

CHAPTER II

LITERATURE REVIEW

2.1 Ingredient Review

2.1.1 Mocaf Flour

MOCAF flour is created by modifying cassava through the use of microbial fermentation methods. The qualities of MOCAF flour are sufficient to completely replace the use of wheat flour. When compared to cassava flour or unfermented cassava flour, MOCAF flour has a superior quality, which is lighter and lacks the scent of cassava. Products made from cassava flour that have not undergone fermentation or cassava have less white (blackish brown) color and frequently a strong musty smell. As a result, the product performs less well but retains its unique cassava aroma. This frequently results in decreased satisfaction within the food processing industry that uses cassava or cassava flour. The results of modified cassava flour, or MOCAF, show that while the whiter and less aromatic qualities of MOCAF flour are retained, substituting flour does not lower the product's quality as long as the amount used is appropriate for the product's intended use. (Webster & Wood, 2011)



Figure 2.1 Mocaf Flour

2.1.2 Almond Flour

Almond flour is a high-protein flour made from almonds that gives any baked good a nutty taste. Use no more than 30% of the total flour mixture because this flour has a relatively high fat content,

especially for dough that needs to rise precisely (Dahlia, 2014). One gluten-free substitute for low-sugar, low-carb wheat flour is almond flour, which is also high in protein and full of beneficial nutrients for health. Whole almonds are ground to the required consistency and then mixed with no additional ingredients to make almond flour. Almond flour is easy to work with in baking and cooking, and it can be substituted for wheat flour in a variety of ways. Gluten free baking and breaded and fried foods. (Donatella Giordano, 2013).



Figure 2.2 Almond Flour

Almond flour, like almonds, keeps properly for up to two months or longer in a well-ventilated room when stored tightly. Almond flour keeps for up to six months when refrigerated (Donatella Giordano, 2013). Almond flour is gluten-free, making it suitable for people with gluten intolerance or celiac disease. Substituting wheat flour with almond flour can improve the quality of the diet for those sensitive to gluten (Giordano, 2013). Additionally, almond flour is low in carbohydrates and high in healthy fats, making it ideal for low-carb or ketogenic diets.

Research shows that low-carb diets can help in weight management and metabolic health (Westman et al., 2007). Almond flour is also low in sugar, which helps in regulating blood sugar levels, important for people with diabetes or those managing their sugar intake (Jenkins et al., 2002). The high protein content in almond flour helps provide a longer feeling of fullness and supports muscle growth, essential

for maintaining muscle mass and general health (Layman, 2004). Moreover, almond flour adds a rich nutty flavor and soft texture to the pie dough, enhancing the sensory quality of the final product (Hathcock, 2014).

2.1.3 Oat Flour

Oat flour can be made by grinding rolled oats or by milling directly. Usually, the oat flour stream contains the fines streams from flaking and cutting groats. Because oat groats have a high fat content, corrugated rolls which are frequently used for milling wheat are not ideal for milling oats because the grooves tend to clog.



Figure 2.3 Oat Flour

Whole oat flour is produced from clean, 100% groats, or from products derived without material loss from whole groats, by stabilizing and size reduction, according to a 2004 definition provided by the AACCI (American Association of Cereal Chemists International) (Webster & Wood, 2011). Oat flour can be thought of as a composite of the previously mentioned sifting losses or as a by-product of the production of oat bran. In order to increase the value of oat flour, it is typically blended with millfeed if there is insufficient market demand for

it as a stand-alone ingredient. When making apple pie, oat flour can be an excellent alternative or addition to traditional wheat flour. It offers nutritional benefits due to its high dietary fiber content, which can improve digestion and provide longer-lasting satiety.

The use of oat flour in the pie crust can give it a unique texture, making it slightly denser with a mild, nutty flavor that complements the sweetness of the apples. oat flour is high in fiber, particularly beta-glucan, which aids digestion and keeps you feeling full longer. Beta-glucan fiber is known to lower cholesterol levels and improve heart health (Whitehead et al., 2014).

Oat flour can also be gluten-free if processed in gluten-free facilities, making it a safe alternative for those with gluten intolerance, providing a safe wheat flour substitute for a gluten-free diet (Foschia et al., 2016).

Oats contain beta-glucan, which can help lower cholesterol levels and improve cardiovascular health (Chen et al., 2011). Additionally, oat flour adds softness and chewiness to the pie dough, providing a pleasant texture to the final product (Hager et al., 2012). Oats also contain vitamins, minerals, and antioxidants that are good for health, such as B vitamins, iron, and magnesium (Slavin, 2008).

Studies have shown that substituting wheat flour with oat flour in pie crust can result in a crispier texture, 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 pie crust with a soft texture and a rich oatmeal flavour (Aryee *et al.*, 2016).

2.2 Product Review

Gluten-free pie has garnered significant attention in recent years as consumers increasingly seek alternatives to traditional wheat-based desserts. According to experts in the field, gluten-free pies offer a viable solution for individuals with gluten sensitivities or celiac disease, providing them with indulgent yet safe dessert options. Research conducted by Smith *et al.* (2018) emphasizes the importance of gluten-free alternatives in promoting inclusivity and catering to the diverse dietary needs of consumers. Gluten-free pies are praised for their ability to replicate the taste, texture, and overall sensory experience of conventional pies, thanks to innovative formulations and ingredient substitutions. Studies by Jones *et al.* (2019) and Patel *et al.* (2020) highlight the use of alternative flours such as almond flour, coconut flour, or rice flour, combined with binding agents and gums, to achieve a flaky, tender crust comparable to traditional pie crusts.

Furthermore, gluten-free pie fillings, ranging from classic fruit fillings to decadent chocolate or savory options, showcase the versatility and creativity of gluten-free baking. Despite the challenges in texture and structure posed by the absence of gluten, advancements in gluten-free baking techniques and ingredient formulations have led to remarkable improvements in the quality and palatability of gluten-free pies. Overall, gluten-free pies have emerged as a delicious and inclusive dessert option, offering consumers with dietary restrictions the opportunity to indulge in the timeless pleasure of pie without compromising on taste or quality.

2.3 Process Review

The baking process using an oven is a long-standing cooking method, aimed primarily at achieving the desired maturity and texture of various food ingredients. This process involves several stages, starting from the preparation of ingredients to strict monitoring during baking. Preparation is an important initial stage in the baking process. Food ingredients to be baked are usually prepared first, including cleaning and applying apple pie ingredients according

to the recipe that has been made. After that, the oven is preheated to the appropriate temperature.

Temperature control in the oven is a key factor in ensuring proper food maturity. Modern ovens are equipped with precise temperature control, allowing users to adjust the temperature according to their cooking needs. Studies by Brennan et al. (2009) show that using an oven with the right temperature significantly affects the final outcome of the baking process.

Energy efficiency is also one of the main reasons for using ovens in the baking process. Ovens can maintain a stable temperature using relatively low energy compared to traditional cooking methods such as cooking over an open flame. Brennan et al. (2009) noted that ovens are more energy-efficient, providing positive effects on the environment and household energy costs.

Lastly, using an oven provides a controlled environment for cooking food. Ovens provide protection against external air contamination and other environmental fluctuations that can affect the baking process and the final quality of the food. Thus, the baking process using an oven is a rational and effective choice in cooking because the oven provides precise control over temperature and heat distribution, high energy efficiency, and a controlled environment to achieve consistent and quality baking results. Brennan *et al.* (2009)