



FORMULATION AND OPTIMISATION OF PROTEIN BAR USING PLANT-BASED SEEDS AS A CONVENIENT AND NUTRITIOUS SNACK OPTION FOR ATHLETES

LOGESHWARI E, **MS PAVITHRA A,** **DR P S PRATHIBHA**
PG SCHOLAR **ASSISTANT PROFESSOR** **PROGRAM HEAD**
DEPARTMENT OF FOOD SCIENCE, NUTRITION AND DIETETICS
Dr.MGR EDUCATIONAL AND RESEARCH INSTITUTE, CHENNAI, INDIA

ABSTRACT

As the demand for convenient and nutritious snack options for athletes continues to rise, the formulation of protein bars has gained significant attention. This research paper focuses on developing a protein bar using plant-based seeds to cater to the nutritional needs of athletes. Plant-based sources offer numerous advantages, including sustainability and potential health benefits. This study uses various plant-based seeds such as chia seeds, pumpkin seeds, and sunflower seeds as primary ingredients for protein bar formulation. The research involves the optimization of the protein bar formulation through a series of experiments. Factors such as seed composition, binding agents, and sweeteners are carefully selected and optimized to enhance the taste, texture, and nutritional profile of the protein bars. Furthermore, sensory evaluation tests are conducted to assess the acceptability and consumer preference of the protein bars. Feedback from student enthusiasts is collected to refine the formulation and optimize the product for commercialization. The research findings demonstrate that plant-based seed protein bars can be an effective snack option for athletes to support their active lifestyle and performance goals. The formulation and optimization of protein bars using plant-based seeds offer a promising solution for addressing the nutritional needs of athletes while promoting sustainability and health-conscious consumption. This research contributes to developing innovative and convenient snack options that align with the growing trend toward plant-based diets and healthy living among athletes and consumers.

KEYWORD: *Protein bar, plant-based seeds, health-conscious, nutritious snacks.*

1. INTRODUCTION

In recent times, there has been a conspicuous shift towards plant-predicated diets among athletes and fitness suckers, driven by concern for health, sustainability, and performance optimization. As a result, there has been a growing demand for accessible and nutritive plant-predicated snack options adapted specifically for athletes. Protein bars have surfaced as a popular choice due to their portability, shelf stability, and capability to deliver essential nutrients for better performance. Athletes lead demanding societies characterized by rigorous training schedules, competitions, and trip commitments. As a result, they bear accessible and nutrient-thick snack options to support their energy conditions and aid in recovery, because they are quick and easy ways to get protein and other critical nutrients, protein bars have become the go-to snack for athletes. still, multitudinous commercially available protein bars are made with beast-derived ingredients or contain artificial complements and preservatives, which may not align with the preferences or salutary restrictions of plant-predicated athletes. thus, there is a growing demand for plant-distracted protein bars that offer an accessible and nutritive volition to conventional options. Seeds are nutritional bootstrappers packed with protein, healthy fats, fiber, vitamins, and minerals. They offer a versatile and sustainable source of nutrients, making them an ideal choice for formulating plant-predicated protein bars. Seeds analogous as chia, flax, pumpkin, and sunflower seeds are particularly rich in protein and essential amino acids, making them precious additions to the diets of athletes. also, seeds contain omega-3 adipose acids, which have anti seditious parcels and can support common health, vital for athletes engaged in high-impact exertion. By incorporating seeds into protein bar phrasings, we can harness their nutritional benefits to produce a snack option that not only meets the protein conditions of athletes but also provides a well-rounded source of essential nutrients (Abdel- Salam, F.F., Ibrahim, R.M., et.al 2022).

In this work, we attempted to formulate and optimize a plant-based protein bar using seeds as the primary ingredient. Such as Chia, pumpkin, and sunflower seeds are rich sources of protein, healthy fats, fiber, vitamins, and minerals. By harnessing the nutritional benefits of these seeds, we aim to develop a protein bar that not only meets the protein requirements of athletes but also provides a well-rounded nutritional profile to support their training, recovery, and overall health. One of the key ingredients that are frequently added to nutrition bars to increase fiber and certain micronutrient levels is oats. Additionally, it is a significant source of soluble dietary fiber, primarily β -glucan, which has been linked to reduced risk of hypertension, cancer, and hypercholesterolemia.

It is also a well-balanced dietary item and a great source of high-quality carbohydrates and protein. Additionally, it has a high concentration of minerals, vitamins, phytochemicals, and unsaturated fatty acids. Date fruits are an organic source of sugars such as sucrose, fructose, and glucose, which account for two-thirds of the fruit's total sugar content. When it comes to energy content, one hundred grams of fresh dates have about 157 calories, but one hundred grams of dry dates have about 300 calories. Dates are a functional food with numerous health advantages; in addition to their high natural sugar content, they also have proteins, lipids, crude fiber, and antioxidants. Thus, blending dates with other nutrient-dense, natural meals may improve athletes' and sports fans' energy levels and general well-being. (Aljaloud, S. O. et.al 2021).

The preservation of health and the motivation of athletes to train and compete is greatly influenced by nutrition. A person who participates in athletics is fitter in society and the individual requires improved nourishment. Given the correlation between sports, health, and nutritional status, sports nutrition has emerged as a powerful determining factor in maximizing athletes' performance. Due to a lack of knowledge about sports nutrition, Indian athletes follow abnormal dietary and nutritional habits. Modern living entails a lengthy workday along with altered eating patterns, which means fewer regular meals throughout the day. As a result, there are constant demands made on the nutritional and functional character of meals. Additionally, sports and physical activities are a bigger part of today's lifestyle to promote health. The body has to be protected from mechanical stress and the potentially harmful effects of free radicals, whose production is boosted by physical activity and exercise and can result in macromolecule oxidative damage, after these activities. As a result, there is a growing market for goods like high-protein bars, which were first created to help sportsmen gain more muscle mass. These products expedite the time it takes to prepare meals by appropriately replenishing nutrients and energy lost via physical activity. (Marić, A. et.al 2021).

2. MATERIALS AND METHODS

2.1 MATERIALS

2.1.1 Raw materials

Raw materials such as pumpkin seeds, chia seeds, sunflower seeds, oats, and dates were purchased from the local market in Chennai.

2.2 METHODOLOGY

2.2.1 Standardization of protein bars using plant-based seeds

The process started by roasting the rolled oats (30g) on low flame for about 15 minutes until they become crisp and transferring the roasted ones to a bowl. In a separate pan, roast chia seeds (10g) for 15-20 minutes until they release a delightful aroma, and keep that in the same bowl. Roast sunflower (15g) and pumpkin seeds (15g) in another pan for 15-20 minutes until they become aromatic and add these seeds to a food grinder along with the oats, processing them into a grainy flour and transfer into the bowl. Blend the half-hour-soaked dates (35g) into a smooth paste using a mixer jar. Cook dates paste on a pan over low to medium flame by mashing and stirring until the mixture turns glossy and detaches from the pan. Transfer the date paste to the bowl with roasted nuts. Mix the ingredients with gloves-covered hands until everything is well combined and the mixture starts to hold its shape. Transfer the combined mixture to a tray lined with baking paper. Press and level the mixture to form a smooth layer. Cover the tray and refrigerate for at least 4 hours or until it sets completely.

Table. 1 Formulation of protein bar

INGREDIENT	VALUE
PUMPKIN SEEDS	15g
SUNFLOWER SEEDS	15g
CHIA SEEDS	10g
OATS	30g
DATES	35g

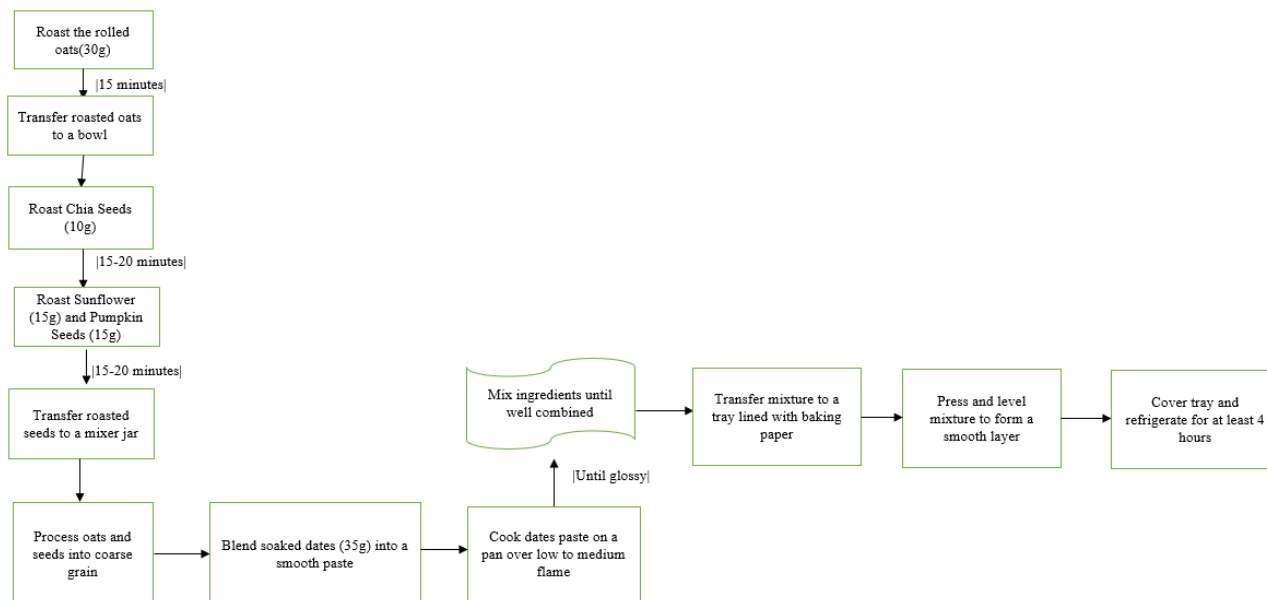


Figure 1: Process flow chart for protein bar

2.2.2 SENSORY ANALYSIS

Sensory analysis of prepared snack bar samples was done using a 9-point hedonic scale rating (Ranganna, et.al 2015).

3. RESULT AND DISCUSSION

3.1 Physical characteristics of snack bars

No marked difference was observed in the size, shape, and weight of snack bars. The size and weight of snack bars were found in the range of 5.3 – 5.5cm, and 6.3- 6.7g, respectively. All the samples were rectangular and recorded dark brown color in protein bars.

3.2 Organoleptic characteristics of snack bars

The developed value-added bar was standardized using a sensory evaluation technique with the help of using 9-point hedonic scale. The developed value-added bar along with a standard sample was served to the 50 consumers for sensory evaluation.

Table 2: Mean scores of sensory evaluation of protein bar

ATTRIBUTE	APPEARANCE	FLAVOUR/TASTE	AROMA	TEXTURE	MOUTHFEEL	OVERALL ACCEPTABILITY
SAMPLE	7.96±0.92	7.9±0.95	7.66±1.13	7.82±0.91	7.82±1.15	8.2±0.75

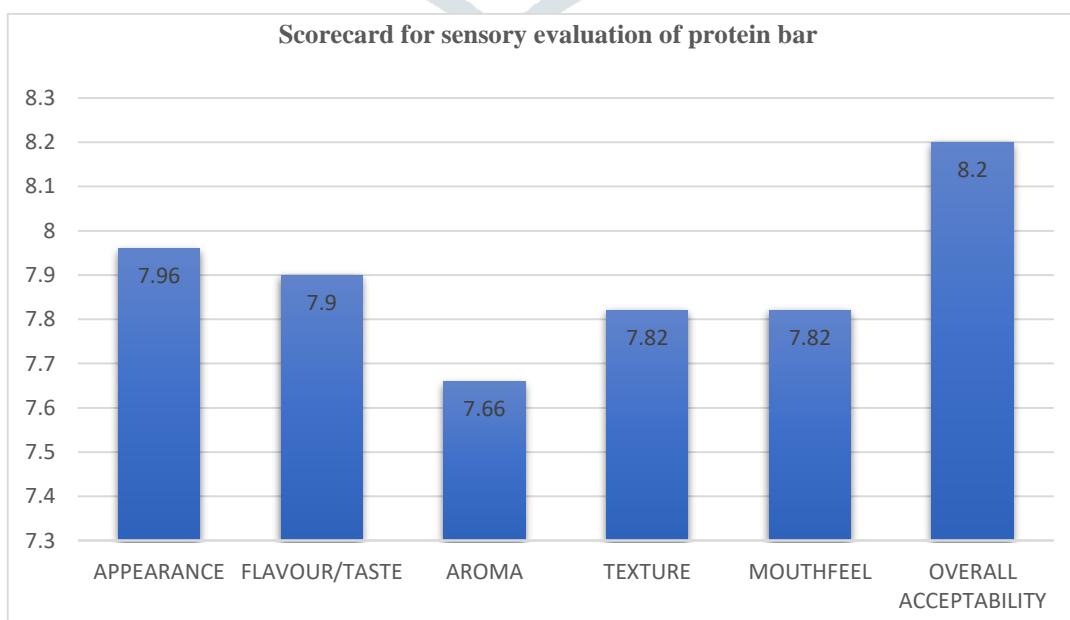


Figure 2: Scorecard for sensory evaluation of protein bar**CONCLUSION:**

This study has demonstrated the appearance, taste, aroma, texture, and mouthfeel, so it is a palatable product. It is evaluated by a 9-point hedonic scale. The formulation and optimization of plant-based protein bars represent a valuable contribution to the field of sports nutrition, offering athletes a convenient, nutritious, and sustainable snack option to support their performance goals. Continuing research and innovation in this area will further enhance the efficacy and acceptance of plant-based protein bars among athletes and consumers alike, fostering a healthier and more environmentally conscious approach to sports nutrition.

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