

Updates on Eco-Friendly Packaging and Edible Cutlery

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ABSTRACT

Globally, there is increased awareness among consumers on products quality. This served as a reason to welcome a product like Edible cutlery, which involves recycling of agro waste or an underutilised material to be made into a cutlery. Unlike the plastics that stay for more than 1000 years, edible cutlery made from renewable materials, degrades into the soil when disposed. It is of great interest to many industries and consumer sectors, which are keen on being eco-conscious. In the advent of plastic pollution and global warming, the use of such materials can sustainable packing bring significant change in the community. The paper discusses on the plastic pollution, sustainable packaging, consumer preference, change in the market trends, sustainable solutions, bio-plastics, and edible cutlery that can be insightful for scholars to understand this genre and perform research

Key Words : Sustainable packaging, Edible cutlery, Eco-friendly packing, Agrowastes, recycling, Upcycling, Food waste, Green packaging

INTRODUCTION

Plastics are made from oil, and when disposed in landfill they don't break down. As a solution bio-plastics are invented that are made from renewable materials like corn, potato, banana peel which can degrade post the use. Plastics are carcinogenic and the percentage of them in the human body is increasing with every year, through the entry of air, food and water. This needs immediate action. Single use plastic materials contribute to 4.24% of marine litter says European Commission 2016 report. In a study, in consumer preference for edible cutlery 100% women, and 86% of men showed desire to use edible cutleries. Recently various researches are conducted on development of biodegradable cutleries from bamboo, sugar, corn, sorghum^[1]. Production company's today have a list of 'Sustainability goals' as part of their goal sheet that works towards establishing a balance and aiding circular economy. Microplastics is

another demon that arises by the larger plastic bags/ packaging sheets, degrading under the sun over a period of time. This elucidates the need to develop better alternatives

Sustainable packaging:

Reports quote, that the US consumes 40 billion cutleries per annum, India discards 120 billion plastic cutleries every year and the Global demand is 640 billion per annum. In the same note Global plastic cutlery market is expected to grow by US\$3 billion by 2025, which is more alarming than ever^[2]. The Sustainable Packaging Revolution: a documentary by Jabil, available on youtube, quotes that from the year 1950, 9.2 billion tonnes of plastic have been manufactured and till now 91% of that has never been recycled. It is found that 90% of plastics are from the food and beverages packaging. It is irony that the consumers have a choice between throwing material into the recycling bin or a trash bin. Studies suggest that

people like to recycle but they lack the knowledge to submit a waste, to recycle or to sort them. The collection of used bags/boxes/spoons for recycling is a real-time challenge, besides, there is less awareness of bio-resins and biodegradable materials.

Production and marketing:

In every company's objective, it is important to design recyclable product packing along with edible cutlery. On the other hand, the research and development team should look to develop alternatives from the regional waste which can collectively reduce the carbon footprint. It is inevitable that there is a demand for edible cutlery in North America, Asia - Pacific excluding Japan (APEJ), Latin America, Eastern Europe, Western Europe, Japan and Middle East and Africa (MEA)^[3]. The key factors in developing a sustainable material (Fig. 1) should be focussed on

(a) Ingredients: should be made from raw materials that are 100% recyclable

(b) Production process: by minimizing wastes, sustainable supply chain, and minimizing carbon footprint

(c) Reusability: designing a method to recycle, repurpose, creating a circular economy around the packaging, extending its lifecycle, and usability will be kept as major objectives.



Fig. 1 : Key factors in designing a sustainable material

Eco-friendly packaging:

Pollution by packaging and cutlery has been rated as one of the most important environmental and ethical concerns of the consumers located in the United Kingdom. Previously, consumers had limited knowledge of material, technology, and appeal. Today, they show a strong desire to shift to eco-friendly packaging with an attractive design and good price. In today's market, eco-friendly packaging is of prime focus, and there are many support measures by the Government too, that insist on

having eco-friendly packaging. There are different names for sustainable packaging namely green packing, environmentally conscious design, environment-friendly packaging, green packing, eco-design, eco-packaging, sustainable packaging, green packaging, and many more.

A study done in Sweden suggests that the consumers preferred eco-friendly packaging in beverages to be an important factor in purchasing them. According to Sustainable Packaging Coalition (SPC), "Sustainable packaging is beneficial, safe and healthy for individuals and communities throughout its life cycle; meets market criteria for performance and cost; is sourced, manufactured, transported, and recycled using renewable energy; maximizes the use of renewable or recycled source materials; is manufactured using clean production technologies and best practices; is made from materials healthy in all probable end of life scenarios; is physically designed to optimize materials and energy, and is effectively recovered and utilized in biological and/or industrial cradle-to-cradle cycles".

Changing Consumer preferences :

A study on consumer preferences for eco-friendly packaging was built on materials used, manufacturing techniques, and market appeal. Among various materials, plastic was understood as the least sustainable material and paper to be the most convenient option. It was found that the consumer buys what is available in that given time. The study suggested that educating the consumer on the findings of the life cycle assessment, effects on the environment in a simple, understandable way can promote sustainable packaging. However, the findings convey that attractive graphics, colour, design, functionality, and pricing are weighed in understanding the eco-friendly attributes of packaging (Fig. 2). There is a sense of disappointment on the dull, unbleached brown bags, colourful images on the package are found to be attractive and appealing to the consumers. Perhaps, the pricing can be equivalent and also less than conventional packaging. However, government norms, guidelines, and standards for environmental impact. Underlying objective of a good packing is to protect the product through its shelf life and to benefit the purpose for which it is designed.

Sustainable Solutions in food packaging:

Sustainable, recyclable, organic, natural, compostable, zero waste, cutting down fossil fuel by 50%, 100 recyclables are the keywords in today's

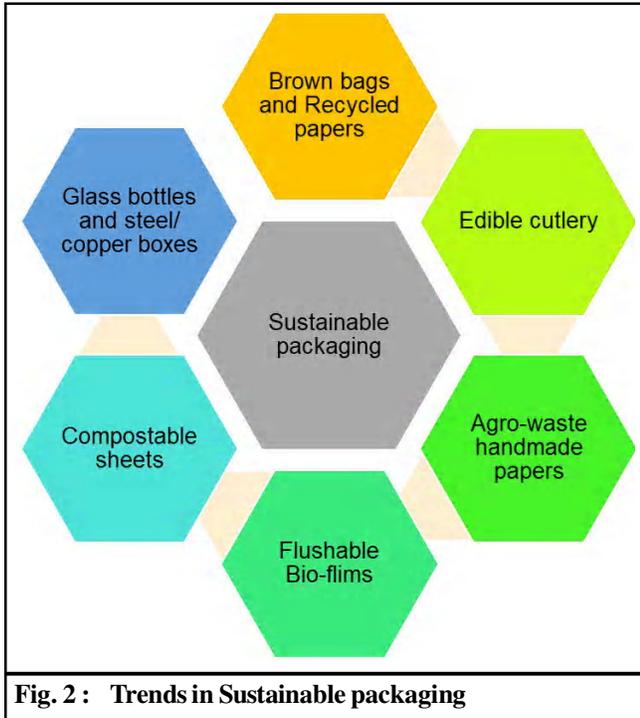


Fig. 2 : Trends in Sustainable packaging

business. Ironically, better consumer choices, drive us to a different path, one that is good for all. Some consumers are aware of the threat by plastics and have made conscious changes, once such being the shift from using plastic to a bamboo toothbrush. Cosmetics and food industry welcome recycled papers, bottles, cans for multiple uses. Some brands made self-imprinting and avoid the plastic labels on them. In a nutshell, when we observe the plastics on the earth, a major portion is from these food and packaging industry, a small initiative, from one person or one enterprise cannot solve the entire problem, but can build a path to reach the destiny of sustainable living. Today bubble wraps are made of recycled polyethylene that is completely recyclable. Corn starch, cardboard, paper, biodegradable plastics are available in the market to adopt green consumerism.

Bioplastics :

Plastic waste management is a buzzing topic world-wide. Polymers and Composites made from nature are used to replace the single-use plastics. Biodegradability and biocompatibility of these biofilms have a significant role in medical applications, as scaffolds in tissue engineering, soil retention sheeting, and containers in agriculture, construction fillers in textiles, foams, and many more. Biobased polymers are made from plants, animals,

and even microorganisms. Some of the examples include polylactic acid (PLA), polyhydroxyalkanoates (PHA), Polyhydroxybutyrate (PHB) and its copolymers. Among these PHB is considered to be equivalent to polypropylene and Polyethyleneterephthalate. The disadvantage of PHB is the high cost of production, poor performance in mechanical properties, and processing. To balance this, cost-effective biomass fillers (starch) are added with PHB to form a composite, which was found to reduce the mechanical properties negatively. The addition of plasticizers (lauric acid) with the biomass filler, increases the flexibility and processing ability, due to the lowering of the glass transition temperature.

Edible cutlery – an invention from India:

The food service sector has achieved a massive growth in recent years. Flourishing tourism has also paved way for restaurants and quick service food counters. This have opened up new gateways for plastic cutleries resulting in landfill pollution. Edible cutleries made from grains like rice, can be a revolutionary break through to replace plastics in packaging and cutleries. During May 2019, Eithad Airways started using edible cups instead of plastic, that has reduced 17 tons of plastic every month. The predictions suggest that this step can reflect in reducing the plastic consumption by 80% before 2022. Various other airlines have also followed the similar strategy now. With the increasing number of populations gearing up towards health-conscious lifestyle, it is encouraging that the market for edible cutleries is also growing, as shown in Fig. 3^[4].

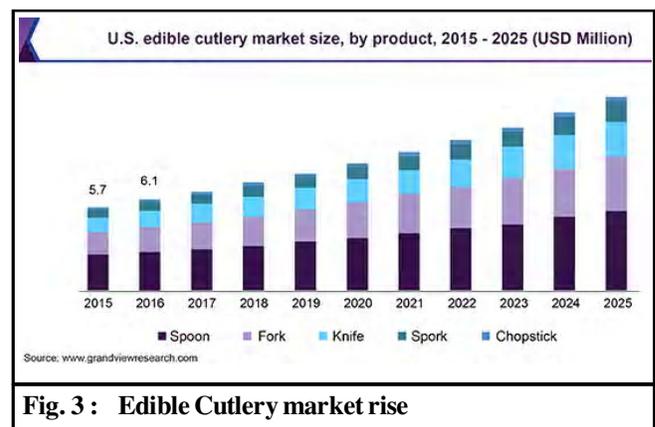


Fig. 3 : Edible Cutlery market rise

It is rare to see a consumer wash a plastic spoon before eating a plate of food. As an experiment, when we drop the plastic spoon in water, a thin coating of oil

appears on the surface. This is a vaseline that is used during production to enable the spoon to fall off the machine, after the moulding process. Similar to wax coating in a ready-to-eat Maggie, this Vaseline also goes to the gut, knowingly and unknowingly. Such an act can result in a series of health hazards. The solution is the use of edible cutlery. The category of edible cutlery does not use chemicals, preservatives, artificial colours, emulsifiers, or milk products^[5].

Certainly, they can be reused and the products are 100% biodegradable, natural, vegetarian, and vegan. Some companies even offer gluten-free variants. It is predicted that 250 edible bowls save around 1 kg of plastic. Edible cutlery serves the answer for the recent consumer demands which is transparency and sustainability. The use of eco-friendly materials in cutlery helps in minimizing pollution. This edible cutlery is manufactured from various grains, rice, wheat along with various spices and flavors, based on the consumer requirement. After serving the purpose they can either be eaten or left to decompose naturally. This route to zero waste eliminated the waste management nor recycling issue. This is one of the prominent factors to fuel the demand for edible cutlery, globally. Besides, it does not drive the need to be washed, which reduces the need for water, detergent, and additionally serves as an animal feed.

Edible cutlery is manufactured in a variety of colours and flavours which is versatile to be used anywhere like party, office, workshops, conferences, and with anything hot or cold. The product should be certified by FSSR - Food Safety and Standards Regulations for human consumption. It will be satisfying for the consumers to see that the product we use daily is good for the environment. Analysing the depth of this technique, we can understand that edible cutlery has an added merit of saving groundwater in India. Millions of tons of rice are left to spoil in godowns and warehouses, due to excess production. The edible cutlery has an additional tag line of restoring the market for millets and protecting the water resources. In a real-time scenario, the farmers choose to grow millet and rice back-to-back, and among them, rice takes 60 times more water than millets. Underground water is pumped for this purpose causing depletion of the water resource. Farmers reported that a better market for rice was the reason to grow them, and these edible cutleries made from millets creates a market and an opportunity to avoid plastics. From the consumer's point of view, some might prefer the fact that it can be eaten

and others for its easily compostable and biodegradable nature. There are various types of agrowastes like wheat bran, rice bran, sorghum, corn, that can be used for manufacturing of edible cutlery^[6].

Growing end-user preference for edible cutlery over conventional formats is driving the demand for this product. Besides, the increasing number of government initiatives and efforts for sustainability is also expected to boost the demand for edible cutlery in the coming years. Thus, the edible cutlery market is projected to register a healthy CAGR as edible cutlery is an environment-friendly alternative to disposable plates, bowls, and cutleries. This has attracted various investors to shift their packaging to eco-friendly options. Manufacturers of edible cutlery can take seek this as an opportunity to invest in the edible cutlery market.

Invention - Edible Cutlery:

Edible cutlery can be the future of eco-friendly utensils. Bakey's by Narayana Peesapaty, is the First Indian cutlery company to develop spoon and forks that are edible. "Now eat what you eat with" is his idea which is very popular in the internet^[7]. Narayana peesapaty, discusses that one night after a tiring day, he ordered roti online, which when eating was in a firm texture where he had to break and dip in the dhal to eat. The next day in this flight journey, he was offered roti, dhal, and a spoon, which was a Eureka moment for him. He says, it instantly gave him the idea to make edible cutlery.

The former consultant wanted to design a product to replace plastic. He made the prototypes and sold them in the local market at Rs. 4 per piece. Initially made in a domestic oven, soon fell out of time. A larger machine, mould required an industrial unit, when the production unit commenced in 2011. Situated in Hyderabad (India) Bakey's makes edible cutlery from millet, rice, and wheat flour with no preservatives and fat, additionally being highly nutritious. This product resembles the flavour of crackers and is available in a variety of shapes resembling spoon, fork, stirrer, chopsticks, and bowl. Millets are complex carbohydrates that don't turn soggy soon and can withstand high temperatures for a good time. The inventor quotes that the steel market, was replaced by aluminium, which was surpassed by bioplastic and now we have the edible cutlery. The technology, creating a market for the new product, testing, and characterization along with updating with the technology was the major milestone. Plastic spoons that are full of toxic compounds

do have a choice, and these edible cutleries which are full of nutrition are the solution^[8].



Fig. 4 : Demonstration of Edible Cutlery by Mr. Narayana Peesapaty, MD Bakeys Foods

The company places its objective enable us to stay away from creating plastic pollution and creating the world's first mass-produced edible cutlery, which can be eaten by anyone. They come in three flavors: plain, sweet, spicy with a shelf life of three years that can be used with hot liquids too. Since the launch, a variety of flavors like sugar, salt, mint, ginger-cinnamon, ginger-garlic, carrot-beet, vanilla, lemon, cumin, rock salt, pepper, celery were developed to suit the needs of the consumer. The product is sold in a paper cover, that is coated inside using potato starch^[9].

Other Edible cutlery brands:

Trishula (Gujarat) by Kruvil:

The concept of edible cutlery, in which the plate/spoon can be consumed unlike the non-biodegradable pollutant, plastic. A start-up company Trishula, in Gujarat, decided to bring this in eight amazing flavors, as an added innovation. India has a wide palette of various taste preferences and to adapt to this diversity this concept which has beetroot, spinach, chocolate, masala, black pepper, mint, ajwain (carom seeds), and plan to suit different needs of the customer. Edible cutleries are made using different flours, spices, flavors which mixed at appropriate proportions and baked at high temperatures (to absorb moisture). The products are natural and have no added preservatives or artificial flavoring with a shelf life of six months from the date of manufacturing. The

very interesting feature is the option to customize the size, shape, and taste of the spoons as per consumer requirement^[10] (Fig. 5).



Fig. 5 : Trishula's edible cutlery

Biotrem (Poland):

The company manufacturers cutleries from wheat bran that are efficiently used to hold hot or cold meals and very ideal for baking and reheating purposing. These are water repellent and can bear up to 350°C. They have tested that the plates take 30 days to compost and is 100% biodegradable. It is estimated that one tone of wheat bran makes 10,000 units and found to be better than the conventional foam, plastic, paper-based disposable plates^[11].

Project Patradya - Shivam Shukla, President, Enactus chapter of Kirori Mal College:

In Sanskrit, the word Patradya means edible utensils. The Kirori Mal College in Delhi University had students who identified that terrifying plastic pollution in their locality loaded with roadside snack shops, café, restaurants, schools, and college canteen. The alarming use of plastics as cutlery and packaging made them realize a problem so regional and quenching for an immediate solution. They worked to create Project Patradya, which enables them to find an alternative solution to the plastics and also empowering Afghanistan refugees. The project is also supported by Enactus India. A global NGO and community working with students. The idea of having edible cutleries (cup and bowl) from multigrain including wheat, rice, and jowar^[12].

Ari Jónsson in Iceland:

Designed biodegradable algae water bottle using powered agar with water as a replacement for plastics. Agar from the 16th century is a material that can mix

with water to form the agar water which can be heated, frozen into a mould that contains water, but soluble to break down easily.

Edible Pro, by Ms. Shaila Gurudutt and Ms. Laxmi from Bengaluru (Karnataka):

It is promoted to be 100% organic and available in flavors like lemon, tomato, dates, pome, beet, chili, cinnamon, chocolate close to 60 variants of tableware since 2018. Millets, grains, pulses, and spices are hand pounded and processed in their units to assure quality in making their edible tableware. The grains are powdered, made into a dough, and after molding by hand or machine they are baked in the oven. They have tested the material to hold its quality in minus forty degrees and with hot material on them for up to two hours. It is available with designs engraved in the rim (using blocks), and different shades obtained by using edible food colors. Fork, spoon, knife, cup, bowls, and tumblers are its design variations^[13].

Conclusion:

Manufacturers who deal with developing packaging materials are looking for ecofriendly alternatives. The development of sustainable pieces helps in reducing the carbon footprint. There is definitely a growing end user preference that promotes sustainable packaging. Concurrently, edible cutlery which is either eaten or decomposed after use, do not contribute to pollution. Various brands have now adopted the technique to create plate, spoon, coffee cup, fork and chopstick which has been widely accepted by the consumers as well. The set back is the cost of the edible cutlery compared to plastic spoon/plate. Another challenge can be the transportation and handling of these cutleries which requires future design, planning and production^[14,15]. Among various segments these two sustainable packaging and edible cutlery have huge market potential and prospective future.

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