(PLACEHOLDER1)

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PRODUCTION OF BIOPLASTIC USING GREEN ALGAE

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ABSTRACT

One of the most essential components of modern life has been plastic. The continued use of petroleum-based, non-biodegradable plastics has accelerated the depletion of fossil resources and caused environmental impact on a worldwide scale. A viable remedy to these new problems is bioplastic, which has qualities that are strikingly comparable to those of petroleum-based polymers. Although algae and cyanobacteria are viable alternatives for the manufacturing of bio-plastic, there have been few research on strain selection and the improvement of growth conditions. Under stress, algae and cynobacteria naturally collect more metabolites, however a recent study on Synechocystis sp. genetic engineering combined with abiotic challenges found up to 81% of rise in PHB level in the transformed lines. This chapter summarises a number of research that have been conducted on algal bio-plastics, covering bioplastic characteristics, genetic engineering, the existing regulatory environment, and bioplastic's potential in the future. Furthermore, the industrial uses of bioplastics as well as their potential and function in the green economy are also covered.

TABLE OF CONTENTS

CHAPTER ONE
BACKGROUND

1.1 Introduction

A sizable group of morphologically varied photosynthetic eukaryotes that live in almost every photic environment on the earth are the green algae. Green algae have a variety of extracellular structures, including cell walls. New and important information about these coverings has recently been disclosed thanks to an upsurge in research on green algal cell walls that was supported by developing technology. For instance, the cell walls of the late diverging species of the Charophycean green algae contain assemblages of polymers that are very similar to the cellulose, pectins, hemicelluloses, arabinogalactan proteins (AGPs), extensin, and lignin found in the walls of embryophyte. Ulvophycean seaweeds have cell wall components whose most abundant fibrillar constituents may change from cellulose to β-mannans to β-xylans and during different life cycle phases. Likewise, these algae produce complex sulfated polysaccharides, AGPs, and extensin. Chlorophycean green algae produce a wide array of walls ranging from cellulose-pectin complexes to ones made of hydroxyproline-rich glycoproteins. Larger and more detailed surveys of the green algal taxa including incorporation of emerging genomic and transcriptomic data are required in order to more fully resolve evolutionary trends within the green algae and in relationship with higher plants as well as potential applications of wall components in the food and pharmaceutical industries (Domozych, D. S., Ciancia, M., Fangel, J. U., Mikkelsen, M. D., Ulvskov, P., & Willats, W. G. T. (2012).

Over 330 million tonnes of plastic are manufactured globally each year. The packaging (40%), construction (20%), and automotive (8%) sectors, as well as the production of home appliances, are the primary users of plastics. Since the great majority of industrial plastics are not biodegradable, the growth in solid waste leads to environmental issues. To solve this environmental issue, research has been done to generate biodegradable materials like bioplastics. Materials that are bio-based, biodegradable, or both are referred to as bioplastics. These materials have exceptional biodegradability and may be utilised to solve environmental issues. As a result, this article provides a general overview of the introduction of bioplastic materials and classifications as well as a thorough analysis of their disadvantages and key research areas, such as basic and applied research as well as recent advancements in biopolymer mixtures and biocomposites. This article also sheds light on how bioplastics research has evolved to fulfil the demands of many businesses, particularly Malaysia's packaging sector. Additionally, this review article gives broad attention to bioplastic packaging usage in industries including food and beverage, healthcare, cosmetics, and so on. (

1.2 Literature Review

1.2.1 Green Algae

The green alga's cytokinesis The Zygnemataceae plant species Spirogyra is distinguished by centripetal development of a septum that presses against a persistent, (Fowke, L. C., and J. D. Pickett-Heaps. 1969. J. Phycol. 5:273-281) A phragmoplast-like structure is produced by the centrifugally growing telophase spindle, which may have phylogenetic significance. The process of cytokinesis was examined, with a focus on the cytoskeletal remodelling and concurrent redistribution of organelles, using a combination of fluorescent tagging of the cytoskeleton in situ and video-enhanced differential interference contrast imaging of live cells.

The thallophyta species known as algae have a lot of promise. In Indonesia, Spirogyra peipingensis algae is one of the most often encountered algae. The ability of this algae to degrade both organic and inorganic substances exists. according to the Bahri According to a 2017 research, Spirogyra pepingensis algae have mechanisms like activated carbon that allow them to considerably reduce toxicity by absorbing heavy metals (Gupta & Rastogi, 2008) and decreasing textile waste (Zer, et al., 2006). Roychordhury has already used algae as a gold metal bioreductor in the past (2016). Anabaena sphaerica, a type of prokaryotic algae (Cyanobacteria), and Chlorococcum infusionum, a type of eukaryotic green algae, were the two types of algae employed. According to Roychordhury et al. (2016), the arrangement of carotenoids, polysaccharides, proteins, and pigments in chloroplasts and thylakoids in algae plays a significant role as reducing agents in the creation of nanoparticle metals. In Spirogyra algae, you may also find proteins, chloroplast pigments, polysaccharides, and