

CHAPTER 6

Environmental Sustainability with Ecofriendly Kitchenware's

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Abstract

Plastics have become one of the most widespread materials; their global production has on average reached 367 million tons per annum in 2020. It became an important part in our lifestyle but growing environmental concern caused by use of plastic utensils have led to many serious issues on human being and environment. The massive production, utilization and improper disposal of plastic results in severe consequences like pollution, depletion of nonrenewable resources, harm to ecosystem and natural environment. As far as food concern, Preparation, storage and packaging of food in plastic materials which contains chemical (BPA) that may cause serious harm to human health and food system. Food has a great impact on our physical and mental health therefore cooking and packaging of food get affected by the utensil that is used. In modern era we used stainless steel, aluminum for cooking and plastic for packaging and storage of food. But these options cannot restore most of the micronutrients rather plastic adds some hazards to the food. Therefore, there is an urgent need to explore and adopt biodegradable alternative to the single use plastic utensils. This chapter aims to provide brief review of impact of plastic on environment, ecosystem and health. Through this chapter we want to reintroduce the ancient and some new cooking and packaging natural materials for kitchen utensils that makes our kitchen ecofriendly. This will help to promote good health, new employment, industrial scope and circulatory economy for sustainable growth and development of country.

Keywords: Biodegradable, Circulatory economy, Ecosystem, Non-renewable resources, Sustainability.

Introduction

Food is necessary for the proper growth and development of human being. Food provides the essential energy requirement, nutrients, vitamins and minerals to body. Metabolic activities and functioning of the body are rely on energy obtained from the food. We have heard a proverb that “the way of heart goes through

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stomach” so food has great impact on us. The food quality does not only depend on its taste but also on the nutrient content of it. Therefore, it is very important to keep nutritive quality of food, it requires protection from various environmental factors from the time of its preparation till it is consumed. Hence proper cooking method, storage and packaging is required to protect the food. Taste and quality of food depends on quality of raw material, cooking and packaging utensils. Nowadays peoples are using steel and plastic kitchenware’s, the food containers like plates, bowls, pots, tiffin box, trays, water bottles, milk bottles, spoon, forks and dinnerware’s etc. are made up of single use plastics and that are not thermostable and cause leaching out of chemical into the food. Teflon coating utensils and BPA coated plastic are not good for the health, these things can cause sever deadly diseases to human being. Present days plastics are one of the most important materials, its production is increased by about 9% per year since 1950. It is because of constant growth in consumer demand since plastic is used in a wide range of home appliances and commercial products. The low cost and variety associated with plastic equipment which attracts consumers towards it. Broadly disposable plastics are thermosetting polymers or thermoplastic. Thermoplastic makes greater share in usage of plastic in kitchen. There are many varieties of plastics are used in kitchen such as Polyethylene terephthalate (PLT) used for plastic bottles, fast food containers, plates and cups. High Density Polyethylene (HDPE) used for manufacturing of colored plastic bottles, fabric softener. Polyvinyl Chloride (PVC) used for bottle and glass dishes detergents, plastic mats. Low Density Polyethylene (LDPE) for juice bottles, mustard cans and beer bottles. Polypropylene (PP) used for pharmaceutical syrup bottles. Polystyrene (PS) for plastic cutlery, dishes and plastic tubes etc. usefulness and utilization of plastic is more but the fact that the plastic utensils are non-biodegradable hence causing high impact on ecosystem and environment. Huge dependence on single use plastic utensils has led down sever problematic situations such as pollution, depletion of renewable resources, harm to ecosystem and wildlife. Therefore, the time has come to find out an alternative to conventional plastic before too late.

Impact of single use plastic utensils

Single use plastic kitchen utensils like plates, bowls, cups and other cutlery are most used items due to their convenience and low cost. However, these disposable utensils cause significant environmental impact. Plastic is nonbiodegradable that causes great damage on natural environment. Thus, the plastic generates certain environmental issues.

Resource depletion

Plastic items are primarily made from fossil fuels such as petroleum which are nonrenewable resources. The extraction of oil and gas from natural gas releases toxic substance in air and water. The refining and processing of these resources contribute to depletion of these natural resources.

Waste creation

Short lifespan of utilization of plastic utensils leads to enormous amount of waste plastic garbage. Every day, equivalent of 2000 garbage truck full of plastics are dumped into worlds ocean, rivers and lakes. According to the study of United Nations Environment Programme, about 300 million tons of plastic waste is generated annually. Plastic waste limits the growth and activities of soil microorganisms. There are reported cases of accidental ingestion of plastic waste by land mammals including cattle’s, elephants and camels resulting in death of these animals (Lai, 2022). Plastic waste on landfills can cause loss of soil fertility, failure of food chain of ecosystem, Accumulation of plastic waste is one of the risk factors of infectious diseases such as dengue, chikungunya, malaria and filariasis etc. The covid-19 virus, SARS-CoV-2 can be vectored by plastics

Pollution

Improper disposal of plastic items often results in ending up in landfills, waterways and ocean. Plastic contains harmful pollutants having the potential to cause toxicity in air, water and land. Groundwater in its

natural state tends to be relatively free of contaminants. When rain falls, all garbage dumps, landfills and plastic wastes that litters everywhere become leached into the groundwater which is the main source of drinking water. Plastic pollution on land poses a great threat to the plant and animals including humans. Toxic chemicals released from plastic waste on interaction with water seeps into the soil, it makes soil to be infertile and affect plant growth. When plastics are burnt, toxic chemicals are released in atmosphere that causes air, soil and water pollution which directly or indirectly affecting the ecosystem and biodiversity on earth.

Persistence

Disposed plastics are found everywhere in houses, on street and roads of cities, towns, villages and colonies which makes it unclean. This plastic garbage cannot be destroyed, even after burning they remains in incomplete burnt solid realizing poisonous gas in air. They can persist in surrounding for hundreds or even thousands of years and have a long-term danger to the ecosystem and biodiversity on earth.

Human health

Air and water pollution is more dangerous to human health causing various diseases such as neurodegenerative, cardiovascular and respiratory diseases. Plastics are well known to disrupting hormonal balance and growth. The microplastics enter into the body which may lead to an array of health effects which includes oxidative stress, inflammation, apoptosis, dizziness, diabetes, arthritis, cancer and stroke etc.

Considering these challenges, there is an urgent need to replace the plastic and develop an ecofriendly, biodegradable alternative to single use plastic utensils. By using biodegradable plant based sustainable materials one can significantly reduce the environmental and health impact of plastic utensils. Moving towards plastic alternative, it requires innovations, new designs and sustainable business models that encourage the lowest environmental impact. Scientists and workers in the field of environment and sustainability are constantly being developed new products based on pre-existing raw materials to achieve plastic free approach. Recently holistic and old designs of kitchen utensils have focused in mainstream which are natural in origin and are bio based, they are also known as bioplastics e.g. cutlery made from coconut and palm. Hence bioplastics can be defined as non-conventional plastic that can be either biobased or biodegradable in nature. Bioplastics are biobased biodegradable material produced by using vegetable oils and fats, corn starch, wheat husks, woodchips, sawdust which can be degrade and composted. It would be a better option for single use plastic to achieve sustainability

Biodegradable raw material for cutlery and utensils in Kitchen

In historic pages of India, the ancient communities use utensils produced either by soil or metals. The plates, bowls and storage baskets are made from plant origin. So, following the phrase “Old is Gold”, now we have to move forward with this type of plastic alternative which will help to achieve environmentally sustainable development. Some of biodegradable materials for kitchen utensils are as follow.

Wheat husk

Wheat bran and husk are the byproducts of wheat milling process and are produced abundantly in milling industries. It has low cost and it is a renewable resource. Wheat husk is one of the important raw materials for making biodegradable bioplastic cutlery, due to their unique properties. They are composed of natural fiber proteins and starch which can easily decomposed naturally. They are food grade material hence do not contain harmful chemical like conventional plastics. They have good thermal stability making them suitable for use with hot and cold food items.

Rice Husk

They are also produced as a byproduct of rice milling industries and are non-toxic, safe for contact with food and drinks. They are also easily decomposed by microorganism and hence suitable for the production of biodegradable utensils. They have good thermal stability that makes them suitable for various food application from serving hot meals to cold desserts.



Cutlery made from husk

Corn starch

It is another widely used material for ecofriendly cutlery and food packaging products. It is derived from corn flour. It is biodegradable material and can exhibit flexibility and strength as conventional plastic cutlery and packaging bags. It can be used to make plates, spoon, forks, knives etc. as they are edible in origin and hence safe to use in kitchen.

Tapioca starch

Peoples believe that tapioca starch is only used in the food industry but it is a key ingredient in the development of biodegradable plastics and products. Tapioca starch is commonly used in the production of biodegradable plates, bowls, spoons, forks, knives and other kitchen utensils. Biodegradability and renewable nature make it a preferred choice for environment friendly products.

Potato starch

Potato starch is also used for making plates, spoons, cups and forks which can be edible after their use. They are renewable, ecofriendly and decompose faster than other biodegradable plastic. Utensils from potato starch can be a fodder for animals after disposal.

Areca leaves

Biodegradable areca plant leaves are very good option to replace dinnerware's made up from single use plastics. Plates and bowls made up of areca leaf can save lot of plastic waste generated during the functions like wedding, anniversaries, parties, where the plates, bowls and glasses used for eating are made up of either plastic or thermacol that goes to create waste garbage and land pollution. Therefore, use of these biodegradable, thermostable and nontoxic areca leaves can be a better option to replace the plastic plates and bowls.

Millets

Millets contain complex carbohydrates which do not break apart when in contact with water or hot liquid. millet is an environmentally sustainable crop. Therefore, edible spoons and cups can be made up of millets.



Areca leaves dinnerwares and edible millet cutlery

Bamboo and coconut

Rural and tribal peoples of India are still using bamboo baskets to store the food grains. In Nanded district of Maharashtra, the woven basket is made from bamboo strips known as “Kangi”. Sometimes this basket is plastered with cow dung or ash mixing with oil of biba seeds (*Semecarpus anacardium*). The cereals can remain for long duration with good nutrient quality in this eco-friendly containers.



Cutlery from coconut, woven bamboo basket and earthen pots

Earthen materials

Clay utensils almost preserve all the micronutrients present in the food. It was used since long time in India but it was replaced by plastic and stainless steel. Nowadays again we need to replace plastic, stainless steel and aluminum kitchen wears due to the health hazards. Earthen cookware's are biodegradable, renewable, non-toxic, thermostable, good for health and restores food quality as well. There are many other options for raw materials for plant-based bioplastic used for making kitchen wares such as Banana leaves, banana stems, Tofu waste, Hemp, Jute, Wood pulp, Sugarcane bagasse etc.

Advantages of using plant-based cutlery and kitchen utensils

All these plants based raw materials are natural in origin, biodegradable material that can be broken down by microorganisms in the environment and release water CO₂, Biomass. It will have a reduced environmental and health impact as compared to conventional plastic kitchen utensils. They are all natural resources and plant-based food grade raw material and not containing toxic synthetic chemicals as in single use plastic. Therefore, they are safe for contact with food, drinks and there is no high risk to human health. Kitchen wares made from earthen material do not affect a natural test and nutrient content of food. These materials exhibit good thermal stability allowing it to with stand both hot and cold temperature. Therefore, it makes suitable for cook, store and package hot and cold food items. The production and degradation of utensils made from plant-based material required less energy and release fewer GHG (Green House Gas) emissions compare to the manufacturing and disposal process of conventional plastic items this helps in reducing the carbon foot print. Biodegradable bioplastic utensils are

renewable and often considered waste products. Utilizing these materials for kitchenware's reduces the reliance on single use plastics and not only sustain the environment but also contribute to circular economy of country.

Despite of these advantages there are certain challenges associated with using plant based and soil-based materials for biodegradable kitchen ware like higher production cost, low market sale due to cheaper plastic products, lack of awareness of hazardous impact of plastic ware. There is need for further research and development to optimize to manufacturing processes, mechanical properties, durability and shelf life of biodegradable kitchen wares. There must be a promotion and encouragement to young professionals to start biobased plastic manufacturing industries. There should be government policies and education policies which focused on biodegradable options for plastics to achieve the international goal of development with environmental sustainability.

Summary

Though plastic is light weight, easy to carry food and dispose, there are a number of health risks associated with long term use of plastic products for cooking and food packaging. The chemical called bi-phenol A (BPA) present in plastic can diversely affect the brain and prostate glands in fetus, infants and children's. The microplastic that accumulate in body are a source of chemical contamination to tissues and fluids. Therefore, biobased raw materials used as alternative to plastic have the potential to serve as environmentally friendly biodegradable kitchen wares. Biodegradable kitchen utensils definitely offer a viable alternative to conventional single use plastic.

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