

## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Ingredients Review

##### 2.1.1 Porang Tubers Flour



**Figure 2.1** Porang Tubers

*Amorphophallus muelleri* Blume is native to Indonesia (Santosa and Sugiyama, 2016). *Amorphophallus muelleri* blume, locally called porang, contained the highest glucomannan compared to other types that grow in Indonesia but lower than konjac glucomannan (KGM) content in *Amorphophallus konjac*. Although konjac has a higher glucomannan content than porang tubers, konjac is difficult to find in Indonesia making porang tubers a much more visible option as a source of glucomannan. Compared to cassava tubers, which are also easily found in Indonesia, cassava tubers do not contain glucomannan like porang tubers. As a functional food source, glucomannan is considered a low-calorie fiber with an important advantage as an indigestible dietary fiber (Horinaka et al., 2016), which has been known to help lower cholesterol levels, modification of intestinal microbial metabolism, and weight loss (Tester and Al Ghazzewi, 2016). In addition to the high glucomannan content, porang tubers also contain 76.5% starch, 9.20% protein, 25% fiber, and 0.20% fat (Masniawati. et al., 2023).

### 2.1.2 Purple Sweet Potatoes Flour



**Figure 2.2** Purple Sweet Potatoes

Purple sweet potatoes (*Ipomoea batatas L.*) are rich in proteins and minerals, low in fat, and high in carotenoids ( $\beta$ -carotene and lutein) therefore it could serve as an excellent source of essential dietary nutrients to prevent and/or manage vitamin A and other micronutrients associated malnutrition (Alam et al., 2016). Different purple sweet potatoes cultivars contain different anthocyanin compositions which possess many health benefits including antioxidative properties, antineoplastic properties, as well as anticancer properties. Besides that, anthocyanins have been used as food pigments in a wide variety of products; for instance, dairy products such as cream cheese, fermented milk, milkshakes, as well as in low-pH beverages, and also in solid food matrices such as pancakes and omelets (Kitts and Tomiuk 2013; de Mejia et al., 2015; Shin et al., 2015; Pineda-Vadillo et al., 2017). Compared to other natural colorants such as beetroot, purple sweet potatoes have a higher nutritional content, such as protein content in purple sweet potatoes which reaches 4.86% - 6.53% (Ji, et al., 2015), while beetroot only ranges from  $1.35 \pm 0.2\%$  (Kale. et al., 2018).

### 2.1.3 Soybean Powder



**Figure 2.3** Soybean

Soybeans (*Glycine max (L.) Merrill*) contain highly valuable proteins and oils (on average ranging from 39-41% crude protein and 18-21% oil) which make them good feed alternatives to animal proteins and oils. The protein in soybeans is lower than animal protein, but in plant-based foods, soybeans have the highest protein value. Soybeans contain neutral lipid composition, carbohydrates, minerals, and proteins (Erickson, D.R., 2014). Soybean protein contains proteinaceous substances known as *trypsin inhibitors* which inhibit the digestion of protein. As a result, the digested food will hold hunger for longer.

### 2.1.4 Dragon Fruit Peel



**Figure 2.4** Dragon Fruit Peel

*Hylocereus polyrhizus*, often known as the red pitaya, is a tropical fruit belonging to the *Cactaceae* family of cacti. Dragon fruit were first time discovered in Mexico, and dragon fruit trees are grown mostly in

tropical nations like Malaysia, the Philippines, and Indonesia. To reduce food waste in the form of dragon fruit peels, the peel of dragon fruit can be utilized because it contains colors, which are typically only thrown away as food waste after being underutilized. This is unfortunate because there are various benefits associated with the dragon fruit itself. The peel possessed polyphenol compounds with antioxidant activities (Wu et al., 2006). The peel contain betacyanin, flavonoids, and phenol. In addition, dragon fruit skin also contains vitamin C, vitamin E, vitamin A, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and phyto albumin which are thought to have antioxidant benefits and can also be potential for antimicrobial activities (Rahmawati, 2016).

## **2.2 Product Review**

Red rice analog is a product made from porang tubers and purple sweet potatoes which are made into flour with the addition of soybean flour and dragon fruit peel powder. This makes the nutritional value of red rice analog superior to red rice in general. Besides being high in fiber from the glucomannan content of the porang tubers, this product has high antioxidants from purple sweet potatoes and dragon fruit peels. Furthermore, the addition of soy flour also adds protein that is not usually found in red rice in general. However, due to the cooking process, this product has lower antioxidants when compared to regular red rice. In addition, the final texture is not as chewy as regular red rice.

With the production of this product, it is hoped that it can become a good health invention of red rice that is not only rich in fiber and antioxidants but also rich in protein. Due to high fiber, antioxidants, and protein, this can be solution for people who work out and require more protein intake but do not wish to reduce fiber intake.

## **2.3 Process Review**

### **2.3.1 Dehydration**

Dehydrating is a crucial step in the food industry's preservation of goods and raw ingredients. This is due to drying is a process in which water is removed to halt or slow down the growth of spoilage microorganisms as well as the occurrence of chemical reactions (Canovas, 1999). Dehydrating is done using a dehydrator machine so that the process is done using heat from an electric machine to remove the water content in food, avoiding the growth of bacteria and the spread of bacteria in food.

### **2.3.2 Steaming**

Steaming is a wet cooking method that use water vapor to cook food. Usually, steaming equipment is multilevel and has a steam path made of a perforated base. This is the safest method because its inherent ingredients' flavor and color are preserved. Beside that, the nutritional content will not disintegrate and dissolve as much as if boiling is done. This method is an important process to cook the dough so that the xanthan gum can be activated so the dough becomes set and can be shaped.