CHAPTER 1

INTRODUCTION

1.1. Background

Molecular gastronomy is an approach that applied in a way to create high-quality foods which having high sensory properties, consumer acceptability, and satisfaction. Several techniques include in molecular gastronomy. Thus, one of the most commonly used is the production of spheres through encapsulation using sodium alginate, which is the principal basis of the spherification technique (Caporaso & Formisano, 2015). Spherification is one of a molecular gastronomy technique used in order to create a coating made up of gel that forms through the chain reaction of calcium lactate and sodium alginate. There are several methods in this technique, such as: basic and reverse spherification. Both reverse and basic methods are commonly used by molecular cooking chefs. Spherification commonly used to produce “false caviar” which able to turn any liquidize food into spheres that easily explode in the mouth after chewed to release its liquid (Farias & Norena, 2019). However, the gelification process occurs during basic spherification technique was a bit hard to control since the it happened inside the spheres. Yet, the spheres need to be consumed immediately (Sen, 2017). Moreover, low pH or high calcium ion content able to lead early gelification to occur, conciliate the encapsulation process (Tsai, Kitamura, & Kokawa, 2017). Therefore, reverse spherification might be used.

Reverse spherification technique is more versatile compared with basic technique. Reverse spherification was done by submerging a calcium-contained liquid in a sodium alginate bath. As the reverse spherification is more versatile than basic spherification, it can make spheres using almost any kind of product (Sen, 2017). However, it is worth to know that it is necessary to maintain the network otherwise spheres produced will undergo deformations and disperse through the sodium alginate solution (Farias & Norena, 2019) Besides, submerging cuisine with art primarily through the name of “molecular gastronomy” often resulted in new combinations of foods and application of refined culinary processes. Moreover, the dishes constructed often intend to challenge the eater by playing

with the culinary mindset and be surprising. Plus, it would affect consumer acceptance within and across meal components, which may not always be consistent (Mielby & Frost, 2010). Therefore, optimization of the sphere production is necessary.

In this study, tomato juice chosen as the model of sample for the reverse spherification. Tomato (*Solanum Lycopersicum L.)* is a nutritious fruit that has been known and grows well in Indonesia which provides a wide variety of nutrients such as lycopene, potassium, vitamins (A, C, E, and K), sucrose and folic acid. It contains low-calorie content which is around 20 kcal/100 g of fruit. Its flavor comes mainly from sugars (fructose, glucose, sucrose) and organic acids contained, such as malic and citric acid. Tomatoes also contained high amounts of vitamins. It has significant concentrations of folate, vitamin C, and vitamin E. It is regarded as the second most important source of vitamin C after oranges (Gahler, Otto, & Böhm, 2003). The lycopene content in tomatoes is predominant. This fruit can be consumed as it is or turned into several tomato-based products, commonly in the form of juice (Silva *et al.*, 2008).

Nevertheless, although there are lots of studies on tomato juice, there is no published scientific studies regarding the application of this spherification technique were found. Moreover, there is a necessity to maintain the stability of the spheres produced. Therefore, different storage solution as well as different concentration of calcium lactate were proposed in a mean to optimize its physical as well as sensorial properties.

1.2. Objectives

This research aims to produce tomato juice spheres from tomato juice using reverse spherification technique and to optimize the sphere formation and its attributes.

1.3. Scope of the Research

Specifically, this research studied the differences in physical characteristics of tomato juice spheres produced with different concentration of calcium lactate (1% and 5%) and different storage solution (water and sugar solution). Physical analysis, included: color, pH, total soluble solids, weight

loss, sphericity, and rupture strength, as well as sensory analysis using acceptance test with 9-point hedonic scale, was conducted.

1.4. Benefits of Research

This research can be used as a basis of future study in regards to tomato juice spheres production using reverse spherification technique with a stage of spheres preformation which includes frozen technique since the study on this technique is still scarce.