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THE IMPACT OF BIOPLASTICS ON THE ENVIRONMENT

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Abstract
This article discusses the importance of bioplastics, their environmental impact and ecological benefits. Bioplastics are considered an alternative to traditional plastics because they are derived from renewable resources and are biodegradable. The study analyzed the types of bioplastics, their benefits and some limitations. The results show that the use of bioplastics reduces the problem of waste and reduces the carbon footprint. At the same time, their widespread implementation depends on reducing production costs and developing recycling infrastructure.

Keywords: Bioplastic, ecology, biodegradation, waste, renewable resources, polylactide (PLA), sustainable development.

Introduction

Bioplastics are materials made from renewable raw materials (such as corn starch, sugarcane, gluten or cellulose). Their main advantage is that they can partially or completely replace traditional petroleum-based plastics, thereby reducing environmental problems. With annual global plastic production exceeding 400 million tons, the share of bioplastics is expected to reach 2.2 million tons in 2024. Although this figure is small, bioplastics are becoming increasingly important for sustainable development and waste reduction. They are increasingly used in the packaging industry, food storage, medical devices and agriculture. Unlike traditional plastics, bioplastics are obtained from renewable sources and are often biodegradable. This significantly reduces their environmental impact. For example, while petroleum-based plastics can persist in nature for hundreds of years, bioplastics can decompose in a few months or years, depending on the conditions. According to statistics, the

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amount of plastic waste produced in the world annually is 350-400 million tons, of which more than 10 million tons end up directly in the oceans. As a result, more than 1 million seabirds and 100 thousand aquatic animals die every year due to plastic waste. Bioplastics help reduce this problem, as they disappear faster in both water and soil. In addition, carbon dioxide (CO_2) emissions during the production of bioplastics are significantly reduced. For example, the production of 1 ton of PLA (polylactic acid) releases up to 60% less greenhouse gases than traditional plastic. According to reports from the International Energy Agency (IEA), if the share of bioplastics reaches 10% by 2030, annual CO_2 emissions could be reduced by 30-40 million tons. Therefore, bioplastics not only reduce waste, but also have a positive impact on slowing climate change. Bioplastics have a number of important advantages over traditional plastic materials and are becoming increasingly relevant due to their wide range of applications and environmental advantages:

Renewable sources – bioplastics are made from natural resources such as corn, sugarcane, starch, cellulose. This reduces dependence on oil and gas. Biodegradability – under certain conditions, bioplastics decompose within months or years and do not remain in soil and water for a long time. This significantly reduces the amount of waste. Reduction of greenhouse gas emissions – CO_2 emissions during the production process are 50–60% less than those of traditional plastics. Therefore, bioplastics help slow down global climate change. Environmental safety – when used in food packaging and medicine, they do not harm human health, as they have a non-toxic composition. Wide application potential – in addition to the packaging industry, bioplastics are also effectively used in medicine (disposable syringes, capsules), agriculture (degradable films, seed capsules), electronics and automotive industries. Although bioplastics are environmentally preferable, they have some disadvantages. First of all, the production cost is higher than that of traditional plastics, which limits their widespread use. Raw material sources rely mainly on agricultural products (corn, sugarcane), which can put some pressure on food security. In addition, not all bioplastics decompose quickly under natural conditions, some require special industrial composting conditions. Their mechanical properties are also often lower than those of traditional plastics, with limitations in strength and long-term durability. Therefore, economic and technological development is required for the effective use of bioplastics on a global scale.

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Conclusion

Bioplastics are considered an important innovative solution to modern environmental problems. Since they are obtained from renewable raw materials and are biodegradable, they reduce waste and significantly reduce the negative impact of traditional plastics. At the same time, greenhouse gas emissions are reduced during the production process, which is of great importance in the fight against climate change. Their widespread use in packaging, medicine and agriculture further increases the scientific and practical importance of bioplastics. Thus, bioplastics are a promising material that is of urgent importance in ensuring sustainable development and environmental safety.

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