Eco-conscious consumers and sustainable packaging: exploring bioplastics adoption in central NCR as a strategic pathway to Viksit Bharat 2047

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Received 11 Sep 2025; Accepted 1 Oct 2025; Published 4 Nov 2025

DOI: https://doi.org/10.64171/JSRD.4.S1.86-92

Abstract

India generates over 3.5 million tons of plastic waste annually, much of it from single-use plastics, posing severe environmental and health hazards. In response, the Indian government has enforced restrictions and promoted eco-friendly alternatives like bioplastics. This study aims to assess the level of awareness among consumers in Central NCR regarding bioplastics. A sample of 120 respondents was selected using primary data collected through structured questionnaires, supported by secondary sources and qualitative focus group discussions. Statistical tools including frequency analysis, t-test, and ANOVA were used to analyze the data across demographic variables such as gender, age, education, and income. Results revealed moderate awareness overall, with significant gaps in knowledge about disposal practices and product differentiation. Inferential analysis showed no statistically significant differences in awareness across demographic groups. The study concludes with a call for targeted educational initiatives to promote informed adoption of bioplastics, supporting India's broader sustainability goals under Viksit Bharat 2047.

Keywords: Eco-conscious, Consumers, Bioplastics, Strategic, Viksit Bharat

Introduction

The rapid industrialization, economic expansion, and population growth in India have led to a dramatic increase in the consumption of goods, particularly packaged products. While packaging is essential for product safety, storage, and distribution, it has simultaneously contributed to the alarming rise in plastic waste. Traditional petroleum-based plastics, due to their non-biodegradable nature and extensive environmental footprint, have emerged as a critical environmental challenge. In response to this growing concern, there is a global push toward sustainable packaging solutions, among which bioplastics are gaining significant momentum. As India envisions a transformative developmental journey under the vision of Viksit Bharat 2047, promoting sustainable consumption practices, such as the adoption of bioplastics, becomes crucial for achieving environmentally responsible growth.

India generates more than 3.5 million tons of plastic waste annually, with a significant proportion originating from single-use plastics in packaging. This escalating crisis poses severe threats to biodiversity, public health, and natural resources. Recognizing this, the Government of India has imposed restrictions on single-use plastic items and is increasingly supporting research and innovation in eco-friendly alternatives. Among the various sustainable materials, bioplastics—derived from renewable biomass sources such as corn starch, sugarcane, cassava, or vegetable fats—offer the dual advantage of being biodegradable and compostable. Despite their potential, the mainstream adoption of bioplastics in India remains limited due to a combination of factors including high costs, limited availability, technological constraints, and lack of consumer awareness.

In this context, consumer behavior plays a pivotal role in driving the demand and successful integration of bioplastics into the market. The emergence of eco-conscious consumerism, characterized by increased environmental awareness and sustainable lifestyle choices, is reshaping purchasing patterns across demographics. Particularly in urban and semi-urban areas like Central NCR, educated and environmentally aware consumers are demonstrating a growing willingness to pay a premium for sustainable products. However, the gap between attitude and actual behavior—commonly referred to as the "green gap"—remains a significant hurdle. It becomes imperative to study the factors influencing this gap, such as perceived effectiveness, trust in bioplastic claims, price sensitivity, and availability of options.

Furthermore, Viksit Bharat 2047, the government's visionary roadmap for transforming India into a developed nation by the 100th year of independence, places a strong emphasis on sustainable development, green innovation, and responsible consumerism. Encouraging bioplastics adoption aligns with several key pillars of this vision, including environmental sustainability, circular economy, and citizen participation. By

nurturing an eco-conscious consumer base and supporting industries that promote green alternatives, India can pave the way for an inclusive and sustainable future. Central NCR, being a microcosm of the broader Indian urban economy, can serve as a pilot region for scalable strategies promoting sustainable packaging through citizen engagement and market-based incentives.

Review of literature

Cao *et al*. (2025) [17] examined Japanese consumers' knowledge and acceptance of bioplastics using an online survey and binary logistic model. Findings revealed limited awareness, with greater acceptance for non-skin-contact products. Key adoption drivers included environmental concern, bioplastics knowledge, policy awareness, and income. The study highlights the importance of addressing consumer misconceptions and preferences to inform effective policy and promote the sustainable adoption of bioplastics in Japan.

Califano *et al*. (2024) [15] explored factors influencing Italian consumers' choices of biodegradable and compostable packaging using a hybrid model combining the theory of planned behaviour and discrete choice experiments. Through latent class analysis, they identified consumer segments based on preferences and psychological traits. The study highlights the role of both economic and psychological drivers, offering valuable insights for promoting sustainable packaging through targeted marketing and policy interventions.

Kumar *et al*. (2024) [16] conducted a systematic review of Life Cycle Assessments (LCAs) to evaluate the environmental impact and mechanical performance of bioplastics. The study found bioplastics to be more sustainable than conventional plastics but highlighted challenges such as high costs, limited biodegradability, and EoL management issues. It emphasizes the need for standardized methodologies, stakeholder collaboration, and further research to enhance bioplastics' environmental and functional viability.

Filho *et al*. (2022) [14] conducted a cross-country study exploring consumer perceptions of bioplastics in 42 nations. Findings revealed generally positive attitudes, particularly regarding their use in packaging and kitchenware. Cost and availability emerged as key adoption factors, though price sensitivity remains a concern. The study highlights a need for better consumer awareness and supportive policies to enhance bioplastics' market penetration and reduce reliance on conventional plastics.

Background of the study

With growing environmental concerns and increasing emphasis on sustainable development, understanding the evolution of packaging practices becomes essential. The background below outlines the historical journey that has led to today's focus on bioplastics.

Pre-industrial era

Before industrialization, packaging was primarily natural and biodegradable—leaves, cloth, jute, and pottery were commonly used. Environmental degradation due to packaging waste was virtually nonexistent, as materials decomposed naturally within ecosystems.

Industrial era (1800s–1950s)

With industrial growth and mass production, packaging needs expanded. The invention of synthetic plastics like Bakelite in the early 20th century revolutionized packaging due to plastic's durability, lightweight nature, and cost-effectiveness. However, environmental concerns were not a priority during this period.

Post-industrial/Consumerism era (1960s–1990s)

The global rise in consumerism led to excessive use of plastic packaging. Plastics became ubiquitous across industries—especially food, retail, and pharmaceuticals. The "throwaway culture" emerged, creating massive non-biodegradable waste and beginning visible environmental harm.

Awareness era (2000s–2010s)

Environmental movements gained momentum. Terms like *climate change*, *carbon footprint*, and *sustainable packaging* entered mainstream discourse. Researchers and activists highlighted the dangers of plastic pollution, marine contamination, and microplastics. Bioplastics began emerging as a viable solution, though adoption remained low.

Sustainability era (2020s–Present)

Governments, including India's, introduced bans on single-use plastics and promoted circular economy models. Consumers, especially in urban areas like Central NCR, became more eco-conscious. Bioplastics are now positioned as strategic alternatives aligned with national goals like Viksit Bharat 2047, aiming for sustainable growth, innovation, and environmental stewardship.

Research objective

- To assess the level of awareness among consumers in Central NCR regarding bioplastics.

Research hypothesis

H_0: There is no significant difference in awareness regarding bioplastics among consumers across different demographic variables.

Concept of bioplastics and eco-conscious consumerism

understanding bioplastics

Bioplastics represent a transformative innovation in the global effort to combat the environmental impacts of traditional plastic packaging. Unlike conventional plastics derived from petroleum, bioplastics are made from renewable biological sources such as corn starch, sugarcane, cassava, or cellulose. Depending on their composition, bioplastics may be biodegradable, compostable, or simply bio-based but with similar properties to conventional plastics. They offer a promising alternative to fossil fuel–based plastics by reducing the carbon footprint, encouraging sustainable resource use, and minimizing pollution.

There are two broad categories of bioplastics

- **Bio-based but non-biodegradable bioplastics:** These are derived from renewable resources but do not degrade easily. Examples include bio-based polyethylene (bio-PE) and bio-polyethylene terephthalate (bio-PET).
- **Bio-based and biodegradable bioplastics:** These decompose naturally under specific environmental conditions and include types like polylactic acid (PLA) and polyhydroxyalkanoates (PHA).

The main advantage of biodegradable bioplastics is their ability to break down into natural substances such as water, carbon dioxide, and biomass, given the right composting conditions. However, it is important to note that not all bioplastics are automatically biodegradable, and their end-of-life management must be clearly communicated to consumers to prevent misuse or contamination with traditional waste streams.

Environmental importance of bioplastics

The growing urgency to replace petroleum-based plastics arises from their contribution to greenhouse gas emissions, marine pollution, and long-term environmental degradation. Plastic waste often takes hundreds of years to decompose, clogging landfills, harming wildlife, and releasing toxic microplastics into ecosystems. In contrast, bioplastics support the principles of a circular economy, where products are designed to be reused, recycled, or composted—thereby reducing the burden on the environment.

Moreover, as nations push for carbon neutrality, the adoption of bioplastics is aligned with global and national environmental policies, including the United Nations Sustainable Development Goals (SDGs) and India's climate action plans under the Paris Agreement. With their lower carbon emissions during production and decomposition phases, bioplastics are a sustainable material choice for future-ready packaging systems.

The rise of eco-conscious consumerism

Eco-conscious consumerism refers to a behavioral shift among modern consumers who are increasingly making purchasing decisions based on environmental, ethical, and social considerations. This new breed of consumers evaluates products not just for their quality or price but also for their environmental footprint, source of materials, production methods, waste disposal impact, and corporate social responsibility.

Several trends reflect this shift:

- A rise in demand for sustainable packaging.
- Increased preference for green-certified or eco-labeled products.
- Support for plastic-free packaging, zero-waste lifestyles, and plant-based materials.
- Consumer readiness to pay a premium for eco-friendly products.

This behavior is especially evident among millennials and Gen Z consumers, who are not only digitally informed but also actively engaged with sustainability campaigns and social causes. In India, urban regions such as Central NCR are witnessing a sharp increase in awareness related to environmental issues, leading to the emergence of a consumer class that prefers sustainable and socially responsible brands.

Bioplastics and the eco-conscious consumer: a natural alignment

There exists a strong link between eco-conscious consumerism and the market potential for bioplastics. As consumers become more informed about the environmental harm caused by single-use plastics, they are more inclined to support packaging that is biodegradable, compostable, or sourced from renewable feedstocks. This shift in consumer attitude acts as a market-driven force influencing industries to innovate and adopt eco-friendly packaging alternatives.

However, the actual adoption of bioplastics by consumers is often affected by several factors:

- Lack of awareness about what bioplastics are and how to dispose of them correctly.
- Price sensitivity, as bioplastics are often more expensive than conventional plastic packaging.
- Greenwashing concerns, where companies falsely label or exaggerate the eco-friendliness of their products.
- Limited availability of bioplastic-packaged products in regular markets and retail outlets.

Bridging this gap between consumer intention and action requires not only consumer education and awareness campaigns but also policy interventions, subsidies, and industry engagement.

India's sustainable transition and regional relevance

In India, the government has taken several steps to reduce plastic consumption, including bans on single-use plastics and the promotion of biodegradable alternatives. Cities within Central NCR, such as Delhi, Gurugram, and Noida, are at the forefront of adopting green infrastructure and environmental governance. Consumers in this region are more likely to encounter and engage with sustainable products, thanks to better exposure, higher literacy levels, and access to eco-friendly alternatives.

Given the region's progressive market and informed population, Central NCR serves as a critical test bed for understanding how eco-conscious consumers interact with emerging packaging innovations like bioplastics. This makes the region a valuable focus area for studying consumer perceptions, behavioral intentions, and readiness for change.

The integration of bioplastics into mainstream packaging systems is deeply intertwined with the rise of eco-conscious consumerism. As India aims to achieve its developmental goals under the Viksit Bharat 2047 vision, leveraging the behavior of informed and responsible consumers becomes essential. A shift toward bioplastics not only contributes to reducing environmental harm but also signals a larger transformation toward sustainable consumption and production. Understanding this consumer-packaging dynamic will be vital for policymakers, businesses, and civil society working towards a greener and more resilient India.

Research methodology

For the present study, a sample of 120 consumers from the Central NCR region was selected to represent the target population. Primary data was collected directly from respondents using structured questionnaires designed to capture both demographic information and variables related to awareness, perception, and adoption of bioplastics.

To analyze the quantitative data, statistical tools such as frequency analysis, T-test, and ANOVA were employed to explore significant differences in awareness levels across various demographic segments, including gender, age, education and income. The data collection process included surveys and interviews.

In addition to the quantitative approach, secondary data was utilized to support the conceptual foundation of the study. This included a review of relevant research articles, academic journals, government reports, policy documents, and books focusing on bioplastics, sustainable packaging, and eco-conscious consumer behavior. To further enrich the study with qualitative insights, focus group discussions were conducted to understand consumer attitudes, barriers to adoption, and expectations regarding bioplastics.

This mixed-method approach enabled a comprehensive understanding of the role of eco-conscious consumers in driving bioplastics adoption in Central NCR, aligning with the broader vision of Viksit Bharat 2047.

Data analysis

Data analysis refers to the process of examining and interpreting the collected data to identify patterns, trends, and significant insights. By applying statistical methods and tools, it helps derive meaningful conclusions, supports informed decision-making, and effectively addresses the research objectives.

Table 1: Frequency analysis of demographic variables

Demographic variables		Frequency
Gender	Male	72
	Female	48
	Total	120
Age (In Years)	18-25	64
	25-35	28
	35-45	21
	Above 45	7
	Total	120
Educational Qualification	12th	15
	Graduation	65
	Post graduation	34
	Others	6
	Total	120
Monthly Family Income (In Rs.)	Less than 30,000	16
	30,000-50,000	68
	Above 50,000	36
	Total	120

Source: Researcher's compilation

The demographic profile of the respondents (N = 120) reveals a diverse representation across gender, age, education, and income levels. In terms of gender, the sample comprises 72 males (60%) and 48 females (40%), indicating a male-dominant participation. Regarding age, the majority of respondents (64 or 53.3%) fall in the 18–25 years age group, followed by 28 respondents (23.3%) aged 25–35 years, 21 respondents (17.5%) aged 35–45 years, and only 7 respondents (5.8%) above 45 years, showing that younger individuals were more actively involved. In terms of educational qualification, most respondents were graduates (65 or 54.2%), followed by postgraduates (34 or 28.3%), 12th pass (15 or 12.5%), and others (6 or 5%), indicating a relatively well-educated sample. With respect to monthly family income, a significant portion (68 or 56.7%) belonged to the ₹30,000–50,000 bracket, while 36 (30%) earned above ₹50,000, and 16 (13.3%) earned less than ₹30,000.

Table 2: Frequency analysis of awareness among consumers regarding bioplastics

Statements	HA	A	N	NA	NAA
I am aware that bioplastics are made from renewable biological sources	46	55	9	5	5
I can differentiate between bioplastics and conventional plastics	28	53	6	6	27
I have seen the term "bioplastics" on product packaging or advertisements	26	25	45	19	5
I am aware of the environmental benefits of using bioplastics over traditional plastics	34	49	27	7	3
I know that bioplastics are biodegradable or compostable under certain conditions	22	29	29	21	19
I understand the role of bioplastics in reducing plastic pollution	27	65	17	8	3
I am aware of the availability of bioplastic products in the market	76	20	6	2	16
I have read or heard about government initiatives promoting the use of bioplastics	34	40	30	13	3
I am informed about the disposal and recycling methods for bioplastics	26	33	36	16	9
I know the difference between biodegradable plastics, compostable plastics, and bioplastics	40	40	23	11	6

Source: Researcher's compilation

The frequency analysis of consumer awareness regarding bioplastics, based on the responses of 120 participants:

- I am aware that bioplastics are made from renewable biological sources.
- A strong awareness is evident, with 46 respondents (38.3%) highly agreeing and 55 (45.8%) agreeing, showing that nearly 84.1% are aware of the renewable origin of bioplastics. Very few disagreed or were unaware, indicating high clarity on this aspect.
- I can differentiate between bioplastics and conventional plastics. Awareness is moderate here, with 28 (23.3%) highly agreeing and 53 (44.2%) agreeing, totaling 67.5%. However, 27 respondents (22.5%) strongly disagreed, reflecting that a notable portion still struggles with this differentiation.
- I have seen the term "bioplastics" on product packaging or advertisements. Only 51 respondents (42.5%) agreed or highly agreed, while 45 (37.5%) remained neutral and 24 (20%) disagreed, indicating limited visual exposure to bioplastics in media or packaging.
- I am aware of the environmental benefits of using bioplastics over traditional plastics. Awareness is fairly high, with 34 (28.3%) highly agreeing and 49 (40.8%) agreeing, totaling 69.1%, indicating a general understanding of bioplastics' eco-friendly nature.
- I know that bioplastics are biodegradable or compostable under certain conditions. This area shows mixed awareness; only 51 respondents (42.5%) agreed, while 29 (24.2%) remained neutral and 40 (33.3%) disagreed, showing a lack of clarity about biodegradability conditions.
- I understand the role of bioplastics in reducing plastic pollution. A strong majority (92 respondents or 76.7%) agreed or highly agreed, demonstrating high awareness of bioplastics' role in addressing pollution.
- I am aware of the availability of bioplastic products in the market. This statement had the strongest agreement: 76 (63.3%) highly agreed and 20 (16.7%) agreed, showing 80% of respondents are aware of market availability.
- I have read or heard about government initiatives promoting the use of bioplastics. Awareness is moderate, with 74 (61.7%) agreeing or highly agreeing, but 30 (25%) neutral and 16 (13.3%) disagreeing, suggesting partial exposure to policy-level promotion.
- I am informed about the disposal and recycling methods for bioplastics. Only 59 (49.1%) showed agreement, while 36 (30%) remained neutral and 25 (20.9%) disagreed, indicating knowledge gaps in disposal awareness.
- I know the difference between biodegradable plastics, compostable plastics, and bioplastics. A majority (80 respondents or 66.6%) agreed or strongly agreed, showing a decent understanding, although 17 respondents (14.1%) disagreed, suggesting the need for clearer differentiation in public messaging.

Overall, while general awareness about bioplastics is relatively high, specific knowledge areas like biodegradability conditions and disposal methods reveal room for improvement.

ANOVA and t-test analysis

H_0: There is no significant difference in awareness regarding bioplastics among consumers across different gender groups.

Table 3: t-test: awareness regarding bioplastics among consumers across gender

Levene's test for equality of variances	t-test for equality of means						
	F	Sig.			Sig. (2-tailed)	Mean difference	Std. error difference
Equal variances assumed	.915	.341	.949	118	.344	1.25694	1.32386
Equal variances not assumed			.990	113.490	.324	1.25694	1.26949

Source: Researcher's compilation

To test the hypothesis There is no significant difference in awareness regarding bioplastics among consumers across different gender groups, an independent samples t-test was conducted. Levene's Test showed a p-value of 0.341, indicating that the assumption of equal variances holds. The t-test result (equal variances assumed) gave a t-value of 0.949 with a p-value of 0.344, which is greater than 0.05. Thus, the null hypothesis is not rejected, suggesting that there is no statistically significant difference in the level of awareness regarding bioplastics between male and female consumers.

H_0: There is no significant difference in awareness regarding bioplastics among consumers across different age groups.

Table 4: Awareness regarding bioplastics among consumers across age

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	234.726	3	78.242	1.574	.199
Within Groups	5766.866	116	49.714		
Total	6001.592	119			

Source: Researcher's compilation

To test the hypothesis There is no significant difference in awareness regarding bioplastics among consumers across different age groups, a one-way ANOVA was conducted. The results show that the F-value is 1.574 with a p-value of 0.199,

which is greater than the significance level of 0.05. This indicates that the differences in mean awareness scores among the four age groups are not statistically significant. Therefore, the null hypothesis is not rejected, implying that consumers' awareness regarding bioplastics does not differ significantly based on age group.

H_0: There is no significant difference in awareness regarding bioplastics among consumers across different educational qualification.

Table 5: Awareness regarding bioplastics among consumers across educational qualification

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	188.210	3	62.737	1.252	.294
Within Groups	5813.381	116	50.115		
Total	6001.592	119			

Source: Researcher's compilation

To test the hypothesis There is no significant difference in awareness regarding bioplastics among consumers across different educational qualifications, a one-way ANOVA was performed. The analysis produced an F-value of 1.252 with a p-value of 0.294, which is greater than the 0.05 significance level. This indicates that the differences in awareness scores among the various educational groups are not statistically significant. Hence, the null hypothesis is not rejected, suggesting that consumers' awareness regarding bioplastics does not vary significantly based on their level of educational qualification.

H_0: There is no significant difference in awareness regarding bioplastics among consumers across different income groups.

Table 6: Awareness regarding bioplastics among consumers across income

ANOVA					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	154.070	2	77.035	1.541	.218
Within Groups	5847.521	117	49.979		
Total	6001.592	119			

Source: Researcher's compilation

To test the hypothesis There is no significant difference in awareness regarding bioplastics among consumers across different income groups, a one-way ANOVA was conducted. The results show a Between Groups Sum of Squares of 154.070, with a Mean Square of 77.035, and an F-value of 1.541. The p-value is 0.218, which is greater than the 0.05 level of significance. This indicates that the variation in awareness levels across different income groups is not statistically significant. Therefore, the null hypothesis is not rejected, suggesting that income does not significantly influence consumers' awareness of bioplastics.

Conclusion

The present study was undertaken to assess the level of awareness among consumers regarding bioplastics and to determine whether demographic variables such as gender, age, educational qualification, and income influence consumer awareness. The findings from the frequency analysis revealed that while consumers possess a fair level of general awareness about bioplastics, there are notable gaps in specific areas such as disposal methods, product labeling, and understanding of composability. A significant number of respondents were aware that bioplastics are derived from renewable biological sources and contribute to reducing plastic pollution. However, fewer participants showed clarity on differentiating bioplastics from conventional plastics or understanding their correct disposal and recycling procedures.

Inferential statistics using t-tests and ANOVA were conducted to evaluate whether awareness levels varied significantly across different demographic segments. The independent samples t-test showed no significant difference in awareness levels between male and female respondents. Likewise, the one-way ANOVA results indicated no statistically significant difference in awareness across age groups, educational qualifications, and income levels. These findings support the null hypotheses framed for each demographic factor, suggesting that consumer awareness regarding bioplastics is fairly uniform across different groups.

The results highlight the need for targeted educational campaigns and broader information dissemination strategies to improve consumer understanding of bioplastics, particularly in terms of product identification and environmentally responsible usage. As bioplastics gain importance in addressing environmental concerns, enhancing consumer awareness becomes crucial to encouraging adoption and proper usage. Stakeholders including policymakers, environmental organizations, and businesses should work collectively to bridge the awareness gaps and promote sustainable consumer behavior.

References

1. European Bioplastics. Bioplastics market data 2023, 2023.
2. Ministry of Environment, Forest and Climate Change, Government of India. Guidelines for Extended Producer Responsibility on Plastic Packaging under Plastic Waste Management Rules 2016, 2022.
3. United Nations Environment Programme (UNEP). Single-use plastics: a roadmap for sustainability, 2018.
4. The Energy and Resources Institute (TERI). Sustainable plastic packaging in India: challenges and opportunities, 2021.
5. Ellen MacArthur Foundation. The New Plastics Economy: rethinking the future of plastics & catalysing action, 2020.
6. Singh P, Sharma V. Adoption of biodegradable packaging in India: perception of consumers and challenges. J Environ Manag Sustain Dev. 2020;9(2):101–15.
7. Kotler P, Armstrong G. Principles of marketing. 18th ed. Harlow: Pearson, 2021.
8. Patel M, Desai S. Green consumerism and sustainable packaging: an empirical study in urban India. Indian J Mark. 2022;52(1):42–55.
9. World Economic Forum. The New Plastics Economy: catalysing action, 2016.
10. Federation of Indian Chambers of Commerce and Industry (FICCI). Report on sustainable packaging and plastic waste management in India, 2023.
11. Planning Commission, Government of India. Viksit Bharat @2047: strategy and vision document, 2023.
12. Joshi Y, Rahman Z. Investigating the determinants of consumer resistance to eco-friendly products: a study in a developing nation. J Clean Prod. 2019;211:552–62.
13. Kumar S, Jain S. Bioplastics in India: opportunities and challenges. Mater Today Proc. 2021;46:8992–6.
14. Filho WL, Barbir J, Abubakar IR, Paço A, Stasiskiene Z, Hornbogen M, *et al*. Consumer attitudes and concerns with bioplastics use: an international study. PLOS ONE. 2022;17(4):e0266918.
15. Califano G, Lombardi A, Giudice TD, Caracciolo F, Cembalo L. Bioplastics in the basket of Italians: a hybrid framework for understanding the adoption of bioplastic food packaging. Aust J Agric Resour Econ. 2024;68(4):826–46.
16. Kumar R, Lalnundiki V, Shelare SD, Abhishek GJ, Sharma S, Sharma D, *et al*. An investigation of the environmental implications of bioplastics: recent advancements on the development of environmentally friendly bioplastics solutions. Environ Res. 2024;244:117707.
17. Cao Y, Otsuka A, Teah HY, Kanematsu Y, Kikuchi Y. Consumers' knowledge, perceptions, and preferences regarding bioplastics: evidence from a survey in Japan. Sustain Prod Consum. 2025;55:1–10. doi:10.1016/j.spc.2025.02.003.