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CHE364 PROJECT

**BIOPLASTIC FROM RENEWABLE BASED MATERIALS:  
METHOD OF PROCESSING**

TECHNICAL REPORT (REVIEW)

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## **BIOPLASTIC FROM RENEWABLE BASED MATERIALS: METHOD OF PROCESSING**

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### **Abstract**

The new generation of bioplastics are from renewable source which are able to substantially minimize the environment problem in terms of both energy use and the greenhouse effect of a particular application. Bioplastic may be manufactured with various properties in a variety of materials. Bioplastic is a family substance that, whether it is biobased, biodegradable, or both, differs from traditional plastics. Bioplastic was mainly derived from plants rich in carbon-hydrogen such as maize or sugarcane, where it was called food crops or feedstock of the 1<sup>st</sup> generation. The production of bioplastic from 1<sup>st</sup> generation of feedstock are the best as it required the least amount of land to grow the plants along with producing higher yields. But due to some reasons, the bioplastic industry is also doing a research on the use of non-food crop (2<sup>nd</sup> and 3<sup>rd</sup> generation feedstock). For example, the cellulose and other waste material sugarcane bagasse, banana peel, or even tomato peel on the review of these materials' further use. Bioplastic and starch-based plastics are mostly used in special industrial applications these days, where degradability is needed. Most of the bioplastic are 100% biodegradable, recycle-free from hazardous chemical and toxic substance. Biodegradable plastic products use less energy for recycling, decreasing reliance on limited fossil resources that are primarily shipped to other countries and reducing greenhouse gas emissions as well. As the human population increased, the demand for plastic had also increased. In this research, bioplastic can be produced from renewable sources with different process methods and resulting different biodegradability.

**Keywords:** Bioplastics, various properties, renewable sources, process methods, biodegradability

# Table of Contents

1. BACKGROUND .....	4
1.1 Introduction .....	4
1.2 Problem Statement .....	4
1.3 Scope of Study .....	5
1.4 Objectives.....	5
2. LITERATURE REVIEW .....	5
2.1 Bioplastic from Palm Waste.....	5
2.2 Bioplastic from Microalgae.....	11
2.3 Bioplastic from Potato.....	18
2.4 Bioplastic from Corn Waste.....	22
3. CONCLUSION.....	27
4. REFERENCE.....	29

# **1. BACKGROUND**

## **1.1 Introduction**

Bioplastic can be produced in a range of materials with resulting a different property. Bioplastic is an encompasses of family material which differ from conventional plastics as they are biobased, biodegradable, or both. Bioplastic were mostly made of carbon hydrogen rich in plant such as corn or sugar can where by it was called as food crops or 1st generation feedstock. The production of bioplastic most efficient in the 1st generation feedstock as it required the least amount of land to grow the plants along with producing higher yields. But due to some reasons, the bioplastic industry is also doing a research on the use of non-food crop (2nd and 3rd generation feedstock) for example the cellulose and other waste material sugarcane bagasse, banana peel, or even tomato peel on the review of these materials' further use. These days, bioplastic and starch-based plastic are mostly used in special industrial application where the degradability is required. Most of the bioplastic are 100% biodegradable, recycle free from hazardous chemical and toxic substance. Biodegradable plastic materials used less energy to recycle where it reduces the dependency on limited fossil resources that mainly imported for other countries and also reduce the greenhouse gas emission.

The extensive use of plastic-based petroleum for over than a century has resulted a major cause towards the environment. The limited future availability of petroleum, with environment and waste managements has thus brought people's concern into more sustainable alternatives to replace petroleum-derived plastic. Synthesizing biopolymer using microbial fermentation is usually expensive with the usage of microbes, nutrient medium and substrates for carbon source. Hence, a new alternative of utilizing agrowaste to replace the original substrate has been discovered. Considering Malaysia with variety agriculture production such as pineapple, sugarcane and oil palm, wastes from these crops could be recycled to synthesize polyhydroxybutrate (PHB). Besides that, producing a biodegradable plastic is prior to control the abundant of plastics leftover that damaging the ecosystem and nature.

## **1.2 Problem Statement**

Nowadays plastics is used everywhere and everyday across the globe as it is an amazing material and invention that has change the world with its variation of uses. The uses of plastics vary from drinking cups to various parts of automobiles and motorbikes. They are imperative to the trade market as well as the packaging of materials all over the world but despite its various of uses, plastic has issues in regard its disposal that threatened the environment. Plastics has prolonged rate of degradation which

lead it to become one of the environmental concerns that is faced by the whole world. Over 1000 million tons of plastic were predisposed of as unwanted elements, and they might take several hundreds of years to decay. This led to rapid increase in the percentage of plastics in municipal solid waste. When plastics wastes accumulate in landfills, they will interact with water and form hazardous chemicals and the quality of drinking water might also affected. Therefore, bioplastics can be an alternative to reduce the synthetic plastics. Most of the bioplastic are biodegradable, recycle-free from hazardous chemical and toxic substance. The development of most bioplastic is assumed to reduce fossil fuel usage, plastic waste, as well as carbon dioxide emissions which is produce positive impact on the environment.

### **1.3 Scope of Study**

Bioplastics can be produced from different renewable sources with different method of processing. Thus, this review study was conducted to identify the method of processing that can be used in producing bioplastics from different renewable materials and also to observe the properties of the bioplastic produced which is in terms of its mechanical properties. Different renewable materials have different purposes and effect of properties. Therefore, this review study was focused on renewable materials such as palm waste, microalgae, potato waste and corn waste.

### **1.4 Objectives**

The objectives of this research are as below:

- i. To compare the method of processing from the different types of renewable materials.
- ii. To compare bioplastic from renewable materials using a suitable method.
- iii. To compare the mechanical properties of bioplastic production from renewable materials.

## **2. LITERATURE REVIEW**

### **2.1 Bioplastic from Palm Waste**

Malaysia is the world's second largest producer of palm oil and this industry produces more than 80 million tons of biomass per year. With the growth of the palm oil industry, there is indeed a significant increase in the amount of biomass residue produced. Compared to other forms of agricultural biomass,