*https://doi.org/10.33472/AFJBS.3.3.2021.111-113*

ISSN: 2663-2187

**African Journal of Biological Sciences**

Journal homepage: http: / / www.afjbs.com

**Research Paper** **Open Access**

# Potato starch based bioplastic as alternative packaging materials

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**Article Info**

Volume 3, Issue 3, July 2021

Received : 13 January 2021

Accepted : 22 May 2021

Published : 05 July 2021

*doi: 10.33472/AFJBS.3.3.2021.111-113*

## Abstract

Bioplastics can be synthesized from agrarian outgrowth. Normally, plastics when get accumulated can enhance the biological clock of many organisms which exist in the ecosystem and causes death. It takes around 3-6 months to reprocess. The objective to use bioplastic is to reduce the level of lethality in the environment. It is comparatively less expensive than the normal plastic. Bioplastics prohibit the utility of fossil fuels. Use of plastic materials finds its way in every household and day to day utility. These single use plastic in turn creates abundant waste. Hence it is imperative to produce bioplastics. The materials that were used in the current research project include potatoes, water, hydrochloric acid, glycerol and sodium chloride. Extraction of starch was done by grinding potatoes. The flexibility of the plastic depends on the amount of glycerol added. Acidity of the solution was checked with the help of litmus paper. These bioplastics are known to be biodegradable. It is also eco-friendly. Use of bioplastics may lead to massive reduction in the level of pollution. Hence, substituting bioplastics with normal plastic wherever possible can be a safe option.

***Keywords:*** *Potato starch, Bioplastic, Ecosystem, Hydrochloric acid, Glycerol, Biodegradable*



## 1. Introduction

Today there is a menace of pollution caused by plastic. Resource management patterns have to be examined due to our increasing population, unnecessary consumption and their adverse effects on the environment. We should rely less on fossil fuels and use bioplastics as replacement of normal plastics.

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Normal plastic when discarded as a waste, creates multiple problems in waste disposal. Bioplastics are biodegradable. Some of the uncommon sources are pea, corn, banana. Use of bioplastic as a packaging material can go a long way to counter the adverse effects caused by normal plastic.

Esen Gokce Ozdamara and Murat Atesb had experimented on producing bioplastic from starch (Özdamar and Murat, 2018). A simple bioplastic is formed with the following equation: Biopolymer(s) + plasticizer(s) + other additive(s) = BIOPLASTIC (Stevens, 2002). It is eco-friendly, cheaper compared to normal plastics. Ezgi Bezirhan Arýkan and H. Duygu Bilgen they have produced bioplastics from renewable sources (Bezirhan Arikan and Bilgen, 2019). Toxic emissions such as carbon dioxide and methane are generated because of plastic incineration. These greenhouse gases (GHGs) affect adversely the climate change (Barker, 2007). In addition, it is expected that fossil fuel will become more expensive and the supply will become more volatile (Philp *et al*., 2013). An attempt is made to prepare the bioplastic material.

## 2. Materials and methods

Two to three raw potatoes were used to extract starch and were chopped into small pieces. The potatoes were smashed in order to extract starch using mortar and pestle. Tap water (100 ml) was added to the chopped potatoes. The solution was kept undisturbed for about 1 h so that the starch would settle at the bottom. The supernatant was discarded and a washing with distilled water was given in order to extract starch in pure form. The material was dried using sun drying method. After sun drying for 48 h, 2.25 g of starch was obtained. In order to prepare bioplastic 25 ml of distilled water, 3 ml of 0.1M HCL and 2 ml of glycerol were added. The solution was heated on Bunsen burner till the gelatinous form was observed. In order to check the pH nature of the solution few drops of solution was checked on litmus paper. The litmus paper turned red, which showed it contains acid. Further 0.1 M of NaOH was added and again the pH nature was checked. The presence of green colour indicated that the solution is neutral. Few drops of oil were applied on petri plate and the semisolid mixture was poured into it and was spread evenly. The semisolid mixture was sun dried for 48 h (You Tube link - https://youtu.be/VUkyW1Pir9g).

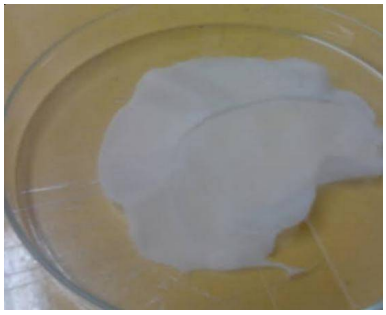
**Solubility test:** The dried plastic was dissolved in 20 mL distilled water.

## 3. Observation

Having prepared the bioplastic by above method, it was observed that upon sun drying for 24 h, bioplastic was found to be partly dried. On further sun drying for 48 h it was found to be completely dried. This was followed by Solubility test.

**Table: Comparison of the dryness of plastic with respect to period of drying**

| Time | Observation |
|---|---|
| 24 hours | Partly sun dried |
| 48 hours | Completely sun dried |



**Picture 1: Indigenously prepared bioplastics**

**Picture 2 : Completely dried plastic**

**Solubility test:** Solubility test was performed after bioplastic was completely dried. It was found to be insoluble in water. It is performed to check whether the prepared bioplastic dissolves in water or not. Since it was found to be insoluble in water, it indicates that it is suitable for use and it can be considered as a safe option to substitute the normal plastic. It can be improvised further to substitute the normal plastic.

## Discussion

In the current project, bioplastic was prepared by Indigenous method. After sun drying it was found to be partly dried after 24 h and completely dried after 48 h.

Rizwana Beevi , Sameera Fathima AR of Ahmeed Sayyed college of women university of Madras, Tamil Nadu, India, had studied the characterization of bioplastic. In their experiment they made use of banana peels as a raw material to make bioplastic. Also the various test were done such as the swelling test where the bioplastic did not show any change when it was soaked in chloroform and methanol. The solubility test was also performed where it was insoluble in acetic acid, ethyl alcohol, water and partially soluble in ammonia (Beevi *et al*., 2020).

Ezgi Bezirhan Hrikan and H. Duggu Bilgen had carried out production of bioplastic from potato peel waste and had investigated its biodegradability. The food wastes could be used for bioplastic production (Bezirhan Arikan and Bilgen, 2019).

M.K Marichelvam, Mohammed Jawaid and Mohammed Asim from department of mechanical engineering, Mepco Schlenk Engineering College, Sivakasi, Tamil Nadu , India, has used the corn and rice starch as the raw material to make bioplastic. They also performed many tests such as thickness measurement, tensile test, water solubility test and biodegradability test for the bioplastic (Marichelvam *et al*., 2019).

## Conclusion

This study concluded that starch can be used for making bioplastic. These bioplastics can be used in packaging industry. Potato starch is a useful material for bioplastics production because it is eco-friendly and easily available. This bioplastic is safe for environment and free from hazardous chemicals and toxins. Bioplastic materials requires less energy to recycle. Bioplastics results in less environmental pollution than other plastics.

## Reference

Barker, T. (2007). In Climate Change Mitigation. Contribution of Working Group III to the Fourth Assessment. Report of the Intergovernmental Panel on Climate Change. 2010, USA: Cambridge University Press.

Beevi, K.R., Fathima, A.S., Fathima, A.T., Thameemunisa, N., Noorjahan, C.M. and Deepika, T. (2020). Bioplastic synthesis using banana peels and potato starch and characterization. *International Journal of Scientific and Technology Research*. 9(1), 1809-1814. University of Madras, India.

Bezirhan Arikan, E., and H. Bilgen (2019). Production of bioplastic from potato peel waste and investigation of its biodegradability. *International Advanced Researches and Engineering Journal*. 3(2), 93-97.

Marichelvam, M.K., Mohammad Jawaid and Mohammad Asim (2019). Corn and Rice Starch-Based Bio-Plastics as Alternative Packaging Materials. *Fibers*. 7(4), 32. https: / / doi.org / 10.3390 / fib7040032

Özdamar, E.G. and Murat, A.T.E.S. (2018). Rethinking sustainability: A research on starch based bioplastic. *Journal of Sustainable Construction Materials and Technologies*. 3, 249-260.

Philp, J.C., Ritchie, R.J.and Guy, K. (2013). Biobased plastics in a bioeconomy. *Trends in Biotechnology*. 31(2), 65-67.

Stevens, E.S. (2002). Green Plastics: An Introduction to the New Science of Biodegradable Plastics, Princeton University Press. Princeton and Oxford p.105.

You Tube link - https: / / youtu.be / VUkyW1Pir9g

**Cite this article as:** Prachi Sonawane, Amisha Panchal, Shreeya Naik, Bhagyashree Mundaye and Unnati Padalia (2021). Potato starch based bioplastic as alternative packaging materials. *African Journal of Biological Sciences.* 3(3), 111-113. doi: 10.33472 / AFJBS.3.3.2021.111-113.