

CHAPTER II

LITERATURE REVIEW

2.1. Flour

2.1.1 Mung bean

The mung bean (*Vigna radiata*) is a short duration legume that is cultivated on more than 7 million hectares, predominantly in Asia, and is rapidly spreading to other parts of the world. Mungbean seeds are rich in proteins (~24% easily digestible protein), fiber, antioxidants, and phytonutrients (Itoh *et al* 2006 in Nair *et al.*, 2019). The mung bean is therefore a significant source of dietary protein when it is eaten as whole seed or divided into meal, flour, and sprouts. The mungbean sprouts are high in thiamine, niacin, and ascorbic acid.

The mung bean is an annual plant, which has a high density of branching and grows about 60 to 76 cm tall (Oplinger *et al.* 1990 in Naik *et al.*, 2020) with a slight tendency for twiners in the top branches. Seed coat, cotyledon and embryo accounted for 12.1%, 85.6% and 2.3% of the total amount of dicotyledonous green gram seed respectively. The outer covering on which an embryo is protected is the seed coat or testa. The embryonic shoot above the cotyledon is epicotyl, and the embryonic root below the cotyledon is hypocotyl. The micropyle is a small hole in the seed that allows water absorption, and the hilum is a mark left on the seed coat by the stalk that attached the ovule to the ovary wall before it became a seed (Sefaddeh and Stanley 1979 in Naik *et al.*, 2020).

The average moisture content present in the whole mung bean seed is 10.6 g/100 g of whole green gram with high protein (22.9 g), fat (1.2 g), total carbohydrate (61.8 g), crude fiber (4.4 g), and ash (3.5 g) per 100 g of sample (Adsule *et al.* 1986 in Naik *et al.*, 2020). The presence of antinutritional factors such as tannins (366.6 mg/100 mg), phytic acid (441.5

mg/100 g), hemagglutinin, trypsin inhibitors, proteinase inhibitors, and polyphenols (462.5 mg/100 g) were reported in mung bean, which affect the digestion and bioavailability of full nutrition (Mubarak et al.2005 in Naik et al., 2020).

2.1.2 Red bean

Worku and Sahu (2017 *in Lee et al., 2018*) said red beans are a good source of dietary minerals, including magnesium, potassium, and zinc. Red beans are rich in saponins that help in relieving constipation and in the actions of diuretics. Red beans also contain large amounts of vitamin B1 that assists in carbohydrate digestion (Jhan *et al., 2015 in Lee et al., 2018*). Red bean powder (RBP) is used in food additives, such as rice cake, bread, soup, and other snacks due to a sweet taste. However, red beans contain a toxin called lectins, which can cause nausea, abdominal pain and headache, and requires a process such as thermal treatment (Berg *et al., 2002 in Lee et al., 2018*).

The average amount of legumes consumed per capita by Indonesians was 35.88 g daily, based on the 2000 Pola Pangan Harapan (PPH) dietary pattern. It is not just the needs of consumers that nuts need to fulfil, but also those of the food industry (Fachruddin., 2000 in Cahyanti et al., 2018).

One of the vegetables that are beloved for their delicious and savory flavour is red beans. The nut contains plenty of vitamin A, B and C, especially in the seeds. Also, good sources of B vitamins that are important for brain cells are kidney beans. It provides nutrients to the brain's nerves and cells, which prevent age related diseases such as Alzheimer's. (Lind et al.,2017 in Maisyara et al., 2018) explain a deficiency of vitamin B6, such as isoniazid, hydralazine and penicillamine, may occur because there is insufficient absorption in the intestine or excessive use of drugs that lead to depletion of vitamins B6.

There is 39.45% of starch in red beans. There is amylose content of 29% (Haryadi 2000.,in Asmara et al., 2018) and 39% (Alam 2006.,in Asmara et al., 2018). in red bean starch. Furthermore, red bean starch has very thick gelatinization properties (Julius et al., 2004 in Asmara et al., 2018).

2.2. Product Review

2.2.1 Pie

Pie and *quiches* are small snacks originating in Europe, consisting of a bowl shaped base or shell, and a filling in the middle. According to (US Whet Associate 1983, *in* Mustika, 2021), "Pie is a cake with a pastry dough base filled with fruit or cream, the top is coated with marique, slagroom or pastry". There are various shapes and sizes of pies. From round, oval, to square shapes with various sizes, some of them are large or small (Diah Takarina *et al* 2013., *in* Mustika, 2021). Also, there are two types of pies in addition to those mentioned above: opened and closed pies. The pies are usually named according to the type of filling they contain. Djoko Hardiyanto (2016, *in* Mustika, 2021) said that a pie's characteristics are that its base tastes delicious, has a delicate and bitter texture.

Research published in other journals also explains that pies are a foodstuff consisting of a skin that has a dry texture and can be filled with a variety of flavours, such as fruit, meat, fish, vegetables, cheese, chocolate and nuts (Baking Industry Research Trust 2010 *in* Yusrina *et al.*, 2018).

The process of baking involves cooking food in the oven with heat from all directions. Baking techniques include the use of a baking sheet filled with water in the oven where the pan is placed in the other pan (*au bain marie*), an example of which is caramel pudding, a baking technique often used for pastries and bread.

1. The basic principle of baking is that, before the food substance goes into the oven, it should be prepared in accordance with the required temperature and monitored during its burning process.
2. A continental food, processed using a variety of baking pastries, bread, potatoes, cakes and pies.

2.2.2 Gluten free

Food and Drug Administration (2014 *in* Muzaki *et al.*, 2022) explain several types of cereals, particularly wheat which is a key ingredient in the manufacturing of flours such as bread and rye are loaded with gluten containing sticky and elastic proteins. This condition may be described as "gluten intolerance" because the proteins in gluten can't be consumed by all humans. This condition is common in celiac sufferers, celiac disease caused by the protein in gluten can cause (diarrhoea, intestinal pain, headaches, growth retardation, osteoporosis, infertility, lymphoma, etc.). About 1% of the world's population consumes wheat (Zilic 2013 *in* Muzaki *et al.*, 2022). Until now, the only way that researchers have found to be able to treat celiac disease is by not consuming foods that contain gluten. Many processed foods originally containing gluten are now replaced by other ingredients, so that *celiac* can also eat them. The use of products that are substituted for certain ingredients is typically accompanied by several advantages, in other words not just avoiding Gluten content but also helping to meet the needs of the body.

In the endosperm of wheat, rye and barley, gluten is a protein that contains starch. The highest level of gluten is found in wheat. And because it is airtight, this gluten makes bread or cake dough moist and expands. For example, all kinds of foods made from wheat flour, such as bread, cakes, donuts, noodles, pasta, including cakes or biscuits sold in supermarkets, contain gluten. Gluten can stick like glue in the intestines, especially for

children because their metabolic system is not perfect (Veronica in Marhelina & Herryani. 2021).

2.3. Process Review

Baking is a method of cooking with dry heat by convection conduction of hot air in the oven. There are two heating elements in some domestic ovens, one which is on the bottom of the oven and a second at the top. The heat energy in the oven does not touch the food directly, but through the hot air that flows from the cracks and holes in the oven.

There is a journal explaining that baking is a technique of cooking food with dry heat by convection (conducting) hot air vapor in an oven. There are two heating elements in some domestic ovens, one on the bottom of the oven to bake and another at the top for broiling.

There is also a book about basic cooking method, which explains that baking uses dry heat to process the ingredients in ovens from all directions. Baking is subdivided into grilling or broiling which includes:

1. Overheat (overall heat) is done on grill bars. The techniques applied in processing the quality cuts of meat, poultry, and fish.
2. Under heat (under fire/heat) is done on a salamander or grill. This technique is used to process steaks, steak chops, fish, tomatoes, mushrooms, it is also used to give a brown color to dishes such as macaroni au gratin.
3. Between heat (flanking heat source) is done on the electric grill bars. This technique is used to process meat.