# DRIFTY BIOPLASTICS FROM THE PERISHABLE PRODUCTS

**Dhanalaksmi S1, Monica M2, Varshaa D3, Vithyalaksmi A4, Arjuman Banu S5**

1Dhanalaksmi S, EEE, Sri Ramakrishna Institute of technology, Coimbatore, India. 2Monica M, ECE, Sri Ramakrishna Institute of Technology, Coimbatore, India. 3Varshaa D, ECE, Sri Ramakrishna Institute of Technology, Coimbatore, India.

4Vithyalaksmi A, ECE, Sri Ramakrishna Institute of Technology, Coimbatore, India.

5Arjuman Banu S, Assistant Professor(Sr.Gr) Chemistry, Sri Ramakrishna Institute of Technology, Coimbatore, India.

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**ABSTRACT** - The growing environmental concerns over conventional plastic pollution have intensified the search for sustainable alternatives. This study explores the development of drifty bioplastic derived from perishable organic waste, offering a dual solution to plastic pollution and food waste management. Perishable waste materials such as fruit peels, vegetable scraps, and starch-rich residues were collected, processed, and transformed into bioplastic through a series of biochemical and thermochemical treatments. The resulting bioplastic was evaluated for its physical, mechanical, and biodegradable properties. Initial results indicate promising tensile strength, flexibility, and rapid degradation under natural conditions. This eco-friendly alternative not only reduces dependence on fossil-fuel-based plastics but also promotes circular economy practices by converting waste into value- added products. The study concludes that drifty bioplastic presents a viable, low-cost, and sustainable material suitable for packaging and agricultural applications, encouraging further research into scalable production methods and performance optimization

*Keywords: Bioplastic, Perishable Waste, Biodegradability Sustainable Materials, Organic Waste Utilization, Circular Economy*

## Introduction

The increasing environmental concerns over plastic pollution have prompted a global shift towards sustainable alternatives. Conventional plastics, derived from petroleum-based sources, are non-biodegradable and contribute significantly to long-term environmental degradation. In this context, bioplastics have emerged as a promising solution, offering biodegradability and reduced ecological footprint. Among various sources explored for bioplastic production, organic waste, particularly perishable waste, presents a unique opportunity. Every year, tons of food waste—rich in starch, cellulose, and other biodegradable components—are discarded without effective utilization. Transforming such waste into value- added materials like bioplastic not only addresses waste management issues but also supports the principles of a circular economy. This study focuses on the development of drifty bioplastic derived from commonly available perishable waste such as fruit peels, vegetable residues, and starchy leftovers. The term drifty reflects the lightweight and flexible nature of the bioplastic produced.

The process involves extraction, blending with plasticizers, and molding to create usable bioplastic sheets. This eco-friendly material is evaluated for its mechanical strength, flexibility, and biodegradability. The research aims to highlight the potential of perishable waste as a low-cost, renewable raw material for bioplastic production, paving the way for sustainable packaging and environmentally responsible consumer products.

## Methodology

Perishable organic waste such as banana peels, potato skins, and citrus rinds was collected from local households and markets. The waste materials were thoroughly washed, chopped, and boiled to soften their structure and extract natural starches. After boiling, the softened mixture was blended into a fine paste using a grinder. To enhance the plastic properties, the paste was combined with a plasticizer (glycerol) and a few drops of vinegar to improve flexibility and durability. This mixture was then heated at a controlled temperature of 60–80°C with constant stirring until a thick, gel-like consistency was obtained. The hot mixture was poured into flat molds or trays and left to air dry at room temperature for 48–72 hours. Once dried, the resulting bioplastic sheets were carefully removed and trimmed for testing. The samples were evaluated for their physical properties, including tensile strength, water absorption, and biodegradability in soil, to determine their practical usability.

## Results and Discussion

The drifty bioplastic produced from perishable waste exhibited promising mechanical and physical properties. Tensile strength tests showed that the bioplastic had a maximum tensile strength of 18 MPa, which, while lower than conventional plastics, was adequate for lightweight applications. Flexibility was assessed using the elongation- at-break test, with the bioplastic showing 30% elongation, indicating satisfactory flexibility for packaging purposes. Water absorption tests demonstrated the bioplastic’s high moisture uptake within 24 hours, which is typical for biodegradable materials, suggesting that its use in outdoor applications would need further enhancement for water resistance. However, the biodegradability tests showed complete degradation within 35 days under soil conditions, confirming its environmentally friendly nature. Compared to other bioplastics, such as those made from starch or

cellulose, the perishable waste-derived bioplastic had a slightly lower strength but performed similarly in terms of biodegradability. This positions it as a viable alternative in applications where disposal and environmental impact are more critical than durability, such as in single-use packaging or agricultural films. Further research could focus on reinforcing the bioplastic with natural fibers to improve mechanical properties without compromising biodegradability. Scaling up production methods and optimizing the raw material mix would also increase the material's performance and reduce costs.



**Figure 1 Product from using bioplastic**

## Future Scope

The development of bioplastic from perishable waste holds significant promise for sustainable material innovation and waste reduction. Future research can focus on optimizing the composition by experimenting with different types and combinations of organic waste to enhance strength, flexibility, and durability. The addition of natural fibers or nano-fillers could improve mechanical properties and widen the application scope. Scaling up production through industrial processes like extrusion or injection molding would be essential for commercial viability. Moreover, conducting long-term environmental impact studies and lifecycle assessments can validate the ecological benefits of the product. Further work on waterproofing, thermal resistance, and shelf-life improvement can make this bioplastic suitable for food packaging and agricultural films. Government policies and industry partnerships can also help promote the use of biodegradable materials. Overall, this innovation encourages circular economy practices and has the potential to replace petroleum-based plastics in several everyday applications.

# Conclusion

The study successfully demonstrates the potential of perishable organic waste as a viable raw material for producing eco-friendly bioplastics. By converting commonly discarded items like fruit peels and vegetable scraps into biodegradable plastic, this research offers a sustainable solution to two major environmental issues— plastic pollution and food waste. The resulting drifty bioplastic exhibits promising physical properties and biodegradability, making it suitable for applications like

packaging and agricultural use. This low-cost, renewable alternative encourages waste-to-resource practices and supports circular economy models. With further refinement and scaling, bioplastics derived from perishable waste can play a significant role in reducing our dependence on conventional petroleum-based plastics.

## REFERENCE

* 1. Dinh, M. Q., & Le, M. T. (2021). Triplexer-based multiband rectenna for RF energy harvesting from 3G/4G and Wi-Fi. *IEEE Microwave and Wireless Components Letters*, 31(9), 1094-1097.
	2. Kumar, S., & Gupta, A. (2020). Bioplastics from agricultural waste: A sustainable approach. *Journal of Environmental Science and Technology*, 12(3), 457-470.
	3. Smith, R., & Zhao, L. (2019). Development of biodegradable plastics from food waste materials. *Renewable and Sustainable Energy Reviews*, 102, 1-8.
	4. Ghosh, R., & Choudhury, A. (2021). Advances in bioplastic production from food waste. *Journal of Bioplastic Materials*, 5(1), 25-40.
	5. Chauhan, R., & Patel, A. (2022). Perishable waste as a feedstock for bioplastics: Challenges and opportunities. *Waste Management*, 121, 204-211.
	6. Yadav, M., & Singh, P. (2018). Biodegradation of bioplastics in natural environments. *Environmental Progress & Sustainable Energy*, 37(6), 2235-2244.
	7. Reddy, M., & Srivastava, A. (2020). The role of food waste in producing sustainable bioplastics. *Journal of Cleaner Production*, 250, 119-129.
	8. Singh, D., & Sharma, S. (2020). Recycling of agricultural waste into bioplastics: A review of techniques. *Journal of Waste Management and Technology*, 25(2), 108-115.
	9. Lee, T. H., & Kim, S. H. (2021). Conversion of perishable organic waste into bioplastics: Methods and challenges. *Biotechnology Advances*, 47, 107652.
	10. Li, X., & Zhang, L. (2022). A novel approach to bioplastic production from fruit waste. *Sustainable Materials and Technologies*, 30, 100198.