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Biodegradable plastics: ecofriendly plastics

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Abstract:

The inappropriate disposal of plastic waste represents a serious environmental issue that is today receiving increased attention. Incorrectly discharged plastic items tend to accumulate in nature, leaving behind an undesirable visual footprint and a potential risk to wildlife. In an attempt to provide solutions (bio) degradable plastics have seen the light. Biodegradable (PE) plastic bags own almost the same qualities as ordinary plastic bags. Biodegradable plastic bags differ mainly through its composability (biological reduction). The underlying technology is based on special additives which, if incorporated into standard PE resins, are purported to accelerate the degradation of the film products. Degradable PE films can help lessen the problem of plastic wastes. By using degradable plastics, farmers can protect their horticultural crops from harsh elements like too much sun, wind, rain, and diseases, without significant negative effect on yield, quality, and heavy metal content of these crops as well as on soil properties.

Keywords: Biodegradable Plastics, Types, Hazards, PHA

Introduction

Our whole world seems to be wrapped in plastic. Plastics have become an important part of modern life and are used in different sectors of applications like packaging, building materials, consumer products, surgical devices, pharmaceuticals and much more. Each year about 100 million tons of plastics are produced worldwide. Currently the per capital consumption of plastics in India is only about 3 kg compared to 30-40 kg in the developed countries. For us the day starts with brushing with nylon brush and ends with relaxing in nylon mosquito net. As synthetic polymers, their structure can be chemically manipulated to have a wide range of strength and shape. Plastics also have a high chemical resistance and are quite durable. So, the use of plastics is reached to such an extent that some of the applications are not possible without them. Life will not be safer without plastic disposable syringes, blood bags etc. Hence, it is not possible to totally dispense away the plastics. Plastic packaging provides excellent protection for the product. It is cheap to manufacture and seems to last forever. Lasting forever however is proving to be a major environmental problem. Another problem is that traditional plastics are manufactured from non-renewable resources – Oil, coal and natural gas.

Hazards of Plastics

1. The presence of plastics particularly thin film carry bags in domestic waste hinders the growth of seeds and percolation of rain water into the soil.
2. One of the biggest challenges with plastic waste is its disposal. It persists in the environment for more than 1000 years. Existing trends to dispose non-degradable plastics are incineration, recycling and landfill. Incineration is expensive and is a dangerous procedure because harmful chemical like hydrochloric acid, hydrogen cyanide and other greenhouse gases are released thus causing harmful diseases and global warming. Recycling also is a difficult procedure, because it is difficult in sorting the wide variety of plastic. The safest and least expensive method is the use of landfills. However, landfills are rapidly reaching their maximum capacity while the amount of plastic through away is rising.
3. The discarded plastic materials are found everywhere in thickly populated cities. The accumulated plastic block the drains and cause stagnation of sewage and rain water which results in mixing of sewerage with drinking water.

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- Poly bags cause animal death. Animal foraging dustbins eat poly bags and die as they block their intestine. Due to pollution caused by clumping plastic bags by rubbish, marine animals are strangled to swain.
- Use of poly bags cause food hazards. Chemicals used to manufacture poly bags leach out into food products stored in them and they reach our system.
- Poly bags when heated release carcinogenic gas vapors which are easily absorbed by food substance. This leads to dreadful diseases like cancer.

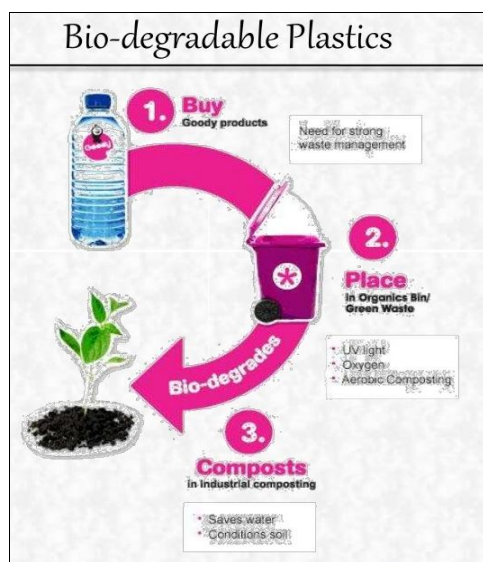
To overcome the problems due to these plastics i.e. to conserve non-renewable resources like petroleum, natural gas and coal, to maintain ecological balance and to reduce pollution we have to develop eco-friendly biodegradable plastic that are made from renewable resources such as plants.

The term biodegradable means that a substance is able to break down into simpler substances by the activity of living organisms (microbes) and therefore is unlikely to persist in the environment. The traditional plastic is not biodegradable because their long, polymer molecules are too long and too tightly bonded together to be broken apart and as simulated by decomposer organisms. However, the plastics based on natural plant polymers derived from wheat or corn starch have molecules that are readily attacked and broken down by microbes. Here is a list of materials and time they take to decompose.

- Skin of banana – 3 to 4 weeks,
- Paper bag – 1 month,
- cloth bag – 5 months,
- Wood – 10-15 years,
- aluminum can – 200-500 years,
- Plastic bag – 1000 years.

Though the demand for biodegradable plastics is increasing, acceptance of biodegradable polymer is likely to depend on factors like.

- Customer response to cost,
- Possible legislation by government,
- The achievement of total biodegradability.

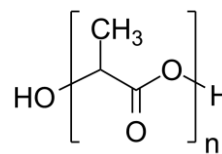


Plastic can be produced from starch

The bio-plastics can be made from abundant agricultural/animal resources like cellulose, starch, collagen, casein, soy protein etc.

Starch is a natural polymer. Cereal plants and tubers normally contain starch in large proportions. Starch is harvested from corn, wheat or potatoes, and then microorganisms transform it into lactic acid, a monomer. Finally the lactic acid is chemically treated to cause molecules of lactic acid to link up into long chains of polymers, which bind together to form a

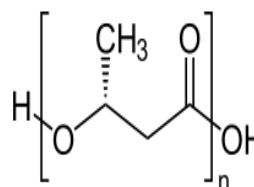
plastic called Poly Lactide (PLA). In these plastics are reinforced with plant fibers such as sponge gourd fiber, jute or fiber from Musa stem, which are locally available; it gives mechanical strength to the plastics.



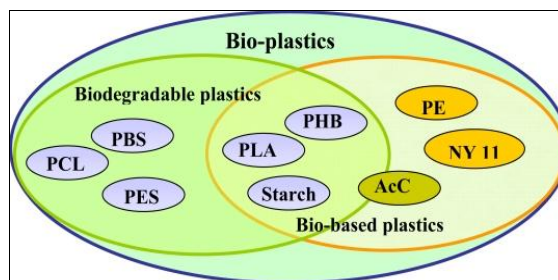
Poly (D, L-lactide)

Plastics can also be produced by bacteria

Polyesters of Hydroxy Alkanoates (PHA) are biodegradable plastics synthesized by microorganisms. These are reconsidered as a strong alternative for petrochemical plastics, due to their material properties similar to synthetic plastics. Immediate application areas identified in India for biodegradable plastics are agricultural mulch, industrial packaging, wrapping, milk sachets, food service, shopping bags, pharmaceuticals, medical devices, plant pots etc.



Poly-Hydroxy Alkanoate (PHA)



Advantages of bio-plastics

Mulch film from biodegradable plastics: Mulch films are laid down over the ground around crops to control weed growth and retain moisture. This can simply be ploughed into the ground after harvest. It is easier, cheaper, and it enriches the soil with carbon.

Pots for Plants: Gardeners and farmers can place potted plants directly into the ground and forget them. The pots will break down to carbon dioxide and water.

Technologies for avoiding contamination & sorting biodegradable plastics in India & overseas

The risk of contamination by biodegradable plastics of conventional plastics which are currently recycled and reprocessed is a significant one, and the resultant effects on recycled plastics has the potential to undermine the growing confidence in recycled plastics. Effective methods for sorting biodegradable plastics would be needed in the event of their significant entry into the Indian market. Possible methods include near infra-red detection, which can be used in a positive sort system, or the use of a specific polymer code, and even colour, to differentiate biodegradable polymers from other recyclable polymers. There are two main ways that

consumers can use to distinguish biodegradable plastic products from conventional plastic products.

Firstly, by touch, Biodegradable plastics have a softer feeling and are silkier than conventional plastics.

Secondly, it is very likely that a product without a quality label is not made of biodegradable plastic. Consumers should look for the presence of labels such as EN 134322, 'ok compost' or similar. A product indicating a biodegradable plastic label is represented as below:-



Conclusion

To overcome the hazards of conventional plastics it is necessary for us to go for bio-plastics. However, these bio-plastics are inferior in application wise as some are less heat resistant and another aspect is because of their biodegradable nature, they are not applicable for use in long term applications where they will degrade. Bio-plastics are inferior to non-degradable plastics in holding precision for components. Hence, concentration should be laid to rectify the problem associated with bio-plastics. It is every one's responsibility to make environment clean, so minimize the use of conventional plastics and provide better and safer surroundings to future generation.

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