International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Formulation and Quality Evaluation of Sugar Free Nutritional Biscuits, Sustainable Health Impediment of Diabetic

Bollapally Amulya[1], Dr. G. Ramu[2]

[1]Research Scholar, Department of Food Science and Technology, Sreechaitanya College, Satavahana University, Karimnagar, Telangana State, India, Email id: *amulyabollapally[at]gmail.com*

[2]Assistant Manager, Quality Control Section, Telangana Foods, IDA, Nacharam, Hyderabad, Telangana State, India
Email id: *golla.ramu[at]gmail.com*

Abstract: ***Diabetes might be one of the most talked about diseases across the world and especially in India but awareness about the same can well estimated by the fact that the India has more people with diabetes,77 million people is suffering with diabetes in India. The WHO estimates that 80% of diabetes deaths occur in low and middle income countries in that India is the second highest in the world. The present aim of the study was carried out to develop the high protein and sugar free biscuits for diabetic patients. Biscuits are the most widely sold products and most of them are high in carbohydrates as they are made of wheat and are unsuitable for daily consumption especially by diabetic patients. Hence these biscuits are generally avoided by diabetic patients as they cause high sugar levels in blood. So a sincere attempt has been made to produce high protein rich and high nutrition with low sugar biscuits using different combination of flours and materials that diabetics can snack on without worrying about it in increasing the sugar levels in blood for this three samples of biscuits were developed using different ratios of flour combinations, All products were analysis for a sensory test. The highly acceptable sample was further evaluated for its nutritional content & its glycemic index was determined. Results obtained suggested that biscuits made from these raw materials were highly acceptable and chosen for nutritional analysis.***

Keywords: Diabetics, metabolic, wheat, flax

1. Introduction

Diabetics is a chronic metabolic and endocrine disease characterized by elevated blood sugar levels with disturbances in the metabolism in carbohydrates, fat and protein resulting from an abnormality in the pancreas causing a defeat in insulin secretion, insulin action or both. This disorder is often associated with long term complications. Biscuits are the most commonly consumed bakery products in the market they are usually found to be in calories, carbohydrates and fats but low in vitamins, minerals and proteins making them unfit for daily consumption these biscuits are specially formulated for the consumption by diabetic patients most of the biscuits were developed by adding different raw materials(foxtail millet, oats, almonds, wheat, flax seeds, milk powder, bittergourd powder, butter, stevia) the importance of foxtail millet was recognized as diabetic food .The millet is rich in dietary fiber(6.7%) protein (11%)and low in fat(4%). Due to the presence of high fiber content and antioxidants in millets it reduces insulin spikes gradually and eases digestion for diabetics moreover it takes a longer time for the body to metabolise and break down millets due to their low glycemic load this means that they are absorbed more slowly into the blood stream and requires less insulin. These millet can manages diabetes, triggers weight loss, stronger bones, strengthens nervous system, boosts cardiac health, helps improve immunity. Almonds are especially good for people with diabetes almonds may reduce the rise in glucose and insulin levels.

Consumption of almonds was associated with lower levels of fasting insulin and fasting glucose. Almonds are high in magnesium, so consumption of almonds is good for diabetes because long term high blood levels may cause a loss of magnesium via urine because of this people with diabetes may be at a greater risk for magnesium deficiency. Oats can help regulate blood sugar, it may be reduce the need for insulin injections when eaten in place of other carbohydrates rich breakfast foods. Oats has a low glycemic index (GI) score and the soluble fiber and beneficial compounds in oats may help people control markers of diabetes. Donkey milk powder could treat diabetes through down regulating phosphoenol pyruvate carboxykinase1 and glucose-6-phosphate.Donkey milk has played an important role in the treatment of diabetes. Bitter gourd is linked to lowering the body's blood sugar this is because the bitter gourd powder has properties that act like insulin, which helps bring glucose into the cells for energy. The consumption of bitter gourd powder can help your cells use glucose and move it to your liver, muscles and fat. The bitter gourd powder may also be able to help your body retains by blocking their conversion to glucose that ends up in your blood stream.

The flax seeds are well known for their dietary fiber the flax seeds has low glycemic index because of the fiber content, which helps keep your blood sugar levels in control. Including flax seeds in your daily meals can improve insulin sensitivity due to the antioxidants present in them. Stevia compared to artificial sweetness, stevia can suppress the plasma glucose levels and raise your glucose tolerance. Stevia also has zero calories, which makes it highly beneficial for people seeking to lower their glucose levels. Blood pressure lowering stevia has cardiotonic properties that normalise the blood pressure and regulates your heart beat. Stevia increases the insulin effect on the body cell membranes and stabilises blood sugar levels and increases the production of insulin. Butter comes under low glycemic

index foods hence it can be safely consumed by diabetes, half teaspoon of butter once daily for lunch will do good for a diabetic.

2. Materials and Methods

1) Raw materials

The raw materials include whole wheat flour, oats, butter, stevia, milk powder, flax seeds, almond powder, bitter gourd powder, foxtail millet, cashew. The three different combinations of flours are as given in the table.

Table 1: Combination of flours

Blends	Wheat Flour	Foxtail Millet	Oats	Stevia	Flax Seeds	Bitter Gourd	Butter	Almond Powder
Blend-1	25%	25%	-	7.5%	5%	-	20%	10%
Blend-2	25%	-	23.5%	12.5%	2.5%	1.5%	20%	10%
Blend-3	25%	11.75%	11.75%	12.5%	2.5%	1.5%	20%	10%

2) Procurement of raw materials

All the required materials for development of diabetic biscuits were obtained from super market. Procurement details of all ingredients are listed below in table-2

Table 2: Procurement of raw materials

S. No.	Ingredients	Source
1	Wheat flour	Super Market, Hyderabad
2	Foxtail millet	Super Market, Hyderabad
3	Oats	Super Market, Hyderabad
4	Stevia	Super Market, Hyderabad
5	Flax seeds	Super Market, Hyderabad
6	Bitter gourd powder	Super Market, Hyderabad
7	butter	Super Market, Hyderabad

3) Process of biscuit manufacturing

a) Different shapes of diabetic biscuits images follows below

b) Physio Chemical Properties of Biscuit

Nutritional analysis

Ash value

Total ash content of the prepared biscuits was estimated by following procedure. According to the procedure 3 gram of sample was taken in a curcible and it was burnt on hot plate until all the carbon burnt.Then sample was kept in muffule furnance upto 4 hours. After 4 hours remove sample from muffule furnance and keep in desicator for 30 mins after 30 mins take final weights.

Total ash value:100(Z-X)Y

Where X-weight of empty dish
Y-Weight of sample taken
Z-Weight if crucible with sample after complete burnt.

Moisture content

Moisture content of the prepared biscuits was estimated by following procedure. According to procedure take empty weight of petridish in that take 10 grams of sample in petridish keep it in hot air oven for 4 hours at 105c after 4 hours remove from oven and keep in desiccator for 30 mins for cooling, after this take final weight of sample.

Moisture %: $(W_1-W_2)x100/W_1-W$

Where, W=weight of sample
W_1=Weight of petridish with sample before drying
W_2=Weight of petridish with sample after drying.

Protein estimation

Protein content of the prepared biscuit was estimated by following procedure. According to the procedure below 0.1 gram of sample was taken in butter place and place that in digestion tube along with the 6 grams of catalyst($CUSO_2$+Na_2SO_4)was added in digestion tubes. After this add 15 ml of concentrated H_2SO_4 was added to tubes and digested for 3-4 hours. After digestion these samples were distilled with 25 ml of boric acid in conical flask and add 2-3 drops of methyl red indicator. Take this digestion tube and conical flask are placed in protein analyser for 5mins.After this collect the sample and do titration against dilute H_2SO_4 solution after titration end point is pink point.

$$\frac{\text{Titrate value x reading blank x normality of } H_2SO_4 \text{ x 1.4 x 6.25}}{\text{Weight of sample}}$$

Fat extraction

Take empty weight of the timble and add 5-10 grams of sample in timble and take weight, now take empty flat bottom flask and add5-6 glass beeds in flask after addind take weight of flask after this take soxhlet appartus and add 150ml of hexane in that and keep it in fat extraction unit upto 4 hours distillation process will done after this remove hexane from flask and remove flask from that fat extraction unit and keep that flask in oven for 30 minutes after this take final weight.

Fat Extraction = %:(W_4-W_3) /W_2-W_1 x100

W_1=empty thimble weight of sample
W_2= thimble+ sample weight
W_3=flat bottom flask weight
W_4=final weight of flask

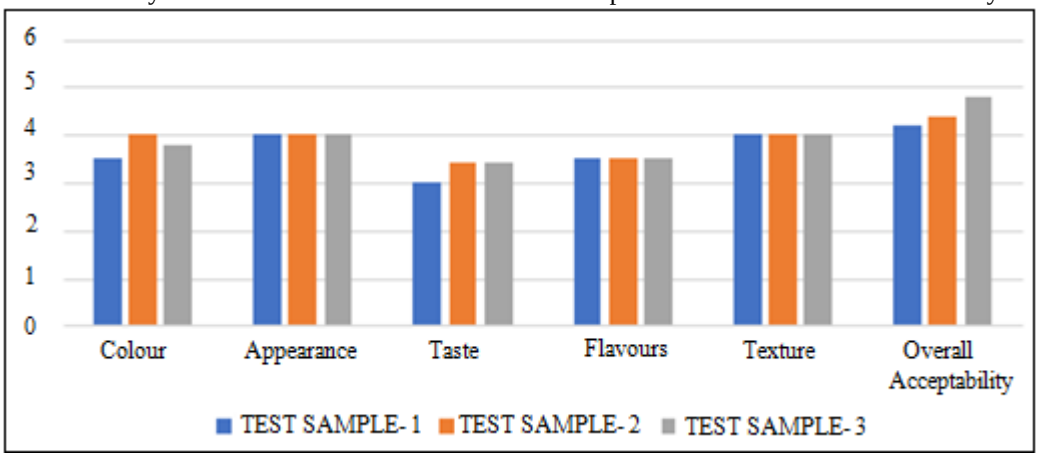
3. Result and Discussion

Sensory evaluation of the biscuits

Organoleptic or sensory evaluation of the biscuits depend on its colour, appearance, flavour, texture, taste, and total acceptability of the sample

	Test sample-1	Test sample-2	Test sample-3
Colour	3.5	4	3.8
Appearance	4	4	4
Flavour	3	3.4	3.4
Texture	3.5	3.5	3.5
Taste	4	4	3.9
Overall acceptability	4.2	4.4	4.6

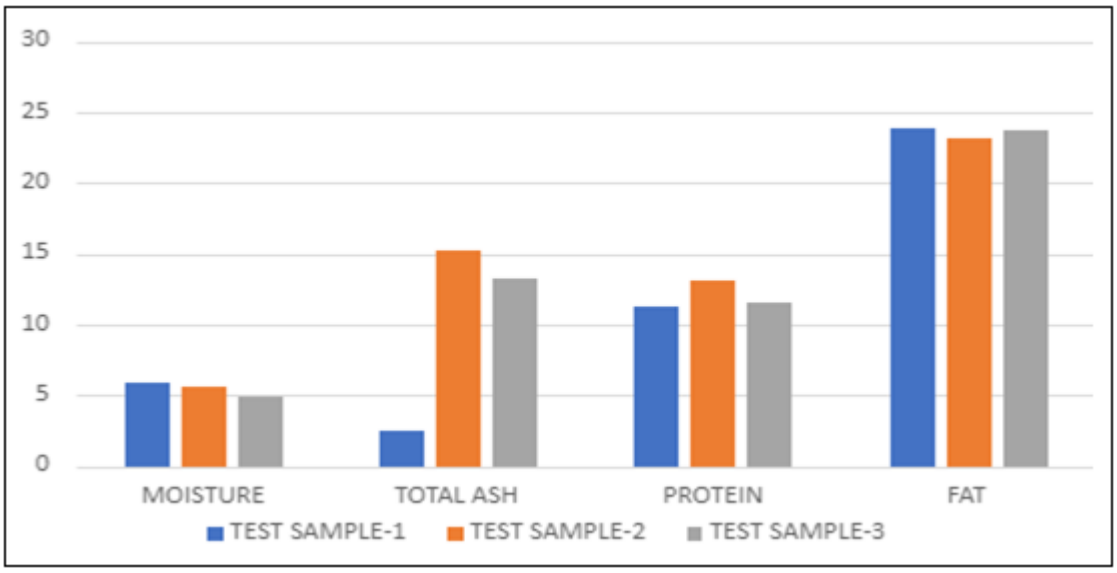
Sensory analysis is carried out by using experienced panelists to measure sensory characteristics like senses of sight, smell, taste, touch and acceptability of biscuit table no- represents the mean scores for sensory evaluation.



4. Nutritional Analysis of Biscuit

The test samples were selected for nutritional analysis.

S.No.	Parameters	Sample-1	Sample-2	Sample-3
1	Moisture	5.9	5.6	4.9
2	Total ash	2.5	15.2	11.5
3	Protein	11.3	13.1	11.5
4	Fat	23.9	23.2	23.7



References

[1] Hooper L, Martin N, Jimoh OF, Kirk C, Foster E, Abdelhamid AS. Reduction in saturated fat intake for cardiovascular disease. Cochrane Database Syst Rev. 2020;8:CD011737.
[2] Naska A, Lagiou A, Lagiou P. Dietary assessment methods in epidemiological research: current state of the art and future prospects. F1000Res. 2017;6:926.
[3] Wong TY, Sabanayagam C. The war on diabetic retinopathy: where are we now? Asia Pac J Ophthalmol (Phila). 2019;8:448–56.
[4] Mukherjee PK, Maiti K, Mukherjee K, Houghton PJ (2006). Leads from Indian medicinal plants with hypoglycemic potentials. Journal of Ethnopharmacology, 106: 1-28.
[5] Pirdehghan, A. and Poortalebi, N. (2016). Predictors of adherence to type 2 diabetes medication. J.Res Health Sci. 16(2):72-5
[6] Roberfroid, M. B. (2008). Defining functional foods. Gibson, G. R., Williams, C. M. (Eds.) Functional Foods- Concept to Product, CRC Press, Boca Raton, pp. 9 – 27
[7] Artemova E N and Novitskaya E A 2005 Method for the production of biscuit semi-finished products Russian Federation patent No. 2256329 publ. 20.07.2005.
[8] Ahmed, T., Sarwar, N., Rahman, N. and Kauser-Ul-Alam, M. (2022). Formulation, development and quality evaluation of a fortified biscuit with antidiabetic potential. Int. J Nutr Sci. 7(1):2-10.
[9] Gallagher, E., O'Brien, C.M., Scannell, A.G.M. and Arendt, E.K. (2003). Evaluation of sugar replacers in short dough biscuit production. J. Food Engg. 56, 261-263.
[10] Maritim, A.A., Sanders, R.A. and Watkins, J.B. (2003). Diabetes, Oxidative Stress, and Antioxidants: A Review J Biochem Molecular Toxicology. 17:1.
[11] Damayanti Korrapati, S. M. (2018, September). Development of Low Glycemic Index Foods and Their Glucose Response in Young Healthy Non-Diabetic Subjects. Preventive nutrition and food science, 23(3), 181–188. doi: 10.3746/pnf.2018.23.3.181
[12] Gadadharan Vijayakumar, S. M. (2019). Incidence of type 2 diabetes mellitus and prediabetes in Kerala, India: results from a 10-year prospective cohort. BMC Public Health. doi:https://doi.org/10.1186/s12889-019-6445-6.
[13] Vasan Alka, B. P. (2017). Grab a healthy bite: Nutritional evaluation of barley based cookies. AGRICULTURAL RESEARCH COMMUNICATION CENTRE, 36(1), 76-79. doi:10.18805/ajdfr.v36i01.7464.
[14] Natsuki Fujiwara, C. H. (2017, January 4). Development of Low Glycemic Index (GI) Foods by Incorporating Pulse Ingredients into Cereal-Based Products: Use of In Vitro Screening and In Vivo Methodologies. Cereal Chemistry, 94(1), 110- 116. doi:10.1094/CCHEM-04-16-0119-FI
[15] Kaur, K., Kaur, H., & Bains, K. (2017). Development and Nutritional Evaluation of Cereal and Pulse Based Biscuits for Diabetic Patients. British Journal of Applied Science & Technology, 25(1), 1-8. doi: 10.9734/BJAST/2017/34139