

# AN ECOFRIENDLY ALTERNATIVE FOR PLASTIC

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**Abstract:** Bioplastic are plastics which are derived from renewable sources such as corn starch, potato starch, sugarcane, banana, plant cello use etc. These polymers can be degraded by microorganisms or even in hot water at certain temperature or can naturally be degraded in soil. Use of bioplastic will certainly reduce the use of fossil fuels and its dependence for our society. Bioplastic has some remarkable properties. These papers focuses on bioplastic made of potato starch their composition, preparation, properties advantages, disadvantages.

**Index Terms - Bioplastic, Potato Starch**

## 1. INTRODUCTION:

We use plastic on daily basis, in our kitchens, bedrooms, food packing, and wallets. It has become impossible to imagine our life without plastic. Since 1950, production of plastic has increased from 2 million tonnes to 380 million tonnes in 2015. Its durability, convince has this made man material important in humans life. In last 70 years about 8.3 billion tonnes of plastic has been produced. The production of disposable plastics or one time use plastic have been more. About 50% of plastic produce are one time use products such as plastic bags, food packaging items, straws, spoons, forks. Around 1 million of plastic drinking bottles are purchased every minute. Around 5 trillion disposable plastic bags are use every year.

### 1.1 Bioplastic:

Use of conventional plastic and increase in demand of fossil fuels and their harmful effects on environments has lead us to find out new alternatives and one of them is bioplastic which are made of potato starch. These bioplastic is made of food items materials consisting of vinegar, glycerine, potato starch etc. Bioplastic are more eco-friendly considered to traditional plastic which emits less greenhouse gases like carbon dioxide which is main reason for pollution leading to environmental problems.

### 1.2 Composition of Bioplastic:

Bioplastic is made of using starch based material which include potato starch, vinegar, glycerine etc.

### 1.3 Preparation of Bioplastic:

- a) Take 10gm of potato starch powder.
- b) Add 60 ml of tap water in potato starch powder.
- c) Add 5ml of vinegar and glycerine respectively.
- d) Then allow the above mixture to heat on burner until it thickens
- e) Keep the bioplastic in oven at 65°C for 1 to 2 hrs. until all the moisture gets removed.



**Fig no.2: bioplastic without glycerine**



**Fig no.2: bioplastic with glycerine**

## II. BIOPOLYMER FROM ORGANISMS:

The dried starch powder is bundle of polymers. The water is added to loosen the bundles. Some polymers have branches to the polymers which makes it difficult to form plastic which is useable. Hence vinegar is added to the polymer to loosen the branches for making linear polymer called amylose. If plastic is just made up of linear polymer (amylose) it would give a hard and rigid polymer. So glycerine is added to make plastic more flexible.

### 2.1 Why Potato Starch?

The main reason of using potato starch is use because it is biodegradable i.e. natural organisms (like bacteria) are capable of breaking the material down into smaller parts.

### 2.2 Degradation of Starch:

We take starch polymer and break it down into its monomer into simple sugars (glucose). Sugar are vital energy source for all living organisms. Many life organisms including humans and bacteria have enzymes that break starch into simple sugars.

### 2.3 How Degradation Takes Place:

The starch polymer is made up of simple sugar called glucose. An enzyme called amylase helps sugar separating each other by fitting between two monomers. A water molecule absorbs in order to break bond between two monomers in process called hydrolysis.

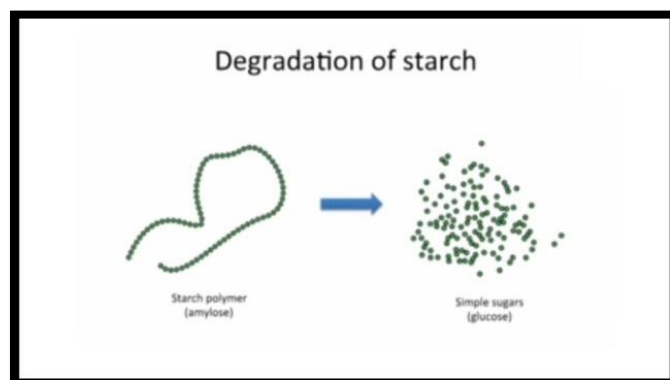


Fig no.3: breaking up starch polymer into simple sugars (glucose)

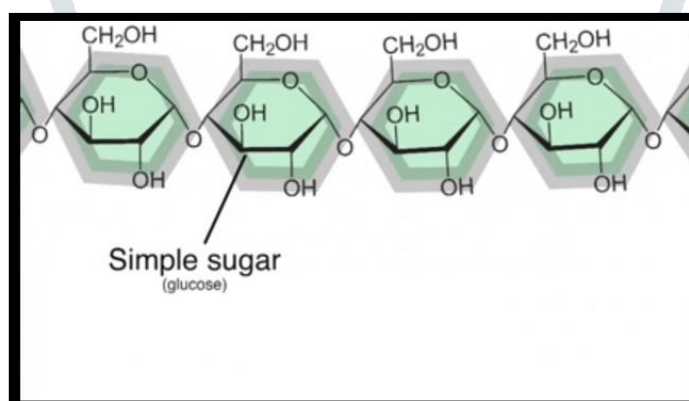


Fig no.4: the monomer made up of simple sugars

### III. ADVANTAGES

Bioplastic has number of advantages upon traditional plastic. The carbon footprint gets reduces on a large scale. A large amount of energy is saved at the time of production. Non-renewable sources are not consumed. Use of bioplastic also reduces use of non-biodegradable waste, which is harmful and pollutes the environment. The bioplastic doesn't contain damaging additives like phthalates or bisphenol-A which are harmful for health.

In addition, urban waste represents a source of carbon that makes it a sustainable raw material for the development of biotechnological production processes. Almost 60% of the material the waste is organic in nature.

### IV. TEST ON BIOPLASTIC

#### 1. DEGRADATION TEST:

For biodegradation of bioplastic has been mixed into the soil layers. After one week the potato made plastic has partially decompose where its size has decreased and has numerous pores.



Fig no.5: bioplastic before degradation process

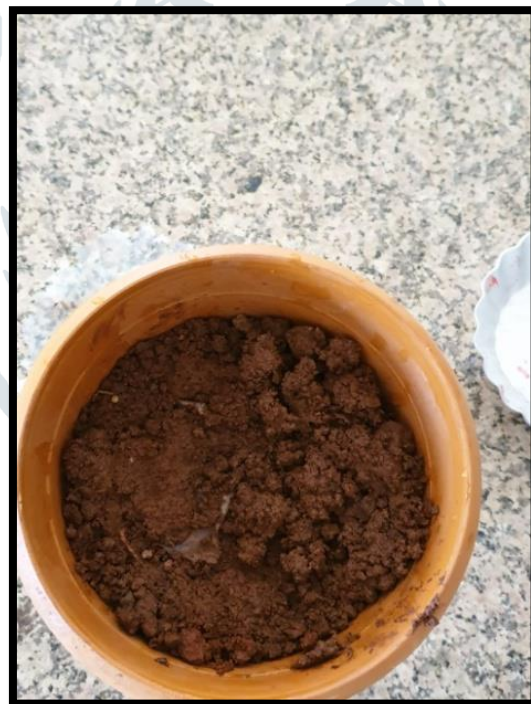


Fig no.6: bioplastic after one week is decompose with small pores

## 2. HEAT RESISTANCE TEST:

A beaker is filled with water and its temperature is increased to 10°C. Sample is put into vessel for 10 min. After every 10 min sample is observed and slowly temperature is increased by 10°C after every 10 min till the plastic decomposes. The plastic got decompose at 60°C.



Fig no.7: bioplastic in hot water at 60°C



Fig no.8: bioplastic in hot water at 120°C

## V. LIMITATION OF STUDY

In India we have a great scope for development of bioplastic based on starch for variety of application due to availability for potato on large scale. India's bioplastic market has a lot of challenges especially low awareness that are typical to markets dealing with eco-friendly products.

The government is rising environmental awareness from which use of bioplastic can be increased. But it goes in segment which has a long way to go in production, process etc. Environmental awareness and promoting bioplastic a suitable alternative for traditional plastic is the initial step which should be taken.

## VI. CONCLUSION

With increasing awareness in the people becoming environmental conscious, bioplastic has started to gain a lot of attention. The advantages like 100% biodegradable, produced from natural renewable resources make it excellent alternative for traditional practice. Bioplastic may not be only solution to all environmental problems but is certainly right decision in right direction.

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