



DEVELOPMENT AND EVALUATION OF SATTU FLOUR BISCUIT INCORPORATED WITH FLAX SEED AND CHIA SEED

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Abstract: In the past few years, the use of wheat flour has been very common flour which is more harmful for those who suffer from celiac disease. To make a healthier option among all age groups use rice flour instead of wheat flour. The objective of this study is to use traditional flour Sattu, a rich source of protein, calcium, and energy. Jaggery gives good color, flavor, and texture in the biscuit. Various analysis parameters were analyzed to obtain results for biscuits to evaluate physio-chemical, and sensory evaluation. The evaluation of sensory analysis of the final product was taken it shows good overall acceptability and based on the result of sensory parameters sample T3 was more acceptable and prepared biscuits contained protein (13.23%), carbohydrate (63.45%), omega-3 (0.34%), fat (25.67%), dietary fiber (5.28%), and energy (537.75%) ash (3.32%), moisture (2.38%), crude fiber (2.95%). The outcome of this research study provides insights into the feasibility and potential health advantages of incorporating flax seed and chia seeds into Sattu flour biscuits, contributing to the development of healthier snack options.

Keywords- Gluten-free, vegan, sattu, sensory-evaluation.

1. INTRODUCTION

Celiac disease is a prevalent global health concern, impacting approximately 1% of the global population. It manifests as an immune-mediated condition marked by a continual inability to tolerate ingested gluten, damaging the small intestine and villous atrophy⁽¹⁾. The most reliable and secure approach for managing celiac disease is to consistently follow a lifelong gluten-free diet, which entails complete avoidance of gluten⁽²⁾.

Rice flour biscuits, being gluten-free, offer more benefits than wheat flour biscuits. They have lower fat, calories, sodium, and cholesterol while fiber-rich. Additionally, rice flour biscuits are less likely to cause allergic reactions than their wheat counterparts⁽³⁾. Biscuits are widely enjoyed globally for their nutritional content. However, they often contain high amounts of sugar (mostly sucrose) and fat, making them calorie-rich. Excessive sugar intake from such products is linked to health issues like diabetes and obesity. To enhance biscuits, their functional properties can be improved by modifying key ingredients⁽⁴⁾. Choosing jaggery to replace white sugar is a healthier option due to jaggery's mineral, protein, glucose, and fructose content, despite its higher calorie count. Additionally, it contains a moderate amount of calcium, phosphorous, and zinc in comparison⁽⁵⁾. Sattu, a traditional solution to combat heat in India, is a popular 'ready-to-eat' snack nationwide. This cost-effective and convenient food is rich in essential digestive and dietary elements. This food item is rich in dietary fiber and low in sodium, while also offering significant quantities of essential minerals such as calcium, iron, manganese, and magnesium⁽⁶⁾. Flaxseed (*Linum usitatissimum* L.) has been utilized for both nutritional and medicinal purposes in various nations⁽⁷⁾. Flaxseed is an effective protein source suitable for all age groups, meeting quality and quantity requirements. Additionally, flaxseed rich in crude fiber with laxative properties, proves beneficial for diabetic individuals and those managing weight⁽⁸⁾.

2. MATERIALS AND METHODS

2.1 Material

Procurement raw materials to prepare the Sattu flour biscuits, the following materials have been purchased from the local market: Sattu flour, rice flour, flax seed, chia seed, jaggery powder, sunflower oil, vanilla essence, baking soda, baking powder.

2.2 Experimental plan

Table 1. Experimental plan

Serial. no	Parameter	Level	discussion
1	Product	1	sattu flour biscuit
2	Ingredient	9	Sattu flour, rice flour, flax seed, chia seed, jaggery powder, sunflower oil, vanilla essence, baking soda, and baking powder.
3	Samples	4	T0, T1, T2, and T3
4	Analysis	2	Physiochemical analysis, sensory analysis
5	Storage condition	1	Ambient temperature

2.3 Formulation of sattu biscuit

Different formulations were prepared by using different proportions of all the ingredients to obtain sattu biscuit.

Table 1. Different formulations used in the preparation of biscuits (in gm) for the T0, T1 T2, and T3 sample

Ingredient	Experimental product			
	T0	T1	T2	T3
Sattu	50	45	45	40
Rice flour	-	-	10	15
Flax seed powder	10	16	12	9
Chia seed	-	7	5	2.5
Jaggery	27	25	27	30
Oil	21	23	15	10
Baking soda	1	1	1	1
Baking powder	1	1	1	1
Vanilla essence	2	2	2	3

2.4 Procedure of making sattu flour biscuit

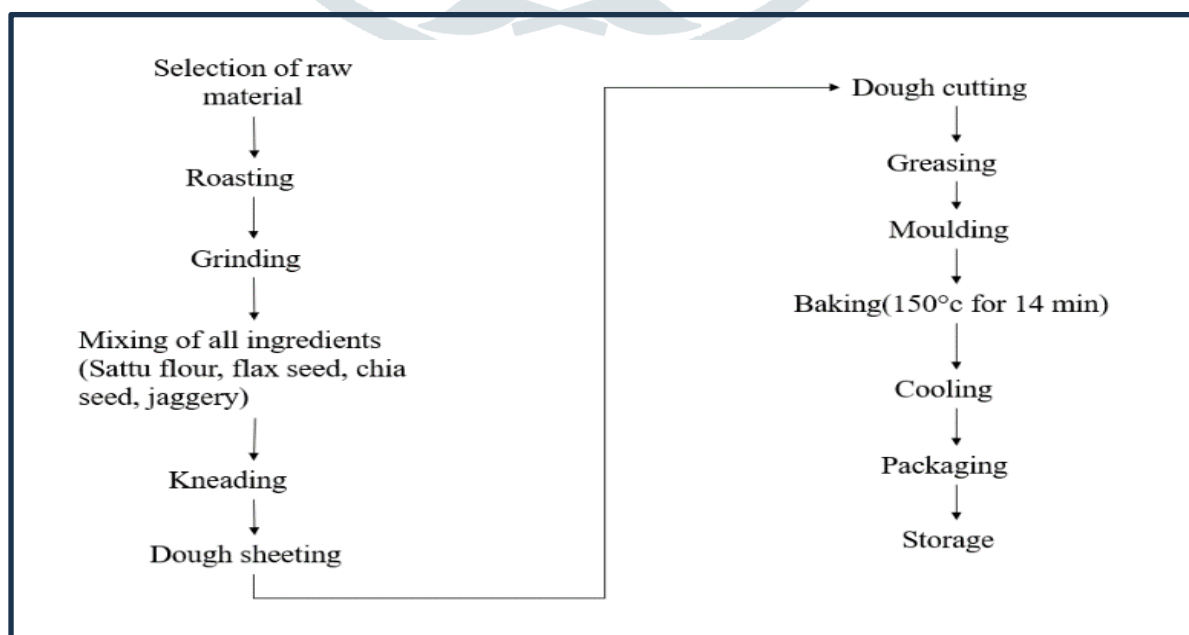


Figure 1. Flow chart for Sattu flour biscuits preparation



Figure 2. The final product (Sattu flour biscuit)

3. RESULT AND DISCUSSION

The nutritional value of biscuits was enhanced by mixing sattu flour, flaxseed, chia seed, jaggery, and sunflower oil. Including flaxseed and chia seeds provided a vegetarian source of omega-3 fatty acids. Different batches, labeled T0, T1, T2, and T3, were prepared with varying ingredient proportions, with T3 emerging as the preferred choice following sensory evaluation. The biscuits were made gluten-free by incorporating rice flour, catering to individuals with gluten sensitivity and those opting for gluten-free options. Furthermore, the use of jaggery powder not only enhanced sweetness but also boosted the biscuits' nutritional profile by eliminating refined sugar. These biscuits contain 13.23% protein, 5.28% dietary fiber, 63.45% carbohydrates, 0.34% omega-3, and 25.67% fat. These adjustments respond to the increasing consumer demand for gluten-free and sugar-free alternatives, enhancing the biscuit marketability.

3.1 Physio-chemical analysis-

The following analysis was conducted as-

The sensory evaluation of Sattu flour biscuit samples was performed by panelists from both students and faculty members of the Parul Institute of Applied Sciences. This evaluation utilized a 9-point hedonic scale to assess various parameters including color, flavor, aroma, texture, mouthfeel, and overall acceptability. The 9-point hedonic scale is a type of consumer test that is widely used to measure the degree of liking for food products.

Table 3. Nutritional composition of Sattu

Parameter	Percentage(%)
pH	7.20
Moisture(g%)	2.32%
ash(g%)	3.32%
Protein	13.23%
Fat(g%)	25.67%
Crude fibre(g%)	2.941%
Dietary fiber	5.28%
Carbohydrate	63.45%
Omega-3	0.34%
Energy	537.75%

flour biscuits.

Table 3 shows the proximate analysis results for the preparation of Sattu flour biscuits, comprising 2.38% moisture, 25.67% fat, 3.32% ash, 13.23% protein, 2.95% crude fiber, 5.28% dietary fiber, 0.34% omega-3, and 63.45% carbohydrates.

3.2 Sensory analysis of sattu flour biscuit

The sensory analysis of the sattu biscuit was conducted, and the resulting data is displayed in Table 3.2

Table 3.2. Sensory scores of prepared Sattu flour biscuits.

Serial No.	Sample Code	Color	Flavor	Aroma	Texture	Mouth feel	Overall Acceptability
1	T0	5	5.5	6	7	6	5.9
2	T1	8	6	7	6	5	6.4
3	T2	7	6	7.5	9	7.5	7.4

4	T3	9	8.5	8	9	8.5	8.6
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The sensory assessment of the sattu flour biscuits yielded favorable outcomes. These biscuits boasted an enjoyable texture, enhanced by the inclusion of rice flour for its binding properties, while the addition of chia seeds contributed to a satisfying mouthfeel. Moreover, the natural sweetness from jaggery made the biscuits taste great without needing any artificial sweeteners. Notably, the T3 sample received the highest sensory rating for overall acceptability, scoring 8.6.

4. CONCLUSION:

In conclusion, the statistical analysis demonstrates that using rice flour and Sattu flour is a practical approach for creating gluten-free biscuits. The comprehensive characterization of the final product indicates favorable percentages of fat (25.67%), dietary fiber (5.28%), protein (13.23%), carbohydrates (63.45%), and omega-3 (0.34%). The study concludes that the resulting gluten-free biscuits maintain their quality when stored in a dry environment. By examining various variations, T3 (40% Sattu flour & 15% rice flour) emerges as the optimal choice, as evidenced by positive outcomes in organoleptic, physio-chemical, and cost analysis. Crucially, the utilization of gluten-free flour maintains the physical and sensory characteristics of the end product without any compromise. The increasing consumer preference for plant-based diets and the rising popularity of vegan food further accentuate the relevance and appeal of these gluten-free biscuits in the market.

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