer acceptability and sample 'E' have less acceptability. The sample C showed the highest score, appearance (8.82 ± 0.18), colour (8.5 ± 0.17), taste (8.2 ± 0.19), flavour (8.21 ± 0.11), texture (8.63 ± 0.09) and overall acceptability (8.53 ± 0.21). The bar with added 40g of dates was having the proper sweetness and texture. It was narrated that with the increasing and decreasing the level of dates there was change in the texture of bar. Average result score is also presented by spider plot graphical representation (fig. no 02). The sensory score helped to select and optimize the final composition of bar.

Table 2: Average sensory score

Sample	Parameters					
	Appearance	Colour	Taste	Flavour	Texture	OAA
A	7.08±0.25	7.21±0.38	6.8±0.14	7.35±0.17	7.61±0.21	6.74±0.34
B	7.36±0.12	7.72±0.23	7.31±0.21	7.46±0.25	7.81±0.15	7.02±0.36
C	8.82±0.18	8.5±0.17	8.2±0.19	8.21±0.11	8.63±0.09	8.53±0.21
D	7.69±0.86	7.8±0.75	7.62±0.34	7.79±0.32	7.23±0.42	7.14±0.39
E	6.92±0.61	7.02±0.34	6.12±0.39	7.14±0.68	5.81±0.51	6.87±0.45

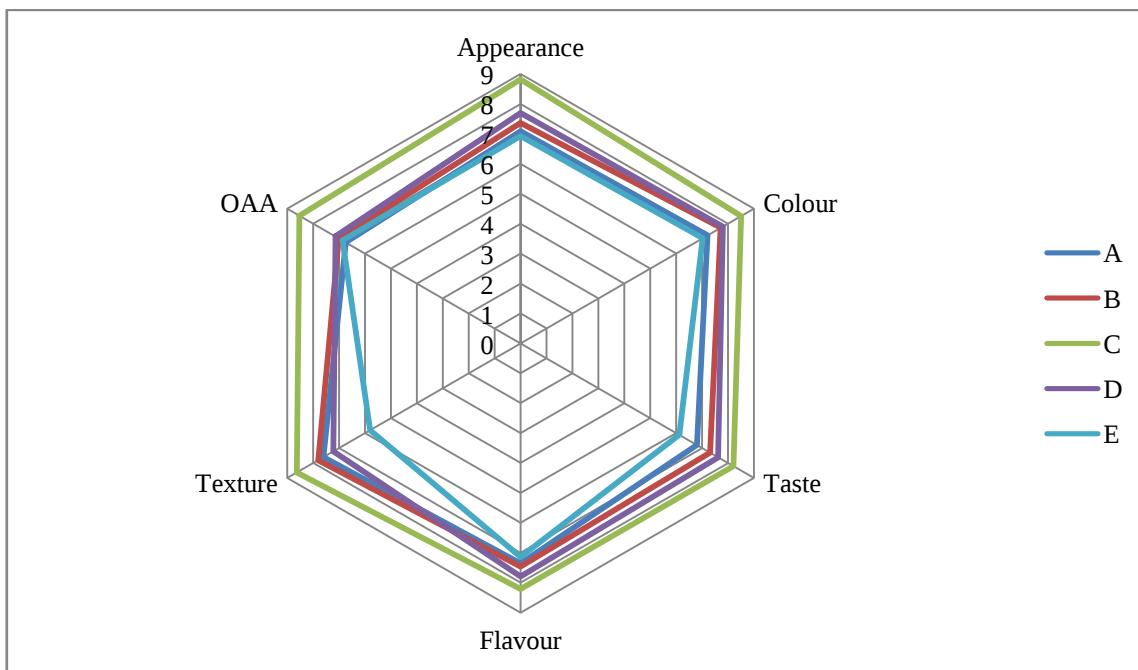


Figure 2: Graphical Representation of Average Sensory Score

3.2 Proximate Analysis:

The values of proximate analysis are presented in table no. 03. The study of analysis narrated that the energy bar was rich in energy (404.84 ± 3.14 kcal), carbohydrate (46.35 ± 0.39 g), fat (18.7 ± 0.46 g) and protein (12.54 ± 0.13 g). Dates are being good source of fiber it was observed that the energy bar contains 3.74 ± 0.02 g of fiber per 100 g. Nuts and edible seeds along with dates are good source of mineral hence the final product showed that iron and magnesium content of bar was (9.05 ± 0.15 mg) and (86.27 ± 0.93 mg) respectively. It was found that the bar was good source of vitamin E (6 ± 0.2 mg). In this way the prepared energy bar was nutritionally very healthful with concern to all nutritional parameters.

Table 3: Proximate Analysis

S.No	Parameters	Value (g/100g)
1	Energy (kcal)	404.84 ± 3.14
2	Moisture	15.36 ± 0.10
3	Carbohydrate	46.35 ± 0.39
4	Fat	18.7 ± 0.46
5	Protein	12.54 ± 0.13
6	Fiber	3.74 ± 0.02
7	Ash	1.93 ± 0.07
8	Vitamin E (mg)	6 ± 0.2
9	Iron (mg)	9.05 ± 0.15
10	Magnesium (mg)	86.27 ± 0.93

3.3 Physical Analysis:

Physical parameters like weight, length, width, thickness and bulk density were calculated and values are presented in the table no. 04. According to the data obtained it was found that the weight (50.61 ± 0.76 g), length (8.18 ± 0.01 cm), width (2.18 ± 0.009 cm) thickness (1.61 ± 0.02 cm) and bulk density (0.790 ± 0.008 g/ml) of energy bar respectively.

Table 4: Physical Analysis

S.No	Parameter	Value
1	Weight (g)	50.61±0.76
2	Length (cm)	8.18±0.01
3	Width (cm)	2.18±0.009
4	Thickness (cm)	1.61±0.02
5	Density (g/ml)	0.790±0.008

3.4 Storage Stability:

It found that the moisture content of the bar was (15.36±0.10 g). The bar was kept at refrigerated condition and the organoleptic parameters were studied after every 15 days to check any undesirable changes. The storage study revealed that the bar was acceptable by the consumer upto 90days. And there was no any change. Hence the prepared energy bars have the shelf life of 90 days at refrigerated condition.

4. Conclusion:

Ingredient composition of the energy bar was optimised dates(40g), chia seeds (5g), dry fig (7.5g), walnut (10g), almond (12g), cashew nut (10g), melon seeds (5g), sesame seeds (5g) and flax seeds (5.5g) based on organoleptic evaluation. The selected ingredients were helps to provide balance nutrition. The prepared bar was high in nutrition content with energy (404.84±3.14kcal), carbohydrate (46.35±0.39g), fat (18.7±0.46g), protein (12.54±0.13g), fiber (3.74±0.02), Vitamin E(6±0.2mg), Iron(9.05±0.15mg) and magnesium (86.27±0.93mg). The dimensions of the bar were maintained for proper shape with consideration of physical parameters weight (50.61±0.76g), length (8.18±0.01cm), width (2.18±0.009cm) and thickness (1.61±0.02cm). The prepared product can be suggested to all group of community like infants, school children, sport persons, defence person, vegans, pregnant woman and elderly persons to fulfil nutrient availability. Keeping quality of product enhanced by storing at refrigerated condition hence shelf life of energy bar was achieved upto 3 months. In this way the study has shown that the ingredients used for the development of energy bar has good potential in snacks industry to achieve the nutritional quality with additive free and natural sugar containing food products.

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