CHAPTER II

LITERATURE REVIEW

2.1 Ingredients Review

2.1.1 Cilembu Sweet Potato (Ipomoea batatas (L.) Lam)

Figure 2.1 Cilembu Sweet Potato

Indonesia being one of the central areas of sweet potatoe diversity and one of the superior food crop commodities is Cilembu sweet potato with a total production 1,914,244 ton (BPS, 2018). Much in demand by consumers makes this sweet potato has a high selling value and are able to penetrate regional and internasional markets. This is also the reason why cilembu sweet potato continues to develop its cultivation techniques so that its availability increases (Dini Rochdiani, 2020)

Figure 2.2 Cooked Cilembu Sweet Potato

Cilembu sweet potato is a type of sweet potato which has a distinctive characteristic of its golden yellow color, has a sweet taste

like honey, and has a chewy flesh structure. The sweet taste of this sweet potato is known by the public as “si madu“ (Brian Alvin Hananto, 2020). Cilembu sweet potato is thought to have high carotene and lycopene content because this sweet potato has a characteristic orange-yellow color. In addition to an attractive taste and aroma, Cilembu sweet potato also has a high carbohydrate content.

Table 2.1 Cilembu sweet potato nutritional value information 100 g edible weight

		% AKG*
Energi	186 kkal	8.65 %
Lemak total	0.20 g	0.30 %
Vitamin A	0 mcg	0 %
Vitamin B1	0.02 mg	2 %
Vitamin B2	0.20 mg	20 %
Vitamin B3	0 mg	0 %
Vitamin C	0 mg	0 %
Karbohidrat total	44.30 g	13.63 %
Protein	1.90 g	3.17 %
Serat pangan	3.40 g	11.33 %
Kalsium	37 mg	3.36 %
Fosfor	51 mg	7.29 %
Natrium	1 mg	0.07 %
Kalium	61.90 mg	1.32 %
Tembaga	100 mcg	12.50 %
Besi	0.60 mg	2.73 %
Seng	0.20 mg	1.54 %
B-Karoten	26 mcg	-

Table 2.2 Red sweet potato nutritional value information 100 g edible weight

		% AKG*
Energi	151 kkal	7.02 %
Lemak total	0.30 g	0.45 %
Vitamin A	0 mcg	0 %
Vitamin B1	0.13 mg	13 %
Vitamin B2	0.08 mg	8 %
Vitamin B3	0.70 mg	4.67 %
Vitamin C	11 mg	12.22 %
Karbohidrat total	35.40 g	10.89 %
Protein	1.60 g	2.67 %
Serat pangan	0.70 g	2.33 %
Kalsium	29 mg	2.64 %
Fosfor	74 mg	10.57 %
Natrium	92 mg	6.13 %
Kalium	565.60 mg	12.03 %
Tembaga	300 mcg	37.50 %
Besi	0.70 mg	3.18 %
Seng	0.50 mg	3.85 %
B-Karoten	0 mcg	-
Karoten total		-
Air	61.90 g	-
Abu	0.60 g	-

Table 2.3 Yellow sweet potato nutritional value information 100 g edible weight

		% AKG*
Energi	119 kkal	5.53 %
Lemak total	0.40 g	0.60 %
Vitamin A	0 mcg	0 %
Vitamin B1	0.06 mg	6 %
Vitamin B2	0.07 mg	7 %
Vitamin B3	0.70 mg	4.67 %
Vitamin C	21 mg	23.33 %
Karbohidrat total	25.10 g	7.72 %
Protein	0.50 g	0.83 %
Serat pangan	4.20 g	14 %
Kalsium	30 mg	2.73 %

Fosfor	40 mg	5.71 %
Natrium	3 mg	0.20 %
Kalium	1 mg	0.02 %
Tembaga	100 mcg	12.50 %
Besi	0.40 mg	1.82 %
Seng	0.20 mg	1.54 %
B-Karoten	794 mcg	-
Karoten total		-
Air	72.60 g	-
Abu	1 g	-

Table 2.4 White sweet potato nutritional value information 100 g edible weight

		% AKG*
Energi	46 kkal	2.14 %
Lemak total	0.20 g	0.30 %
Vitamin A	0 mcg	0 %
Vitamin B1	0.30 mg	30 %
Vitamin B2	0.30 mg	30 %
Vitamin B3	0.90 mg	6 %
Vitamin C	8 mg	8.89 %
Karbohidrat total	8.20 g	2.52 %
Protein	2.80 g	4.67 %
Serat pangan	4.80 g	16 %
Kalsium	120 mg	10.91 %
Fosfor	50 mg	7.14 %
Natrium	10 mg	0.67 %
Kalium	0 mg	0 %
Tembaga	200 mcg	25 %
Besi	0.80 mg	3.64 %
Seng	0.50 mg	3.85 %
B-Karoten	103 mcg	-
Karoten total		-
Air	87.50 g	-
Abu	1.30 g	-

Table 2.5 Chemical Composition of Raw Cilembu Sweet Potato Flesh

No.	Analysis			Amount
1.	Pectin levels		(% Ca-pektat wb)	0,618
			(% Ca-pektat db)	1,38
2.	Crude Fiber Content		(% wb)	1,86
			(% db)	4,16
3.	pH			6,565
4.	Total Sugar Level	Cilembu Sweet Potato	(% wb)	23,931
			(% db)	53,57
		Other Sweet Potato	(% wb)	12,681
			(% db)	28,38
5.	Water Content		(% wb)	55,33

(Source : Fatonah, 2002)

With the highest carbohydrate content compared to other sweet potatoes, the sugar content is also high because in general, the sweet taste of sweet potatoes is obtained through the process of breaking down carbohydrates (starch) by the amylase enzyme into sugar. The diversity of the environment results in different chemical compositions of the tubers. Several studies reveal the influence of climate, soil and pests on the production or sugar content of sweet potatoes. The sugars produced from this decomposition process are glucose, sucrose and fructose. This type of sugar determines the sweet taste of each type of sweet potato.

2.1.2 Kacang Tanah (Arachis hypogaea L.)

Figure 2.3 Peanuts

Peanut (Arachis hypogaea L.) is the second most important raw material after soybeans and it also a rich source of protein and fat. The use of soybeans by Indonesian people continues to increase every year, while production decreases. this causes the government to import soybeans to meet domestic needs (Setywan & Huda, 2022) therefore it uses other types of beans which also have a high protein content, namely peanuts. Peanuts have many benefits such as preventing an increase in cholesterol levels, preventing wrinkles, high fiber content, a source of energy and preventing cancer. On the other hand from the benefits of peanuts, accurancy is needed in the process of harvesting, storing and processing them because peanuts are easily contaminated with afatoxins which are harmful to health (Damat, et al 2021). Processing peanuts is one of the efforts that can be made to extend the shelf life of peanuts. Peanuts are generally consumed in the form of raw materials as well as traditional and modern processed products. Various processed products based on peanuts such as peanut shells (crunchy), seasonings, peyek, ting-ting and so on. Peanuts are rich in protein, essential amino acids, unsaturated fats, fiber and mineral. Every 100g of peanuts contains 525 kcal of energy, 27,9 g of protein, 42,7 g of fat, 17,4g carbohydrates and 2,4 g of fiber (Mona Fitria, et al, 2022).

2.2 Product Review

Figure 2.4 Flakes

Flakes are cereal food products such as rice, wheat and corn which has gone through the extrusion process. Flakes have the shape of thin, flat, crunchy and are consumed with the addition of milk, yogurt, etc as a breakfast menu because they taste good, healthy, and practical (Nurhidayanti dkk, 2017). Although it is better known as a breakfast product, now many people use flakes as the main or additional ingredient in the manufacture of cookies, cake, snack bars, etc. Flakes products are often found, namely corn flakes which are made from whole corn kernels and them go through a flaking process. This food product is in the form of thin sheets, round, brownish yellow. The selection of raw materials for the manufacture of cereals is based on raw materials containing high starch because starch contain amylose and amylopectin which are important in the formation of a crunchy texture and product swelling power. according to Nurhidajah's 2015 study regarding the ability of water absorption by corn-soybean sprouts cereals to be affected by their starch and protein content. Water absorption depends on the availability of hydrophilic groups and the capacity to form macromolecular gels, i.e. the amount of gelatinized starch, a decrease in the amount of gelatinized starch and a decrease in the water content of the product will reduce water absorption. The presence of a protein source will increase water absorption because

almost all proteins contain polar numbers along their peptide framework and make them hydrophilic. There is starch gelatinized increases absorption time water due to the breaking of hydrogen bonds between starch molecules so that water enters more easily to starch molecules.Besides that, cereal product also contain various nutritional values such as protein, fat, and fiber (Imaniar Nurhikmawati, 2018). Information on the nutritional value of cereal products generally presented in Table 2.6

Table 2.6 Nutritional Content of Cereal Products

Composition	Unit (100g)	Rate
Water	g	3,00
Protein	g	14,70
Total Fat	g	1,20
Carbohydrate	g	79,60
Energy	kkal	364
Fiber	g	4,4

Sumber : USDA (2016)

Table 2.7 Cereal Product Standard (CODEX STAN 74-2016)

Composition	Unit	Spesification
Protein	g/100 kkal	Min.2
Fat	g/100 kkal	Max.3,3
Fructose	g/100 kkal	Max. 2,5
Sodium	mg/100 kkal	Max. 100
Calcium	mg/100 kkal	Min. 80
Thiamin	ug/100 kkal	Min. 50

Source: CODEX ALIMENTARIUS (2016)

2.3 Process Review

In manufacture of cilembu sweet potato and peanut cereals, there are 3 main processes, namely :

2.3.1 Baking

Baking technique is a cooking method that uses an oven that produces dry heat energy (dry heat cooking). In the process of making flakes, there are 2 baking processes, namely in the process of making Cilembu sweet potato flour and in the process of making flakes. Baking technique is a cooking method that uses an oven that produces dry heat energy (dry heat cooking).

Cilembu sweet potato is not suitable for frying, because the high sugar content makes this sweet potato burn very easily, and it is also not suitable for boiling, because the aroma of the honey will diminish or even disappear. In the 1980s, a student from Padjadjaran University tried to process Cilembu sweet potato by baking it in the oven and it turned out that this process made the Cilembu sweet potato release a liquid that melted like honey. The liquid is sweet potato latex which melts due to the roasting process.

The effect of roasting on carbohydrates is generally related to the hydrolysis of starch. Cilembu sweet potato starch content ranges from 7 between 35-36% at harvest. Starch hydrolysis is the process of breaking down starch molecules into simpler constituent parts such as dextrin, isomaltose, maltose and glucose. The longer the hydrolysis time, the higher the glucose level. The longer the time, the more perfect the starch will break down so that the glucose level is higher. This is what causes the Cilembu sweet potato to release a sweet liquid when baked.

In making Cilembu sweet potato flour, the Cilembu sweet potato is baked first with the hope that the sweet liquid contained in

the Cilembu sweet potato can come out so that when the Cilembu sweet potato has become flour, the Cilembu sweet potato flour will still have a sweet taste. In addition to maintaining the sweetness of the Cilembu sweet potato, the process of ripening the sweet potato first is an attempt to remove the raw taste of the flour.

Roasting is also one of the processes in making flakes. Baking is the process of operating heat on dough products in an oven. Roasting time can affect the maturity level of the resulting product.The process of making flakes (flakes) is very simple, including making dough, forming flakes, and molding, then baking them at high temperatures for a relatively short time.

The flakes that are made are usually baked to reduce the moisture content which affects the crispness of the final product, to create aroma and to produce a bubbly effect. Changes in taste in flakes are caused by changes that occur during the roasting process which reduced product density due to the development of a porous texture (occurs structural changes) (Dena Ratu Maulid, 2019)

2.3.2 Dehydrate

A food dehydrator is a food and food drying machine that helps speed up the drying process of certain food products and food ingredients. The tool has similarities like an oven which functions to dry food by removing the moisture content contained in food. But its function is not like an oven that can bake food. This drying system uses specially designed dehydrator technology to regulate drying time and temperature.

Food dehydrator has a fan and ventilation on the machine for air circulation. This air circulation draws the moisture in the food and throws it out of the machine. This air circulation also functions to take in air from outside the machine and flow it into the machine to help

the process of removing the moisture content of the food ingredients, and to prevent the water content that has come out of the food ingredients from being re-absorbed by the food ingredients.

The application of drying cilembu sweet potatoes that have been in the oven with a food dehydrator drying machine is intended to optimize the drying process. Cilembu sweet potato drying can be done by two methods, namely by conventional and mechanical methods. In Indonesian society, conventional drying is still often found, namely by drying it in the hot sun. However, this method has many drawbacks, namely it requires a large area of land and also requires a long time takes a long time because it depends on weather conditions and the ongoing season, also this conventional drying has a risk that the material can be contaminated with dirt and bacteria. In the mechanical process, it is possible to reduce the water content in the processing of Cilembu sweet potato flour by drying using a food dehydrator.

From several research results in Indonesia, the water content level of sweet potato flour obtained on average was 7.81%, with range 6.77 – 10.99%. But when compared with the standard used by sweet potato flour exporting companies has a water content of around 3.65%. In a study regarding the drying process of purple sweet potato which was carried out using a food dehydrator for 5-7 hours at a temperature of 60°C having a water content of 7.80 %, so in the manufacture of Cilembu sweet potato flour this time in the food dehydrator drying process using a temperature of 60oC for 3 days which produces a moisture content of around 4.00%. Dried Cilembu sweet potato with low water content can have an impact on long shelf life because the growth of microorganisms can be inhibited (Olatunde et al. 2016; Ijabadeniyi & Pillay 2017).

2.3.3 Sieve

The physical requirements follow the requirements for flour products in general, i.e. normal shape, odor and color, no foreign matter is allowed, and a fineness level. at least 95% of the product passes the 80 mesh sieve as permitted by SNI 01-3751-2006 (Ali Umar Dhani, 2020), therefore after the Cilembu sweet potato is dried and blended, It is necessary to go through a process where the resulting flour must pass a 100% sieve, dust/soil/gravel larger than 80 mesh will be retained on the sieve so that it can be separated immediately.