JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

COMPARATIVE AND EXPERIMENTAL ANALYSIS OF THE BIODEGRADABLE EDIBLE GLASSES

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Abstract: As sustainability has become more fashionable, many businesses have begun to use ecologically friendly accessories. This is especially important in the case of the disposable tableware request. Most plastic tools, paper plates, and Styrofoam carrying carriers are used only for a few hours before being discarded in a landfill for hundreds of generations before degrading. In recent years, efforts have been undertaken to develop single-use tableware that biodegrades in a shorter amount of time. Despite its widespread use, single-use glass has yet to receive an environmental update. This research paper emphasizes to design an experimental approach to replace single use plastic with edible glass and to standardize different concentrations of agar base to produce a feasible version of edible glass.

Keywords: **sustainability, disposable tableware, edible, agar.**

INTRODUCTION

Solid waste disposal is a big challenge in the current situation. Due to rapid urbanization and population growth, several countries are experiencing major solid waste management issues. In many locations, the rise of industry has augmented the agony of solid wastes in open indentures has been a routine practice. Solid facades have accumulated, posing a serious threat to the health of vibrant living reality. Furthermore, land quality deteriorates over time. Plastic items are one of them, and they are discarded in vast quantities, polluting the environment severely.

According to a report published by the Central Pollution Control Board in 2018-19, India discards 3.3 million tonnes of single-use plastic per year. Deforestation, pollution, and fatal health problems are all consequences of their product, operation, and disposal. Attempts to make more ecologically friendly tableware have been made, however these solutions are never economically or logistically practicable. This design aimed to create a single-use cup that met the request's requirements while being biodegradable and supplied responsibly. The mug's potential to enter the assiduity is demonstrated by a financial and request analysis.

In recent years, there has been a lot of research into the use of non-toxic and edible biopolymers as film and coating materials in the food industry to avoid using carcinogenic and harmful petroleum products (Pizarro & Barrales, 1986; Renn, 1984; Alkahane & Izumi, 1976). Mill can be eaten on the go thanks to digestible packaging made of natural, biodegradable materials. There is no need for garbage collection, processing, recycling, or disposal. Increasing population growth, pollution, and energy are all major worldwide challenges that have led to the development and use of renewable and environmentally beneficial energy materials.

Natural macromolecules have received a lot of attention because of their biodegradability, low production cost, and good physical and chemical properties. Commercial agar has been widely investigated in recent years to see if it can be used in a variety of applications.

Agar is a gel-forming material that can be obtained from red seaweeds known as "agarophytes." Agar is a natural polymer that is biodegradable, hydrophilic, inexpensive, non-toxic, and chemically stable. Agarose is assumed to play a substantial effect in agar's mechanical behavior, with agaropectin having a minor impact. Major objective of this study is to extract useful information from literature and other forms of publications in order to identify innovative ways to use natural products as raw materials and make ready-to-use objects that are environmentally friendly.

MATERIALS AND METHOD

Selection of biodegradable source:

For implementation of the said objective Agarose powder was selected and used for the preparation of edible glasses (Fuse & Goto, 1971). Agarose is a linear polymer with a molecular weight of about 120,000 that is based on the -(1→3)-β-Dgalactopyranose-(1→ 4) 3,6-anhydro—L-galactopyranose unit; Agaropectin is a heterogeneous collection of smaller molecules that occur in lesser numbers (Watase & Nishinari, 1983). They have similar structures but are somewhat branched and sulfated, and methyl and pyruvic acid ketal substituents are possible. They do not gel well and can be easily detached from the superior gelling agarose molecules by charging them. Alkaline treatment improves the quality of agar by converting any L-galactose-6-sulfate to 3,6-anhydro-L-galactose.

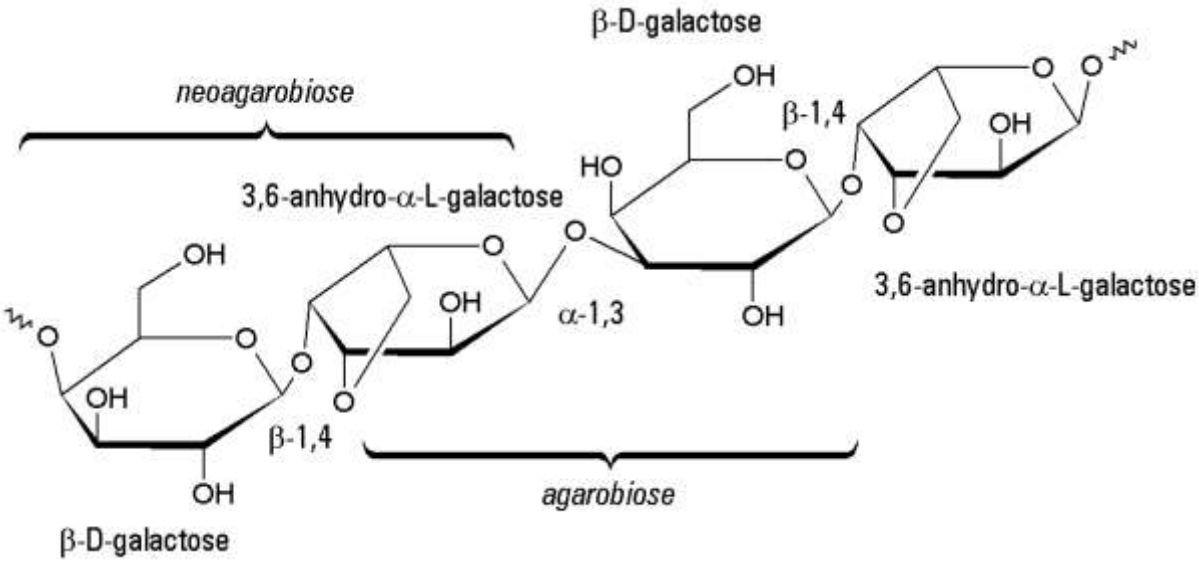

Figure 1. Linear Polymer structure of Agarose

Standardization of different concentrations of Agarose:

In order to make edible glasses, several amounts of agarose were explored. Standardization was done at two different concentrations: 6 grams per 500 ml and 10 grams per 500 ml. These agarose concentrations were chosen to test the product's stiffness.

Addition of Additives:

The edible glasses were given a proper taste, flavor, and color to make the product more appealing and attractive. Green, yellow, and red were chosen as the primary colors. Again, three flavors were chosen for flavoring: cardamom, strawberry, and vanilla. Sugar was used to keep the cups' basic flavor sweet.

Methodology

The first hurdle was developing the optimal formulation for a cup-shaped product. The form was created using a silicon mold. If the amount of agar used is insufficient, the product will have a gelling texture and will be unable to maintain its shape. By increasing the agar content, a stiffer product with the desired texture was obtained (Figure 2).

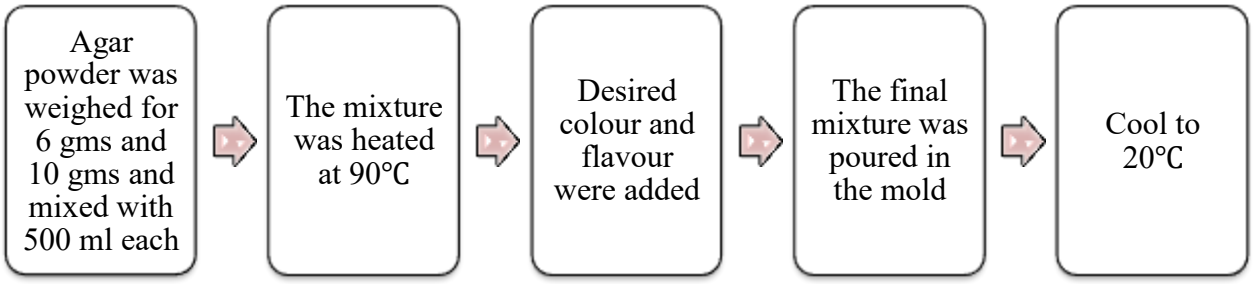

Figure 2: Representation of Methodology

RESULT

Several samples were made using varying amounts of water and agar, all of which were tested. Texture ranges from extremely delicate to quite firm. The most effective formulation is provided in Table 1.

Table 1. Observations obtained with different concentrations of Agarose.

Formulation	Water (ml)	Agar (gm)	Observations
I	500	6	Semi-rigid, translucent
II	500	10	Rigid, semi opaque

Figure 3: Preparation of Edible glasses of different concentration.

Figure 4: Edible Glasses – Chewable, Biodegradable and Sustainable

The edible glasses were also put through a shelf life test. The storage conditions offered to the items were found to be quite favorable. The edible glasses were kept at 4°C for storage. The glasses stayed in their original shape for seven days at 4°C. When the same was observed after 10 days, the glasses began to lose their shape and deform (Figure 5).

Figure 5. Deformation of Edible glasses when kept at 4°C for 10 days (left). Deformation of Edible glasses when kept at 4°C for 7 days (right).

CONCLUSION

The common misconception about environmentally friendly goods is that they are more expensive than regular goods. The reason for this is that the goods would have to undergo extensive research and development before becoming environmentally friendly. However, this is not always the case; these edible glasses are extremely affordable. It is feasible to employ a natural polymer to replace plastics. The objective of this study was met when a biodegradable and edible product was created.

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