CHAPTER I

INTRODUCTION

1.1 Background

Noodle has become the alternative staple food after rice in Indonesia. The number of instant noodles consumption in Indonesia is the second highest in the world after China. Noodle is made from wheat flour as the main ingredient. The high consumption of noodles has made Indonesia one of the largest importers of wheat flour because 70% of the wheat flour is used for production in the noodle industry (Hou, 2010; USDA, 2019; WINA, 2020). Therefore, the local materials should be introduced to substitute wheat flour usage in noodles to reduce the dependency on imported wheat flour (Abidin *et al.*, 2013).

One of the local materials that can substitute the usage of wheat flour in noodle production is cassava (*Manihot esculenta* Crantz). Indonesian production of cassava is the third largest worldwide in 2017 (Ebewore and Isiorhovoja, 2019). The nutritional value of cassava flour and wheat flour are relatively similar. However, the cassava flour does not contain gluten which is a protein in wheat flour that provides extensibility and elasticity in the noodle. The amylopectin content in cassava is higher compared to the amylase content. the high amylopectin content in cassava yielding in higher viscosity and stickiness (Abidin *et al.*, 2013).

Other than cassava, rice is also can be used to substitute wheat flour for noodle production. Indonesia is one of the largest rice producers in the world. Unlike wheat

flour, rice does not contain gluten, so people with celiac disease can consume the noodle made with rice flour. However, the lack of gluten makes the noodle from rice flour does not have the desired texture of noodles because rice flour cannot form an elastic and cohesive dough (Weng *et al.*, 2020). The addition of hydrocolloid can help to overcome the textural problem. The viscoelastic properties of gluten can be imitated by hydrocolloid to improve the texture of the noodles (Udachan and Sahoo, 2017). According to the research conducted by Tasia (2020), the addition of tapioca flour can reduce the stickiness in noodle analogue made with cassava flour. The addition of rice flour is expected to reduce the stickiness of the noodle analogue.

Hydrocolloids are long chain polymers that can form a viscous gel when dispersed in water. Hydrocolloids have some functional properties which are emulsifying, coating, thickening, stabilization, and gelling. The viscoelastic characteristic can replace the role of gluten in wheat flour. The addition of hydrocolloid in noodle also improves the textural properties and the cooking quality of noodle. Carboxymethyl cellulose (CMC) is one of the hydrocolloids which commonly used in noodle production (Sutheeves *et al.*, 2020; Valdez, 2012). Based on the research conducted by Suwannaporn and Wiwattanawanich (2011), the addition of CMC in wheat-rice noodles creates a comparable sensory quality with wheat noodles and improved the textural quality. The addition of 2.5% CMC in rice-based noodle analogue shown the best characteristics in terms of water absorption, cooking loss, and textural properties (Devi, 2021). Based on the research done by Padalino *et al.* (2013), the addition of 2% CMC in gluten-free

spaghetti succeed to improve the chemical and functional properties of the spaghetti.

The previous research conducted by Devi (2021) about noodle analogue made from rice flour with the addition of CMC, the water absorption was lower compared to the wheat-based noodle. The textural properties in terms of hardness, adhesiveness, springiness, and cohesiveness were still worse compared to the wheat-based noodle. The research conducted by Tasia (2020) also shown that the noodle made with cassava flour and tapioca starch is more adhesive compared to the wheat-based noodle based on the comparison test.

In this research, cassava flour and rice flour were used in cassava-rice noodle making to replace the usage of wheat flour. The formulation was added with CMC as hydrocolloid to improve the texture of the cassava-rice noodle. By conducting this research, it was expected that the addition of CMC can improve the texture of the cassava-rice noodle, and cassava flour and rice flour can complement each other in improving cassava-rice noodle characteristics.

1.2 Research Problem

The main raw material in noodle is wheat flour. The high consumption of noodles in Indonesia has increased wheat flour import because the land and weather are not suitable for the growth of wheat. Furthermore, gluten content in wheat flour makes the celiac disease patient cannot consume noodle made with wheat flour. To overcome the problems, the production of noodle analogue made with local food source and free of gluten is needed to be conducted.

The production of noodle analogue can be done by replacing wheat flour with cassava flour or rice flour. However, the high content of amylopectin in cassava flour makes the noodle sticky, and the noodle made with rice flour has a fragile and sticky characteristic. The lack of gluten in cassava flour and rice flour also become a problem because the gluten in wheat flour improves the texture of noodle (Abidin *et al.*, 2013; Nagai *et al.*, 2018). Therefore, the viscoelastic properties of hydrocolloid were expected to help to create the desired texture of cassava-rice noodle.

1.3 Objectives

1.3.1 General Objectives

The general objective of this research was to produce cassava-rice noodle with cassava flour and rice flour as the main ingredients and carboxymethyl cellulose (CMC) as the hydrocolloid.

1.3.2 Specific objectives

The specific objectives of this research were:

1. To determine the effect of concentration of cassava flour and rice flour ratio and carboxymethyl cellulose (CMC) in cassava-rice noodle made from cassava flour and rice flour on the sensory properties, cooking loss, water absorption, and textural properties, and to select the best formulation.
2. To compare the best cassava-rice noodle made with cassava flour and rice flour to commercial wheat-based dry noodle.