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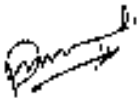
Editorial Note

CSIBER International Journal of Environment (CIJE) offers a venue where relevant interdisciplinary research, practice and case studies are recognized and evaluated. Increasingly, environmental sciences and management integrate many different scientific and professional disciplines. Thus the journal seeks to set a rigorous, credible standard for specifically interdisciplinary environmental research. CIJE is a multidisciplinary journal, publishing research on the pollution taking place in the world due to anthropogenic activities. CIJE welcomes submissions that explore environmental changes and their cause across the following disciplines like atmosphere and climate, biogeochemical dynamics, ecosystem restoration, environmental science, environmental economics & management, environmental informatics, remote sensing, environmental policy & governance, environmental systems engineering, freshwater science, interdisciplinary climate studies, land use dynamics, social-ecological urban systems, soil processes, toxicology, pollution and the environment, water and wastewater management, etc.

We invite authors to contribute original high-quality research on recent advancements and practices in Environment Management. We encourage theoretical, experimental (in the field or in the lab), and empirical contributions. The journal will continue to promote knowledge and publish outstanding quality of research so that everyone can benefit from it.

Er. D. S. Mali
Editor, CIJE



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CONTENTS

Bioplastic: A Sustainable Alternative for Single Use Plastic Food Packaging and Study of Hotels Attitude towards this Packing

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Abstract

Bio based plastic is made from renewable substances as an alternative to non-renewable fuels. Examples of Renewable carbon substances include corn, potatoes, rice, soy, wheat, and Oil. Biobased plastic can be partly or entirely biobased. This report presents a review of biobased or bio-degradable plastics, especially for food parcels and other packing purposes. Biobased plastic refers to either the biobased plastic or the bio-degradable characteristics of plastics. In this report, a clear distinction is made between biobased plastics and non-decomposable plastics. The basic aim of this research study is to collect more details about biobased plastic and information from different hotels in Tirunelveli, and their perspective related to this biobased plastic. This research report is about survey interpretation from the hotels where the one-time use plastics are banned and replaced with the usage of bioplastic to know their perspective about bioplastic. In addition, more details, about the positive and negative consequences of b from the perspective of hotels. A few questionnaires are asked to them to know the distinction between non-degradable plastic and biobased plastic in their hotel business. The surveys are collected on the hotels in Tirunelveli district of Tamil Nadu. After the methodology in hotels, it is clear that biobased plastics have many drawbacks rather than benefits from the perspective of the hotels. By methodology, I came to know that the hotels are using these biobased plastics at a loss, as it is more overpriced than the normal plastics. There are other consequences in the packaging (while using) these biobased plastics because these biobased plastics are not able to bear a temperature of more than 50^0C, thus food is not able to serve the food Faster than when using normal plastics. Not only that this biobased does not have much more holding capacity as compared to normal plastics because the bags they use are less than 50 Microns

Keywords: Biobased Plastics.

Introduction

Plastics are a comprehensive of artificial substances that use polythene as a main component. The flexibility during the production process makes it possible for plastic to be cast into solid objects of various shapes, making it a versatile product for many different uses. Plastics are made from non-biodegradable substances through polymerization or polymer condensation methods. After the origination of one-time plastic, it became part of the daily routine of humans because it is very easy to handle and disposable. About trillions of one-time-use plastics are

used yearly across the world. The inclining population increases the usage of plastic which leads to the production of plastic increases along with the pollution of plastic. Chemicals present in plastics are absorbed by human bodies. Not only humans, it also affects the marine and other animals. Most of the plastic items in our daily lives are used once and then chucked: grocery bags, plastic wraps, one-time-use cutlery, straws, and coffee cup lids. Plastic remains deep in landfills and toxic chemicals pollute groundwater by leaching. This has become a big issue in all developing and under-developing countries including India. To stop this plastic-related problem many Indian state governments have banned the usage of One-time plastic. Every country in the world is looking towards Innovations and another great replacement for bad plastic. Plastic pollution has become very problematic for the world. Our Indian government is also thinking of a new and better replacement for plastic. One of the very good and eco-friendly innovations is eco-plastic or bio-plastic. Biobased plastics are those plastic substances that are manufactured by using natural resources. Biobased plastic is a substance made from organic biomass sources, unlike artificial plastics which are made from the non-biodegradable substance. Bioplastics are made through several different processes. Some Use a microorganism to process base materials, such as cellulose, vegetable oils, and starches. Bioplastic is made from plant material and it should decompose relatively quickly in Landfills and, in some cases, compost bins. The most common forms are starch-based, like plastic, which is the most common foRM. BIOBASED PLASTIC CAN BREAK DOwn in 180 days, given the suitable conditions.

Literature Review

A brief review of the past studies related to bioplastic and their uses in food industries according to the N.A. MostafaaAwatef and his co-authors in their article, Production of biodegradable plastic from agricultural Wastes, explain that Agricultural residue management is considered to be a vital strategy to accomplish resource conservation and to maintain the quality of the environment. In recent years, bio-fibers have attracted increasing interest due to their wide applications in food packaging and the biomedical sciences. These eco-friendly polymers reduce rapidly and replace the usage of petroleum-based synthetic polymers due to their safety, low production costs, and biodegradability. This paper reports an efficient method for the production of cellulose acetate bio-fiber from flax fibers and cotton linters. The used process satisfied a yield of 81% and 54% for flax fibers and cotton linters respectively (based on the weight of the cellulosic residue used).

The structure of the produced bioplastic was confirmed by X-ray diffraction, FT-IR, and gel permeation chromatography. Moreover, this new biopolymer is biodegradable and is not affected by acid or salt treatment but is alkali labile. A comparison test showed that the produced cellulose acetate was affected by acids to a lesser extent than polypropylene and

polystyrene. Therefore, this new cellulose acetate bioplastics can be applied in both the food industry and medicine.

Another article on Bioplastics in Food Packaging: Innovative Technologies for Biodegradable Packaging by the author Lillian Liu San Jose explains, that the challenges surrounding plastics waste treatment are multifaceted and complex – and, as numerous studies have indicated, are further being compounded as time progresses. It will be up to future generations of society to produce the necessary resources to address this growing environmental concern with viable, long-term solutions. Truly innovative global research and development has resulted in today's emerging field of bioplastics. By combining the disciplines of agricultural biology, food packaging, and microbiology, new biodegradable packaging solutions made from renewable plant resources are helping to address this environmental concern of rampant worldwide growth in plastics waste. It is important to recognize that although past and recent efforts have thus far yielded significant strides in the field of bioplastics, continued research in this field is needed if economically viable development and sustainable production processes are to be widely implemented throughout the world. As with any emerging technology, continued innovation and global support are essential for bioplastics to fully demonstrate its socioeconomic benefits and further challenge the status quo of traditional petroleum-based plastics.

Another article by the author Muthusamy Selvamurugan on the article Bioplastics – An Eco-Friendly Alternative to Petrochemical Plastics explains that plastics have varied applications and have become an essential part of our daily lives. The use of plastics has increased twenty-fold in the past half-century and is expected to double again in the next 20 years. As a global estimate, around 330 million tons of plastics are produced per annum. The production, use, and disposal of plastics emerged as a persistent and potential environmental nuisance. The improper disposal of plastics ends up in our environment, resulting in the deaths of millions of animals annually and also the reduction in the fertility status of the soil. The bioplastics products are manufactured to be biodegradable with similar functionality to that of conventional plastics, which has the potential to reduce the dependence on petrochemicals-based plastics and related environmental problems. The expansion and development of bioplastics and their products would lead to an increase in the sustainability of the environment and a reduction in the emission of greenhouse gases. The bioplastics innovation would be a key to the long-term solution for plastic pollution. However, widespread public awareness is also essential in effecting longer-term change against plastic pollution.

Another book Innovations in Food Packaging, a volume in Food Science and Technology chapter 15 - utilization of Bioplastics for the Food Packaging Industry by authors Young-Jae Byun, and Young Teck Kim, reviews the bioplastics market. Most market reports claim

that the bioplastics market is growing. In 2011, bio-based pets had the highest production capacity followed by bio-based pets. Among biodegradable and compostable bioplastics, pla had the highest production capacity. It is expected that non-biodegradable bioplastics, such as bio-based pe, pp, and pet, will lead the entire bioplastics market over the next 10 years. Braskem, coroplast, coca-cola, Nature Works, novamont, and Pepsico, are major key players in the current bioplastics market. New technologies for bioplastic production will emerge over the next 10 years.

The other article on Bioplastics from agro-wastes for food packaging applications by authors Isabel Gonçalves de Moura, Arsénio Vasconcelos de Sá, Ana Sofia Lemos Machado Abreu and Ana Vera Alves Machado says, that Bioplastics exhibit unique properties and can be produced from plants and crop wastes, among others, cellulose, proteins, and starch are some of the examples. Due to environmental concerns, it is of high priority to replace conventional plastics with bioplastics, and even better if they are directly synthesized from agro-waste. Green chemistry methodology is applied to extract natural polymers, such as cellulose, from vegetable wastes. This article focuses on the preparation of new functional biopolymers for packaging based on extracted cellulose, which exhibits broadly tunable thermomechanical properties and biodegradation. Therefore, this contribution shows the potential of agro-wastes to produce new cellulose-based bioplastics for food packaging applications

Another article Sustainable bioplastics derived from renewable natural resources for Food Packaging by authors Xianhui Zhao 10, Ying Wang 10, Xiaowen Chen, Arthur Ragauskas, Soydan Ozcan, Hongli Zhu explains, that Food packaging is one of the leading sectors for the end use of plastics. Bioplastic is produced from natural renewable resources such as crops, wood pulp, and herbaceous fibers. This article summarizes the rational design of bioplastics from natural resources for food packaging. The bioplastic properties considered include thermal properties, mechanical performance, oxygen/moisture resistance, and biodegradability. Bioplastic degradability and technologies for handling bioplastic waste are discussed. Various aspects of the sustainability of bioplastics (e.g., environmental profile, techno-economic analysis, and societal impact) are investigated. The main challenges of bioplastic application, such as low fracture strain and inferior barrier properties, are discussed. Mitigation approaches to overcome the mechanical properties of bioplastics, such as adding plasticizers, are also discussed. Bioplastic can have properties comparable with fossil-based plastics. Bioplastic can be an alternative to conventional plastic in most applications of food packaging, which can reduce the carbon footprint and environmental impact because of its biodegradability.

The article on Bio-Based Bioplastics in Active Food Packaging by authors Elena Stoleru, Anamaria Irimia, and Elena Butnaru says that Plastics are the most common packaging materials and bioplastics (in particular biologically derived plastics) proved, that they can be used in active food packaging applications, mainly in applications that include products with short shelf-life. The bio-based bioplastics are split into two categories, namely, biodegradable and non-biodegradable materials. Relatively recent is evidenced that bioplastics can represent a solution to overcome the drawbacks associated with the conventional plastics used in food packaging (environmental issues, health problems, etc.). Packaging plays an important role in maintaining food quality and active packaging appears to be a smart solution to successfully extend shelf-life or to enhance food quality and safety. This chapter aims to review the latest developments and challenges in the field of bio-derived plastics applied in the food packaging sector (focusing on active food packaging). It highlights the bio-derived plastics most used in this field and their advantages and limitations over common plastics and gives an overview of the recent developments in active food packaging applications

Methodology

Qualitative & Exploratory Research. Visited 5 Hotels (having more than 2 branches) in Tirunelveli Tamil Nadu.Biobased plastics are plastic materials produced from degradable biomass substances, such as oils and fats of vegetables, starch of corn, food waste which are recyclable, etc. Bioplastic can be Made from agricultural waste and also from used plastics by using microorganisms. Application areas identified in India for biobased plastics are Agricultural compost, pharmaceutical packing, Industrial Packaging, Milk pouches, food centers, Personal Care, Medical Devices, etc.

The Tamil Nadu government has banned plastic packaging of items even at the manufacturing Stage. The Environment and Forest Department issued an order (https://tnpcb.gov.in/pdf/GO/G.O_84_BanPlastic3718.pdf).It Has to be enforced with immediate effect, but it is unclear how authorities will proceed with this enforcement. Ever since the ban on plastics was announced by the Tamil Nadu government, hotels and Restaurants across the State have been working on various options and some have even adopted Innovative methods. However, once the industries here start producing the bio bag, all the hotels in the city will switch over to it. These are very effective and environment friendly too. The survey was collected from the hotels in Tirunelveli Tamil Nadu and collected their perspective Related to these plastics

Results and Discussion

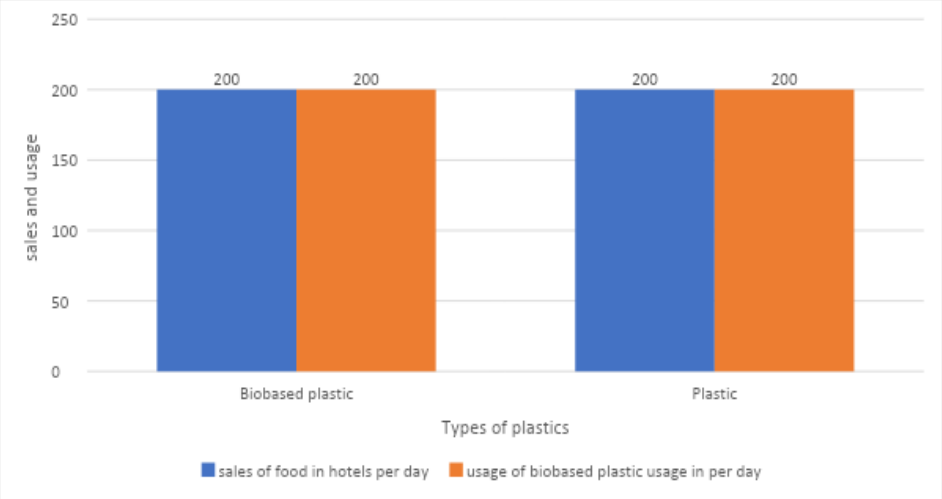
Perspective of people about bioplastic (hotels)
Questionnaire of hotels about bioplastics. (Methodology)

The methodology is done through a questionnaire and the sample size of hotels is 5 (hotels having more than 2 branches in the city)

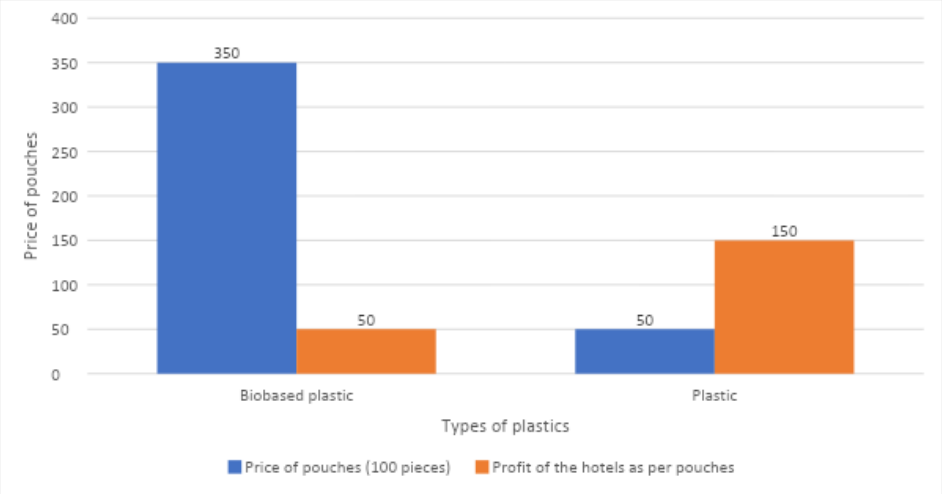
1. How much quantity of eco plastic did you use for a day?
   Response: The quantity used depends upon the sales of the food on that day. But approximately more than 200 packaging packs.
2. How did you manage the price of this eco-plastic compared to normal plastic?
   Response: The prices of the bags are higher than the normal plastics they used before. Rather than loss, they don't collect extra money from Customers.
3. Is eco-plastic easy to handle?
   Response: It is not very easy to handle but the foods should not be more than 50oc while packaging.
4. As per you what is the difference between the bioplastic and normal plastic?
   Response: There are many differences between both of them like not easy to package and low holding capacity and profit-wise loss to them from these bioplastic packages.
5. Do you have any problem buying or using this plastic?
   Response: There is no problem related to buying these plastics but there are a few problems while using them like packaging was difficult.
6. Where did you buy this bioplastic?
   Response: They are supposed to buy these bioplastics from the companies that are producing them with the proper licenses. They do not buy this from any local companies because the government is strict about these bioplastics.

Data Analyses of the Hotels Survey

Usage comparison of biobased plastics and plastics in hotels

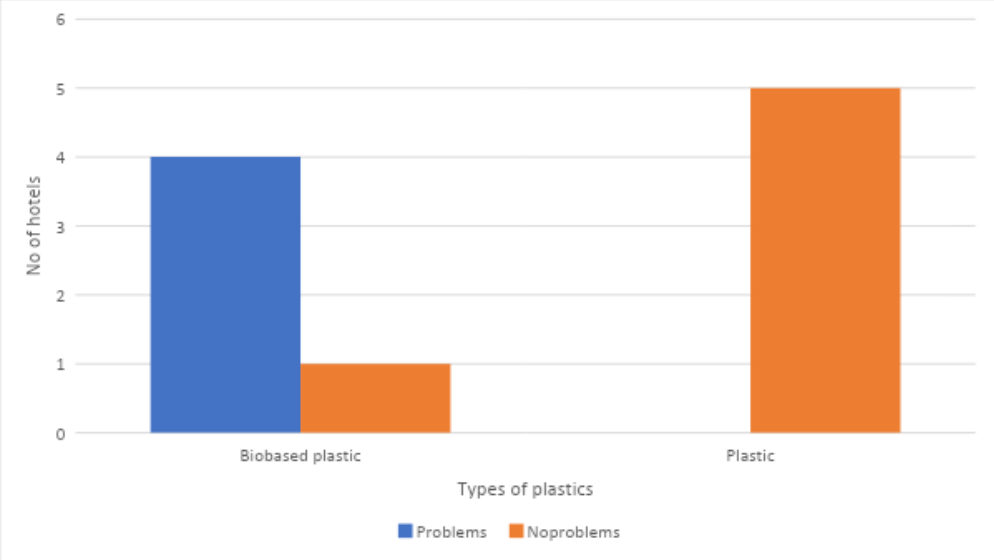


According to analysis no changes in the usage of plastic and biobased plastics. The usage of bioplastics depends on the sales of the food in the hotels Price and profit comparisons of the hotels by using biobased plastics in replacement of plastics



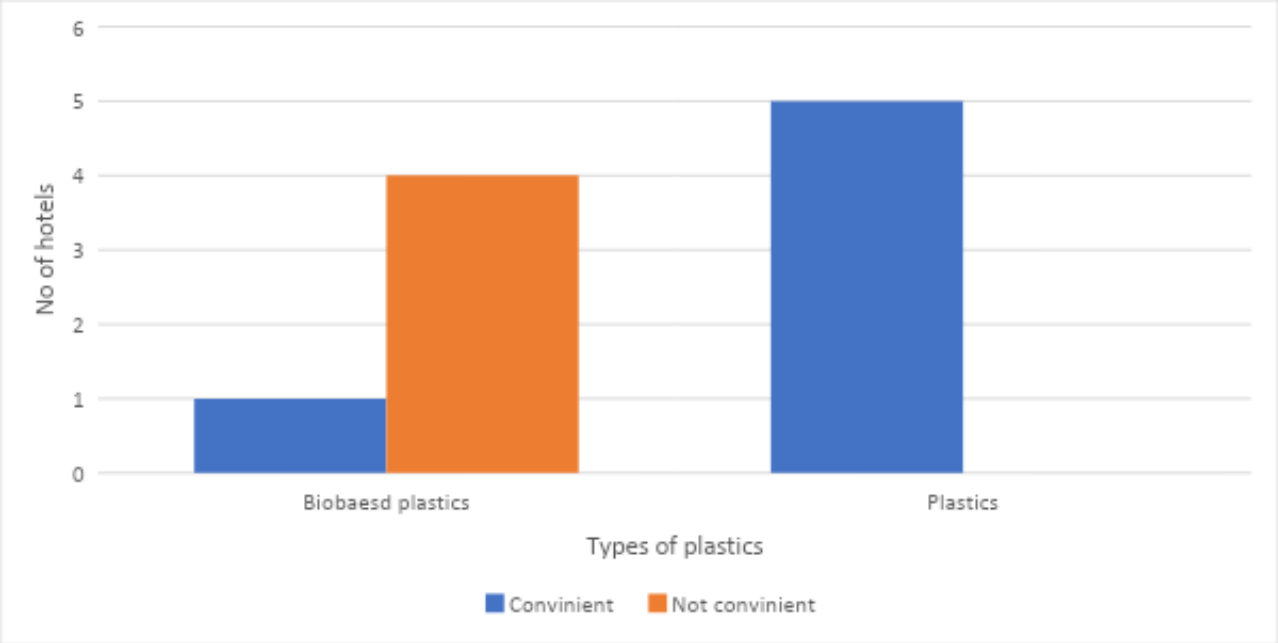
According to analysis, the profit of the hotels is less in the usage of biobased plastic compared to normal plastics

Problems related to plastic and biobased plastics



According to analysis biobased have more problems related to packaging and holding capacity while normal plastics have no problems

4. Handling was convenient or inconvenient



According to analysis, biobased plastics are less convenient as compare to plastics

Table 1: Comparison between Bioplastic and Non-Decomposable Plastics

Comparison Between Bioplastic and Non-Decomposable Plastics			
Sr.No.	Characteristics	Conventional plastics	Biobased plastic
1.	Energy consumption in production	Energy consumption is high due to the usage of fossil fuels.	Low energy consumption compared to conventional plastic. Comparatively lower than fuel-based plastic production
2.	Raw Materials	Non-renewable resources are used to make these plastics like petrol and other fossil fuels.	Renewable resources are used to make this type of plastic. Biomass obtained from starch of corn, sugarcane, potato, and other renewable crops is also used.
3.	Carbon Footprint	The carbon footprint is very high as petroleum is involved	Carbon footprint is very low as compared to conventional plastic. Less emission of

			CO2 which is significantly less than traditional plastics
4.	Presence of chemicals	It contains polyvinyl chloride (PVC). It is the most toxic and the most harmful form of plastic. It also contains bisphenol A (BPA), lead, phthalates, mercury, dioxins and cadmium	Mostly made by plant-based and renewable substances. Thus, less presence of any toxic chemical
5.	Biodegradability	It could take more than 500 years to decompose completely or need to be recycled. Can stay on land for a long time and can cause problems to the soil.	Decomposes within 180 days if decomposed in the right environment; releases methane on decomposition which can be harnessed to produce energy
6.	Arable land usage	No agricultural lands are used to manufacture this conventional plastic.	Currently, very low agricultural lands are used
7.	Effect on holding contents	Fails to retain the flavor and scent of the food stored in them; potentially releases harmful substances in the food on long exposures	Retains the original flavor and scent of the food being carried in them
8.	Handling and holding capacity	Easy to handle and easily hold heavy things	Little difficult to handle and lightweight things because of less thickness
9.	Price.	The price is very low.	The price is very high compared to conventional plastics. Comparatively higher than conventional plastics due to less technology development

Conclusion

After this methodology, it is clear that biobased plastics have many drawbacks rather than benefits from the perspective of the hotels. Biobased plastics are eco-friendly and safe for humans and animals, but not friendly for hotels that are using them. By methodology, I came to know that the hotels are using these biobased plastics at a loss, as it is more costly than plastics. There are other problems in the packaging (while using) this biobased because this plastic is not able to bear temperatures more than 50^0C, thus food is not able to serve the food faster than when using normal plastics. Not only that, these biobased plastics do not have much more holding capacity as compared to normal plastics because the bags they use are less than

50 microns. There is lots of wastage while packaging. The hotels are taking more care of packing while packing food. There is no problem related to these biobased plastics packages but they should buy these packs in large quantities and keep them in stock. These packs also have expiry dates thus holding them can be a loss for them.

The main conclusion from this study is that biodegradation of biobased plastic materials strongly depends on both, the environment where they are placed and the chemical nature of the material. Companies have understood the importance and potential mindset of people towards the Go Green campaign and have started producing biopolymers-based packaging for the food industry. When one looks at the present market for biodegradable food packaging materials it is still non-existent compared to conventional plastics used in packaging reasons being their high production costs and sometimes their underperformed properties, but there are still a heap of opportunities for the industries to develop new products with specific properties and more research is required to put these bioplastics in direct applications for different products. The growth of bioplastics In India is a positive change in consumer behavior and with continued support from the government and the citizens themselves, awareness about bioplastics can become even more widespread. As these bioplastics have some drawbacks it is very important for humans as well as the environment. As many governments are implementing laws against the usage of plastic it should be followed strictly. There are very few drawbacks in bioplastic but it can be improved though it will be very beneficial.

Suggestion

This bioplastics package should be more than 50 micrometres because the bio bags of less than 50 microns are very weak to carry, as they can decompose easily, increasing the little thickness of them can help hotels to use them.

The hotels should estimate the usage of these bioplastics packages because it helps them from the wastage of these packs. As they can melt when the food is more than 50oc they can use these packs while the food is less hot. They can request some subsidies from the government related to these bioplastics because they are expensive to buy. However, bio-based plastic products often have a very similar appearance compared to conventional fossil-based plastic products. As a consequence, they cannot be easily distinguished by consumers. The same is valid for biodegradable versus non-biodegradable products. Logos and labels can be used to make clear to the consumer (and retailer) whether a plastic is bio-based and/or compostable, and how to dispose of the plastic after use.

As they are also made of oils Waste Frying Oil Can Be Converted into Bioplastic. Second-generation bioplastic can be made from used frying oil. This kind of oil is a great source of polyhydroxy butyrate that can be used to make bioplastics. Instead of using vegetables, we can use the increase of bioplastics from agricultural waste. Or the bioplastics company can buy the

vegetables. The hotels are the area where they get this waste more which will price them cheaper than buying the vegetables.

Bioplastics are very expensive due to their chemicals but not by machinery so our Indian scientists can research to create that chemical in a simple and less costly way.
As bioplastics are very expensive government should encourage local companies through various policies and subsidies The growth of bioplastics in India is a positive change in consumer behavior and with continued support from the government and the citizens themselves, creating awareness among their parents and other people about bioplastics can become even more widespread which will lead to the plastic-free INDIA!

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