TITLE:

PRODUCTION OF PLASTIC BY GREEN ALGAE

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2023

ABSTRACT

An enormous amount of plastic garbage is polluting the environment, especially the marine environment, as a result of the rising global demand for plastic materials. Since microplastics can infiltrate the food chain and have a number of negative effects on health, this important issue has an influence on both humans and marine life. It appears that landfill, incineration, chemical treatment, and plastic recycling are not the best options for minimising plastic pollution. In order to address the rising global plastic waste, this paper provides two newly discovered environmentally acceptable solutions: plastic biodegradation and bioplastic synthesis utilising algae. Utilizing the plastic polymers as carbon sources, algae, and microalgae in particular, can break down the plastic molecules using their own toxin systems or enzymes. In this research, the use of algae for plastic biodegradation has been rigorously examined to show the mechanism and the impact of microplastics on the algae. This research offers details pertaining to the creation of plastic from green algae. The purpose of this study was to create plastic using green algae. The majority of the green algae's composition, or between 50 and 70 percent, is made up of polymer proteins and carbohydrates. By altering or making structural changes to the polymer structure of the algae—a process known as protein denaturation—algae can be made into plastic. In a process known as protein denaturation, chemical agents such as sodium dodecyl sulphate (SDS), sodium sulphite, and urea were utilised to unravel the intricate structure of an algal protein polymer. Cutting, mixing, and drying were the steps that went into making this plastic from green algae. The ingredients, such as starch, glycerol, and plasticizer, were added during compounding. The plastic was created by drying the plastic in an oven at various temperatures between 110°C and 80°C. According to the results, the formulation of the sample with the addition of starch exhibits the highest performance, which practically has a plastic property. As a result, a lot of work must be done to achieve better results in order to make plastic with the best characteristics.

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CHAPTER ONE
BACKGROUND

1.1 Introduction

Plastics that disintegrate naturally in anaerobic landfills and aerobic composting are considered biodegradable. They could be made of petroleum-based plastic with an additive or bioplastics, which are plastics whose components come from renewable basic materials. According to Fukuda (1992), biodegradable plastic is a type of polymer that transforms into compounds with a lower molecular weight through metabolism when it comes into contact with living things. The development of biodegradable and renewable source plastic polymers is a growing area of study. There have been studies on the development of biodegradable plastic, particularly from plant-based materials such starch-rich corn, potatoes, activated sludge from wastewater treatment, chickpea, and others.

The process of making plastic from sea algae will be investigated in this study. Since protein makes up between 50 and 70 percent of an algae's entire composition, there is a strong likelihood that it may be processed into plastic. Algae have gained recognition as a fresh source that has been used in numerous different applications and sectors. In order to produce such a diverse spectrum of fuel and non-fuel products, many additional applications are being found from the same algae feedstock. Research on algae also offers an eco-friendly remedy for a significant worldwide problem like greenhouse gas emissions. In attempt to find another alternative fuel to petroleum, previous research has focused on its potential to be a significant source of biofuels. The chemical makeup of algae reveals that they contain a significant quantity of protein polymer, which can be altered into a plastic shape through chemical protein denaturation. Since proteins are made up of various amino acids, the quantity, amount, and availability of a protein's amino acids largely determines its nutritional quality (Becker, 2004). Numerous studies of the overall chemical make-up of various algae have been reported in the literature.

1.2 Literature Review

In order to fill the gap left by petroleum sources in a few years, biodiesel is being produced as a renewable resource thanks to recent research and interest in utilising algae. In addition to producing biodiesel, algae also offer a wide range of possible uses and applications. However, there hasn't been much research done on using algae as a new source for making plastic; this field of study is only now beginning to develop. The development of biodegradable plastic from various raw materials, including maize starch, potato starch, chickpeas, and others, has been the subject of numerous studies in the interim. Additionally, numerous studies on the chemical makeup of various types of algae have been conducted and published in the literature. These findings could be useful in understanding how to make biodegradable plastic from algae.

1.2.1 BIODEGRADABLE

There has been interest in creating biodegradable plastic from vegetable materials, which are often made from chickpea, potato, corn, and other starches, for a number of years. These biodegradable plastics frequently have additional components that improve flexibility, chemical crosslinking, or polymerization. In particular, the packaging industry has seen an upsurge in demand for biodegradable plastic products. Arvanitoyannis (1999) claims that the ongoing expansion of environmental contamination has recently increased the need for novel biodegradable polymers, particularly for uses related to food packaging and agriculture. Many substances, including starch film, blood meal, and others, have been suggested as biodegradable alternatives. However, because to their relatively quick breakdown in wet environments and their innately low breaking strength, these primarily starch-based polymers are frequently not suitable for many applications of solid packing foam (Tarrant et al, 1994).

The use of additives, such as chemical agents for protein denaturation, plasticizers, antioxidants, heat stabilisers, water repellents, impact modifiers, lubricants, fillers, viscosity modifiers, and combinations of these, can also be included in the production of algal plastic. Algae have been found to be excellent candidates for use as raw materials for moulded foams and other plastics because their cell walls naturally contain polysaccharides like cellulose, which serve as structural support. The foams made of algae might be flexible, semi-rigid, or hard (Tarrant et al, 1994).