CHAPTER I

INTRODUCTION

1.1 Background

Noodle is a product made from wheat flour as the main ingredient, and it is highly consumed by Indonesian people. Wheat flour is used in the production of noodle since it builds the structure of the noodles and contributes to the nutritional value contained in noodle such as carbohydrate and protein. High-protein wheat flour is used to make noodle (Abidin *et al*., 2013).

The main component of wheat flour is starch, but it also contains 7 to 15% protein. According to Barak (2012), the gluten network makes up about 80% of the total proteins in wheat flour. There are two types of major protein in the gluten network, which are gliadin and glutenin. Gliadin affects the firmness of the noodle, while glutenin affects the elasticity of the noodles and both of it plays an important role to the texture and the body of the noodles. These characteristics of wheat noodle makes it a widely used ingredients in the production of various food products. According to Asosiasi Tepung Terigu Indonesia (APTINDO) (2017), the total amount of wheat that is imported by Indonesia is 11.48 million tons in 2017. Thus, the diversification of local food needs to be conducted in order to reduce the amount of imported food ingredients including wheat flour.

In Asia, especially in Indonesia, rice is one of the most consumed sources of carbohydrate. According to BSN (2015), rice is the main result yielded from the milling process of wheat (*Oryza sativa* L.) which all of its husk has been peeled and the whole or a part of its bran layers has been separated which can present in the

form of whole grains, head rice, broken rice, or *menir*. According to Badan Pusat Statistik (BPS) (2020), the productivity value of rice reaches 31.31 million tons in 2019.

Rice flour is a flour that yielded from milling or mashing process of rice (*Oryza sativa* Linn) (BSN, 2009). In Southeast Asia, rice flour is usually used as the main ingredients in the making process of traditional snacks or food since a long time ago. Rice flour is free from gluten. Therefore, it is beneficial and recommended to be consumed by people who suffer from celiac disease, people with high blood sugar, or people who have gluten allergy. Since noodle is commonly made using wheat flour, replacement of wheat flour with rice flour is needed to increase the utilization of rice flour in the manufacturing of food product.

The production of noodle analogue made from rice noodle needs some modification from the production process of wheat-based noodle since rice flour does not contain gluten. Therefore, hydrocolloid needs to be added during the production of noodle analogue made from rice flour to improve the texture of noodle analogue made from rice flour which tends to break easily.

Hydrocolloid is one type of food additives which acts as thickener, gelling agent, stabilizer, emulsifier, or coating agent and commonly used to improve the physical characteristics of food. Hydrocolloid is able to reduce the free water content in food (Sahin and Sumnu, 2006). In manufacturing process of noodle, hydrocolloid is also added to reduce the stickiness and improve the physical characteristics of the noodle. According to the research done by Ratnawati and Afifah (2018), addition of hydrocolloid in noodle production positively affects the gelatinization profiles and cooking quality of the noodle. According to

Widyaningtyas and Susanto (2015), the moisture content, texture, and chewiness of noodle are also improved by the addition of hydrocolloid.

Carboxymethyl cellulose (CMC) is one of the hydrocolloids that is made from cellulose pulp which is anionic and water-soluble cellulose derivative. CMC will maintain the chewy texture of the noodle during storage period and it also improve the resistance of the noodle towards water. Furthermore, CMC has no maximum level to be added as additives in food (Murray, 2009; Brown, 2014).

Besides hydrocolloid, addition of egg was done to improve the physical characteristics of noodle analogue made with rice flour. In noodle manufacturing process, egg gives additional nutrient value and it also maintain the structure of noodle so that it will not break easily. The egg yolk contains lecithin which can act as emulsifier when it is added on a food product. Meanwhile, the egg white can create a thin and strong layer on the surface of the noodle (Winarno, 2002). According to the research done by Wijaya (2013), the addition of 4.5% of egg yolk on the production of cassava and purple sweet potato noodles resulting in noodle with yellow color, chewy texture, and low cooking loss.

In this research, noodle analogue was made using rice flour and added with CMC as hydrocolloid and egg as the protein source. It was expected that addition of CMC and egg would improve the body and the texture of the noodle including its hardness, adhesiveness, springiness, and cohesiveness, until it resembles the physical characteristics of commercial noodle analogue made with wheat flour.

1.2 Research Problem

Wheat flour is the most common raw material that is used in the manufacturing process of noodle. Wheat flour contains gluten that can build a distinct structure in noodle. Meanwhile, wheat flour is one of the food commodities that cannot be massively produced in Indonesia which makes Indonesia relies on wheat flour imports that may affect the national food security negatively. Thus, the production of noodle analogue made with non-wheat flour is needed to be conducted.

Noodle production can also be done using rice flour as the raw materials. Noodle made with rice flour might have a fragile and sticky characteristic which is not preferable. Thus, hydrocolloid and protein are also needed to be added to improve its physical characteristics until it resembles the characteristics of noodle made with wheat flour. The characteristics of noodle made with wheat flour which are used as the reference for noodle made with rice flour are texture, cooking loss, water absorption, elongation percentage, as well as tensile strength. However, the amount of hydrocolloid such as carboxymethyl cellulose (CMC) and protein source such as egg need to be determined in noodle analogue production process.

1.3 Objectives

1.3.1 General Objectives

The general objective of this research was to utilize rice flour as a main basic ingredient, carboxymethyl cellulose (CMC) as a hydrocolloid, and egg as source of protein in the production of noodle analogue.

1.3.2 Specific Objectives

The specific objectives of this research were of the following:

1. To determine the effect of selected concentration of CMC which can create the best characteristics of noodle analogue made with rice flour based on its sensory properties, cooking loss, water absorption, tensile strength, elongation, and texture.

2. To determine the effect of selected concentration of egg that can create the best characteristics of noodle analogue made with rice flour such as its sensory properties, cooking loss, water absorption, elongation percentage, tensile strength, and texture.

3. To compare the best formulation noodle analogue made with rice flour to commercial wheat-based noodle.