Original Research Article

NUTRITIONAL &ANTIMICROBIAL ANALYSIS OFDEVELOPED EDIBLE BASKET USING NORI SHEET

Abstract

The current challenge for food packaging and preservation technology is extending the shelf life and material containment of food goods. Applications for eatable cones have significantly increased in recent years. The vegan basket is the greatest substitute for paper cutlery because it is biodegradable and environment friendly. Cereals are recognized for being more nutrient-dense foods that contain protein, fat, and carbohydrates in addition to being connected to greater diet quality. Nutritional analysis &Characterization of edible basket were performed by Ash, fat, protein, fiber, carbs, moisture content,scanning electron microscopy (SEM) with Energy-dispersive X- ray spectroscopy (EDS),Fourier Transform Infrared SpectroscopyFT-IR,Water absorption capacity (WAC). A test was conducted to determine the edible cone's ability to absorb water. As we all know, microbial infection may result in food spoilage or even food poisoning. Therefore, its surroundings operate as a microbiological barrier to maintain quality, safety, and to extend the packaged food shelf-life. The study included disc diffusion method(antimicrobial testing) to ensure that the developed product was devoid of any microbial growth for this reason. The result assured that edible cone was safe and free of infection; a positive result was given after 48 hours.According to the results basket could be the best alternative of plastic cutlery.

Key words-: Edible basket, Antimicrobial,Characterization, nutritional analysis, nori sheet

1. INTRODUCTION

The creative innovation of edible cutlery, which is composed of plant-derived materials, allows meals to be presented and then devoured. It was created in India in 2010 as a substitute for single-use plastic cutlery by a company called Bakes (1). Single-use plastic cutlery is a major threat to the entire ecological community, hence it is imperative to replace it with better solutions, like edible cutlery. Edible cutlery, which is made from a combination of flours, is frequently called EBO (eco-friendly, biodegradable, and organic). [2] Biodegradability and environmental friendliness are the two key benefits of using edible cutlery instead of plastic, as plastic poses a significant risk to both people and the environment.[3]. Since it doesn't truly

require any more preparation, this edible cutlery is regarded as ready to eat. In contrast, they can decay in any kind of environment if they are not consumed because they don't require any particular circumstances to do so. [4]. Ragi, also referred to as finger millet, is a commonly consumed millet in numerous regions of India and Africa.[5]. Although it originated in the Ethiopian highlands, it was long ago brought to India. For the people living in South India's rural areas, it is considered a staple food. Ragi farming is practiced in several regions of India, namely Karnataka and Tamil Nadu, but it is also found in Uttarakhand, Maharashtra, Andhra Pradesh, Orissa, Gujarat, West Bengal, and Bihar. [6]. Due to the presence of free sugars and non-starchy polysaccharides, finger millet is an excellent source of carbs. The nutritional fibre level of finger millet is significantly higher than that of brown rice, polished rice, and every other type of millet, such as foxtail, tiny, kodo, and barnyard millet. [7]. Finger millet has a higher concentration of the amino acids methionine and cystine—two of which include sulfur—than milled rice. The amount of tannin in the grain affects how well finger millet breaks down proteins. [8]. Finger millet contains a high percentage of triglycerides, small levels of sterols, 5-6% phospholipids, 10-12% glycolipids, and 70–72% neutral lipids. The percentages of oleic acid, linoleic acid, palmitic acid, and linolenic acid in oils and fats are 46–62%, 8–27%, and 20–35%, respectively. [9]. In addition to having phosphorus, iron, and numerous other trace minerals and vitamins, finger millet is remarkably high in potassium and calcium when compared to other millets and cereals[10]. The finger also has health-promoting properties that are antimicrobial, antioxidant, and anti-diabetic. [9]. Wheat is well known for being an excellent food for maintaining good health because of its high level of dietary fibre, B-group vitamins, minerals, and protein. Wheat has replaced all other grains as the primary grain and is used more frequently than any other cereal for making bread because it includes a special protein called gluten in both large and small amounts. [12]. The structure of edible spoons is derived from processed wheat flour. When the two ingredients are combined, the white flour's proteins react with the water to generate gluten. Throughout rising, the elastic gluten structure swells to make room for the increasing leavening gases. [11].This edible cutlery can be called "ready to eat" since it doesn't require any extra preparation. Edible cutlery can be used as utensils as well as for serving solid or semi-solid foods. It takes a bit for them to get moist. These are environmentally benign since they can be easily discarded and eaten by animals. They don't require any additions to be eaten. When food is scarce due to a lack of resources during a natural catastrophe or conflict, edible cutlery can be provided. (13). Cutlery and edible containers are linked to certain health benefits. The leaves that are used to build the containers often contain compounds like alkaloids and antioxidants that are beneficial to health. When food is placed on a leaf, they ooze into it and end up in our food. These substances are thought to reduce risk for even the most serious illnesses, like diabetes and cancer (14). Furthermore, when it comes to edible cutlery composed of flours, it is possible to select flours that are composed of healthful yet uncommonly ingested grains. (15). With the increasing use of plastics, majorly the disposable ones and with growing consumer awareness of the negative impact of plastic on the environment various paper-based products have been produced (16). This study aims to develop a healthy, edible, and biodegradable alternative for the

plastic cutlery. The detailed analysis of the nutritional profile and antimicrobial test of the resulting vegan edible basket was conducted, which was never done before.

2. MATERIAL & METHOD

2.1 Materials

The study was carried out at Babasaheb Bhimrao Ambedkar University's Food Science and Technology Laboratory (FSTL). The edible basketwas formed using Refined wheat flour, whole wheat flour, rice flour, bajra flour (pearl millet), corn starch purchased from Lulu Mall Lucknow&powdered sugar, baking powderwere procured from Local market of Lucknow. Nori sheet was purchased from Nature's Soul, New Delhi.

2.1.1Preparation of Edible Basket

This study focused on the preparation of a vegan edible basket by using multigrains, cereals and other ingredients. After various trials were conducted to each constituent's development process and concentration for, many formulations were conducted.

Table 1.Composition of edible basket by using different flour

Ingredients	Bajra	Multigrains	Refined flour	Whole wheat flour
Flour	45.4g	55.6g	52.8g	48.9g
Powdered sugar	10.5g	11.6g	11.6g	10.9g
Salt	7.6g	6.5g	5.6g	6.7g
Corn starch	10.8g	7.5g	8.6g	8.9g
Melted butter	12.9g	8.9g	10.5g	12.8g
Baking powder	5.9g	5.9g	5.5g	5.9g
Spices	6.9g	4g	5.4g	5.9g

2.1.1.1Development of composite flour

composite flour for development of edible basket contained a mixture of 30% refined flour, 20% multigrain, 5% bajra, 20% whole wheat, 20% rice flour and 20% corn starch. Table 2 lists the edible basket's ingredient concentration.

Table 2.Concentration of ingredients for composite flour edible basket

Ingredients for making composite flour	Concentration

Refined flour	**30%**
Multigrain	**20%**
Bajra	**5%**
Whole wheat flour	**20%**
Rice flour	**10%**
Corn starch	**15%**

In the formulation of edible basket composite flour are used as the main ingredients in which Bajra, whole wheat flour, refined wheat flour are used as the composite flour.

2.1.1.2 Development of different edible basket by using different flour

Three distinct varieties of edible baskets weredeveloped throughout the formulation process using various raw materials. Dough using bajra flour and other unprocessed components was prepared for the first sample of edible basket. Dough using wheat flour and refined wheat flour along with additional raw ingredients was made for the second sample of edible basket. For the third sample, dough was prepared usingmultigrain and additional raw components. Fourth sample was prepared using a nori sheet, other cereals and multigrain.

The edible basket was categorized into three categories: cereal edible basket (type S0), multigrain edible basket (type S3), and nori sheet edible basket (type S4). 2.1.5 Development of edible basket by different materials.

Table 3.Preparation of edible basket by Cereals, multigrain, nori sheet

Samples	**Raw materials amount**								
	Refined flour	**Bajra flour**	**Nori sheet**	**Wheat flour**	**Multigrains**	**Corn flour**	**Baking powder**	**butter**	**Other ingredients**
S0	20g	10g	-	15g	-	10g	10g	20g	15g
S3	-	-	-	-	50g	10g	10g	15g	15g
S4	20g	-	15g	15g	5g	10g	10g	10g	15g

2.2. Nutritional analysis

2.2.1.Moisture estimation

As per AOAC 2020, precisely weighed two grammes of the material into a preweighed, dried petri dish. After the sample-containing petri plate was cooled in a desiccator for three to four hours at 110 °C, it was weighed until there was a consistent weight difference. The following formula was then used to determine the moisture percentage by weight.(23)

Moisture (%) = $\frac{(W1-W2)}{(W1-W)} \times 100$

Where, W – weight of empty petri plate (g),

W1 - weight in grams of the dish with the sample before drying,

W2 - weight in grams of the dish with the sample after drying.

2.2.2Ash content

Ash estimation was done on the basis of AOAC 2020. In a dried, pre-weighed silica crucible, weigh two to three grammes of the material. The sample was flame-burned until it was smokeless for charring. A muffle furnace was then used to hold the crucible containing the sample at 600 °C for four to five hours. When the weight reached a consistent value, it was weighed after being cooled in a desiccator. (24)

Ash content was determined using the formula:

Ash (%) = $\frac{(W2-W3)}{(W2-W1} \times 100$

Where, W1 - weight in grams of the empty crucible,

W2 - weight in grams of the crucible and the sample

W3 - weight in grams of the crucible and ash

2.2.3Fat estimation Fat estimation

As per AOAC 2020, the product's fat content was determined using the Soxhlet technique. The dried powdered sample that has been preweighed is placed in a filter paper thimble and stored in a glass cylinder of the Soxhlet device. This cylinder comes with an intake tube as well as a syphon tube. A water condenser is attached to the top of the cylinder. The entire system is inserted into the neck of a flask with a circular bottom that holds the solvent. Heat is applied to the flask in a hob. The solvent vapours enter the cylinder through the inlet tube and ascend into the condenser. When the condensed solvent comes into touch with the crude organic substance, it dissolves. the instant the solution enters the top of the syphon tube. In this way, the dissolved organic material returns to the flask, ensuring that the solvent vapour in the cylinder is always flowing. Following the cessation of the heating, the solvent is extracted from the liquid in the flask by distillation, leaving the organic product behind. (29)

Crude fat (%) = $(W2-W1)\ S \times 100$

Where, W- Weight of empty flask (g)

W2- Weight of flask and extracted fat (g)

S- Weight of sample

Crude fiber (%) = $\frac{(W2-W1)}{(W1)} \times 100$

2.2.4Protein Estimation

The Kjeldahl technique was used to estimate the protein content of the samples. Five grammes of the samples were put to the digestion flask, along with ten millilitres of concentrated H2SO4 and five grammes of the K2SO4:CuSO4:Na2SO4 digestion mixture (equal ratio). The flask was stirred to fully combine the ingredients before being placed on a heater to begin digestion until the mixture became transparent (blue green in colour). The entire procedure took three hours to complete.

The resulting solution was brought to room temperature and put to a volumetric flask of 100 ml.Distilled water was used to top up the volume.Thereafter, ten millilitres of digest were gently added to the distillation tube, along with 10 ml of 0.5 N NaOH.

Due to the presence of NH4OH, a yellowish tint emerged during distillation. The distillate was then titrated with a 0.25mol/L standard HCL solution until a pink colour was obtained. In order to determine how much titrant was utilised, the initial and final readings were recorded at this phase and marked as Vs. The nitrogen content of acetanilide or tryptophan after addition of 1 g of saccharose was determined at the titration stage for the blank, and the volume of titrant utilised was indicated as Vb. The %N in samples was calculated via the given formula followed by the calculation of % P by multiplying the %N with the protein factor (PF) that is 6.38(28)
Protein % = $Vs - Vb \times F \times C \times f \times (N)\ m \times 1000 \times 100$

Where,

Vs- volume of titrant used for sample

V_b- volume of titrant used for blank

F- molar reaction factor of titrant (HCl-1 and H2SO4- 2)

C- concentration of titrant (mol/L)= 0.25mol/L

f- Factor of titrant = 1

M(N)- Molecular weight of Nitrogen = 14.007g/mol

m- sample weight

1000- conversion factor(ml into L)

%N- % weight of N

2.2.5 Water absorption capacity (WAC)

The water was poured over the edible basket for a predetermined period of time. After removing the sample from the beaker, any surface water was wiped off with tissue paper. Use the following calculation to get the percentage of water absorption..(9)

WAC (%) = weight of cutlery after water− weight of cutlery before water)/ weight of cutlery before water × 100

2.2.6.1 TSS (Total Suspended Solid)

- The surface of the refractometer prism was cleaned and allowed to dry.
- Afterwards, a tiny quantity of sample was applied to the refractometer's prism.
- After looking through the eyepiece, point the prism away from the sun and towards a bright area of light.
- Stayed focused, taking a reading of the blue color's base on the scale. *H*
- After that, note the percentage Brix 20).

2.2.6.2 Total Soluble Solids (TSS)

TSS was estimated by filtering a known volume of sample using 4.7 cm Whatman GF/C glass fibre filters and drying it at 103–105 °C. Using the difference in filter weight before and after filtration, the TSS was computed. (20)

2.2.7SEM

The morphological surface characteristics of the samples were analyzed using a scanning electron microscope model (JSM 6490 LV, JEOL, Japan)2. Multiple magnifications were used to examine the sample, including ×800, ×2000, and ×5000Before scanning, a small layer of platinum was applied to the film samples to produce electricity. The working distance of 7.4 mm and the acceleration voltage of 15 kV were selected. The SEM apparatus was operated at a current of 58 μA [18]

2.2.7.1 EDS

Energy- dispersive X- ray spectroscopy (EDS) analysis display the chemical characteristics of the developed edible basket as shown in the 3.2.4.3

2.2.8FT- IR

Edible cone powder were put into the Nicolet-6700. FTIR spectrometer, which was made available by Thermo Fisher Instruments, USA, to determine functional group. The spectra were captured in the 400-4000 cm-1 wave number range, and the resulting spectra were analyzed as described by singhet al. (17)

2.3Antioxidant activity

The AOAC method was used to assess the extracts' capacity to scavenge DPPH (2,2-diphenyl-1-picrylhydrazyl) radicals. After 30 minutes of incubation, 1 mL of the extract and 1 mL of the 0.4 mM ethanolic solution of DPPH radicals were combined, and the absorbance at 517 nm was determined. The percentage (%) suppression of free radical scavenging was used to express the ability. (21)

DPPH radical scavenging activity (%) = $(1 - absorbanceofsample/\ absorbanceofcontro) \times 100$

2.4Antimicrobial analysis

2.4.1 Agar diffusion method

These media can be used for a variety of purposes, including testing, long-term preservation, enrichment, maintenance, and cultivation. The shelf life of each functional classification is restricted by the formulation. The duration of time that these cultural media have on their shelf is known as chemico-physical characteristics of the medium are retained. Agar plates, or Petri dishes with commercially available solid growth media, often have a short shelf life of 30 to 90 days. Important factors that affect overall shelf-life and microbiological growth efficiency include medium composition (i.e., general-purpose to specialised formulations), sterilisation procedure, storage temperature, exposure to light, and packaging. The shelf life of packed agar plates used for drug sensitivity testing, isolation, enrichment, or selection varies, according to several research. Microorganisms include things like fungi, bacteria, and parasites. Ulisse and colleagues, for instance, investigated twelve distinct media types with differing levels of intricacy, enclosed in shrink-wrap film, kept at 5 °C, and coded for durations ranging from three to thirty days. Once the medium has been tested for pH, sterility, weight loss (water loss), and the capacity to support bacterial growth, shelf-lives of 90 to 120 days may be assigned. It is necessary to aid in the growth and characterization of the target microorganism. (20)

2.4.2Total Plate Count Microbial Shelf Life

- Dilute a sample up to a 10-4 series.

- Pipped out 100µl onto the centre of an agar plate surface from the relevant required dilution series.
- Lighted a lamp with the glass spreader.
- Using a sterile glass spreader, uniformly distribute the sample across the agar surface while carefully rotating the petri dish underneath.
- For a whole day, the plate was incubated at 37℃.
- After the incubation period, take out all the petri plates that had anywhere from 30 to 300 colonies. Plates containing more than 300 colonies are deemed too numerous to count (TMTC) because they cannot be tallied.
- The number of bacteria (CFU) per millilitre or gramme of sample was determined by dividing the quantity of specimen supplied to liquified agar by the number of colonies multiplied by the dilution factor.
- This procedure was carried out on several days (days 1, 3, and 5) using the same sample.(20)

2.4.3Determination of Colony forming units

- The first dilution was created by adding 1 millilitre of sample to 9 millilitres of sterile peptone water using aseptic method. This dilution is 1/10.
- The 10-1 dilution is then shaken to disperse the germs and break up any clumps by holding the tube between the palms of both hands and rapidly spinning to form a vortex.
- After shaking the 10-1, remove the cap and aseptically transfer 1 millilitre to a second 9 millilitre peptone water.
- The second blank shows a 10-2 dilution of the original sample because this was a 10-1 dilution. After that, it was diluted up to a 10-4 dilution.
- Pipetted out 100µl from the appropriate desired dilution series on to the center of the surface of an agar plate.
- The cooled medium was then poured into the plate, and the agar-sample mixture was immediately mixed gently while the plate was resting on the table top or platform of the LAF cabinet.
- The pour plates were then inverted and incubated at 37℃ for 24 hours after the agar was completely solidified.
- Select all the petri plates with between 30 and 300 colonies when the incubation period was up. Plates that have 300 or more colonies are too numerous to count (TMTC) and cannot be tallied.
- Plates with fewer than 30 colonies are designated too few to count (TFTC). Count the colonies on each plate.
- Calculated the number of bacteria (CFU) per milliliter or gram of sample by dividing the number of colonies by the dilution factor multiplied by the amount of specimen added to liquified agar.

Number of Bacteria/ml = Number of colonies observed/ amount plated on media*Dilution factor. (20)

2.5CFU

Represents the unit of measurement for live bacteria or fungus called colony forming units. With CFU, viable cells are estimated as opposed to a direct microscopic count, which counts all cells, alive or dead. It took incredible growth to produce a viable colony, and at the time of counting, it was difficult to determine if the colony originated from one or 1,000 cells. CFU/ml for liquids and CFU/g for solids are the stated findings, which take this uncertainty into account.20)

3 Result and Discussion

3.1Proximate analysis

Data presented that the proximate analysis of edible basket prepared by using cereals,multigrains, nori sheet. Results of moisture content of (nori sheet) S4 Nori sheet had higher protein 41.4% as compared to other ingredients. As nori sheet is richest source of, protein,

Table 4.Proximate analysis of edible basket

Sample	Moisture %	Protein %	Ash %	Total Fat %
S0	13.7	11.6	1.22	5
S3	13.1	8.8	1.00	1.5
S4	13.19	41.4	2.00	0.95

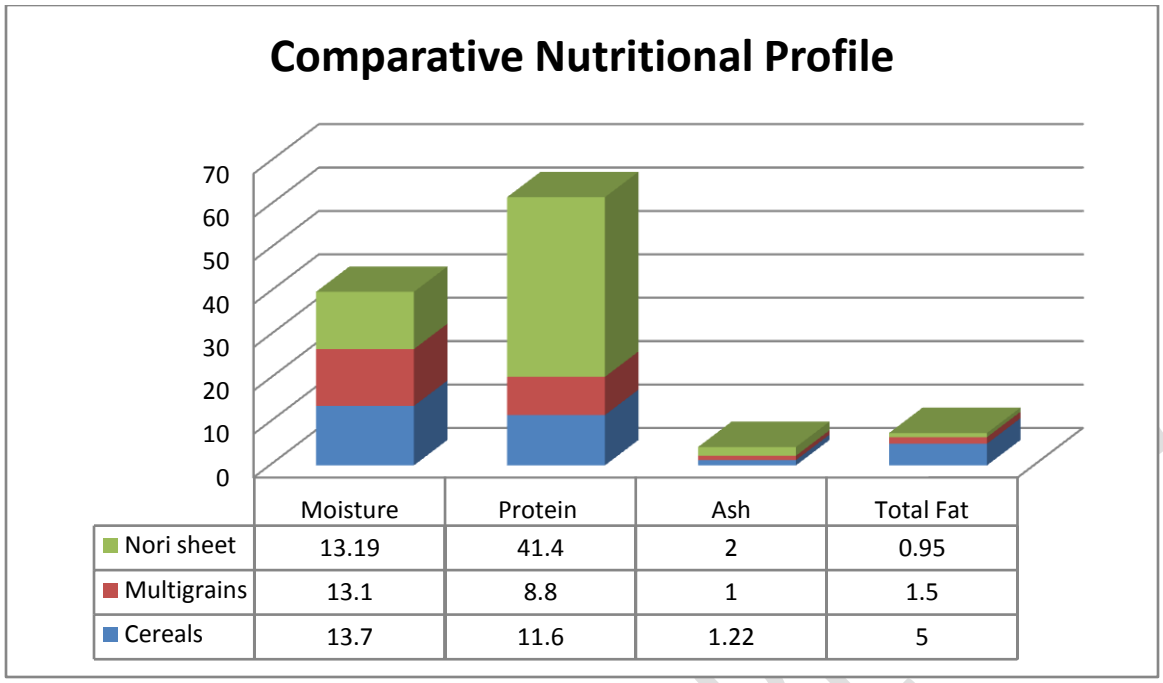


Figure1. Comparative nutritional profile of S0, S3, S4 (cereals, multigrains, nori sheet)

3.2.3 Water absorption capacity (WAC)

Within its structural limits, a product's ability to absorb water is known as its water absorption capacity. The nori sheet has the greatest capacity to absorb water, I discovered. In Table 5, the water absorption capacity of three distinct edible basket samples (S0, S3, S4) was compared at various time intervals (5, 10, 15, 20, 25, and 30 minutes). Sample S4, which contained 4g of multigrain powder and 15.5g of rice flour, had higher WAC values than the other samples. The characteristics of flours with higher protein and fibre content are associated with a higher rate of water absorption. Thus, the higher protein and fibre content in these rice flours and multigrain powders may be the reason for increased WAC.The S4 sample spoon had a relatively higher water absorption capacity than the S0 and S3 basket samples. While the S0 basket is produced with cereals, the S3 and S4 baskets are prepared with multigrains and nori sheets, respectively.

Table5. Water absorption capacity of different basket

Time (min)	**WAC (%)**		
	S_0(cereal)	**S_3(** multigrain)	**S_4(** nori sheet)
5 min	9.70±0.04	10.10±0.09	10.25±0.05
10 min	19.51±0.05	20.21±0.08	20.51±0.09
15 min	25.70±0.09	26.20±0.09	26.50±0.08

20 min	25.70±0.08	29.90±0.10	30.21±0.10
25 min	34.50±0.16	34.70±0.12	35.90±0.24
30 min	37.60±0.12	38.50±0.14	39.50±0.22

Values are means± Standard Deviations (SD) of three determinations (19)

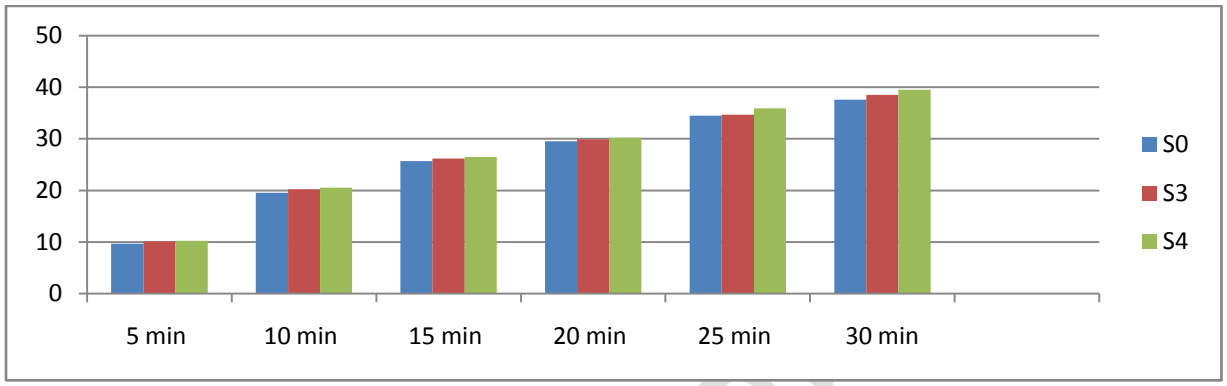


Fig2.water holding capacity of edible basket

3.2.4 SEM

The edible basket was analyzed and studied for its morphology:

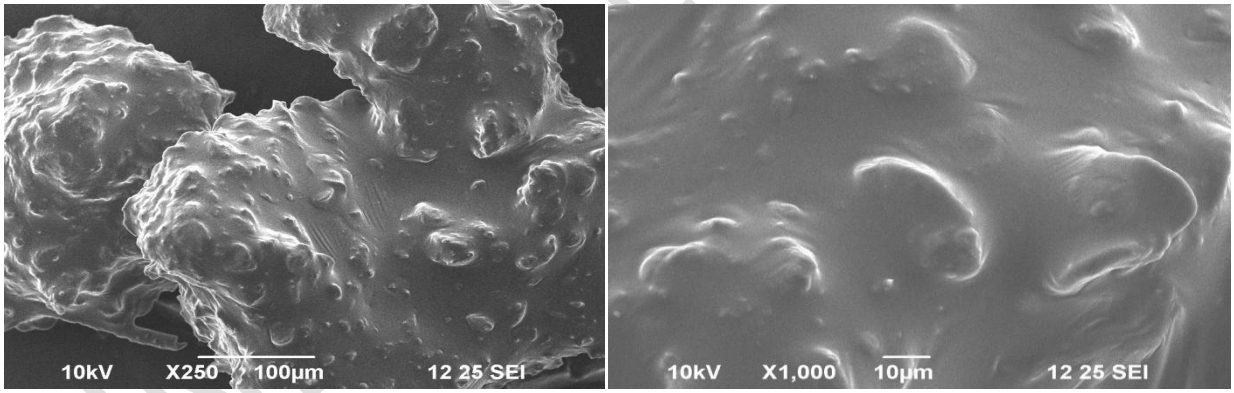


Figure 3. SEM images of Premix Powder at X250 & X1000 level magnification

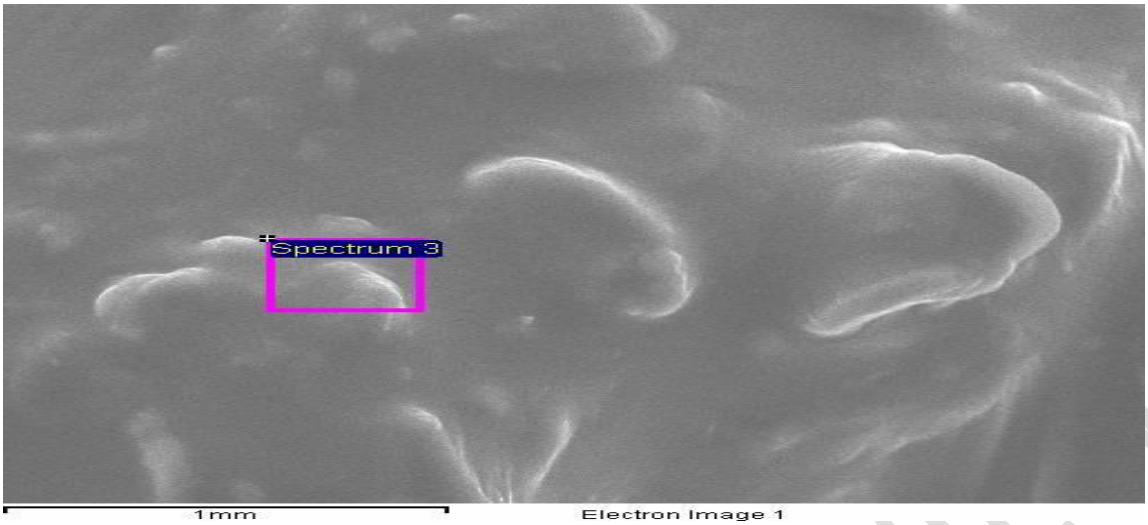


Fig 3a. Scanning electron microscope morphology of the edible basket powder surface

Above fig. depicts the scanning electron microscope morphology of the edible basket powder surface. The structure of the basket powder was uneven, rough, because of rice flour and nori sheet, somewhere nori sheet particles were also observed.

List 1.Structure of the basket powder

Element	**Weight%**	**Atomic%**
O K	78.09	91.93
Na K	4.44	3.64
Cl K	4.69	2.49
K K	1.85	0.89
Pt M	10.94	1.06
Totals	100.00	

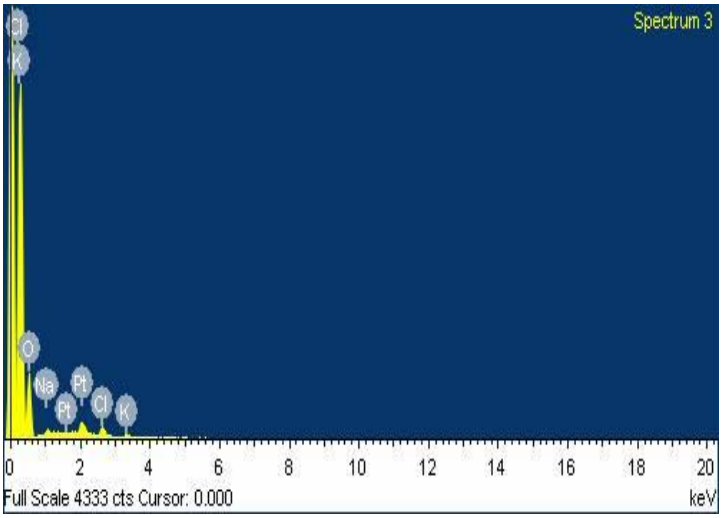


Figure 4. EDS Spectrum

EDX was used along with SEM to determine mineral distribution in the Edible basket Sample. The elements present in the developed edible basketwere O, Na, Cl, K, M and Pt. The percentage of these elements are given in table no 6 From fig 4 it is clear that the element present in the largest amount is Oxygen i.e. 78.09% and the element present in least amount is potassium i.e. 1.85%. The edible basket that was created contained elements including oxygen, sodium, chlorine, potassium, magnesium, and platinum (O, Na, Cl, K, M, and Pt).

3.2.5.1 FT-IR

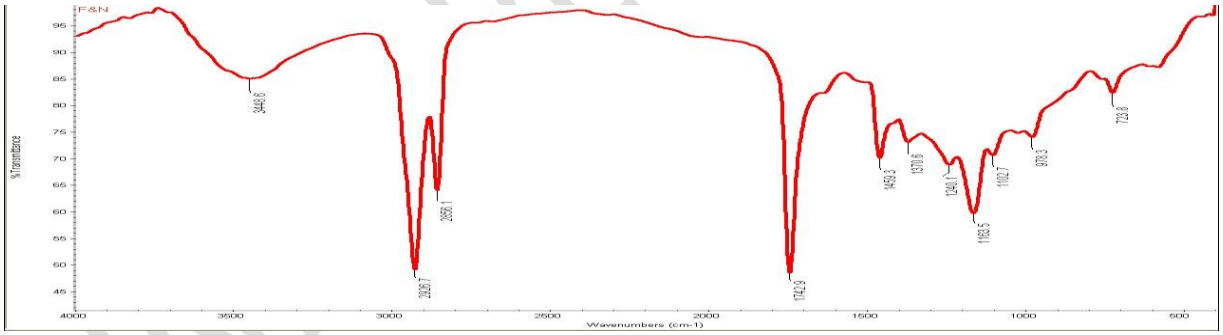


Fig 5.FT-IR analysis of edible basket on the basis of their morphology

The edible basket preparation entails physically combining the components because the FT-IR data for the consumable did not disclose any new peaks. The absorption band observed at 3000-3500 cm-1 is indicative of the stretching vibration of the OH group in relation to the intra- and intermolecular interactions of the hydroxyl group present in the adjacent starch molecules. The creation of hydrogen bonds between the constituent materials in each film is revealed by (Guadarrama-Lenzama). As a result, hydrogen bonding may be crucial to the development of films and their unique qualities. The stretching vibrations of the glycerol's C-HH and C-H2 bonds correlate to 2856.1–2926.7 cm-1.

3.3Antioxidant activity

Edible cutlery spoons with added multigrain flour, grains, and nori sheets have antioxidant properties. Results indicate that increasing the amount of multigrain powder and cereals in the formulations enhanced their antioxidant activity. According to the results, sample S4 (3.116%) had greater antioxidant activity values than samples S3 (2.445%) and S0 (1.968%). There is a clear correlation between the total phenolic content of multigrain powder and the greater antioxidant activity values.(21)

Table 6. Antioxidant activity of samples

Sample	**Free Radical scavenging activity (%)**
S_0	1.968±0.12
S_3	2.445±0.14
S_4	3.116±0.14

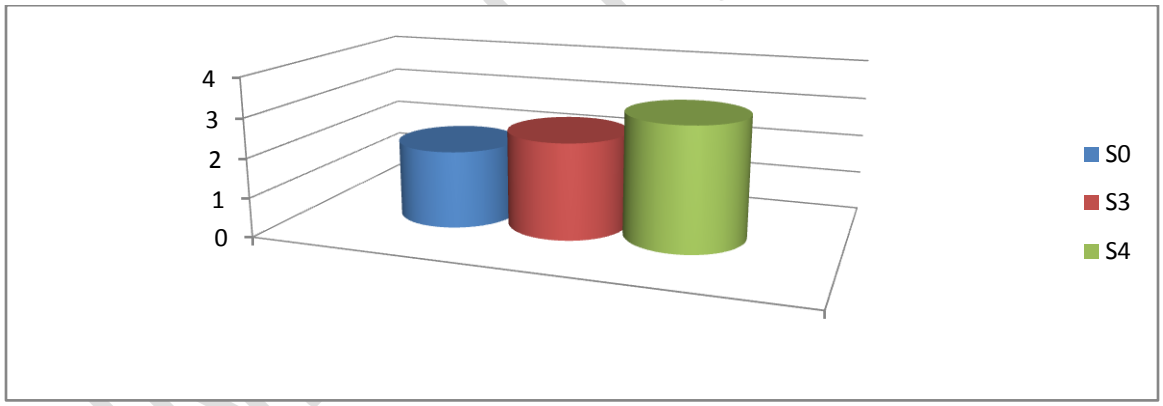


Fig 6. Graph of scavenging activity

The yield percentage of cereals, Multi grain and Nori sheet was calculated through equation 1 and the yield % come from raw stage are shown in Table 7.Total Extracted Yield (%):

Table7. Tabular Representation of Total Extraction Yield

Selected Raw Sample	Initial Weight(Raw)	Final Weight (Dehydration)	Total Extracted Yield (%)
Cereals	500gm	300grm	30
Multi grains	500grm	250grm	25

Nori Sheet	300grm	200grm	20

During the processing of raw selected sample we observed that the highest yield percentage seen in the cereal sample and after that Multi grain and Nori sheet respectively show in 3.3.2

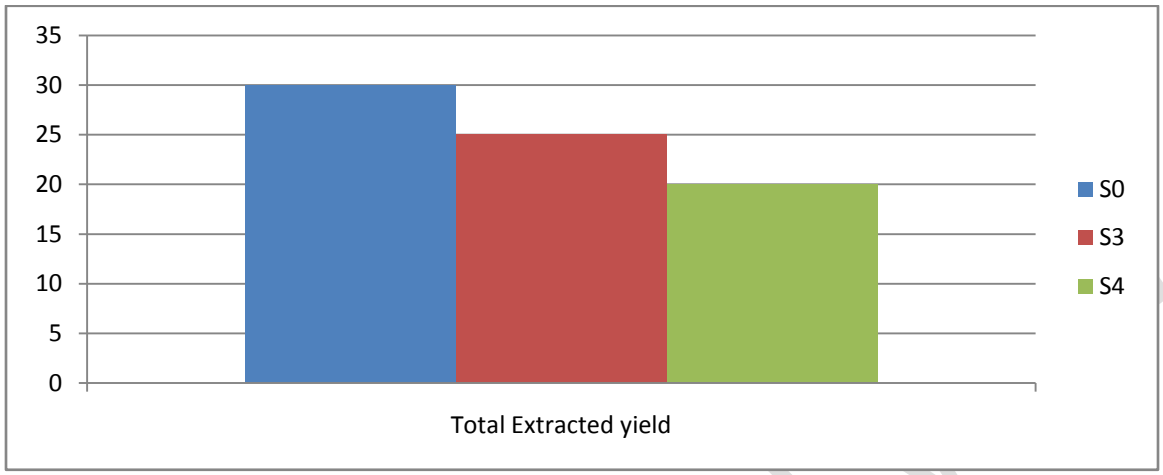


Fig7. Graphical Representation of Total Extraction Yield

3.4 Analysis of microbes

3.4.1 Report on the test

- Calculate the colony forming units (CFU/ml) using the test.
- Utilised method: Pour Plate Method for Total Plate Count.

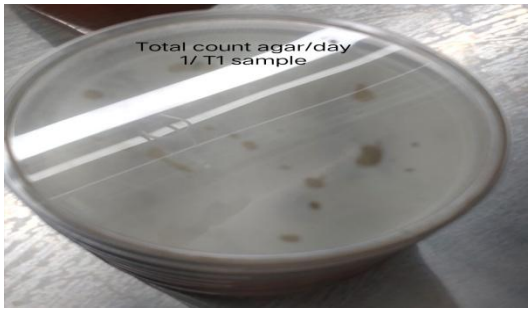
3.4.2 Type of Media:

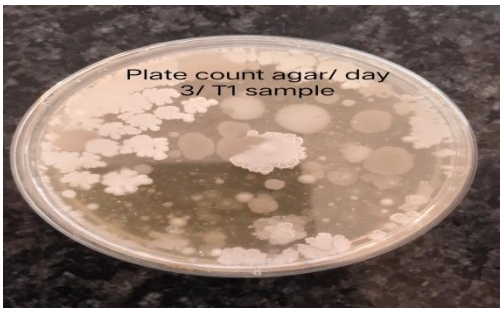
• Total number of plates: Agar media plate count s

Total suspend solid (TSS)

Test sample (T1)

3.4.3Observation and result:





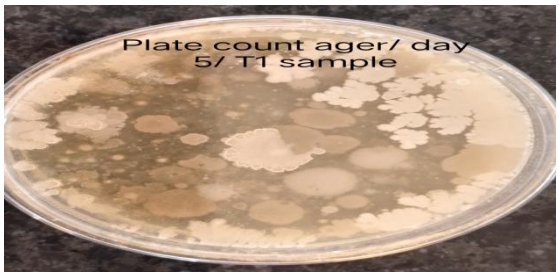


Fig 8. Shelf- life on plate count media in different time period for sample T1

Table 8 Total % Brix (T1 sample)

S. No.	**Sample code**	**% Brix x**	**Average TSS ± SD**
1.	T1	2%	2.33 ± 0.471
2.	T2	2%	
3.	T3	3%	

Table 9. Total CFU count

S. No.	**Sample code**	**PCA**	
1.	T1	Count	CFU\ ml
		65	65×10^{-J}

Table 10.Shelf life in different time period (T1 sample)

S.No	Sample code	Day1		Day3		Day5	
1.	T1	Count	CFU\ml	Count	CFU\ml	Count	CFU\ml
		3	3×10^{-J}	6	6×10^{-J}	66	66×10^{-J}

*** PCA: SDA:** Sabouraud dextrose Agar (yeast and mould count); MAM: MacConkey Agar Media (total coliform count); Plate count Agar (total plate count); The dilution employed was 10-4, and the plated sample was 100 µl. Not relevant Too numerous to count, TMTC. (20)

4 Conclusion

The major cause of concern in solid waste management is disposal of plastic wastes. Use of plastic containers and cutleries are increasing day by day especially due to elevating trend of food delivery apps. This paper aims to provide a replacement for plastic cones. An edible and biodegradable basket was developed and analysed for its proximate constituents. The developed basketswere found to be rich in protein content i.e 69.63%. The morphology of the developed basket was observed to be smooth under SEM analysis test. Apart from this, shelf life of the sample was estimated to be 1 months as no microbial growth was observed in the sample when kept in open environment for 5 days. For confirming the same SEManalysis was done and no microbial growth was observed.SEM (Scanning Electron Microscopy) and EDS. Additionally, a study of the FT-IR spectra revealed that the hydroxyl group (OH) was at 3402.43 cm-1 and the alkane group (CH) was at 2939.52 cm-1. Utilizing SEM and FT-IR measurements, shelf-life study was also conducted. Images captured by a SEM at 20kV of a material that was left in an open environment for 30 days reveal no signs of microbial development. At 3000- 3500 cm1, FT-IR displays an absorption band.The current study offers a disposable cutlery usage strategy that is environmentally favorable. Further study is necessary to lower the cost of biodegradable cutlery so that it can rival plastic silverware in the marketplace. The main goal of edible basket is able to prmote sustainable lifestyles by eliminating the plastics waste from food consumption. in fact, since the invention of their production, they have been able to replace 1.2 million plastic utensils waste product.

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