CHAPTER 1

INTRODUCTION

1.1. Background

Shelf life is a period during which the food remains safe to consume, retains its sensorial, physical, chemical, and microbiological properties to a certain level, and conforms to nutritional labeling (Giménez, Ares, & Ares, 2012). Evaluating shelf life is crucial in food industry to ensure safety, predict quality, and comply with food regulation. The accuracy of shelf life estimation is necessary for both consumers and manufacturers. Shelf life dating determines consumers' purchase decision in a sense that a product is safe and qualified if consumers purchase the product within the shelf life range. If a product is found unacceptable within its shelf life, consumers' trust and product sales will be negatively affected. Some studies also revealed that shelf life date on product label can influence consumers' perception and expectation toward a food product significantly (Hough & Garitta, 2012). Furthermore, accurately predicting shelf life can reduce food waste during supply chain and provide effective waste management. Therefore, food manufacturers should have an accurate and effective method of shelf life evaluation.

One of the most common method in determining shelf life is Accelerated Shelf Life Test (ASLT), which is conducted by exposing the food towards extreme condition, usually high temperature, in order to increase the rate of deterioration and reduce the time needed for shelf life testing. The ability of ASLT in evaluating product shelf life significantly shorter than actual shelf life will increase efficiency and reduce the cost of shelf life testing in comparison with full-length shelf life test. The extreme condition and parameter tested in ASLT should be decided through experimentation, depending on the type of product. One of the challenges in ASLT is determining the procedure for heat-sensitive product, including mayonnaise.

Mayonnaise is an oil in water (o/w) emulsified condiment which undergoes deterioration during storage, including physical destabilization, chemical oxidation, and microbial degradation. Storage at high temperature can result in dissociation of mayonnaise as an emulsion. According to Santiprasert, Sanguandeekul, & Phimolsiripol (2009), temperature above 55^0C was not appropriate for mayonnaise shelf life test since the sample was rejected because of phase separation. High-temperature storage increases Brownian motion of oil droplets, decreases the viscosity of continuous phase, and solubilizes the emulsifier, resulting in emulsion breakdown (Depree & Savage, 2001). Hence, it is essential to select temperature storage during ASLT of mayonnaise carefully. Aside from physical destabilization, mayonnaise is susceptible to oxidative deterioration and able to produce undesirable rancidity since it contains a substantial amount of oil.

The demand for low-fat food, including low-fat mayonnaise, has been increasing in the past few years due to association of high-fat diet with various non-communicable diseases, such as hypertension, cardiovascular disease, and obesity (Amin, Elbeltagy, Mustafa, & Khalil, 2014). Low-fat mayonnaise contains 20-30% fat, which equals to around half of the fat present in full-fat mayonnaise (Morley, 2016). The reduction of fat also reduces the cost of mayonnaise production since the amount of oil used is lower. However, determining the shelf life of low-fat mayonnaise through accelerated method is more challenging because it is more susceptible towards creaming since the oil droplets are not closely packed and able to move freely. In this case, stabilizer or thickener including modified starch and hydrocolloids can be utilized to retain the emulsification, although there is no evidence that mayonnaise with modified starch is able to withstand high-temperature storage during ASLT.

Currently, research regarding ASLT in low-fat mayonnaise is still limited, whereas shelf-life determination in mayonnaise is crucial. Mayonnaise industries still rely on full-length shelf life test or static test, which is a time-consuming and expensive method because this method does not induce stress to the product to accelerate physical, chemical, or microbiological deterioration; hence, the test takes a

longer time to observe changes than ASLT. A quick, low-cost, and reliable method for shelf life testing in mayonnaise is on demand. Through the accelerated method, food industries expect to be able to predict the shelf life of mayonnaise more rapidly by measuring specific quality parameter.

1.2. Problem Formulation

Based on the research background, the problems which would like to be addressed are formulated by these following questions.

a. Which physicochemical or sensorial property has the highest association with storage time to develop ASLT method in low-fat mayonnaise?
b. Which storage temperature has the highest correlation with storage time to store low-fat mayonnaise during ASLT?

1.3. Objective

The purpose of this thesis research is to determine parameter and storage temperature for Accelerated Shelf Life Test (ASLT) of low-fat mayonnaise through exposure towards different storage temperature and measurement of physicochemical and sensorial properties during storage.

1.4. Scope of Work

This research focuses on methodology development specifically in the quality assurance field which is limited to

a. determination of shelf life parameter through Arrhenius model
b. the use of temperature as the acceleration factor
c. measurement of physicochemical and sensory parameter