CHAPTER I
INTRODUCTION

1.1 Background

The global consumption of plastic food packaging has been immense in recent years, with billions of tons produced annually. In 2015, global plastic production reached about 381 million tons, of which a significant portion was used for food packaging. More recently, estimates indicate that 40% of global plastic production is allocated to packaging, with food packaging comprising a large share of this category [1].

Plastic waste is a pressing issue in Indonesia, as it ranks among the top contributors to ocean plastic pollution. A 2022 study estimated that food packaging is a significant part of the plastic waste generated. For instance, in Jakarta alone, about three-fourths of the waste in rivers is plastic, a considerable amount related to food packaging [2].

Plastics produced on an industrial scale are typically nondegradable, making their continued use a significant environmental concern. These plastics can take decades or even centuries to decompose. Their chemical structure is resistant to alteration by microorganisms or chemical agents such as water, methane, or carbon dioxide. To address these issues, the development of degradable bioplastics is essential [3].

Recently, researchers have increasingly focused on developing bioplastics for food packaging as a more sustainable alternative to conventional synthetic plastics, contributing significantly to pollution. [4]. Starch is one of the most common biopolymer sources. Derived from crops like corn, potatoes, tapioca, and sweet potatoes, starch-based plastics are biodegradable and suitable for various packaging applications. Similar to other starches, sweet potato starch has unconvincing mechanical and barrier properties than commercial plastics and requires some modification [5].

Starch has a brittle structure due to its hydrophilic character. Various methods to enhance the properties of starch-based films include incorporating organic or

inorganic fillers into the starch matrix and adding functional compounds. These modifications improve the films' mechanical strength and barrier performance [6].

A study explored natural fiber-reinforced bioplastics and emphasized that tannin, which could also be found in Gambier wastewater, significantly improves tensile and flexural strength, depending on their concentration and compatibility with the polymer matrix [7].

West Sumatra Province produces the largest amount of Gambier in Indonesia and is the largest exporter of Gambier in the world, with more than 80% of the export volume [8]. When producing Gambier sap with the traditional process, a by-product of Gambier liquid waste is obtained. This waste has not been widely utilized despite still containing high tannin. Around 9-11% tannin is found in Gambier wastewater [9].

1.2 Problem Statement

Based on the explained background, the problem statement is that purple sweet potato starch-based bioplastic still has poor mechanical properties and high UV transmittance, hence, the addition of Gambier wastewater, which has tannin content, is expected to overcome this issue.

1.3 Research Objective

This research aims to obtain the effect of Gambir wastewater addition on the mechanical and anti-UV properties of purple sweet potato starch-based bioplastic.

1.4 Benefit

The intended benefit of this research is to obtain the composition of a purple sweet potato starch-based bioplastic with good mechanical properties and low UV transmittance by incorporating Gambir wastewater.

1.5 Research Scope

1. The testing that would be done on the sample is a tensile test and a UV transmittance test.
2. The dimension of the sample that would be tested by tensile testing is according to ASTM D638-14 Type 5
3. The dimension of the sample that would be tested by UV Transmittance testing as specified by ASTM D1003-00.

4. Purple sweet potato starch used in this research would be extracted manually from its raw form, bought from the local wet market in Siteba, Padang.
5. Gambir wastewater used in this research is produced by a local Gambir farmer in Payakumbuh.

1.6 Report Outline

This proposal will consist of three chapters in total:

1. Chapter I is the Introduction, which explains the background of the chosen topic, problem statement, research objective, benefit of the research, research scope, and the report outline.
2. Chapter II is the Literature Review, covering the base theory related to the planned final project, starting from the material preparation to obtain the samples for testing.
3. Chapter III is the Methodology that describes the procedures that would be done within the research for the final project, beginning from the equipment and material preparations, until the testing samples were achieved.