

CHAPTER I

INTRODUCTION

1.1 Background

Bioplastics, often referred to as biodegradable plastics have become a promising sustainable alternative to petroleum-based polymers like polyethylene (PE), polystyrene (PS), and polyethylene terephthalate (PET). Bioplastics have the ability to disintegrate its body due to natural environmental factors, making it decompose more rapidly in the environment compared to petroleum-based polymers. Bioplastics are extracted from renewable biomass resources, such as vegetable oils, corn starch, and certain microorganisms. Hence of that, bioplastics can work as an eco-friendly substitute for conventional plastics.

There are several types of bioplastics, one of which is polylactic acid (PLA), PLA is widely recognized as a biodegradable polyester derived from renewable resources. Recently, PLA had been studied thoroughly as a promising material to be utilized in the future due to its unique characteristics. The production of PLA derived from chemical processing of carbohydrate-rich sources, such as corn that are transformed into glucose, then after the fermentation process occurred, it transforms into lactic acid and subsequent polycondensation [1]. PLA has the properties of biocompatibility, minimal toxicity, and reliable reproducibility, making it applicable across diverse fields.

The application of PLA extends across diverse fields, one of its applications that is being studied extensively is its use of being biodegradable food packaging. Food packaging plays a crucial role in preserving the quality and safety of food products throughout storage process, transportation, and distribution to customers. It also works extend products shelf life by protecting food from external factors such as microorganisms, contamination, ultraviolet (UV), oxygen exposure, and moisture.

PLA has been characterized as a biodegradable polyester that offers good mechanical properties and thermal plasticity that suits the utilization of being a promising candidate for food packaging. However, depites of its advantages, PLA

exhibits inherent brittleness and relatively low impact resistance, which restricts its broader applications [2].

To overcome these limitations, natural additives such as plant-based extracts are often incorporated to reinforce the polymer matrix without cancelled out its environmentally friendly properties. One of the plant-based extracts that has promising eco-friendly characteristics is Bajakah Tampala (BT) (*Spatholobus littoralis Hassk*), a plant native to Kalimantan, Indonesia. Bajakah Tampala is well known for its antimicrobial activity and UV-protective properties. The extracts that obtained from its roots rich in phenolic compounds, such as flavonoids, phenols, saponins, tannins, and alkaloids that contribute to its antibacterial activity [3].

These properties of BT suggest that it has strong potential to enhance the functionality and value of PLA in food packaging applications, especially by improving its mechanical performance, providing UV protection, and producing antimicrobial activity into the film. In addition to that, the use of Bajakah Tampala, as an indigenous Indonesian plant, further increases the added value of the product by incorporating locally sourced natural materials.

This study is conducted to investigate the potential improvement in mechanical properties, especially from the tensile properties aspect, of eco-friendly bio-blended PLA films with addition of Bajakah Tampala root extract. The developed films are intended for food packaging applications, the tensile properties evaluation carried out according to standards set by the American Society for Testing and Materials (ASTM).

1.2 Problem Statement

Based on the information presented in Subchapter 1.1, the problem is to evaluate the effect of varying concentrations of Bajakah Tampala extract on the tensile strength of a PLA based bio-blended film.

1.3 Research Objective

The objective of this research is to evaluate the effect of varying concentrations of Bajakah Tampala extract on the tensile properties of PLA based bio-blended films.

1.4 Benefit

The advantages of this research are:

1. To explore the potential of bio-blended PLA film with additional Bajakah Tampala extract to be used as a viable biodegradable food packaging.
2. As a reference for an active film of PLA bio-blended film product.
3. To support future research on natural additives that can contribute to the improvement in mechanical performance of biopolymer films.

1.5 Research Scope

The research scopes of this study are as follows:

1. The testing that would be done on the sample is a tensile test.
2. The dimensions of the sample that would be tested by tensile testing is according to ASTM D638-14 Type V.
3. The Bajakah Tampala extract used in this research has been extracted manually from its raw form that has been done in the Biota Sumatera Laboratory, Andalas University.
4. The dichloromethane (DCM) used in this research was bought from Biota Sumatera Laboratory, Andalas University.

1.6 Report Outline

This study consists of five parts, chapter I is the Introduction, consists of topic selection background, research objective, benefit, research scope, and report outline. Chapter II is Literature Review, which explains various supporting theories related to the final project to be carried out, starting from preparing materials to making samples for testing. Chapter III is Methodology, which explains the research working process, starting from tools and materials preparation until getting samples that will be tested later. Chapter IV is the results and discussions, this chapter consists of the results of the tested sample and the discussion of the results. Chapter V is the conclusion of the tested sample and the suggestion for the next researchers.