International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252

Development and Quality Evaluation of Eco-Friendly Moringa Oleifera Leave Powder Incorporated Edible Cutlery

M.Shabaana[1], T.Fahima Firdouse[2], Dr.P.Hema Prabha[3]

[1, 2]*M.E, scholar, Department of food processing and preservation technology, Avinashilingam Institute for Home science and Higher education for Women, Coimbatore.*

[3]*M.Tech., Ph.D., associate professor, Department of food processing and preservation technology, Avinashilingam Institute for Home science and Higher education for Women, Coimbatore.*

Submitted: 25-02-2021 Revised: 05-03-2021 Accepted: 10-03-2021

ABSTRACT: Edible cutlery is an innovative and novel concept which is likely to attract consumers and researcher alike in the near future. It is a natural product with no preservatives, additives, emulsifiers or fats and are just and are just flours kneaded with water. Nowadays plastics are banned to use as it is not a bio-degradable one and dapping plastics in ground will causes severe damage to ground water table and many gases are produced by it. Millets are a group of highly variable small-seeded grasses, widely grown around the world as cereal crops for fodder and human. Among the minor millets, pearl millet and foxtail millet, in cereal wheat, and in tuber, cassava has been selected as the base ingredients to manufacture edible cutlery because of the following reason, there are an excellent source of starch and fibre.

KEYWORDS: Bio-degradable, Edible cutlery, Minor millets, No preservatives, Starch and fibre.

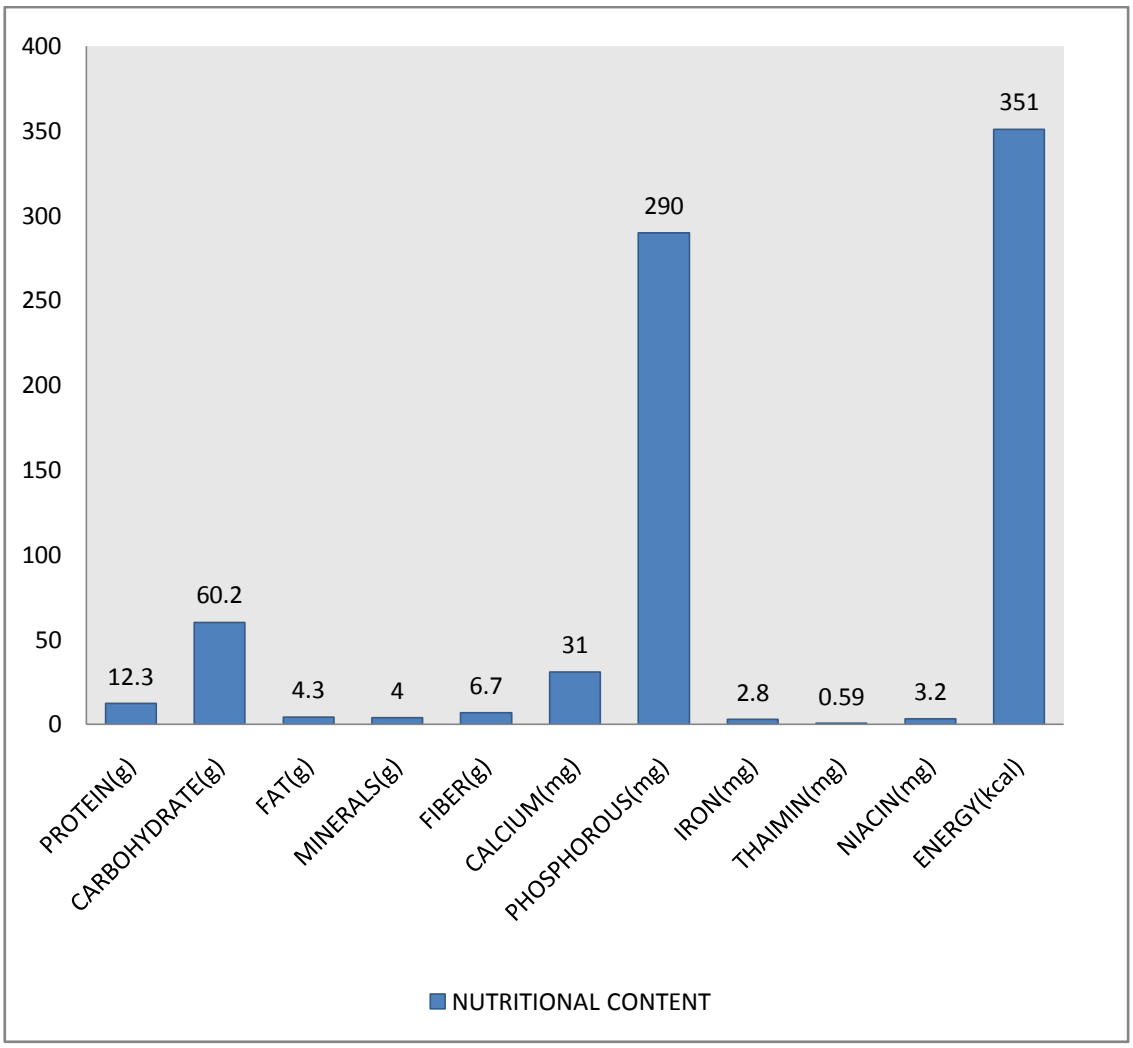
I. INTRODUCTION

Edible cutlery is an innovative and novel concept which is likely to attract consumers and researcher alike in the near future[10]. Edible cutlery is made of flours of different millets and cereals. It is a natural product with no preservatives, additives, emulsifiers or fats and are just and are just flours kneaded with water. So by using edible and eco-friendly cutlery will reduce the deposition of plastics to ground and it is also a bio-degradable and easily decompose in soil also plastic cutlery are made using chemicals it can harm the environment and people [1].Edible cutlery can be eaten after using it or can be left to decompose [7]. It does not dominate the taste of the food being consumed. It is manufactured using flour of food grains and is **low in cost** [8]. It is nutritious and contains no preservatives and chemical substance [2]. Millets are a group of highly variable small-seeded grasses, widely grown around the world as cereal crops for fodder and human. Among the millets, finger millet and foxtail millet, in cereal wheat, and Moringa oleifera has been selected as the base ingredients to manufacture edible cutlery because of the following reason, There are an excellent source of starch and fibre. Edible cutlery is the next step to biodegradable edible coatings. It is made of flours and is a natural product with no preservatives, additives, emulsifiers or fats and are just flours kneaded with water. It can be eaten after using it or can be left to decompose and does not dominate the taste of the food being consumed. Since it is manufactured using flour of food grains it is low in cost and also nutritious [4].

A. Finger Millet

Ragi or finger millet (Eleusine coracana L.) is one of the common millets in several regions of India. It is also commonly known as Koracan in Srilanka and by different names in Africa and has traditionally been an important millet staple food in the parts of eastern and central Africa and India. Traditionally in India, finger millet was processed by methods such as grinding, malting, and fermentation for products like beverages, porridges, idli (Indian fermented steamed cake), dosa (Indian fermented pan cake), and roti (unleavened flat bread).

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252

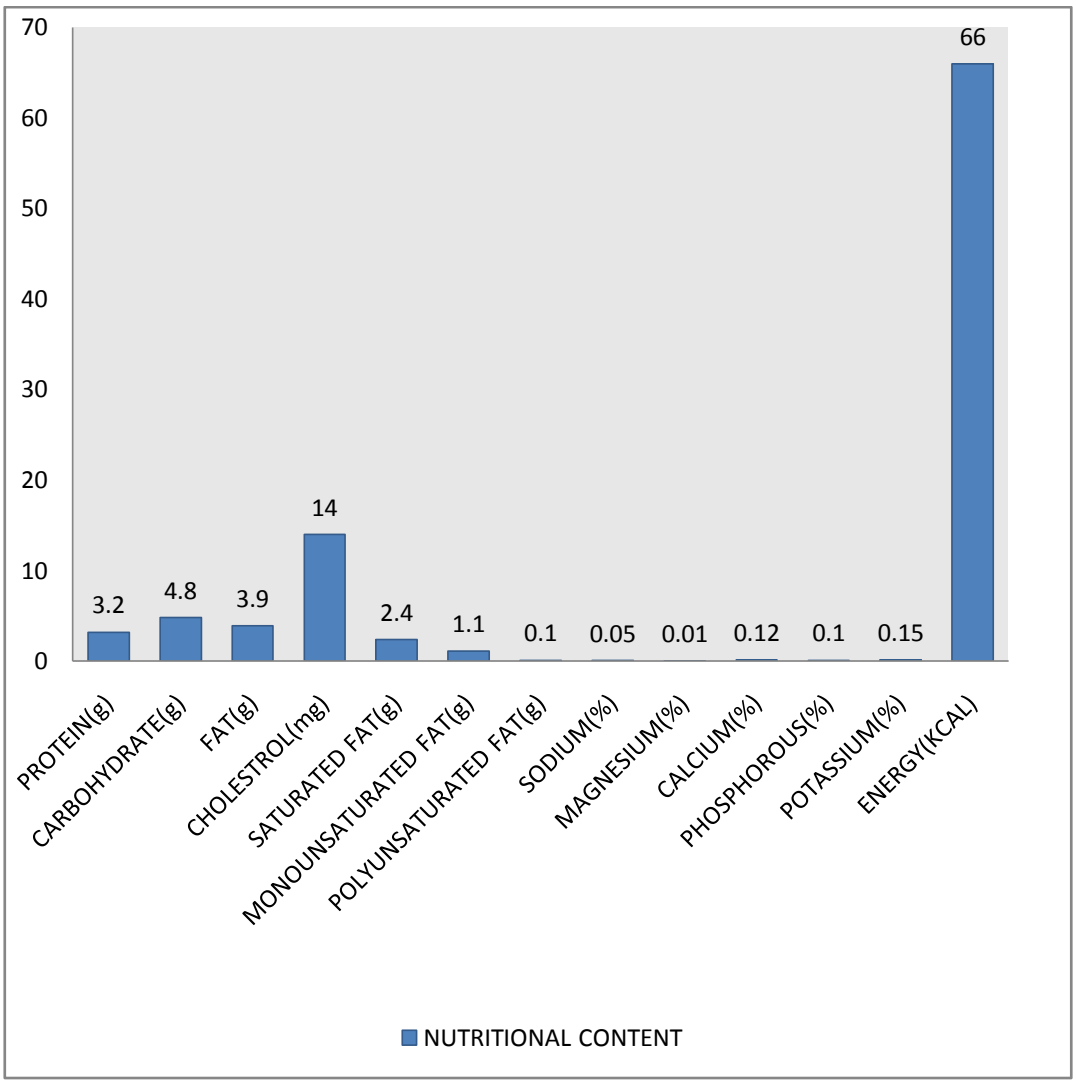


Nutritive value of finger millet
(Millets - WordPress.com)

B. Foxtail Millet

Foxtail millet (Setaria italica (L.) P. Beauv.) has been identified as major millet in terms of worldwide production, as it is the sixth highest yielding grain[4]. It is one of the easily cultivated cereal grains belonging to the Setaria genus of Poaceae family and subfamily Panicoideae. The husk forms 13.5% (w/w) of the grain, and the bran and the germ only constitutes 1.5–2% (w/w). Foxtail millet and milk obtained from millet contains a pertinent number of nutritional components, especially starch, protein, vitamins, and minerals. Foxtail millet, like most millets, is also a good source of crude fiber helps in the digestive process and helps to induce bowl movement, thus producing a laxative effect that is beneficial for a healthy digestive system.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252



Nutritive value of foxtail millet
(Millets - WordPress.com)

C. Moringa oleifera

Moringa oleifera tree is referred to as a miracle tree due to its rich source of certain macro and micro nutrients of great importance in human nutrition. The chemical composition of the different parts of the Moringa tree may vary depending on cultivar and source [5]. M. oleifera leaf, seed and flower have found numerous applications in food. In this review we firstly summarized the present knowledge on the use of M. oleifera as a food fortificant in amala (stiff dough), ogi (maize gruel), bread, biscuits, yoghurt, cheese and in making soups[6]. M. Oleifera leaf powder (MOLP) at varying concentrations of 2.5%, 5%, 7.5% and 10% was reportedly used in the fortification of amala prepared from yam flour Karim et al. (2013).

D. Significance Of Eco-Friendly Edible Cutlery

Edible cutlery is the next step to biodegradable and edible coatings[10]. It is made of flours and is a natural product with no preservatives, additives, emulsifiers or fats and are just flours kneaded with water[11]. It can be eaten after using it or can be left to decompose and does not dominate the taste of the food being consumed. Since it is manufactured using flour of food grains it is low in cost and also nutritious [3].

II. MATERIALS AND METHOD

Raw materials include foxtail millet ,finger millet, wheat, and rice flour, They were procured from the local market. A stainless steel moulds were brought for making edible cutlery. The millets were cleaned to remove dust, other foreign matter from grains is removed and millets

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252

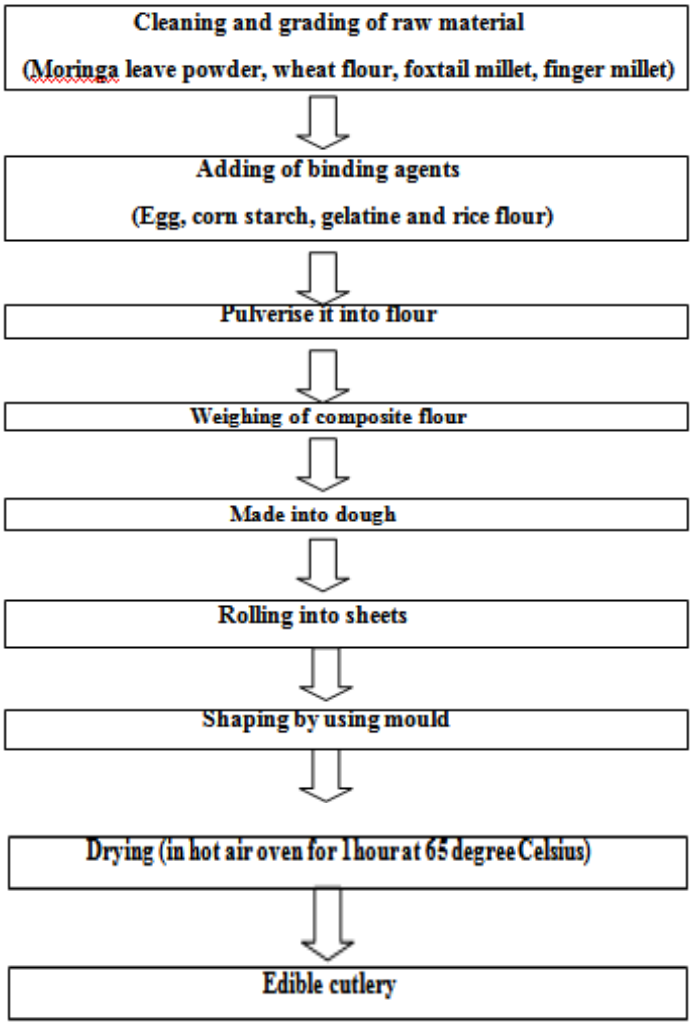
were grinded to a fine powder in a roller mill. The flour was sieved to obtain fine flour and it is stored in a stainless steel container for long self-life. **Moringa oleifera** leave powder is obtained by dehydrating the leave in the cabinet dryer. And dehydrated leave is powdered using crusher.

A. Preparation Of Edible Cutlery

The preliminary trial was done with the ingredients- foxtail millet, finger millet, wheat, and rice with **Moringa oleifera** as primary ingredients. It was basically a standardisation process to arrive at the right proportion of ingredients to be used for designing and making edible cutlery. A total of nine trials were done between 60°C and 100°C with an increase of temperature of 5°C in each trial.

The ingredients and the composition ratios were varied according to the end product obtained from each trial. Drying was done in hot air oven.Flours of foxtail millet, finger millet, wheat and rice were weighed at appropriate ratios to a total of 30 g and Moringa oleifera leave powder is added. And binding agent also added [1] .Adequate amount of water (approximately 13 ml) was added to the composite flour and mixed well to obtain a consistent dough. Dough was made into sheet and shaped in a stainless steel mould (spoon). The shaped dough was kept in hot air oven for drying. Edible cutlery was removed from the drier after complete sheet and shaped in a stainless steel mould (spoon). The shaped dough was kept in hot air oven for drying. Edible cutlery was removed from the drier after complete.

B. Production Of Edible Cutlery



Flow chart for the production of edible cutlery

International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252

III. RESULT

Physical characteristics and drying characteristics were determined and proximate analysis was carried out for edible cutlery.

1. Moisture content

For checking moisture content of the sample, drying was carried out using hot air oven. The hot air oven temperature can be adjusted to 65°c and samples are kept for 1 hr. Moisture content for the sample is measured by taking weight measurement every 10 minutes. Moisture loss was found to be 95%.

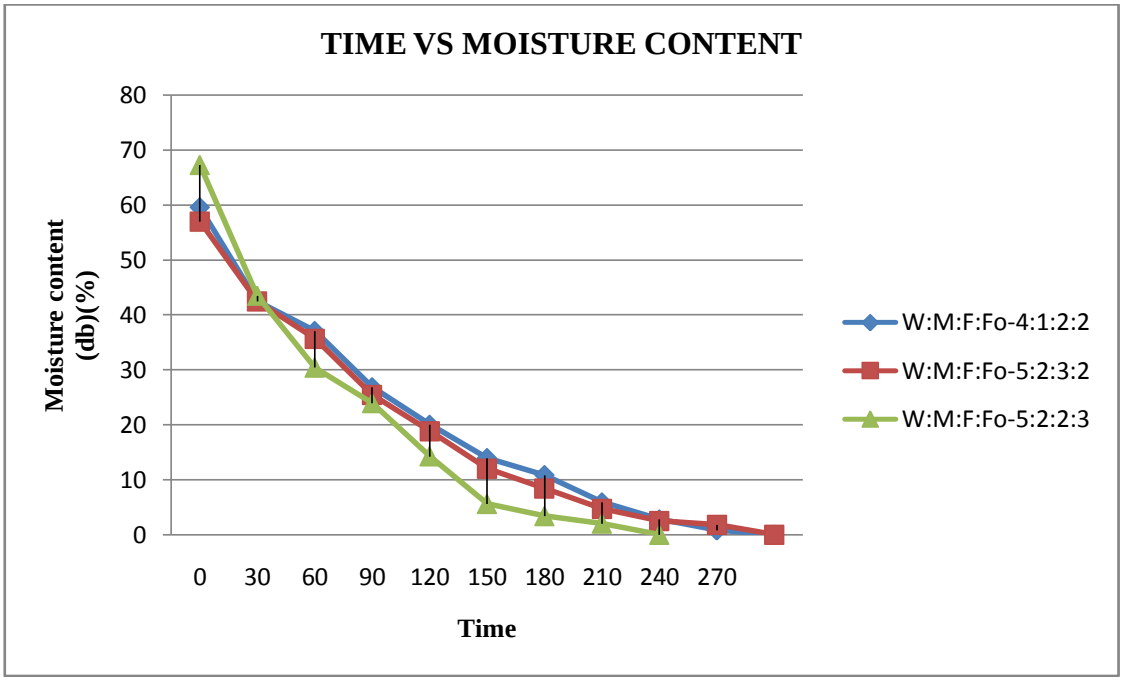
2. Ash content

For checking the ash content the sample is placed in muffle furnace for 3 hours at 550°c.intial and final weight of the sample is noted. The reduction in weight shows the ash content of sample. The ash content was found to be 0.05%.

3. Drying characteristics of wheat flour: moringa leave powder: finger millet flour: foxtail millet flour-4:1:2:2 at 70°C

Time	Edible spoon weight(g)	Moisture removed	Moisture Content (wb) (%)	Moisture Content (db) (%)	Drying rate (g/min)	Moisture ratio
0	10.29	0.72	37.31778	59.53488372	0.048	1
30	9.19	0.29	29.81502	42.48062016	0.019333	0.8125
60	8.84	0.1	27.0362	37.05426357	0.006667	0.622396
90	8.81	0.28	21.14914	26.82170543	0.018667	0.450521
120	7.74	0.31	16.66667	20	0.020667	0.335938
150	7.35	0.15	12.2449	13.95348837	0.01	0.234375
180	7.15	0.16	9.79021	10.85271318	0.010667	0.182292
210	6.83	0.06	5.56369	5.891472868	0.004	0.098958
240	6.63	0.03	2.714932	2.790697674	0.002	0.046875
270	6.5	0.03	0.769231	0.775193798	0.002	0.013021
300	6.45	0	0	0	0	0

4. Time vs Moisture content at 70°C



International Journal of Advances in Engineering and Management (IJAEM)
Volume 3, Issue 3 Mar. 2021, pp: 160-166 www.ijaem.net ISSN: 2395-5252

IV. DISCUSSION

Moisture Content, moisture-related microbial growth is a key factor contributing to food spoilage in developing countries. Dehydration or drying of food reduces the moisture content supporting this microbial growth, thereby addressing this problem [13]. Moisture content measurement methods in agricultural food products, in particular high moisture content fruits and vegetables grown in developing countries.

Total Ash, the inorganic residue remaining after either ignition or complete oxidation of organic matter in a food sample. Determining the ash content of a food is part of proximate analysis for nutritional evaluation and it is an important quality attribute for some food ingredients[14]. Also, ashing is the first step in the preparation of a sample for specific elemental analysis. This laboratory exercise uses the dry ashing technique with a muffle furnace to determine the ash content of a variety of food products. Moisture content determination is also included so ash content data can be expressed on both a wet weight basis and a dry weight basis [15].

Drying characteristics, drying of food is perhaps the oldest method of food preservation. Conventional drying technologies have now been used on commercial scale for drying numerous food products. Different methods of drying are associated with advantages and limitations. Natural and artificial methods have been employed to preserve valuable commodities [16].

Physical characteristics**, Physical** properties of food constituents are very important for developing new products. Physical properties of foods (including thermal, mechanical, rheological, dielectric, and barrier properties and water activity) are important for the proper design of food processing, handling, and storage systems. Proteins are widely used as ingredients in foods because of their functional properties, i.e., emulsification, gelation, thickening, foaming, and fat- and flavor-binding capacity [15].

Carbohydrate, a clear aqueous solution of carbohydrate was transferred using a pipette into a small tube. A blank of water also was prepared. An aqueous solution of phenol was added, and the contents were mixed [14]. Concentrated sulphuric acid was added rapidly to the tube so that the stream produces good mixing. An exception is starch, which can be measured specifically by digestion to glucose using specific enzymes (amylases), followed by measurement of the glucose released. Insoluble dietary fiber, soluble dietary fiber, and total dietary fiber are each composed primarily of non-starch polysaccharides. Methods for the determination of total dietary fiber and its components rely on removal of the digestible starch using amylases and removal of digestible protein with a protease, leaving a non-digestible residue [17].

Proteins have a major role in the growth and maintenance of the human body and are, along with carbohydrates and lipids, the energy giving nutrients in the diet [18]. In addition, proteins also pose a wide range of other functions in the body, such as enzymatic activity and transport of nutrients and other biochemical compounds across cellular membranes . In order to maintain these important functions, it is essential to provide the body with good quality proteins through diet[16]. Inadequate intake of dietary proteins containing essential amino acids results in increased turnover of muscular proteins, leading to reduced growth and loss of muscle mass. Impaired immunity, as well as reduced hormonal and enzymatic activity may subsequently follow [17].

Fat, the reasons for the increased world-wide incidence of obesity, type-2 diabetes, and cardiovascular disease include sedentary lifestyles and poor food choices. Regulatory agencies in several countries now require companies to add become the new target. Consumption of saturated fat over polyunsaturated oil has been clearly shown to increase cholesterol levels in humans. However, saturated fats provide the functionality required in many food products [16]. To complicate matters, concerns over sustainability, veganism, genetically modified organisms, animal welfare, as well as religious beliefs, severely limit our sources of saturated fat. unattractive front of package labels to their products where salt, sugar and fat (or saturated fat) levels are prominently displayed. After the demise of partially hydrogenated fats, saturated fat has In this review we will discuss recent advances in our understanding of the nano and mesoscale structure of fats, responsible for their physical functionality and contrast it to that of fat mimetics [18]

V. CONCLUSION

Edible cutlery, a natural nutritive product with no preservatives from composite

millet flour. Preliminary trial was carried out to standardise the ingredients for designing and making edible cutlery [14].Iron deficiency is the most common nutritional deficiency in the world with immense public health consequences. It has a complex etiology and prolonged imbalance between dietary intake, absorption, and body needs which leads to iron deficiency anemia. If developed during pregnancy, it significantly alters pregnancy outcomes. Low birth weight is one of the main features, and those infants are at increased risk of developing anemia later in life [12].so by incorporating moringa oleifera in edible cutlery may reduce the of anemia in child[9].

REFERENCE

[1] Kim Grundy, PT , "What Foods Are Binders?," on December 20, 2019.
[2] "World food situation: FAO cereal supply and demand brief". Rome, Italy: United Nations, Food and Agriculture Organization. 10 March 2019.
[3] Hughes, N; Oliveira, HR; Fradgley, N; Corke, F; Cockram, J; Doonan, JH; Nibau, C (14 March 2019). "µCT trait analysis reveals morphometric differences between domesticated temperate small grain cereals and their wild relatives". The Plant Journal. 99 (1): 98–111. doi:10.1111/tpj.14312. PMC 6618119. PMID 30868647.
[4] Narayana Peesapaty, "edible-cutlery the future of eco friendly utensils," 2017.
[5] LakshmipriyaGopalakrishnanb ,KruthiDoriyaa, Devarai SanthoshKumara, "Moringa oleifera: A review on nutritive importance and its medicinal application," Food Science and Human Wellness Volume 5, Issue 2, June 2016, Pages 49-5.
[6] Adewumi T. Oyeyinka , Samson A. Oyeyinka, " Moringa oleifera as a food fortificant: Recent trends and prospects," 2018.
[7] Sakib, S. N. (2019, January 12). Export of plastic goods marks 21pc rise in H1 of current FY. Retrieved from The Financial Express.
[8] Sangita Sood*, Deepshikha , "Development and Quality Evaluation of Edible Plate,"ARC Journal of Nutrition and Growth Volume 4, Issue 2, 2018, PP 1-4 ISSN No. (Online) 2455-2550 DOI:http://dx.doi.org/10.20431/2455-2550.0402001.
[9] Ines Banjari , "Iron Deficiency Anemia and Pregnancy;" (2018).
[10] Hemraj Narhar Patil*, Preeti Sinhal** , "A Study on Edible Cutlery: An Alternative for Conventional Ones," 2018.
[11] Md. Sadat Rashid , "Edible Cutleries as Sustainable Substitute for Plastic Cutleries," 2019.
[12] Physical Properties of Sonicated Products, in Ultrasound: Advances for Food Processing and Preservation, 2017.
[13] Khuthadzo Ngoma,1 Mpho E. Mashau,1 and Henry Silungwe1, "Physicochemical and Functional Properties of Chemically Pretreated Ndou Sweet Potato Flour", 2019.
[14] Nargis Yousf, Fiza Nazir, Rehana Salim, Hafiza Ahsan and Adnan Sirwal, "Water solubility index and water absorption index of extruded product from rice and carrot blend," 2019.
[15] Devinder Dhingra Mona Michael, Hradesh Rajput, and R. T. Patil, "Dietary fibre in foods: a review,"2016.
[16] Ardita veseli., "A review of methods for solubility determination in biopharmaceutical drug characterization," 2019.
[17] MarinaVera Zambranoa BaishaliDuttaaDonaldG.MercerbHeather L.MacLeanacMarianneF.Touchiead,"Ass essment of moisture content measurement methods of dried food products in small-scale operations in developing countries: A review," 2019.
[18] Alejandro G. Marangoni, *[a] John P. M. van Duynhoven,[bc] Nuria C. Acevedo, [d] Reed A. Nicholson[a] and Ashok R. Patel†[e], "Advances in our understanding of the structure and functionality of edible fats and fat mimetics," 2020.

International Journal of Advances in Engineering and Management
ISSN: 2395-5252

IJAEM

Volume: 03 Issue: 03 DOI: 10.35629/5252

www.ijaem.net
Email id: ijaem.paper@gmail.com