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PREPARATION OF BIODEGRADABLE PLATES FROM NATURAL RESOURCES

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Abstract: Anthocephalus cadamba leaves of these tree are used for treatment of many illnesses such as curing diabetes, Reduce blood sugar level, inflammation etc. So, the purpose of this project is to make on biodegradable plate from Anthocephalus cadamba tree leaves. Biodegradable plates are environment friendly, controllable for longer duration storage and can be easily disposed of. Biodegradable plates have been in use since prehistoric times.Anthocephalus cadamba tree leaves are found mostly in Alluvial soil which is mostly found near the bank of river are the most suitable soil for growing cadamba. Leaves were extracted from this Anthocephalus tree. Glycerine have been used for softening of leaves. Natural gum, that is Guar gum has been used for binding of paper plates. Guar gum was prepared from guar bean. Using various mechanical processes. Shaping the biodegradable plate has been done from press moulding machine. Various properties such as moisture content, E. coli, Coliform, Salmonella, Yeast and Mould are tested from Analytical and environmental lab. So, from the synthesis, it concludes that the biodegradable plate manufactured from Anthocephalus cadamba tree are cheaper, as raw materials are easily available. The plate also possesses various medicinal advantages.

Key words: Anthocephalus cadamba, Guar gum, Glycerine

1. INRODUCTION

The disposable plates, cups, bowls, tumblers, spoons, bags, covers, sheets, films are made from plastics such as polythene, polypropylene, polyester, polyethylene terephthalate, polystyrene, polycarbonate, epoxy resins, polysulfone, polyvinyl chloride, polyvinylidene chloride, and melamine formaldehyde. These plastics can release toxic substances including bisphenol A, melamine, vinyl chloride, phthalates, etc. into the food during usage. For example, bisphenol A, a starting material for the synthesis of plastics such as polycarbonate, epoxy resins, and polysulfone, is a possible carcinogen and causes prostrate and breast cancers, insulin resistance, and heart diseases (Today 2017). Patravali or petal is an Indian eating plate. They are prepared from banyan leaves and also made in circular shape, by jointing 6 to 8 Sal leaves with the help of tiny wooden sticks. The industry in Indian where women work on weaving them in reception in spare time. It had been used extensively within the antique times by Indians for its purity. In our custom temple prasadam has always been offered to serve in patravali.The plates are well-known in dry areas of the country, particularly in villages in Gujarat. Biodegradable plates provide a number of advantages, including being one of the most environmentally friendly disposable foods serving systems available. Unlike a metallic porcelain utensil, it degrades rapidly. Remember those disposable leaf plates and bowls used to distribute "prasad," or the purest food for man's spirit, at various religious gatherings. Alternatively, perhaps the banana leaf wishes to serve south Indian cuisine. The need existed for far longer than we'll ever know, and they need always used paper or plastic plates since they're biodegradable and environmentally beneficial.Surprisingly, a couple of people in Germany were so moved by this age-old Indian practise that they began making plates and cups out of leaves. This company, Leaf Republic, is now being founded by a small group of people, including engineers and designers who are aiming to make environmentally friendly products. But, more often than not, the falling leaves are burned or dumped, where they will continue to fall apart over time, but the plastic bags that were used to collect them will survive for a long time. Verterra, a company founded in 2007. The impact of disposable plasticware utilization in our day to day has led to a search for alternate renewable resource, i.e., use of plant leaves as dining plates and food wraps, a traditional practice in India. The long-standing tradition has its own cultural, religious, medicinal, socioeconomic importance in India. The leaves are one of the non-timers forest produce (NTFP) and collected from the forests by the tribal people of India. The plates and cups made out of leaves are known as patravali, pattal, vistari, vistaraku; and done, dona, respectively, in various Indian languages. The leaf plates are environment friendly, biodegradable, amenable for longer duration storage and can be easily disposed off. They are economical and don’t require cleaning with phosphaterich soaps and detergents, a time taking, labor intensive process. The nutrient-rich detergents released into the water bodies lead to a phenomenon known as eutrophication, in which excessive growth of algae and its anaerobic decomposition depletes dissolved oxygen leading to fish kill (Sarin, 2017). The leaves exhibit significant antibacterial and antifungal properties against

various bacteria and fungi, thus protect us from the environmental and food borne pathogens (Sahu and Padhy 2013). The abundance of polyphenols, which could probably be leached into the food make them as ideal natural antioxidants (Somayaji and Hegde 2016). The goal of this project is to create a biodegradable plate out of the leaves of the Anthocephalus cadamba tree. Biodegradable plates are safe for the environment, can be controlled for longer storage times, and are easily disposed of. The leaves of the Cadamba tree are used to treat diabetes. In mouth gargle, an extract of the leaves is used.

2. LITERATURE REVIEW

2.1 Biodegradable plates made of pineapple leaf pulp with biocoatings to improve water resistance

Author- Jutarut Iewkittayakorna,, Piyaporn Khunthongkaewa,

A crucial property of fibrous packaging paper for food is water resistance, while strength Properties are also important. To improve these properties, several bio-coating solutions were applied as coatings on paper made of pineapple leaf pulp. The effects Of beeswax, chitosan, shellac, alginate/gellan gum and beeswax–chitosan (1% chitosan+4%glycerol+30%beeswax) solutions on pineapple leaf pulp paper were assessed in Relation to making biodegradable paper plates. The cooking time (120–180min) of chemical pulping and the dose of pulp by moist weight (200, 250, and 300 g) to a paper frame(40 × 40 cm2) were also studied on making the paper samples. The papers were tested for their physical and mechanical properties.

2.2 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.

2.3 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 Pharmacognostical, Physicochemical and Preliminary Phytochemical studies of Anthocephalus cadamba (Roxb.) Leaves

Author- Rahul Kaushik, Jainendra Jain, Pallavi Rai, Yogesh Sharma

Anthocephalus cadamba Roxb. Or Kadamb, a huge evergreen tree with large leaves and beautiful ball shaped Fruits is commonly found in India. The leaves, fruits and bark of Kadamb posses significant pharmacological Properties due to presence of variety of chemical constituents in them. The present study is aimed to evaluate the Pharmacognostical, physiochemical and phytochemical parameters for Anthocephalus cadamba Roxb. Leaves as Per the WHO guidelines for herbal drug standardization. WHO emphasized the use of standardized herbs and Formulations for safety and best therapeutic results. Pharmacognostical studies shows that the leaves of Kadamb Are green to pale yellow, odourless with a bitter and acrid taste. The simple, ovate-elliptical, petiolated leaf sized Between 15-50cm in length and upto 26cm width with glossy upper surface, undulated margin and pinnate Venation. The powder microscopy shows the presence of aboundant multicellular trichomes, phloem fibres, Scleriform xylem vessels, epidermal cells, cork cells and parenchymatous tissues.

2.5 The Study of Anatomy and Fiber Banana Leaf as a Potensial 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 fibers, and fiber 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 fiber). The T-test (independent sample) was used to determine the mean diameter of fiber in adaxial and abaxial sites. The results Showed that M. Brachycarpa had the highest number of fiber cells, a wider diameter fiber, and more adaxial fiber cells than the abaxial site.

2.6 Guar gum: processing, properties and food applications—A Review

Author- Deepak Mudgil & Sheweta Barak

Guar gum is a novel agrochemical processed From endosperm of cluster bean. It is largely used in the Form of guar gum powder as an additive in food,Pharmaceuticals, paper, textile, explosive, oil well drilling And cosmetics industry. Industrial applications of guar gum Are possible because of its ability to form hydrogen bonding With water molecule. Thus, it is chiefly used as thickener And stabilizer. It is also beneficial in the control of many Health problems like diabetes, bowel movements, heart Disease and colon cancer. This article focuses on production, processing, composition, properties, food applications And health benefits of guar gum.

3. EXPERIMANTEL SECTION

3.1Materials:

Anthocephalus cadamba tree leaves are found mostly in Alluvial soil which is mostly found near the bank of river are the most suitable soil for growing cadamba. Leaves were extracted from this Anthocephalus tree. Glycerin was used for softening the leaves. Glycerin(Cas.No.: 56-81-5) Used. Guar gum was prepared by guar seed. Guar beans grow best in loose, well-worked, welldrained soil rich in organic matter. (But beans will grow in soil that is sandy, rocky, and even clayey.). In a village near Vadodara, the guar seed of the Guar bean plant were picked. Press moulding machine and compression moulding machine was Applied on the plate to make them plate in the proper shape.

3.2 Methods

3.2.1 Raw material preparation

A freshly prepared Anthocephalus cadamba tree leaves was ejected from Anthocephlaus cadamba tree (Vadodara). The leaves were screened after being washed. After that, the leaves are screened. A total of 5-6 leaves were selected for further processing.

Fig. 1 Screening of leaves

Guar gum was prepared by guar seed. Seed was kept sunlight for 2-3 days to remove moisture.Water was added as a solvent after drying to turn the gum into glue.

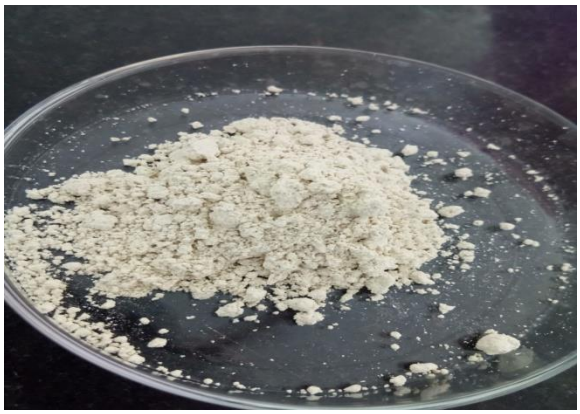

Fig. 2 Guar gum powder

Fig. 3 Addition of water in guar powder

3.2.2 Preparation of Softening the leaves

Mix the glycerin and water so that it is one part glycerin and two parts water.Pour the solution into a flat pan, place the leaves in the solution, and then put the weight on the leaves to keep them submerged. Keep the leaves submerged in the solution for 2-3 days. Dry the leaves gently with a paper towel.

Fig. 4 softening of the leaves

Fig. 5 Drying of the leaves

3.2.3 Making biodegradable plate

The leaves get softened and dry. The leaves are then stick with the help of guar gum. Guar gum was prepared from Guar seed). The plate was then joined by forcing them together with the help of a rectangular-shaped rock. and assembling of the leaves. Then Prees mold machine and compression molding machine for proper shaping of plate.

3.2.4 Anthocephalus cadamba leaves plate

Fig. 6 Press molding machine used

Fig. 7 Compression molding machine used

4. Result and Discussion

4.1 Moisture content

To determine the moisture content of leaves, obtain fresh leaves, weigh them, then dry them in a hot oven. Take readings of the dried leaves until the weights are equal. The moisture content of the leaves can then be calculated by subtracting it from the freshily leaf weight. The moisture content is found by dividing the result by the weight of dry leaves.

Test Methods: Annex B of IS: 15271-2003 RA2013 Ed 1.1 (2006-02)

4.2 Total Yeast and Mould count

A high yeast and mould count in food goods is not desired and shows that insufficient plant sanitation management, inappropriate packaging, and faulty storage were the contributing causes throughout product manufacture. The sample for microbiological inspection should be handled with caution and should be truly delegated of the lot. IS 5404 must be followed for this object. Preparation of poured plates with an identify choose media and an identify quantity of the test sample if the starting product is liquid, or an identify suspension if the starting product is other.

Test Method: IS 5403: 1999 RA 2018

4.3 Coliform count

Bacteria that produce distinctive colonies in gentian violet neutrai red bile lactose agar under the test circumstances specified within this International Standard at the required temperature (i.e. 30°C, 35°C, or 37°C, as agreed). Prepare two stream plates, hire a solid choose medium, and hire a set quantity of the test sample if the starting product is liquid, or hire a certain quantity of an initial suspension if the starting product is another. Other pairs of stream plates are prepared under similar conditions, using decimal dilutions of the test sample or the starting suspension.

Test Method: IS 5401(Part 1): 2012 RA 2018

4.4 Escherichia coli (E Coli Detection)

This standard (Part II) specifies the method for isolating, validating, and counting Staphyloccus aureus and Fusarium spp. in foods. The samples for microbiological research should be handled with care. IS : 5404-1969t will be used for this object. This standard describes the method for locating and estimating important microorganisms that cause food-borne illnesses.

Test Method:IS: 5887(P-1): 1976 RA 2018

4.5 Salmonella (Detection)

Methods for examining Bacteria that are responsible for gastrointestinal disorders. The moola head's outermost leaves were removed since they were unsanitary, and only the centre 2–3 leaves were used for the practical. The leaves were unsanitary, so cut them into 3 x 3 cm pieces with a sterilised scalpel, as previously recommended.

Test Method: IS:58887(P-3): 1999 RA 2018

S.No	Quality Characteristic	Units	Results	FSSAI Limits	Test Methods
1	Moisture	%	23.7	-	Annex B of IS:15271-2003 RA2013 Ed 1.1 (2006-02)
2	Total Yeast and Mould Count	cfu per gm	16,800	-	IS 5403: 1999 RA 2018
3	Coliform Count	cfu per gm	3,230	-	IS 5401(Part 1): 2012 RA 2018
4	E Coli (Detection)	per 25 gm	Present	Absent	IS:5887(P-1):1976 RA 2018
5	Salmonella (Detection)	per 25 gm	Present	Absent	IS:5887(P3):1999

5. CONCLUSION

Leaf plates and cups have several advantages over traditional throwaway paper and thermocal plates, such as renewability, biodegradability, non-toxicity, and so on. Banana leaves, badam leaves, areca nut, banyan tree, sal leaves, and other leaves have been employed in the past. Cadamba leaves have anti-diarrheal, anti-inflammatory, and anti-fungal effects.Cadamba leaves were used to make biodegradable plates. Screening of leaves was done first, and then they were softened using the glycerine process. Gaur gum, which was created using diverse mechanical qualities. After that, the plate was created by stamping it with a press mould machine. Moisture content, total yeast and mould count, coliform count, E-coli detection, and Salmonela were all investigated in the lab. When compared to other products, the finished product will be less expensive, and it will not cause illness or have any negative effects on humans.

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