

## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 Ingredient Review**

##### **2.1.1 Arrowroot Starch**

Garut tuber (*Marantha arundinaceae*) is a type of local tuber plant that is often found in Indonesia. Arrowroot tubers are easy to grow in environments with minimal sunlight and on soils with low fertility levels. Caring for this plant is also not difficult and the attacks of pests and diseases that attack this plant are relatively small, so arrowroot tubers can be easily cultivated (Caesarina and Estiasih, 2020). Arrowroot is a source of carbohydrates that has the potential to substitute for wheat because it does not contain gluten. Apart from being used directly, arrowroot tubers can be used more widely, one of which is by processing them into flour (Chintya Yulian, 2020). Arrowroot tuber is a food source of carbohydrates, and the dominant one is starch. White arrowroot tubers are covered with light brown scaly skin, cylindrical in shape. Arrowroot tubers can be used as an alternative source of carbohydrates to replace wheat flour because of their high starch content, especially those that are 10 months after planting. Fresh rhizome contains 69–72% water, 1.0–2.2% protein, 0.1% fat, 19.4–21.7% starch, 0.6–1.3% fiber and 1.3–1.3% ash 1.4% (Literature, 2020). Arrowroot tubers have a carbohydrate content of 25-30%, starch content of 20%, the flour can be used as a substitute for wheat flour. Arrowroot tubers have health benefits because of their low glycemic index (14), lower than rice, wheat, potatoes, and cassava which are 96, 100, 90, and 54

respectively. The glycemic index of other tubers, such as gembili, kimpul, canna, and sweet potato 90, 95, 105, 179 respectively (Suhartini and Hadiatmi, 2019). Garut is one of the starch producers, where arrowroot tubers are potential starch producers with starch yields ranging from 1.92 to 2.56 t/ha. Arrowroot starch can be used as a substitute for wheat flour up to 50-100% (Djaafar and Pustika, 2019). Arrowroot flour or starch can be used as a raw material for food products such as bread, cookies, cakes, noodles, snacks, and various traditional foods. Arrowroot flour can be used as a mixture of wheat flour in the food industry, for example in the manufacture of white bread with a proportion of arrowroot flour 10% - 20%, noodles 15% - 20%, even dry cakes up to 100% (Rukmana, 2020).

Starch is a polysaccharide compound consisting of monosaccharides. The monomer of starch is glucose which is linked by a (1,4)- glycosidic bond, which is a chemical bond that joins 2 monosaccharide molecules that are covalently bonded to each other. Starch is a carbohydrate starch substance with a polymer of glucose compounds consisting of two main components, namely amylose and amylopectin. (Akbar et al., 2013). Amylose is a linear polymer component with  $-(1 \rightarrow 4)$  glucose units attached. The degree of polymerization of amylose ranges from 500 to 6000 glucose units, depending on the source. Amylopectin is a polymer  $-(1 \rightarrow 4)$  glucose units with a side chain of  $-(1 \rightarrow 6)$  glucose units (Herawati, 2016).

Natural starch has several weaknesses which can be an obstacle in its utilization, especially in the food sector, including limited solubility, requiring a long time to cook, the resulting paste is quite hard, and has low stability (Retnaningtyas and Putri, 2021). The use of starch in food processing also requires certain characteristics or functional properties,

especially if the process takes place at high temperatures, low pH, and so on, so that starch must have functional properties with certain criteria. Not all of these criteria are met by natural starch, so efforts are needed to fulfill them, namely by modifying the natural starch (Erika, 2019).

### **2.1.2 Non-Dairy Creamer**

Vegetable creamer (nondairy creamer) is a substitute for milk or cream which is a fat-in-water emulsion product. Non-dairy creamer is made from vegetable oil and corn syrup solids, which are hydrogenated by the addition of permitted food additives. Non-dairy creamer products can be in the form of powder or liquid and are generally used to add flavor to food and beverages. Functionally, non-dairy creamer has many advantages compared to dairy products in general. For example, in terms of raw materials, non-dairy creamer does not contain animal fat, but vegetable fat so that non-dairy creamer does not contain lactose and is healthier for consumption (Novandhy, 2019).

Non-Dairy creamer is a multifunctional creamer made from natural carbohydrates called oligosaccharides which are easily absorbed by the large intestine. Non-dairy creamer can add a creamy and delicious taste that can be applied to various food and beverage menus. Non-dairy creamer can be used as a substitute for milk and coconut milk in food and beverages. Such as rendang, soto Betawi, chicken opor, and various other coconut milk dishes. Non-dairy creamer has a taste similar to coconut milk. Another advantage of Non-dairy creamer is that it is high in fiber, low in sugar, cholesterol free, trans oil free, gluten free and safe for those with milk intolerance (Anonymous, 2021).

## 2.2 Product Review

Arrowroot cendol is a drink made from arrowroot flour and also non-dairy creamer, where arrowroot flour has many benefits, namely it can improve digestion, treat diarrhea, heal wounds and treat poisoning. Arrowroot flour is also superior compared to other flours because the protein contained in arrowroot flour is very high and gluten free, so it is safe for people with celiac disease (gluten allergy) and Non dairy creamer as a substitute for coconut milk which is made from vegetable oil where non dairy creamer is free from animal fat so non dairy creamer does not contain lactose and is healthier for consumption

Arrowroot cendol is made so that ulcer sufferers can drink cendol which is healthier because arrowroot flour as the main ingredient of cendol has many benefits for ulcer sufferers where arrowroot starch has high food fiber which functions to relieve stomach pain, neutralize excess stomach acid and contain starch essence in tubers arrowroot can increase the pH level of the stomach so that it can reduce the number and sores on the stomach. As a complementary ingredient, non dairy creamer has a taste like coconut milk where non dairy creamer has lower fat and is rich in fiber which is very suitable as a substitute for coconut milk.

The process of making arrowroot cendol is to make arrowroot flour first. The manufacture of arrowroot flour uses a starch isolation process to extract starch which is then dried to become the main ingredient for making cendol. The finished arrowroot starch is then boiled together with pandan water extract to become cendol. Meanwhile, for making sugar water, you need palm sugar and also water, which uses the boiling process to get the desired sugar water. Making non dairy creamer gravy is by mixing non dairy creamer with warm water so that the non dairy creamer will dissolve and blend with the

warm water so that the non dairy creamer becomes gravy in the arrowroot cendol drink

The advantages of arrowroot cendol is that it is suitable for ulcer sufferers who are afraid to drink cendol because there is coconut milk because arrowroot cendol has ingredients suitable for ulcer sufferers, can improve digestion because non dairy creamer is rich in fiber so it does not cause constipation, arrowroot cendol has gluten-free ingredients suitable for people with celiac sufferers. The disadvantage of arrowroot cendol is that it is not good if you drink it in excessive amounts, non-dairy creamer is suitable for ulcer sufferers, but if you drink it excessively, it is unhealthy. when consumed in large quantities, of course it can affect health because calorie intake becomes excessive in our body.

## **2.3 Process Review**

### **2.3.1 Starch Isolation**

Starch isolation is one way to engineer the starch content of a material. The methods commonly used are chemical or manual (non-chemical). Chemically there is the Waliszewski method, and Lii and Young. According to Waliszewski in the AACC (American Association of Cereal Chemists) isolating starch by dissolving the sliced material in NaHSO (Torre-Gutierrez, 2007) with a concentration of 0.25 g/L water at an initial immersion temperature of 40°C. Then the soaking water is discarded and the bananas are blended into mush and then water is added as much as two to four parts of the initial weight. The resulting slurry is then stirred and kneaded so that the starch release process from the protein wrapper is faster, then the suspension is filtered. The pulp pulp is then washed until clear and then deposited for 6-8 hours until the starch

separates from the soaking water. The precipitated starch is then washed with water until a white starch is produced, then dried and baked in the oven. After that, the starch content was calculated. Whereas the Lii and Young method cooperates with the Waliszewski method, the difference is the concentration of NaHSOs used as much as 1.22 g/L of water and the addition of 0.045 M NaOH to the resulting slurry (Lii and Young, 1982). In the method of making arrowroot starch, the working principle is like the Waliszewski method and also Lii and Young, but in the process of making arrowroot starch, no chemicals are added.

### **2.3.2 Boiling**

Boiling is a technique of cooking food ingredients in liquid until the boiling point reaches 100 degrees Celsius. Liquids that can be used in this technique are water, broth, coconut milk, and also milk or other ingredients. In addition, the level of heat in this liquid can be added by covering the pot, so that the water vapor is retained and then causes heat. Usually this technique is used when cooking soup, curry, opor to soup. The cooking time with the boiling technique varies greatly depending on the level of doneness desired. The longer a dish is cooked with this technique, the result will be softer because the cooking water content is able to absorb into the cooking ingredients. In making arrowroot cendol use this process to make cendol where the arrowroot starch will be put into boiling pandan water extract so that it will thicken into cendol dough and also to make palm sugar water where palm sugar is put into boiling water and wait until it reduces slightly