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Designing of Low GI Biscuit Suitable for All Age Group

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Abstract:- The current food habits with junk foods & unhealthy snacks looks very much suitable for dynamic business life but on other side it possess a critical danger to the health by being an cause of multiple disease like Obesity, Diabetics, Heart disease,etc ,the better way to control & take of our health is to focus on Healthy foods which has Low GI rating. The objective of this research is to design a low GI biscuit suitable for all age group.

The GI analysis demonstrates that the high fibers added to biscuits had benefits to its consumers. It increase dietary fiber intake and reduce the glycemic index value of the biscuit, moreover it act as prebiotic to the gut microflora. The GI analysis shows the biscuit with more fibers rather than only wheat flour has very low GI of 40.96 when compare to 63.25 for the control. Hence low GI biscuits can be suitable for all age groups and can be seen as a Healthy alternative for junk foods especially to school going kids.

I. INTRODUCTION

The glycaemic index (GI) is defined as "the incremental area under the blood glucose curve following ingestion of a test food, expressed as a percentage of the corresponding area following an equivalent load of a reference carbohydrate, either glucose or white-wheat bread".

The glycemic index (GI) is the value which will help us to classify the foods according to their glycemic response. It measures the blood-glucose-raising ability of the available carbohydrate in foods. The principle is that the slower the rate of carbohydrate absorption, the lower the rise of blood glucose level and the lower the GI value. As per WHO guidelines GI value of ≥70 is considered high, a GI value 56-69 inclusive is medium and a GI value ≤ 55 is low, where glucose = 100.

The biscuit formulation is done by selecting the fine ingredient which will contribute to the low Glycemic Index of the biscuit, the low GI biscuit recipe includes Inulin, Polydextrose, Ragi, Oats fiber, even though Ragi is the food ingredient which comes under High GI rating it is used for its fiber content which will help to slowly release the glucose into blood stream.

II. OBJECTIVE AND SCOPE

The Major outcome will be achieving obtaining the low GI product by critical selection of raw materials or ingredient ,proper formulation and through continues trial, The Low GI biscuit will release the glucose into the blood stream in a very control as well as in a slow and study way so that there won't be any spike in the glucose in the blood stream once the biscuit is consumed, This will help us to prevent any health issue or Diabetic kind of any hereditary disease and it help us to create a healthy society.

A. Objective

To design low GI Biscuit suitable for all Age.

B. Scope

Low GI Biscuit will be helpful to maintain healthier life and will be very much beneficial for Diabetic population.

III. MATERIALS

A. Experimental Location

Mumbai Andheri East - Bakery Unit

B. Materials Required For Making Low GI Biscuit

Wheat flour, Polydextrose, Sucralose, Wheat bran, Oats fibre, Inulin, Palm oil, Salt, Sodium Bicarbonate, Ammonium Bicarbonate, Water

C. Materials Required For Analyzing GI

Electromagnetic sieve shaker, Water bath, Fibertech flasks, Standard flasks-100ml, Pipettes1ml,2ml,5ml,10ml , Measuring Cylinder, Centrifuge tubes.

D. Biscuit formulation

INGREDIENT
Wheat Flour
Sugar
Palm oil
Lecithin
Salt
Sodium Bicarbonate
Ammonium Bicarbonate
SAPP
Water

Table 1:- Recipe of Control Biscuit

INGREDIENT
Wheat Flour
Ragi
Maltodextrin
Maltitol
Wheat Bran
Oat fibre
Palm oil
Lecithin
Salt
Sodium Bicarbonate
Ammonium Bicarbonate
SAPP
Inulin
Sucralose
Polydextrose
Water

Table 2:- Recipe of low GI Biscuit

E. Making of Biscuits

The biscuit are made by following the industrial process, in first stage all the liquid ingredient like edible oil, emulsifier where added and mixed for 5 min for proper blend in Hobart mixer followed by the addition of leavening agent in dissolved condition and mixed for 5 minutes once the content was mixed uniformly without clumps the powdery ingredients where added and mixed for 4 min for proper dough development in the Hobart mixer,once the dough is made resting time of 10min was given under room temperature.

The dough was sheeted in the sheeter to the required thickness of 3.5mm and moulded into round shape for Bkaing, the biscuit is baked in the stationary oven for 6 min at the temperature of 240C

F. Particle Size Separation

The biscuit powder was broken into 3 different sizes, namely 500µm, 355 µm, 250 µm respectively with the help of Electromagnetic Sieve Shaker.

G. Chemicals and Reagents

- 0.05N Hydrochloric Acid
- 0.5 M Sodium Acetate
- 66% Ethyl Alcohol

➢ *Sample Preparation*

The Food Test sample should be of uniform size for Glycemic Index analysis. The sample can also be sieved to get even particle size.

H. Enzymes and their Preparation

➢ *Enzymes Used*

- Pepsin from porcine gastric mucosa
- Pancreatin from porcine gastric mucosa
- Invertase from Saccharomyces cerevisiae
- Amyloglucosidase from Aspergillus Niger.

➢ *Enzyme Preparation*

- *Pepsin*
  0.25g of Pepsin in 25ml of 0.05N Hydrochloric acid.
- *Pancreatin*
  1gm of Pancreatin in 6.5ml of distilled water.
- *Invertase and Amyloglucosidase*
  Readily available.

IV. METHODOLOGY

A. Estimation of Glycemic Index by Invitro Englyst et al Method

➢ *Procedure*

- The sample of uniform size is measured such that the content contains 0.5gms of Carbohydrate.
- The sample is initially digested with Pepsin in Fibertech flasks for 30 minutes at temperature of 37 °C
- The pH is brought to 5.2 by adding 5ml of 0.5M of Sodium Acetate
- The sample is then subjected to the digestion of Pancreatin and Amuloglucosidase, followed by Invertase
- Immediately after adding the enzyme, 1 ml of aliquot from the Fibertech flasks are transferred to 2ml of 66% ethanol containing 100ml standard Flasks. The sample is made upto 100ml with distilled water . This will be "G0 sample" i.e , the sample withdrawn at 0^{th} minute.
- The same procedure was repeated at 20^{th}, 60^{th}, 100^{th} and 140^{th} minute respectively. Where, G20 is RAG i.e Rapidly Available Glucose. G140 is SAG i.e Slowly Available Glucose
- The released glucose will be analyzed by the DNSA Reagent method and the Glycemic Index values at the 0^{th} , 20^{th}, 60^{th}, 100^{th} and 140^{th} minute were calculated as standardized.

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V. RESULTS

➢ *Physical Observation at Various Particle Sizes and Processing Conditions*

SAMPLE SIZE	RAW
500µm	Coarse
355 µm	Less coarse
250 µm	Powdered

Table 3:- Glycemic Index of biscuit powder at different particle sizes

- **G0 –** Sample collected immediately after adding enzymes
- **G20-** RAG (Rapidly Available Glucose) - sample Collected after 20 minutes
- **G60-** Sample Collected after 60 minutes
- **G100-** Sample Collected after 100 minutes
- **G140-** SAG (Slowly Available Glucose) - sample Collected after 140 minutes (The above data applicable for all the following tables

S.no	G0	G20	G60	G100	G140
500 µm	20.25	28.12	40.25	52.24	63.25
355µm	26.39	37.45	44.87	57.87	67.21
250 µm	35.41	43.14	49.35	62.01	75.24

Table 4:- GI analysis of Control Biscuit

S.no	G0	G20	G60	G100	G140
500 µm	6.69	11.51	21.65	36.62	40.96
355µm	9.54	13.19	26.79	44.32	42.62
250 µm	10.06	19.14	39.35	44.01	51.99

Table 5:- GI analysis of Low GI Biscuit

VI. DISCUSSION

Baking has a detrimental influence on the starch digestibility which might be due to the transglycosidation reactions. These chemical alterations of starch takes place under conditions like baking at temperature at 240C leading to formation of atypical glycosidic bonds and the concomitant reduction in amyloytic susceptibility resulting in formation of Resistant Starch.

Cooking increases the degree of Starch gelatinization and its susceptibility to enzymatic digestion.

The influence of food processing and cooking on glycaemic response is well documented. Treatments incorporating the generation of forces such as shearing, compression and extreme heat treatment increase gelatinization, which results in the breakdown of the starch granule. Thus, many processing conditions lead to an increased susceptibility of the starch.

The fibre contribute to a low GI than control samples, this may be due to the presence of Inlulin, Polydextrose, Maltitol & Wheat bran which is present in the Low GI biscuit.

VII. CONCLUSION

Thus addition of easily available fibres like Wheat bran, Oats fibre to the recipe of Biscuits contribute to the slow release of glucose into the blood stream ,apart from the fibres the addition of pre biotic foods like Inulin, Maltitol & Polydextrose make the product rich in Nutrition as a not only Low GI product but also a prebiotic foods.

The GI analysis shows the biscuit with more fibers rather than only wheat flour has very low GI of 40.96 when compare to 63.25 for the control.

Hence low GI biscuits can be suitable for all age groups and can be seen as an Healthy snack for the school going kids rather than the Junk food.

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