CHAPTER 1 INTRODUCTION

1.1 Research Background

The Ministry of Fisheries and Maritime Affairs of the Republic of Indonesia in early 2019 has issued a regulation on fish drug classification to regulate the use medicine for clinical cases. The regulation explains that there are types of antibiotics that fall into the category of hard drugs. One such drug is tetracycline.

Shrimp is one of the excellent commodity in Indonesia since the increases of intensification in shrimp farming encouraged in the 1990s. At that time, shrimp became the quite significant contributor in Indonesia's foreign exchange income about 5-10%. In 2001-2002 there was a decrease in the volume of shrimp exports due to the EC (European Comission) issued a regulation stipulated in the Commission Decision (2001/705 / EC) which requires the Veterinary Authority in the EU (European Union) country to test all imported fishery products and shrimp originating from Indonesia. This regulation was issued related to the violation of antibiotic residues by shrimp products from Indonesia. Then this regulation was revoked in 2003 (Suhada, 2008).

Tetracycline can be easily obtained and used in aquaculture to treat or prevent bacterial diseases, while it is known that shrimps are one of the aquatic animals that never go the surface. That trait makes the accumulation of chemical hazardous involved drug metabolite in shrimp is very high and easy to monitor. The occurrence of antibiotics residues in microbial system may lead to genetic or mutational changes in normally sensitive bacteria, allowing the bacteria to survive

and further proliferate as ARB (antibiotic resistant bacteria) that carry antibiotic resistant genes (Martinez, 2009).

Several analytical methods have been reported for the determination of tetracycline in biological matrices using spectrophotometric (Tomida et al., 2011), electrochemical (Wong et al., 2015), biochemical (Jeon and Rhee Paeng, 2008), and HPLC (high performance liquid chromatography) (Castellari et al., 2009), but these methods require a prohibitive cost and complicated procedures.

Based on the background above, research is conducted on the optimization and validation of UV-Visible spectrophotometric method for the determination of Tetracycline concentration in shrimp as biological matrices. The purpose of this research is to get a more affordable and simple yet still sensitive, selective, and accurate method for the determination of tetracycline in biological matrices.

1.2 Problem Statement

Does the UV-Visible spectrophotometric method for the determination of Tetracycline concentration in shrimp meet the validation requirements of selectivity, linearity, accuracy, precision, the limit of detection, and the limit of quantitation?

1.3 Research Aim

The objective of the research aim was to validate the UV-Visible spectrophometric method for the determination of tetracycline concentration in shrimp.

1.4 Research Beneficience

1.4.1 Theory Beneficience

1. Can be used for validity method for tetracycline measurement in another biological matric.
2. Can be used for model research analysis of tetracycline in another biological matrices by UV-Visible spectrophotometer.

1.4.2 Practices Beneficience

1. Can be used as a real application in the field for tetracycline analysis in biological matric by UV-Visible spectrophotometer.
2. Can be used for another analysis of tetracycline derivate, i.e., oxytetracycline, chlortetracycline, and others.

1.5 Theoretical Base

Tetracyclines is one of the most important antimicrobial agents, which are bacteriostatic and have a broad usage in the treatment of clinical infections (Sheykhsaran et al., 2019). These antibiotic not only prescribed for the treatment of infections in humans but also animals and plants (Aminov, 2001). Tetracycline pharmaceutical preparations have high specification when binding to biological matrices. The specification in question is the inability to escape the protein bonds from biological matrices. This implication will cause a deviation in the examination. The main requirement in examining analytes (tetracycline) in the biological matrix is the separation of the bonds between protein macromolecules and analytes. For implementing the technique, it needs an effort, namely optimization, and validation.

Each pharmaceutical preparation has a different character which is related to the bond between drugs and protein macromolecules (Azkari Rizvi, 2018). Drugs that are bound to these macromolecules have limited ability to be monitored. Therefore a validation after the separation of the bonds between drugs and protein is necessary.

The administration of tetracycline in aquaculture is generally mixed with feed (Julinta, 2017). With this condition, it will be difficult to know the dose of tetracycline in the shrimp. If the number of doses that enter the shrimp is less or below the usual dose, it will trigger antimicrobial resistance (Martinez, 2009). But if the dose of tetracycline in shrimp is excessive, it will cause drug residues in the shrimp (Qiao et al., 2017). Therefore a method to determine the levels of tetracycline in shrimp is needed.

Tetracycline analysis using UV-Visible spectrophotometer showed positive results (Nurhasnawati et al., 2016). Previous studies have used wavelength ranges between 200 to 400 nm (Laboratory Quality Assurance Division, 2007). In this wavelength range, tetracycline has optimal absorption to support the validation of the method. The data obtained from the method validation is used to show that this method is a suitable analysis method.