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PREPARATION OF BIODEGRADABLE PLATES FROM NATURAL RESOURCES

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Abstract: Now a days Most of the disposable materials are used to produce plastic. Plastic takes several hundred to thousand years to decompose & releasing toxic substances like bisphenol A, melamine and many more in the process. Therefore, this work was to analyze alternatives to plastic takeaway cutlery. This biodegradable plates are made up of wheat flour, maida & top coat of banana leaf. These are the major raw materials required for preparation of bio-degradable plates. At initial stage raw materials were collected then dough was prepared. After making dough moulding was done followed by drying of final product. After that application of top layer was done using babul gum. To check the properties of the plate regarding the degradation, how much time it will take fully to degrade as compare to regular bases.

Key words : Banana leaf, Wheat flour, Maida flour, Acacia Nilotica (Babul Gum), Bio-degradable plate.

1. INTRODUCTION

Disposal of solid waste is a major issue in today's scenario. Many countries are facing massive solid waste management problems due to rapid urbanization and population explosion. Disposals plastic industries are very old industries. According to the world economic forum; worldwide plastic production has been risen from 15 million tons in 1964 to 311 million tones in 2015 the number is assumed that it would rise triple around 2050 with concern over environment degradation and pollution of human's health due to plastic consumption. Many entrepreneurs have developed innovative edible tableware, which also provides great degradability.

Edible plates have emerged around 1400s. First introduction was in form of Bread bowl in 1427, to impress the Britishers. Bio-degradable cutlery are now used in almost every part of entire world. Minor amount has been commercialized; rest are at the initial stage of development. Different countries has different type of bio-degradable cutlery. Some of them is mention as below.

INDIA: - Bakeys founded in 2011 by a groundwater researcher, narayan peesapathy for production of edible cutlery as an alternative of the plastic disposables.

TAIWAN :- The sugu company of Japan has produced edible disposable plates and other tableware item, and in 1986 claimed to have been invented the "world's first range of edible tableware" as a means to replace disposal tupperware.

SOUTH AFRICA:- The company Munch Bowls private limited was founded by gergina de kock and established in western cape, south Africa, since 2011. The produce edible, crisp wheat bowls, known as Munch Bowls.

JAPAN : - Japanese designer Nobuhiko Arikawa of rice-design company has created edible tableware for Orto cafe in Japan. The plates, bowls, and chopsticks are intended to replace disposable paper tableware.

2. LITRATURE REVIEW

2.1. Paper vs leaf: Carbon footprint of single-use plates made from Renewable materials

Author- Lucia korbelyiova, Christopher Malefors, Cecilia Lalander

Plastic pollution of the natural environment world-wide is ubiquitous. More than 80% of marine litter Is made of plastics, 70% of which originates from disposable items, so plastic disposables need to be Replaced with disposables made from renewable materials. However, it is important to investigate the Environmental impact of renewable alternatives through their life cycle, in order to support sustainable Consumption and production. In this study, the carbon footprint of disposable plates made from two Different renewable materials (paper, tree leaves) were analysed using life cycle assessment. The leaf plate Was produced in India and the paper plate in Finland, but both were used and disposed of in Sweden. The Results showed that the leaf plate had higher carbon footprint, due to long-distance transport and use of Fossil fuel-based electricity for production. Scenario analysis indicated that the emissions associated with The leaf plate were lower when replacing air freight with sea transport and with economies of scale In expanded production.

2.2. The Study of Anatomy and Fibre Banana Leaf as a Potential Wrapping

Author- Nunung Harijati*, Rodliyati Azrianingsih

The aims of this research were to study the leaf anatomy of Musa brachycarpa, M. Paradisiacal normalis, M. sapientum and M. cavendishi as well as the length, width, and thickness of the leaf and the number, diameter, and tensile Strength of leaf fibres. Samples were collected in Dampit, Wajak and Batu, Malang. Indonesia. The criteria for leaf Samples were that they were fresh, mature, and not torn. Microscope slides used for anatomical observations were prepared using a semi-permanent method. The Retting method was applied to extract the fibres, and fibre strength was Measured using a tensile strength tester. One way Anova and the Duncan test were used to establish the mean and other Parameters of the dependent variables (length-, width-, thick-leaf; number-, diameter-, and tensile strength of fibre). The T-test (independent sample) was used to determine the mean diameter of fibre in adaxial and abaxial sites. The results Showed that M. Brachycarpa had the highest number of fibre cells, a wider diameter fibre, and more adaxial fibre cells than the abaxial site.

2.3. Leaves as dining plates, food wraps and food packing material: Importance of renewable resources in Indian culture.

Author- Jyothi Kora

The disposable plates made up of plastics such as polythene, polypropylene, polystyrene, polycarbonate, Polyvinyl chloride, etc. pose health risks due to the release of toxic chemicals; bisphenol A, melamine, vinyl chloride, and Phthalates. The usage of disposable plasticware not only depletes fossil fuels but also causes microplastics pollution. Thus, Thrust has been shifted to utilization of disposable plates made from plant leaves, which are renewable, biodegradable, And enriched with antioxidants and medicinal values. In India, serving food on leaf dining plates is a long-standing tradition with its own cultural, religious, medicinal, And socioeconomic significance. The leaf plate stitching is a livelihood activity for tribal people in Odisha, Madhya Pradesh, Chhattisgarh, Andhra Pradesh, and Telangana states of India. The leaves and leaf plates are used for offering Naivedyam to god during worship and distribution of prasadam to devotees. They are extensively used for serving food During marriages, religious festivals, community feasts, etc. The leaves from a vast variety of plants are used as dining Plates, food wraps during steam cooking, grilling and frying of various dishes, and food packing material in India.

2.4. A study on Edible cutlery : An Alternative for conventional ones.

Author- Hemraj Narhar Patil*, Preeti Sinhal*

Plastic cutlery is a convenient choice, disastrous to environment as well harmful to health. Being a petroleum by-product, the presence of toxin and carcinogens that can be easily absorb into human body. Disposal of plastic cutlery has become hazardous foe environment as toxin and carcinogens can leech into food through the natural ecosystem as plastic are occupying a lot of space and clog the landfills annually. The recent ban on plastic and due to the threat to environment seeded the idea of biodegradable cutlery. Although India has seen only one major entrepreneur of edible cutlery but with time and demand many other suppliers will emerge.

2.5. Quality Analysis of Acacia nilotica (Babul) Gum Exudates

Author- B.L. Jani1*, B.M. Devani , D.M. Vyas and S.H. Akbari

Gums are polysaccharide compounds having many medicinal and food uses. The tapping and extraction of gum was carried out with the trees of desired diameter at different tapping height from ground level. 4-7 cm wise cut treated with different concentration of H2 SO4 . After collection and purification of the gum, the different quality parameters and their optimum value in the gum sample were determined such as moisture content 15.31 %, wb, ash content 1.89 %, volatile matter content 65.78 %, pH 4.44, protein content 16.54 mg/g, tannin content 0.0032 mg/g, methoxyl content 1.37 %, major elemental contents in ppm like copper 67.02, ferrous 1247.90, manganese 95.39 and zinc 94.97 when tree diameter was more than 20 cm and tapping height either more than 80 cm or less than 40cm from ground level. Treating the tapped portion with different concentration of H2 SO4 did not show significant effect.

3. EXPERIMENTAL SECTION

3.1. RAW MATERIAL

3.1.1. BANANA LEAF :-

Botanical Name : Musa paradisiacal

Common Name : Genus Musa, Kadali, Arati, Kela

Family Name : Musaceae

Soil Requirement : Deep, rich loamy soil with 6.5 to 7.5 PH. Soil for banana should have good drainage, adequate fertility and moisture. Saline solid, calcareous soils are not suitable for banana cultivation.

Atmosphere : Banana, basically a tropical crop, grows well in a temperature range of 15°C - 35°C.

Origin : Their origin is placed in southeast Asia, in the jungle of Malaysia. Indonesia or the Philippines. Where many varieties of wild bananas still grow today. Australia, India and China are also the large producer of banana in the whole world. In India Andhra Pradesh, Gujarat & Maharashtra these three states that produce large amount of banana trees every year.

Health Benefits Of Banana:

- It is chemical free.
- It help in curing kidney problems.
- It helps to remove all the toxic material from the body.
- It is help to purify blood. It is an enzyme to treat Parkinson's disease.

Fig. 3.1.1. BANANA LEAF

3.1.2. WHEAT FLOUR :-

Botanical Name : Triticum aestivum

Synonyms : cereal, grass, durum, gluten, spelt.

Common Name : Triticum aestivum

Family Name : poaceae

Soil Requirement : Loam soil is required for wheat production. Clay and sandy loam soils can also used for wheat cultivation provided there is proper system of drainage and these soils should not either be acidic or sodic. Besides wheat field should be free from weeds.

Atmosphere : Wheat cultivation required cool climate and medium rainfall. The ideal temperature needed in winter for the production of this crop is 10°C to 15°C.

Origin : China and India produces maximum production of wheat. In India Uttar Pradesh, Madhya Pradesh, Punjab, Haryana & Rajasthan produces highest tonnes of production of wheat every year.

Health Benefits Of Wheat Flour:

- Wheat flour is used as a source of dietary fibre for preventing colon diseases like. stomach cancer. breast cancer. gallbladder disease etc.
- It is also used for treating constipation, irritable, high cholesterol, high blood pressure, and type 2 diabetes.

Fig, 3.1.2. WHEAT FLOUR

3.1.3. MAIDA FLOUR :-

Botanical Name : Triticum aestivum

Synonyms : cereal, grass, durum, gluten, spelt.

Common Name : Triticum aestivum

Family Name : poaceae

Origin : Maida is made from the endosperm of wheat grains.

Health Benefits Of Maida Flour:

- Maida flour doesn't have any nutritional value but does have plenty of calories.
- It is made of wheat grain that contains high amounts of many nutrients, such as, fibre, vitamins, iron, magnesium, phosphorus, manganese and selenium.

Fig, 3.1.3. MAIDA FLOUR

3.1.4. ACACIA NILOTICA (BABUL GUM):-

Botanical Name : Vachellia nilotica

Synonyms : chicle gum, sweet, chicle, chewing gum, gum ball, confection.

Common Name : Vachellia nilotica

Family Name : fabaceae.

Soil Requirement : Including heavy clay soils and saline with 5-8 PH. Babul acacia prefers alluvial soil. It can be grown in any type of soil.

Atmosphere : To grow in temperatures of 19-28°C, but it can grow at extreme conditions of temperature.

Origin : Vachellia nilotica is a flowering plant tree in family of fabaceae. It is origin to Africa, the Middle East and the Indian subcontinent.

How to extract : Acacia Nilotica Gum is the sticky exudates from Acacia Nilotica and is often referred to by its technical name, gum arabic. Acacia Concinna Fruit Extract is obtained by drying and pulverizing the pods of Acacia Nilotica.

Health Benefits Of Acacia Nilotica:

- This plant has anti-microbial, anti-plasmodia and antioxidant activity. Extract gum from this plant.
- It is edible and good for human health

Fig. 3.1.4. ACACIA NILOTICA (BABUL GUM)

3.2. METHOD

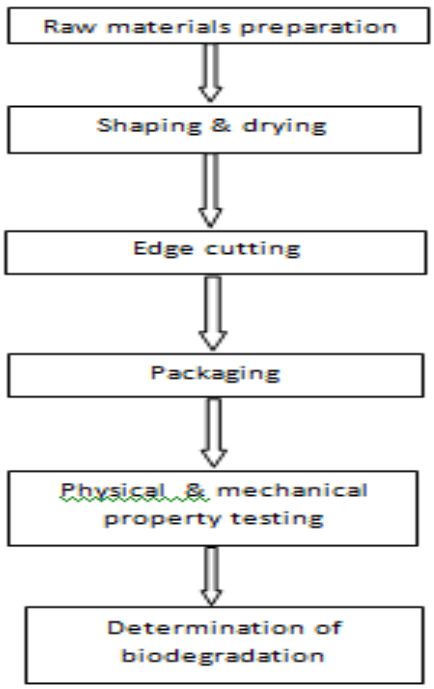

Fig. 3.2. FLOW CHART OF EXPERIMENTAL WORK

3.2.1. PROCEDURE

Frist of all cut banana leaves (musa leaves) and wash it properly & keep aside. Than took wheat flour and maida flour & mixed well.

Fig. 3.2.1. CUTTING OF BANANA LEAVES

Fig.3.2.2. MIXED WHEAT & MAIDA FLOUR

After the mixed flour prepared dough. After the preparation of dough put that dough in molding and drying machine.

Fig. 3.2.3. PREPARE DOUGH (WHEAT & MAIDA)

Fig.3.2.4. MOLDING AND DRYING MACHINE

For that molding process adjust 50 mm of Hg and 200℃ for 15 to 30 minutes. After this adjusted pressure, temperature and time got targeted bio-degradable plate. After the preparation of flour plate babul gum (acacia nilotica) was applied for the application of top layer that is banana leaf. Acacia nilotica applied between two layer for proper bonding.

Fig, 3.2.5. FLOUR PLATE & APPLIED BABUL GUM

Fig. 3.2.6. TARGETED BIO-DEGRADABLE PLATE

Targeted plate made from flour, leaf and acacia nilotica (babul gum) as a binding agent. This plate is totally bio-degradable and non-toxic.

4. RESULT AND CONCLUSION

As our motto was to synthesized edible dish for decreasing environment pollution , we synthesized edible dishes successfully from Musa leaves, Wheat flour & Maida flour. Biodegradability of plate was done and it was observed that the plate takes 30-40 days to degrade in normal temperature pressure.

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