

CHAPTER I

INTRODUCTION

1.1 Background of the Study

The increasing global emphasis on health, sustainability, and nutrition has heightened the demand for functional food products that can serve both dietary needs and lifestyle convenience. Protein bars have become a popular choice among health-conscious individuals seeking nutritious snack alternatives. However, many commercial protein bars contain high levels of refined sugars and artificial additives, which contradict the principles of clean-label and health-focused eating (Aschemann-Witzel et al., 2021). This has created a need for plant-based protein bars composed of natural, minimally processed ingredients that are rich in protein, fiber, essential minerals, and these are key nutrients that support metabolic health, satiety, and overall well-being (Esmaeili et al., 2021).

Among such ingredients, pumpkin (*Cucurbita moschata*) stands out as a widely available, underutilized crop known for its high dietary fiber, β -carotene, potassium, magnesium, and vitamin content. Studies have shown that pumpkin flour can serve as a valuable gluten-free alternative in bakery and snack applications, providing beneficial nutrients while improving the functional properties of food products. Drying pumpkin at 60°C helps retain β -carotene content and reduces moisture to safe levels for storage (Mardiah et al., 2020). The high dietary fiber in pumpkin has been linked to improved digestion and prolonged satiety, while its potassium and magnesium content contribute to cardiovascular and muscle health (Aziz et al., 2020).

Complementing pumpkin flour with soy flour, derived from *Glycine max*, can enhance the protein content of the bar. Soy flour is a high-quality plant protein source containing all essential amino acids, making it a complete protein. According to Messina (2016), soy protein has been associated with various health benefits, including cardiovascular protection and reduced risk of chronic diseases, due to its isoflavone content. Additionally, soy flour

contributes considerable amounts of dietary fiber and minerals such as iron, calcium, and phosphorus. Its emulsifying and water absorption capacities also improve the texture and structural integrity of food products, which supports its application in snack bar development (Zhang et al., 2017).

To further boost the nutritional profile, incorporating super seeds like chia (*Salvia hispanica*) and pumpkin seeds (*Cucurbita pepo*) is beneficial. Chia seeds contain approximately 18–24% protein and 30–34 g dietary fiber per 100 g, with a high content of omega-3 fatty acids and minerals such as calcium, magnesium, and phosphorus (Grancieri et al., 2019). Pumpkin seeds are similarly nutrient-rich, offering protein, iron, magnesium, and zinc. These seeds have also demonstrated antioxidant activity and potential in improving nutritional outcomes when used in functional food formulations (Vázquez-Ovando et al., 2015).

Enhancing the bar's palatability and nutritional value can be achieved by using natural sweeteners like dates and honey. Dates are rich in dietary fiber, natural sugars, and polyphenols, contributing to both sweetness and antioxidant activity. They also provide essential minerals such as potassium, magnesium, and calcium, supporting various bodily functions (Parvin et al., 2015). Honey contains antioxidants and trace minerals, including potassium, calcium, and iron, as well as prebiotic compounds that support digestive health (Ahmed et al., 2021). The use of these natural sweeteners aligns with clean-label preferences while enhancing the overall nutritional profile of protein bars.

Building on these nutritional foundations, this study focuses on the development of a nutrient-dense protein bar is explored using a blend of pumpkin flour and soy flour. Chia seeds and pumpkin seeds are added for their nutrient-rich properties, while natural sweeteners replace processed sugars. The production process involves dehydrating pumpkin to create flour, mixing it with soy flour, seeds, and sweeteners, shaping the dough, and baking the bars at 165°C for 15 minutes. This process preserves the integrity of the ingredients and results in a convenient, shelf-stable snack that provides a balanced nutritional profile (Zielińska et al., 2020).

1.2 Objectives of the Study

The primary objective of this study is to develop a nutritious, plant-based protein bar using pumpkin flour and soy flour as key ingredients. The specific objectives are as follows:

1. To formulate a protein bar that provides high protein and fiber content to support an active lifestyle.
2. To provide a snack option that promotes muscle recovery with plant-based protein sources.
3. To create a wholesome, on-the-go alternative to commercially processed snacks using only natural ingredients.