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Editors

Asmadi Mohammed Ghazali
Abd Latif Abdul Rahman



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DEVELOPMENT OF BIODEGRADABLE PLASTIC USING *CAULERPA LENTILLIFERA*'S EXTRACT FOR A SUSTAINABLE ENVIRONMENT

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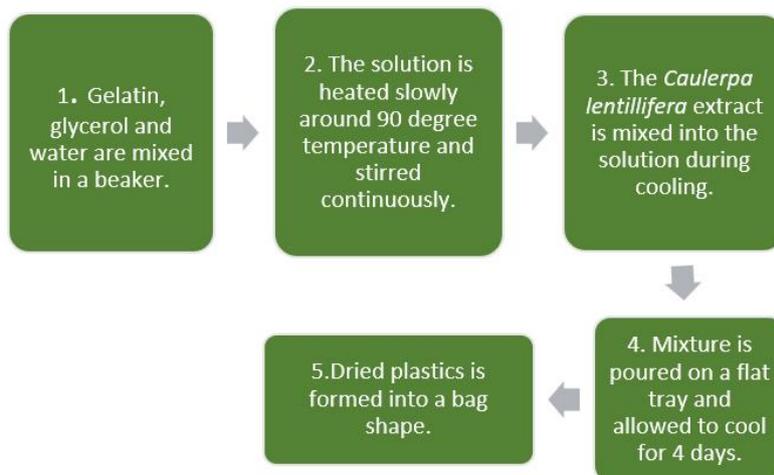
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Abstract

Due to the rise in the use of products made of plastic, the demand for plastic has increased, placing additional strain on the waste management system. There is much interest in reducing the usage of plastics made from petroleum, which pollute the environment on a large scale. One of the solutions to tackle the issues is to replace conventional plastics obtained from the petrochemical process with biodegradable plastic derived from natural resources such as raw agricultural waste, aquatic life, and even microbes. All these efforts aim to meet the global bioplastics and biopolymer goals. This study emphasizes one aquatic life, most notably known as sea grape or *Caulerpa lentillifera*, in stemming its potential to create a biodegradable plastic. Sea algae have a high nutritional value and are a vital source of dietary fibre, minerals, proteins, vitamins, and eicosatetraenoic acid (EPA). It also noted that *Caulerpa lentillifera* contains antibacterial properties, and it is found abundant on the east coast of Sabah and Malacca Strait and has economic importance in Malaysia. The innovation project aims to produce biodegradable plastic using *Caulerpa lentillifera*. This innovative product is expected to have high potential commercialization and benefit society. Awareness of using biodegradable plastic has increased recently because it has excellent biodegradable properties. In addition, it is easy to stretch, and its use can reduce the carbon footprint. Biodegradable plastic does not release carbon dioxide gas and indirectly reduces the greenhouse effect. Moreover, it does not generate much toxic emission and can biodegrade into a harmless natural component that mixes with the soil. Further, biodegradable packaging has been used in agriculture, consumer goods, medical equipment, and automotive. Furthermore, this innovative idea is consistent with the Sustainable Development Goals established by the United Nations SDG 14: "Life below water".

Product Description

Biodegradable plastics are currently being explored intensively as a replacement for conventional plastics due to their outstanding biodegradability and biocompatibility, considering the depletion of petroleum resources and environmental impacts caused by traditional plastics. In the meantime, the recent advancement of biodegradable plastics has sparked a desire to manufacture plastic that incorporates natural resources, including those from plants, marine life, and even microbes, as a race to meet global bioplastics and biopolymer goals. One of the most discussed topics in the field is the incorporation of marine algae in the production of new biodegradable plastics. However, only a few studies have been done on marine algae named *Caulerpa lentillifera*. In 2019 medical studies, *Caulerpa lentillifera* contains anti-microbial properties and is effective against gram-negative bacteria. Thus, using *Caulerpa lentillifera* to create biodegradable plastics might fend off dangerous bacteria and prevent the spreading of infections.



Novelty and Uniqueness

Caulerpa lentillifera is an excellent source of cellulose. One of its key benefits is the enhancement of the qualities of various bioplastics, such as those based on starch and hemicellulose, with the addition of cellulose. Given its susceptibility to physicochemical influences, cellulose is a polymer that interacts readily with water and bacteria and is readily broken down. However, *Caulerpa lentillifera* contains anti-bacterial properties that might hinder the imminent biodegradation of cellulose. As such, it might have proven a good criterion for long-lasting biodegradable plastic.

Benefit to Mankind

Awareness of using biodegradable plastic has increased recently because it has excellent biodegradable properties. In addition, it is easy to stretch, and its use can reduce the carbon footprint. Biodegradable plastic does not release carbon dioxide gas and indirectly reduces the greenhouse effect. Moreover, it does not generate much toxic emission and can biodegrade into a harmless natural component that mixes with the soil. Further, biodegradable packaging has been used in agriculture, consumer goods, medical equipment, and automotive.

Potential Commercialization

It has been noted that the sales of petroleum, chemical, rubber, and plastics products in Malaysia increased to 24.4% in August 2022 (from July 2022, 23.8%) with RM157.4 billion, ultimately showing proof that the plastic production in the country is one of the driven forces of the economy. The market is growing because of ongoing research and development efforts, rising environmental consciousness, and the implementation of strict environmental legislation. There are many different business applications for biodegradable plastics. The biodegradable market is driven by packaging and disposable household items. For biodegradable polymers, foam packaging still holds a substantial market share. Foam packaging is followed in terms of volume by compostable bags and single-use carrier plastic bags.

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