CHAPTER II
LITERATURE REVIEW

2.1 Ingredients Review

2.1.1 Taro Stem

Taro (*Colocasia esculenta (L.) Schott*) is believed to be one of the world's most ancient food crops, with a history of more than 2000 years in cultivation (Matthew, 2020). Taro, a starchy root vegetable extensively cultivated and consumed around the world, has multiple edible portions, including tubers, leaves, flowers, and stems. In Indonesia, the part of the taro plant most commonly consumed is the tuber and the stems are rarely utilized. While taro stems may have nutritional value and other advantages, they are frequently seen as food waste. However, taro stems possess potential value beyond being considered waste material when utilized appropriately (Matthew & Ghanem, 2021).

Figure 2.1 Taro Stems

Taro stem is a nutritious food, offering various essential nutrients per 100 grams. It provides 11 calories, 2.3 grams of carbohydrates, 21 mg vitamin C, 4.5 grams of dietary fiber, contributing to digestive health. It contains 1 gram of protein and is virtually fat-free (0.1 grams). Additionally, it offers 332 mg of potassium, which supports heart health and fluid balance.

Taro stems are low in fat but are a good source of dietary fiber, vitamin, and potassium. Taro stem also contain antioxidants and anti-

inflammatory properties (Cahyani et al., 2023). Compared to other food waste materials, such as banana stems, taro stems exhibit superior nutritional value. Taro stems have a lower caloric value than banana stems. Taro stems contain 2.3 grams of carbohydrates per 100 grams, whereas banana stems contain 2 grams, making taro stems superior in terms of carbohydrate content. Furthermore, taro stems contain 4.5 grams of dietary fiber, which is higher than the 2 grams found in banana stems. Moreover, taro stems are rich in potassium, with 332 milligrams per 100 grams, whereas banana stems contain no potassium. Using taro stems as the main ingredient in making vegetarian *basreng* is considered the right choice in terms of nutritional source and the aim of reducing food waste.

2.1.2 Oyster Mushroom

Oyster mushrooms (*Pleurotus ostreatus*) belong to the family *Pleurotaceae,* which includes several species known for their culinary and medicinal uses (Kadam et al., 2020).

Oyster mushrooms contain approximately 35 calories, 3.3 grams of protein, 0.4 grams of fat, and 6.4 grams of carbohydrates per 100 grams. They are also an excellent source of dietary fiber (2.4 grams). They also provide 38 micrograms of folate and 420 milligrams of potassium.

Figure 2.2 Oyster Mushroom

The choice of oyster mushrooms over other mushroom varieties can be justified by several factors related to their nutritional benefits, ease of cultivation, environmental impact, and content. Oyster mushrooms are

known for their excellent nutritional profile. They are a good source of minerals and dietary fiber, and low in calories and fat. These properties make it a highly nutritious choice compared to some other mushrooms. In addition, it has significant medicinal properties, including antioxidant and anti-inflammatory effects. Oyster mushrooms are among the easiest mushrooms to cultivate. They can grow on a wide variety of substrates, including agricultural and industrial waste products such as straw, sawdust, and coffee grounds. This adaptability reduces production costs and environmental impacts, thereby encouraging sustainable agricultural practices. Due to their fast growth rate, high yield, and ability to grow on cheap substrates, oyster mushrooms are economically viable. This mushroom is traded at a cheaper price than other mushroom species (Beri et al., 2015). Therefore, oyster mushrooms are the best choice among other mushrooms as an ingredient for making vegetarian *basreng*.

2.2 Product Review

In a culinary landscape increasingly influenced by sustainability concerns, the emergence of vegetarian *basreng* made from taro stems exemplifies an innovative solution to food waste. Crafted from often overlooked ingredients, these creations not only address environmental issues but also cater to the growing demand for plant-based alternatives. The impetus behind these culinary innovations lies in a dual commitment to reducing food waste and providing sustainable dietary options (Matthew & Ghanem, 2021). By transforming taro stems, typically classified as food waste, into a savory meatball snack alternative, the potential for minimizing culinary waste is effectively demonstrated.

The benefits of these vegetarian *basreng* extend beyond their environmentally conscious origins. With a rich nutritional profile and versatile culinary applications, this product offers an attractive option for discerning consumers seeking both taste and sustainability. Taro stems are a good source

of dietary fiber and vitamins, provide a robust nutritional foundation for this meatball creation. Additionally, their adaptability to various recipes and flavor profiles enhances their appeal, catering to diverse dietary preferences and culinary tastes. By repurposing underutilized ingredients, these vegetarian *basreng* not only minimize waste but also exemplify the transformative power of culinary ingenuity.

2.3 Process Review

2.3.1 Boiling

Boiling is defined as a heating process in which a liquid reaches a temperature at which its vapor pressure equals the surrounding atmospheric pressure, causing the liquid to change to vapor (Doretti et al., 2017). This process is important in various food processing applications because it provides uniform heating of the cooked ingredients. Boiling is an effective method for killing dangerous pathogens in food, such as Salmonella, E. coli, and viruses. The high temperatures reached during boiling ensure that harmful microorganisms are destroyed, increasing food safety (Okpala et al., 2019).

Taro stems contain oxalate, a compound that can cause irritation to the skin and throat if consumed in high amounts. In scientific journals, research has shown that boiling can reduce the oxalate content in taro stems, thereby reducing the potential for irritation when consumed. This is because oxalate can dissolve in water and is wasted with the cooking water (Arias et al., 2020). Boiling can affect the antioxidant properties of vegetables in a complex way. Although there is a loss of some water-soluble nutrients, increased the total phenolic content can increase the antioxidant capacity of boiled vegetables (Vinha et al., 2013). There is research showing that boiling can change the nutritional composition and antioxidant properties of taro stem. The approximation changes in nutritional value per 100 grams of boiled taro stem are presented in the table 2.1.

Table 2.1 Nutritional Value of Boiled Taro Stem

Nutritional value	Raw taro stem	Boiled taro stem
Calories (cal)	11	10
Carbohydrates (g)	2.3	3.2
Dietary fiber (g)	4.5	4
Protein (g)	1	0.7
Fat (g)	0.1	0.1
Vitamin C (mg)	21	19
Sodium (mg)	1	2
Potassium (mg)	332	320

Source: Nutrionvalue

Boiling has a minimal impact on nutrition, as it causes an increase in carbohydrate content, while other nutrients experience a minor decrease. Moreover, the total antioxidant activity may even increase subsequent to boiling, attributable to the heightened extraction of phenolic compounds from plant tissues that undergo breakdown during the heating process (Chandrasekara & Kumar, 2016). Another study published in Food Research International states that boiling can increase the antioxidant activity of taro. This is caused by an increase in the availability of phenolic and flavonoid compounds bound in plant cell structures (Huang et al., 2007).

There is also a research showing that boiling can change the nutritional composition of oyster mushroom. The approximation changes in nutritional value per 100 grams of boiled taro stem are presented in the table 2.2.

Table 2.2 Nutritional Value of Boiled Oyster Mushroom

Nutritional value	Raw oyster mushroom	Boiled oyster mushroom
Calories (cal)	35	33
Carbohydrates (g)	6.4	6.5
Dietary fiber (g)	2.4	2.3
Protein (g)	3.34	3.31
Fat (g)	0.4	0.4
Folate (mcg)	38	24
Sodium (mg)	18	18
Potassium (mg)	420	420

Source: Fatsecret, Crystalsea

Boiling can lead to a decrease in the caloric content, as the cooking process can break down some of the nutrients and reduce their overall energy value. The protein content of boiled oyster mushrooms may decrease slightly; however, boiling does not significantly reduce the protein quality of oyster mushrooms. Despite this, sodium, potassium, and fat remained unchanged. The fiber content has decreased slightly. This decrease is caused by softening and damage to cell walls and overall tissue during the boiling process. Some antioxidant compounds may undergo reduction during boiling, as these compounds are susceptible to decomposition at elevated temperatures or dissolution in boiled water.

2.3.2 Frying

Frying as a process requiring efficient heat transfer, resulting in a crispy exterior layer and moisture retention within the food, highlighting complicated heat and mass transport processes, such as water evaporation and oil absorption (Farid et al., 2020). Frying is a cooking method that involves heating food in hot oil or fat, reaching a temperature high enough to produce reactions of physical and chemical changes in the food that provide the desired savory taste, aroma, and texture (Oke et al., 2018). Several studies show frying has several advantages over other cooking methods. Due to the use of high temperatures, it significantly reduces cooking time and allows food to cook quickly and develop desired sensory

characteristics such as crispness and enhanced flavor. Fried foods are also tastier, making them more attractive to customers (Wang et al., 2021).

Frying is the method required to prepare *basreng*. Frying produces a crispy texture that increases palatability, achieved through rapid evaporation of water at high temperatures. This method can improve the flavor profile, resulting in a rich and savory taste. Additionally, frying reduces the water content, thereby extending the shelf life of snacks by inhibiting microbial growth. The convenience and speed of frying makes it ideal for commercial production and home cooking.