The Edible Water Bubble by Spherification

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***Abstract*—Plastic pollution is exploding in its full acceleration. Each day is becoming more and more vulnerable for the environment and the world's future. Edible plastic water balls can be made from Brown Seaweed, readily available in the ocean and easily grown. Sodium alginate forms a gel-like structure when reacted with calcium lactate or calcium chloride which can be used to make these water balls. The research design used for the study was quantitative experimental research while utilizing a purposive sampling technique. The statistical treatment used for this study was a T-test to determine the difference between the two groups of respondents. They were using a questionnaire as the research instrument. The researchers surveyed to identify the level of acceptability of the model in terms of construction materials, designs, procedures, and presentation.**

I. INTRODUCTION

Edible Water Bubble is a food and biodegradable water bottle designed to replace single-use plastic bottles, which is made by the rock lab. It is made from a marine algae-rich membrane and can be consumed, or if not, will naturally disintegrate within a few weeks, addressing plastic waste.

This water can be done by methos of spherification in molecular gastronomy, which means of branches into spherification where sodium alginate extracted from seaweed, in combination with calcium salts, forms edible spheres filled with liquid which encapsulate flavors. The spheres are thin and membrane like and burst upon consumption.

Spherification needs two compounds for to make Edible water bubble, which are Sodium alginate and Calcium Lactate, the Structure of this two compounds are,

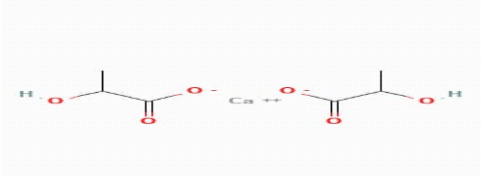

fig 1, structure of Calcium Lactate

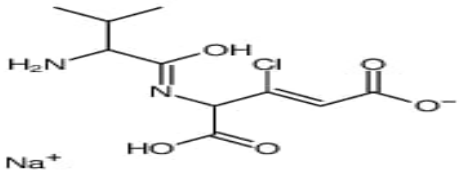

fig 2, structure of Sodium alginate

II. KEY FEATURES

Food and Biodegradable:

Water capsule is made from marine algae and calcium chloride, both are safe to consume, and the entire structure is biodegradable, breaks within 4-6 weeks.

Continuous Options:

It aims to change single-use plastic water bottles, addressing environmental concerns about plastic waste and its long-term effects.

Slept and neutral:

The membrane itself has no taste, enjoying the flavor of the inherent liquid to the user.

Convenient and portable:

Water capsule is quite small to consume directly and can be used for various fluids, which can include water, juice, and even spices, which makes it suitable for on-the-go consumption.

Versatile application:

It is being tested for use in sports events, as well as other fluids and applications where traditional packaging is desired.

III. METHODOLOGY

Water capsule food water bottles are produced using sodium alginate (from seaweed) and calcium chloride. This process involves creating a gel -like

membrane around the water, making the entire product food and biodegradable.

Manufacturing Process:

1. Preparation for solution:

1g of Sodium alginate is dissolved in water to create liquid solutions.

2. Needle:

The liquid solution is then carefully immersed in calcium lactate solution.

3. Gel Formation:

This process causes the alginate to gel and forms a membrane around the water, making a food area or bubble.

4. When this two solutions are mixed they undergo reaction and form the Sodium chloride or Sodium lactate and Calcium Alginate which is responsible for creating shape and gel.

The chemistry this reaction is named as Chemical Double Displacement reaction.
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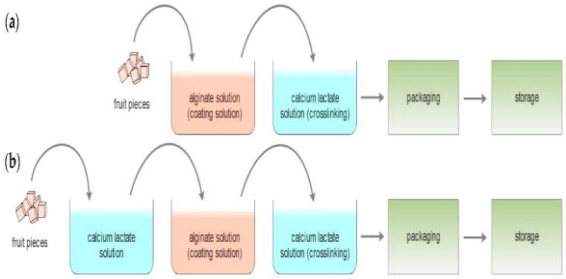


fig 3, manufacturing process of the edible water bubble (Water capsule)

It takes some trails and errors while preparing the Water capsule.

We can use Calcium lactate or Calcium Chloride the only difference in that I'd the diameter of water capsule is varying.

The ingredients which are using to create the water capsule and not side effects, why because the sodium alginate is obtained from plant and Calcium lactate is obtained by milk, Calcium Chloride is salt which have no side effects.

TRAIL 1

TRIAL 2

TRIAL 3

These are the trials of taking 1g of sodium alginate and 5gm of calcium lactate in 100ml of distilled water in trail one

And further changing the concentration of sodium alginate to make the gel layer thick and slowly immerse the calcium lactate using bowl typed spoon, hold this for 1-2 minutes, Then we are getting the water bubble. This is the simple way to do.

According to CBS University of Applied Sciences, Oho comes into flexible plastic packaging for Edible Water Bottle Transport and Storage.

Major materials and properties:

Sodium alginate: A natural polymer, obtained from seaweed, is used to make membrane.

calcium chloride: A salt, which causes alginate in the gel, makes a tight seal of water around the water.

Food and Biodegradable: Both membranes and packaging are designed to be environmentally friendly and naturally break.

Tasteless: Water capsule membrane is tasteless, allowing consumers to drink water without any unwanted taste.

Decomposition level of Edible Water Bubble: Water capsule is a food and biodegradable water bottle, naturally biodegrades in 4-6 weeks, unlike plastic bottles, which take for centuries. This is rapid decomposition because Water capsule is made from a marine algae extract and calcium chloride. The material breaks into natural components, contributing to a smaller environmental footprint than plastic waste.

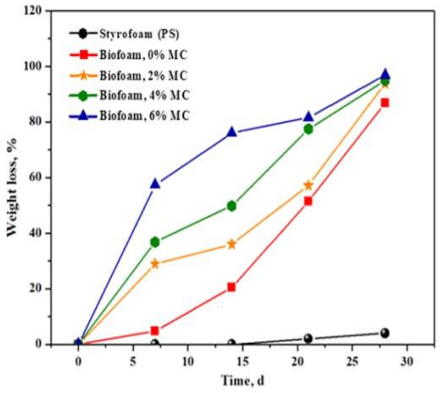


fig 4.weight loss % vs time graph

IV. FUTURE PLANS OF TECHNOLGIES PROGRESS

Automatic production: The development of fully automated machines for Water capsule production is going on, which can lead to more efficient and cost - effective manufacturing.

Improvement stability: Research and development efforts are likely to focus on improving the strength of the membrane, making it more resistant to transport and storage.

Long -term shelf life: It is important to address the current boundaries in Water capsule shelf life.

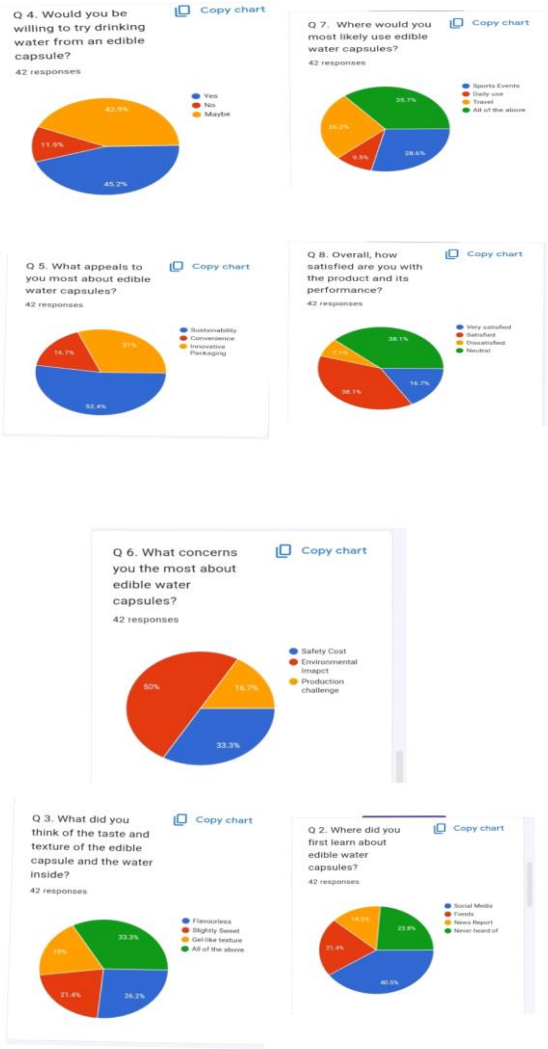
Re-sealing: Re-sealing Water capsule will increase its convenience and capacity for multi-use.

Our plan is to increase the life span of the water capsule by adding additive chemicals which is not side effects for human health.

We have Thought to made the taste water capsule by giving Flavours.

V. ONLINE SURVEY

We had posted some questions on water capsule through online and we got some good opinion by people to bring into the market. I have uploaded the response.



These are the responses which are done by RVCE students and the humans on edible water bubble which it may concludes that The Edible Water Bubble has acceptance to use in the market instead of using plastic water bottles.

V. CHALLENGING AND LIMITATION

1.The major constraint is associated with the storage and shelf life of Edible Water Pods. Unlike plastic bottles which can store liquids for a long time, Edible Water Pods have a much shorter shelf life.

2.The lessened strength, portability, and durability of water orbs are its most notable weaknesses in comparison to a conventional water bottle.

VI. CONCLUSION

Water capsule is designed as a permanent option for plastic bottles. It biodegrades within 4-6 weeks and is made from natural ingredients such as seaweed extracts, reduces plastic waste and reduces its environmental effects.

2.By changing plastic bottles with Water capsule, incidents and individuals can significantly reduce waste and garbage, especially in areas with high water bottle consumption, such as sports events and festivals.

3.The food nature of Water capsule adds a unique sales point, appealing to consumers who want waste-free and convenient hydration options.

4.Ooho is manufactured at a lower cost compared to plastic bottles, making it a viable and inexpensive durable option.

5.Ooho can be used for various applications, including sports phenomena, festivals and even other liquids and foods as a permanent packaging option.

6.Some reports highlight some plastic and possible health risks associated with their chemicals. Water capsule provides a safe, plastic-free option to consume fluids.

REFERENCES

Below are some notable authors and researchers bound to Edible water capsule

[1] Rodrigo García González: In 2013, at London's Imperial College, he created the edible water bubble prototype that became the basis of Ooho. He is also the co-founder of Notpla, the company behind Ooho.

[2] Pierre Paslier: Co-founder of Notpla and also worked on Ooho's development.

[3] Guillaume Couche: Through Skipping Rocks Lab, he worked towards the creation of Ooho.

[4] Lise Honsinger: Notpla's CFO is quoted talking abou sustainability and infrastructure concerns for Ooho. Some notable publications and presentations which feature or discuss Ooho includes:

[5] Ellen MacArthur Foundation: Featured Ooho as an example of edible food packaging aimed at reducing plastic pollution.

[6] Atlas of the Future: Discussed the opportunity to use Ooho as a sustainable liquid packaging, pointing out its biodegradable and compostable properties.

[7] Notpla Official Website: Offers comprehensive information about the composition, manufacturing process, and possible uses of Ooho.

[8] https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.notpla.com/ooho&ved=2ahUKEwjI2Jnvt8WNAxXxjGMGHf6rKSEQFnoECBoQAQ&usg=AOvVaw0UylPAgndpW7l98AZiwHQE

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[12] https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.researchgate.net/publication/361843795_A_STUDY_OF_EDIBLE_WATER_BALLS_IN_INDIAN_MARKET_CONTEXT&ved=2ahUKEwjI2Jnvt8WNAxXxjGMGHf6rKSEQFnoECCIQAQ&usg=AOvVaw384D7NRWCGHdJ0VVh8B0h7

[13] https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.imperial.ac.uk/news/190938/edible-water-bottles-developed-imperial-start-up/&ved=2ahUKEwjI2Jnvt8WNAxXxjGMGHf6rKSEQFnoECCcQAQ&usg=AOvVaw2uHvDSiL8zmzH-kCnst4Gn