

# **Formulation and Organoleptic Evaluation of Nutritious Vegan Cake Premix by Using Millet and Sweet Potato**

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## **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Health professionals and customers are putting more pressure on food corporations to produce healthier food. Gluten-free flours (for example, millet, sweet potatoes, soymilk, chia, etc..) are growing more and more popular, which is creating new business prospects for food companies. In light of this, a study was carried out to develop millet-based sponge cakes in order to improve the product's sensory and nutritive attributes. We created five different compositions using sweet potato, chia seeds, and malted finger millet blended in the following ratios: 60:35:5, 40:50:10, 30:60:10, and 60:30:10, respectively. The control sample used 100% Wheat flour. These samples were thereafter subjected to sensory analysis. Standard techniques were used to establish the approximate composition of the several flour blends used to make premix instant cake. According to sensory acceptability, wheat flour is still uncommonly used to make cakes by local consumers, who gave grades of 6 and 7 and left remarks like "I liked it mildly" and "I liked it considerably." The study's

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findings suggest that composite flour is a workable substitute for traditional flour for use in baking. The great nutritional value of these cakes makes them potentially advantageous for developing children, teenagers, pregnant women, and nursing mothers.

**Keywords:** Malted finger millets; sweet potato; chia seeds; organoleptic properties.

## 1. INTRODUCTION

Food supplementation is widespread right now as people become more mindful of their nutritional needs. One option to meet the needs for protein, especially in baked goods, is to supplement with legumes, cereals, and seeds [1]. Vegetarians generally have a lower risk of heart disease, obesity, type 2 diabetes, and several malignancies [1].

One of the most popular bakery items consumed worldwide is cake. Lipid oxidation is a significant issue that cake makers are currently dealing with because it reduces the shelf life of their products [2]. Due to the oxidation of polyunsaturated fatty acids, bakery items like cakes, especially those with a high lipid content, tend to turn rancid after being stored for a long time [3].

Cake is a type of cuisine that is frequently baked and typically sweet. It provides protein, lipids, and carbs for developing muscle. Cake is typically made with refined wheat flour, a binding agent, an egg, oil, and vanaspati, as well as a liquid flavour and a leavening agent like baking powder or yeast. Finger millet has gained popularity recently, and attempts are being made to offer it to consumers in convenient formats [2]. In the current study, malted ragi flour was added to cakes in an effort to increase their nutritional quality in terms of their mineral and fibre contents.

The grass family (Gramineae/Panicaceae) contains a range of small edible grasses called millets, which are also referred to as coarse cereals [4]. Ragi or mandua are common names for the finger millet (*Eleusine coracana* L.). The majority of the global output of finger millet comes from India, which accounts for around 60% of it [5]. It was also referred to as "rajika" or "markataka" [6]. For people who have celiac disease, which is the condition most frequently produced on by consuming grain proteins, millet has been discovered to be a nutritious food option [3]. Protein, iron, calcium, phosphorus, fibre, content are all abundant in it. Ragi has the best quality protein, as well as essential amino acids, vitamin A, and vitamin B [7]. Ragi is a healthy source of nourishment for young children, expectant

mothers, elderly people, and patients [2]. Ragi digests gently and gradually because to its high calcium content, antioxidant properties, and phytochemicals content. Hence, For diabetics, it offers incredibly excellent blood glucose regulation. We feel fuller on fewer calories because to the bulk of the fibres and the slower rate of digestion; this may assist us avoid overindulging [3].

In the past, ragi was processed through fermentation or malting [2]. Malting finger millet has a noticeable impact on decreasing the antinutrients and improving the grain's sensory, nutritional, and digestible qualities. Finger millet has second-to-none malting qualities to those of other millets [2]. Malting has a number of advantages, includes vitamin C development, increased availability of phosphorus, as well as the production of lysine and tryptophan (Dulby and Tsai, 1976). A lot of weaning foods, quick mixes, beverages, and pharmaceutical goods are made from malted and fermented ragi flour [2].

The fourth most popular food in the world is the sweetpotato (*Ipomoea batatas*), a tuberous root with a sweet flavour [8]. It belongs to the Convolvulaceae family, which contains approximately 400 Ipomea species spread over the tropics [9]. Compared to other staple foods like rice, the sweet potatoes appear to be a great food supplement for low-income families [10]. Sweet potatoes are a good source of vitamins C and E, dietary fibre, potassium, and iron which are also rich sources of iron and low in fat and cholesterol. It provides a substantial amount of starch and other essential carbohydrates for humans, as well as serving as a significant source of protein for many cultures throughout the world [11]. It is an excellent source of calcium, niacin, thiamine, riboflavin, Carotene and vitamin C both function as potent antioxidants in the body by removing free radicals. Moreover, sweet potatoes are an excellent supply of folic acid, that is needed for the conversion of homocysteine, a byproduct of the crucial cellular methylation process that creates key intermediate products, into other benign molecules, reducing the risk of a stroke or cardiac arrest [12]. Sweet potato flour is an

essential part of numerous dishes that can enhance customers' dietary and physical well-being [13].

Chia, or *Salvia hispanica* L., is an annual herbaceous plant that is indigenous to southern Mexico and northern Guatemala [14]. The chia seed is high in polyunsaturated fatty acids, particularly omega-3 fatty acids (linolenic acid, 54-67%), and omega-6 fatty acids (linoleic acid, 12-21%), and has a high oil content (30-40%). Chia is used more frequently in the production of functional meals due to its fibre content (18-30%) [14]. Compared to wheat, corn, rice, oats, and barley, it has greater protein. The two protein components that are found in chia seeds, both albumin and globulin, are easily digested and have significant oil and water holding capacities [15]. Agua de chia, popularly known as "chia fresca," is currently one of the few foods that use chia [16]. Moreover, chia seeds are non-toxic to human health, gluten-free, and anti-allergenic [17]. Also, the prevalence of cardiovascular diseases, a high level of cholesterol, diabetes, cancer, and and obese has render chia seeds an indispensable component of the populations fight against these diseases [18]. Yet, egg replacement in dishes is encouraged by customer choice in support of a vegan diet and the dangers regarding consuming eggs, for instance, allergies and excessive cholesterol levels [19]. The rising prevalence of cardiovascular illnesses has been strongly linked to the higher cholesterol content (1.08 g/100 g) of yolks of eggs [19]. Similar to this Lecithin (about 250 mg) found in egg yolk is regarded as a proatherosclerotic component because it is transformed into trimethylamine through intestinal microbes and then moreover oxidised through the liver [19,20]. The aim of this research was to make a healthy, nutrient-rich vegan cake using flour from sweet potatoes, chia seeds, and germinated millet.

## 2. MATERIALS AND METHODS

### 2.1 Materials

The current research had been completed over the course of nine months at the Food Science and Technology Laboratory of Babasaheb Bhimrao Ambedkar University in Lucknow. The current research is an experiment. On organic Gyan websites, finger millets and chia seeds were purchased. wheat flour, sweet potatoes, soymilk powder, brown sugar, cocoa powder, baking soda, and virgin coconut oil were purchased from lulu mall Lucknow.

### 2.2 Prepration of Malted Ragi Flour

The ragi seeds were steeped in water for eight hours after being rinsed five times with water. Extra, Water had been removed, seeds had bound with muslin cloth, and a 5 kg weight was left over the top of the mixture. These seeds were dried in the shade for two days after being germinated at 27°C for 24 hours. Using the electric grinder, flour was made from the malted ragi seeds.

### 2.3 Prepration of the Sweet Potato Flour

The sweet potato tubers has been cleaned, peeled, and cut into sliced by hand before being blanched at 100°C for 15 minutes then dried at 65°C in a dehydrator about 24 hours. Once it had dried, it had been blended, sieved, and put into an airtight container for storage [5] (Fig. 2).

### 2.4 Prepration of Chia Seeds Flour

The chia seeds were rinsed and sieved, sieved, ground, stored in an airtight jar, preserved in the refrigerator until the next use.

**Table 1. Approximate composition of premix powder**

Type of cake	Ingredient									
	Wheat flour (gm)	Malted finger millets flour (gm)	Sweet potato flour (gm)	Chia seeds flour (gm)	Soymilk Powder (gm)	Brown sugar (gm)	Baking powder (gm)	Coeca Powder (gm)	Virgin Coconut Oil (gm)	Water
Control	100	-----	-----	-----	15	70	4	10	20	105
T1	-----	60	35	5	10	50	3	5	10	100
T2	-----	50	40	10	10	60	3	6	10	105
T3	-----	40	50	10	15	80	4	8	10	105
T4	-----	30	60	10	15	70	4	10	20	105
T5	-----	60	30	10	15	70	4	10	20	105

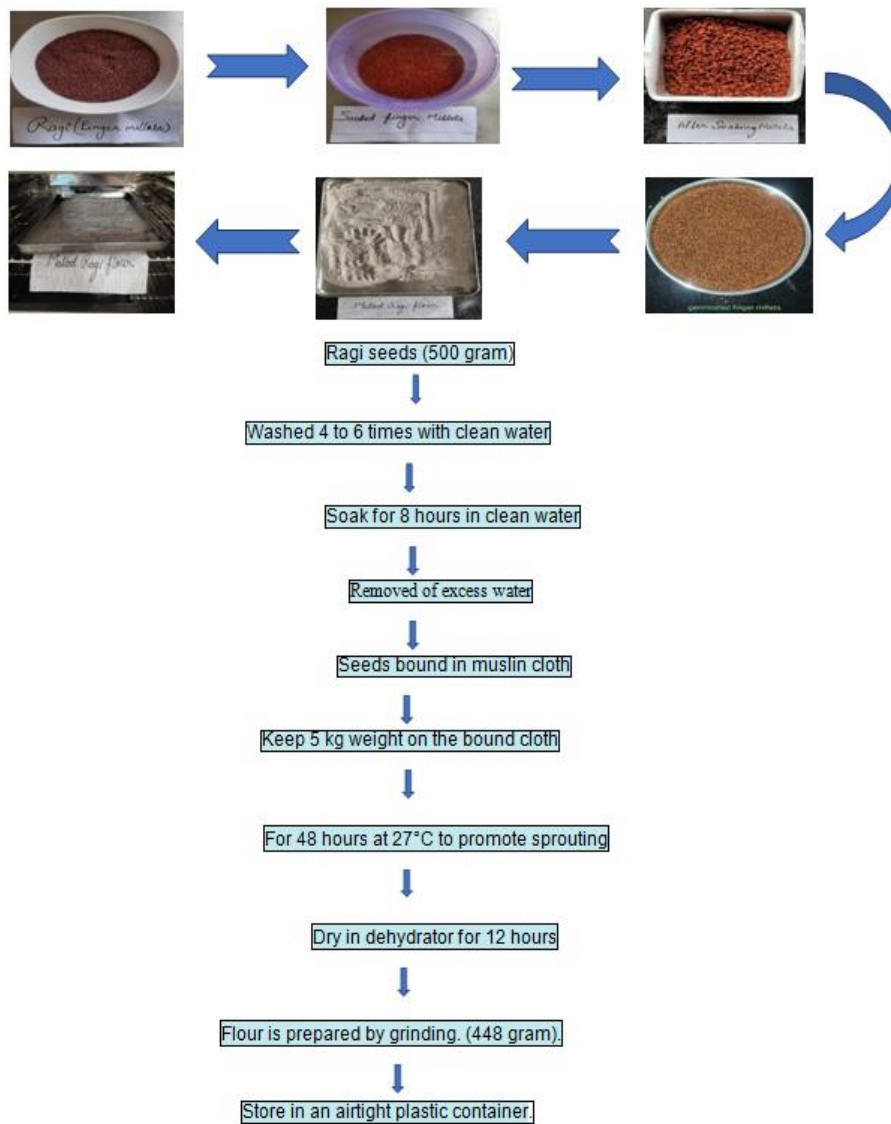
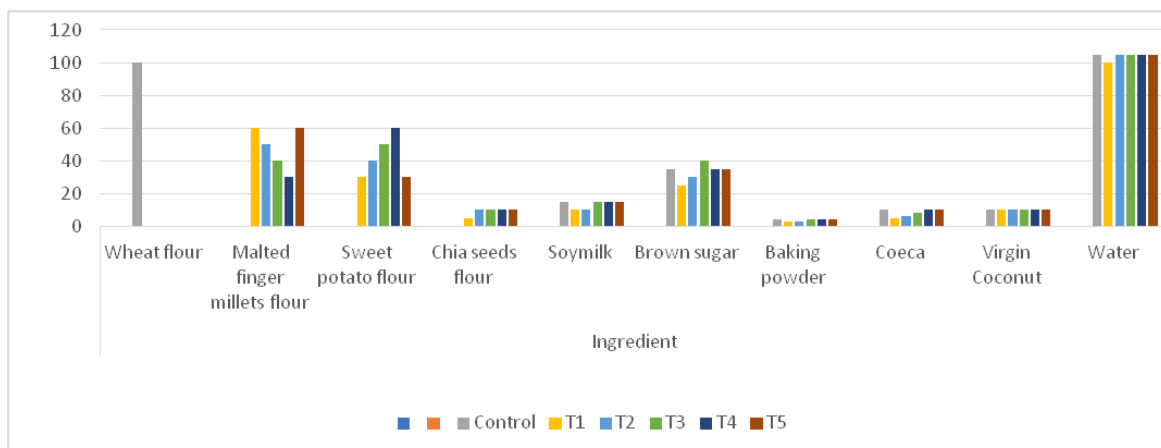


Fig. 1. Flow chart for making malted Ragi flour



Graph 1. Graphical representation of premix powder

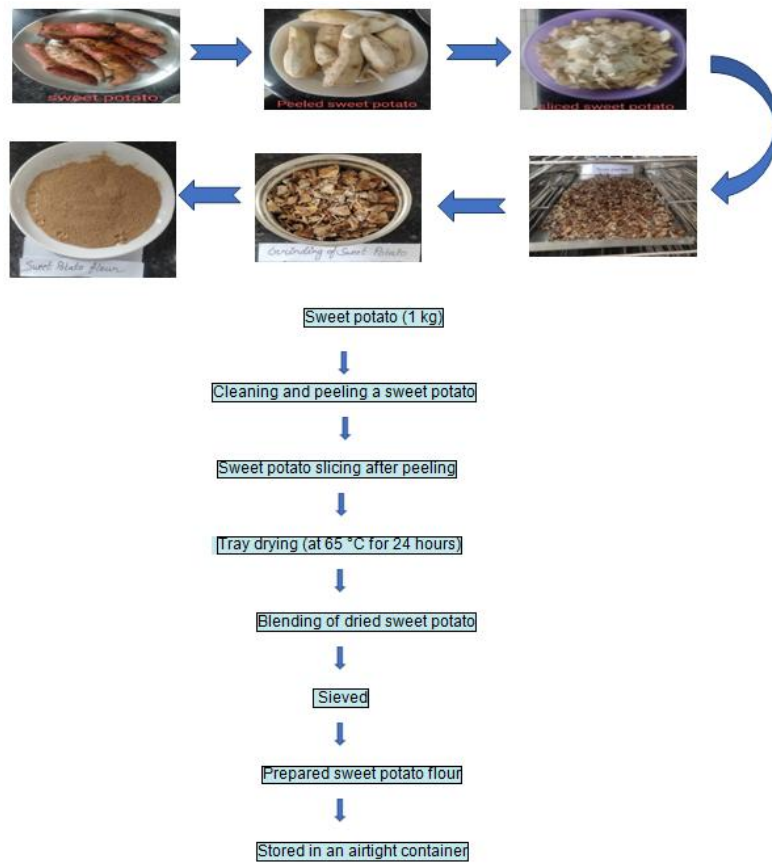


Fig. 2. Flowchart for making sweet potato flour

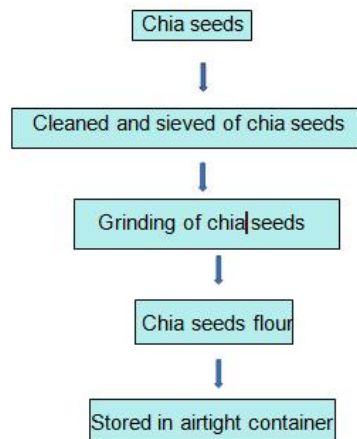


Fig. 3. Flowchart for making of Chia seeds flour

**Table 2. 9-point hedonic scale for sensory evaluation**

Score	Rating scale	Appearance/ Color	Taste/Flavor	Smell/odor	Texture/ consistency
9	Like extremely				
8	Like very much				
7	Like moderately				
6	Like slightly				
5	Neither like or dislike				
4	Dislike slightly				
3	Dislike moderately				
2	Dislike very much				
1	Dislike extremely				

Feedback:  
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### 2.5 Prepration of Composite Flour

At the ratios of 60:35:5, 50:40:10, 40:50:10, 30:60:10, 60:30:10 respectively, finger millets flour, chia seeds flour, and sweet potato flour were used to make five composite flour samples.

### 2.6 Premix Powder Production

Composite flour (flour made from malted finger millets, sweet potatoes, and chia seeds), brown sugar powder, soy milk powder, baking soda, and cocoa powder were combined in different compositions to create a premix mixture that was then stored in an airtight container. Table 1 displays the findings of the approximate composition of premix powder.

### 2.7 Cake Production

Cake was made using the flour samples, a little differently than [1] described. This includes composite flour, soymilk powder, flavor, brown sugar, virgin coconut oil, and soymilk powder. The mixture was baked at 150°C in a preheated

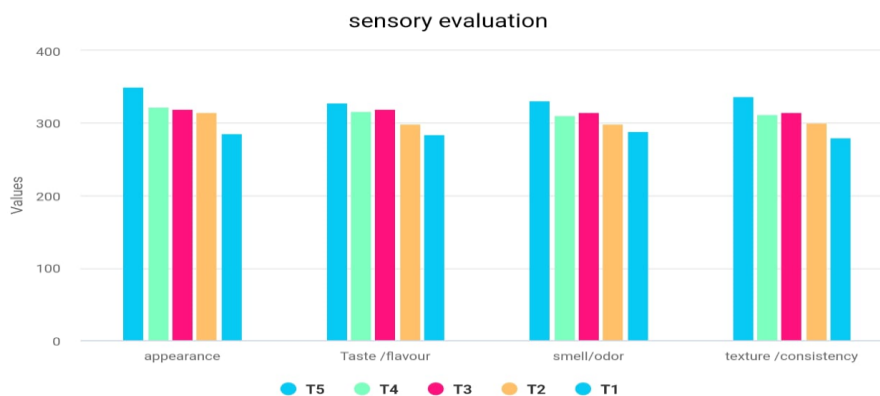
oven for 40 minutes, then chilled and depanned after an additional hour.

### 2.8 Sensory Evaluation

When the cake samples were prepared, the sensory evaluation took place four hours later. forty untrained students from Babasaheb Bhimrao Ambedkar University composed the sensory panel. Cake samples was evaluated on a 9-point hedonic scale for flavor, scent, texture, appearance, and overall acceptance. Since the 9-point hedonic scale demonstrates and explains the level of consumer acceptability and pleasure. The hedonic rating card that is displayed in the Table 2 was handed to them.

## 3. RESULTS AND DISCUSSION

Table 3 displays the mean and standard scores for the sensory evaluation of the control, T5, T4, T3, T2, and T1samples. The sample T5 that contained 60% finger millets, 30% sweet potato flour, and 10% chia seed flour received the highest ratings for appearance, smell, taste, texture, and overall acceptance in general.



**Graph 2. Graphical representation of sensory evaluation**

**Table 3. Mean and standard score of prepared cake**

	T1		T2		T3		T4		T5	
	Mean	Standard deviation	Mean	Standard Deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Appearance /Color	7.15± 0.8336		8.0±0.7845		8.075±0.7970		8.025±0.6975		8.8±0.4051	
Taste/Flavor	7.125±1.0175		7.55±0.8458		8.05±0.7143		7.925±0.6558		8.225±0.6197	
Smell/odor	7.425±0.8738		7.875±0.8825		7.9±0.7089		7.75±0.7425		8.275±0.7506	
Texture/mouth feel	7.1±0.8712		7.45±1.0610		7.875±0.8825		7.8±0.8228		8.425±0.7121	

Sample T1: Cake made with 60% finger millet: 5% chia seeds, 35% sweet potatoes.  
 Sample T2: Cake made with 60% finger millet: 5% chia seeds, 40% sweet potatoes.  
 Sample T3: Cake made with 40% finger millet: 10% chia seeds, 50% sweet potatoes.  
 Sample T4: Cake made with 30% finger millet: 10% chia seeds, 60% sweet potatoes.  
 Sample T5: Cake made with 60% finger millet: 10% chia seeds, 30% sweet potatoes.

**Table 4. Percentage of result**

	T1 (Percentage)	T2 (Percentage)	T3 (Percentage)	T4 (Percentage)	T5 (Percentage)
Appearance/ Color	71.5	78.75	80	80.75	87.75
Taste/ flavour	71.25	74.75	80	79.25	82.25
Smell/ odour	72.25	74.75	79	77.75	82.75
Texture/ mouthfeel	70.25	75	79	78.25	84.25

### 3.1 Discussion

Health professionals and customers are placing greater demand on food corporations for healthier food options. The demand for gluten-free flours (such as millet, tapioca, potato, soy, etc.) is growing steadily in popularity in the typical supermarket, creating new sales opportunities for food firms. To make millet-based cake with the goal of enhancing the products' sensory and nutritional qualities, a study was conducted against this backdrop. However, Table 2 sensory evaluations of the products on a 9-point hedonic scale demonstrate that overall, product scores were higher than 7, indicating that the panel at least somewhat appreciated each sensory attribute.

### 4. CONCLUSION

The 9-point hedonic scale was used by the faculty of BBAU and students of the BBAU university to assess the consumer acceptability of the produced product, which is made using composite flour, soymilk powder, brown sugar, virgin coconut oil, and baking soda. The prepared samples were manufactured to be assessed by a total of 40 consumers, who completed score cards for the samples based on their appearance, aroma/odor, texture, color, taste, and general acceptability. There were only minor changes among the five samples, which were all created using various proportions of all the ingredients. In contrast to the other 4 examples, sample T5 was thought to be more acceptable. The T5 sample had 60 g of finger millet, 30 g of sweet potato flour, and 10 g of chia seeds. Thus, the malted ragi flour-enhanced cake sample will be advantageous to growing youngsters, teenagers, pregnant women, nursing women, and anemic patients.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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