



# Bioplastic: The Future of Eco-friendly Packaging Materials

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## *Abstract*

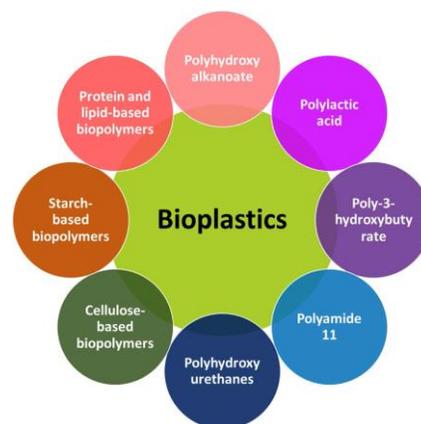
Plastics play a major role in several industrial applications owing to their properties such as elasticity, cheap availability, durability, convenience in packaging and various other features. Its usage has posed severe irreversible threats to the environment and its species owing to its non-biodegradable nature. Bioplastics are one of the most innovative and new packaging materials that are biobased and biodegradable which is made from waste, biomass, fruits and vegetables industrial waste like peel. The ideology of producing bioplastics from agro-based wastes proves to be an innovative solution to the aforementioned issue.

## **Introduction**

Environmental pollution is one of the serious problems faced on humanity and other life forms on our planet today. Environmental pollution is a global problem and is common to both developed and developing countries. In the new era of world, dependency on petroleum-based polymers has extensively increased over the years. Synthetic polymers like polypropylene, polyethylene, nylon, polyester, and epoxy are derived from petroleum hydrocarbons. Synthetic plastics are non-biodegradable. Since they remain in the environment for long, they cause landfill deposition problems, toxicity, deposition in water bodies thereby increasing the BOD, disturbing the carbon chain, and adversely affecting biodiversity. Plastics continue to play a defining role in finding innovative and forward-looking solutions to the way we live. Plastics are everywhere, in our housing, clothing, automobiles, packaging, electronics, aircrafts, cars, autos etc. Hence, there is a consistent need to change the current lifestyle and industrialization to a sustainable way by preventing excessive plastic usage.

## **What is Bioplastics?**

Bio-plastics from renewable origin are a new generation of plastics which are able to significantly reduce the environmental impact in terms of energy consumption and greenhouse effect in specific applications. Initially, bioplastics were mostly made of carbon hydrogen rich plants, such as corn or sugar cane, so called food crops or 1<sup>st</sup> generation feedstock. But due some justified reasons, the bioplastics industry is of course also researching the use of non-food crops (2<sup>nd</sup> and 3<sup>rd</sup> generation feedstock), such as cellulose, and some waste material sugarcane bagasse or banana peels or potato peels, with a view to its further use (Fig.1). The major difference between conventional plastics and bioplastics is given in Table 1



**Fig. 1: Commonly used bioplastic polymers**

**Table 1: Difference between conventional plastics and bioplastics**

Conventional plastics	Bioplastics
Commonly produced from fossil fuels and petrochemicals	Produced from natural resources
Finite resources.	Renewable resources
Almost all plastics are non-biodegradable	Most of the bioplastics are biodegradable
Takes centuries to disintegrate into smaller particles	Takes 3–6 months for complete biodegradation under controlled microbial composting conditions after the end-of-life use
Causes environmental pollution	Environmentally friendly
Used to manufacture packaging materials, grocery bags, shoes, bottles, construction, textiles, electronic materials, electrical cable, food packaging, etc	Used to manufacture biodegradable food packaging, compostable cutlery and coffee pods, bio composite automobile interior parts, edible films, carpets, bags, disposable biomedical tools, bottles, etc
Emits high amount of greenhouse gases	Emits fewer greenhouse gases.
Examples: High-density polyethylene, low-density polyethylene, polyethylene terephthalate, polyvinyl chloride, polystyrene and polypropylene	Examples: Polyhydroxyalkanoate, polylactic acid, poly-3-hydroxybutyrate, polyamide 11, polyhydroxyurethanes as well as cellulose-based, starch-based, protein and lipid-based biopolymers



### Benefits of Bio-plastics

Bio-plastics are 100% biodegradable, compostable or recyclable free from hazardous chemical and toxic substances. Biodegradable plastic materials take less energy to recycle; it reduces the dependency on limited fossil resources mainly imported from other countries and reduces greenhouse gas emissions. Bioplastics has the potential to reduce the petroleum consumption for plastic by 15 to 20% by 2025.

### Applications of Bio-plastics

- It can be used in manufacturing of shopping bags.
- Utensils can also be made.
- It's been used in Automobile industry in manufacturing of auto parts.
- It's also used in non-disposable applications including mobile casings, carpet fibers, car interiors, fuel lines and plastic piping.
- It's used to obtain disposable crockery and cutlery.

### Conclusions

Conventional synthetic polymers are considered hard-to recycle due to their highly heterogeneous nature, which creates environmental pollution. On the contrary, bioplastics are a feasible solution to reduce the reliance on conventional petrochemical-based synthetic plastics. Moreover, bioplastics are biocompatible, biodegradable and exhibit mechanical properties equivalent or superior to petrochemical-based plastics.

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