

CHAPTER II

LITERATURE REVIEW

2.1 Ingredient Review

2.1.1 Soybeans

Soybeans (*Glycine max L.*) are one type of legume believed to have numerous health benefits. Soybeans (*Glycine max L.*) originated from China where they have been cultivated for over 5000 years. Soybeans can be found growing in China, Japan, Korea, and parts of eastern Russia. Soybeans contain high levels of plant-based protein, providing all the essential amino acids needed by the human body. Its protein content can reach around 36-40% of the dry weight of soybeans (Hill, 2015).



Figure 2.1 Soybeans

Soybeans contain healthy fats, including monounsaturated and polyunsaturated fatty acids, as well as omega-3 and omega-6 fatty acids. Its fat content can reach around 20% of the dry weight of soybeans (Messina, 2014). Additionally, soybeans are a good source of various vitamins and minerals, including B-complex vitamins (such as folate and thiamine), vitamin E, calcium, iron, magnesium, phosphorus, and potassium (Messina, 2014). Soybeans also contain phytochemical compounds called isoflavones, primarily genistein

and daidzein. These isoflavones have the potential health benefits of protecting against the risk of heart disease, osteoporosis, and certain types of cancer (Messina, 2014).

The advantage of high-protein soy flour is approximately 35%, and in superior varieties, it can even reach 40-43%. Substituting soy flour is also expected to reduce the glycemic index value of the product, as soybeans are known to have a low GI of 31 (Marsono et al., 2002). The utilization of soy flour as a food ingredient is still very limited, therefore, this research aims to develop products using soy flour as the main ingredient.

2.1.2 Oat Flour

Oat flour (*Avena sativa L.*) is known to have various health benefits as it contains soluble fiber, beta-glucan, which has been shown to lower LDL cholesterol levels and improve heart health (Whitehead et al., 2014). The high fiber content in oat flour can also help regulate blood sugar levels, maintain healthy digestion, and provide a longer-lasting feeling of fullness (Zhang et al., 2021).

Substituting some or all of the wheat flour with oat flour in cookies can increase the fiber, protein, and other nutrient content, while reducing saturated fat and sugar, making cookies a healthier snack option (Aryee et al., 2016).



Figure 2.2 Oat Flour

Studies have shown that substituting wheat flour with oat flour in cookies can result in a higher nutrition and distinctive flavour, often preferred by consumers (Aryee et al., 2016). The use of proper processing techniques, such as fine grinding and the use of oat flour, can help produce cookies with a soft texture and a rich oatmeal flavour (Aryee et al., 2016).

2.1.3 Canola oil

Canola oil is known to have a healthy fat profile, low in saturated fat, and high in monounsaturated fatty acids, especially oleic acid, which has been shown to support heart health and reduce the risk of cardiovascular disease (Jones et al., 2014). The relatively high content of omega-3 fatty acids in canola oil also provides additional benefits for heart health, such as reducing inflammation and improving blood vessel function (Jones et al., 2014).

Substituting butter with canola oil in cookie production can result in a final product that is lower in saturated fat and cholesterol, making it a healthier choice for consumers concerned about heart health (Sadowska-Rociek et al., 2018).



Figure 2.3 Canola Oil

Sensorial studies have shown that cookies made with canola oil have a taste and texture similar to those made with butter, with a significant increase in nutrition (Turk et al., 2019). Canola oil has a high smoke point and can be well-tolerated in baking processes, making it suitable for making cookies that require high temperatures (Brennan et al., 2018). The use of canola oil in cookies also allows for easier mixing and shaping of the dough, resulting in a softer and more tender final product (Brennan et al., 2018).

2.2 Product Review

Cookies are one of the favourite snacks enjoyed by all ages, including children, teenagers, and the elderly. Cookies have a delicious taste and a crispy texture. The average consumption of cookies (including cookies) is quite high in Indonesia, with a growth rate of around 24.22% higher than the average consumption of wet cakes (boil or steam cake) which is only 17.78% in the period of 2011-2015 (Setjen Pertanian, 2015). The main ingredients for making cookies consist of wheat flour, sugar, and fat (Millah et al., 2013). However, gluten, the main protein in wheat flour, is associated with three conditions: gluten intolerance, also known as celiac disease, gluten allergy, and non-celiac gluten sensitivity (Raungrusmee, 2020). Cookies made from soybean flour have become an innovative choice for consumers looking for healthier and gluten-free snacks. With the

increasing awareness of the importance of healthy eating patterns and the demand for gluten-free products (Daliu et al., 2018), this product meets those needs.

This product was created in response to market demand for healthy, nutritious snacks, and suitable for those who have gluten intolerance or choose a gluten-free lifestyle. These cookies contain 7 grams of protein per serving. Research shows that consumers are increasingly choosing products with high nutritional content (Chen et al., 2020), so these cookies are designed using protein-rich soybeans as the main ingredient. Additionally, this product also uses oat flour which is high in fibre. The high fibre content in oat flour can also help regulate blood sugar levels, maintain healthy digestion, and provide a longer-lasting feeling of fullness (Thondre et al., 2013). Substituting butter with canola oil in cookies production can result in a final product that is lower in saturated fat and cholesterol, making it a healthier choice for consumers concerned about heart health (Sadowska-Rociak et al., 2018).

2.3 Process Review

In the making of cookies from soybean flour, the drying method is an essential stage that influences the quality of the final product. Drying aims to reduce the moisture content in the cookie dough, resulting in a dry and crispy texture. The drying methods used in the making of these cookies are dehydrator and oven. Drying is undoubtedly the oldest method and is still widely used today among many techniques for food preservation. Water is removed from the food through evaporation or sublimation, reducing the available water for microbial, enzymatic, or chemical reactions that can lead to food degradation (Guiné & Dets, 2018).

The drying method (dehydrator) can maintain the nutritional quality of the raw materials, especially the protein content of soybeans which are sensitive to heat. The temperature used to dry the soybeans is 50 degrees Celsius for approximately 24 hours. According to research by Liu et al. (2019), the drying method effectively maintains the nutrient content and enzyme activity in the raw materials, resulting in a more nutritious final product.

The drying method allows better control over the drying time and temperature. This is important to avoid over-drying, which can result in nutrient loss and changes in the taste of the product. Studies by Wang et al. (2018) show that the drying method can provide better control over the temperature and drying time, resulting in cookies with an optimal texture. The temperature used to bake the cookies is 165° C for 10 to 15 minutes.

The use of the drying method can help prevent potential microbial contamination in the final product. According to research by Kim et al. (2017), the drying method reduces the moisture content in the product, inhibiting the growth of pathogenic microorganisms such as bacteria and fungi, which can cause food poisoning.