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## Utilization of cassava flour and foxtail millet flour in whole wheat flour for preparation of Indian Snack - halwa

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### Abstract

Composite flour may be defined as a combination of varying proportions of more than one type of non-wheat flours with wheat flour so as to improve the nutritional profile of regular wheat flour. This study was undertaken with the aim to develop a composite flour blend comprising of whole wheat flour, foxtail millet flour and cassava flour to prepare an Indian snack named “halwa”; to evaluate the sensory properties of the developed product; to assess the nutritional composition; and to calculate the cost of developing the product. A total of four treatments with different proportions of the flours were produced, where T<sub>0</sub> served as control and the treatments as T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, which were replicated three times. The sensory evaluation based on “9-point Hedonic Scale” showed that T<sub>3</sub> has the highest acceptability in terms of colour, texture, taste and overall acceptability. Nutritional composition of the product was estimated based on the nutritive values of ingredients per 100g. The results showed that T<sub>3</sub> had higher nutritional value in terms of energy (395.44 kcal); carbohydrate (59.86 g); dietary fibre (4.32 g); and calcium (18.8 mg) as compared to the control T<sub>0</sub>. The incurred expenditure for the production of halwa for each treatment was Rs. 12.81 (T<sub>0</sub>); Rs. 14.29 (T<sub>1</sub>); Rs. 15.04 (T<sub>2</sub>); and Rs. 15.89 (T<sub>3</sub>). Thus, it can be stated that the use of composite flour for the development of the snack had considerable influences on its nutritional profile.

**Keywords:** Foxtail millet, cassava, whole wheat flour, composite flour blend, halwa, sensory evaluation, nutrient composition, cost calculation

### Introduction

The trending surge in healthier diets for a healthier lifestyle has led to a growing interest in enhancing food ingredients for proven health benefits. When integrated into food products, even modest enhancements in the composition of grains, particularly in terms of starch and fiber, hold the capacity to yield substantial health benefits on a population scale, given their status as fundamental dietary elements (Regina *et al.*, 2007) [1]. The use of composite flour, which is a blend of wheat flour with other flours, is a relevant example which help improves the nutritional and sensory qualities of the regular wheat flour. Therefore, crafting composite flour consisting of other flours along with wheat flour for development of food products will help enrich the nutritional aspects of the developed product.

Foxtail millet (*Setaria italica*) is a highly nutritious type of millet owing to its rich composition of vitamins, minerals, sulphur-containing amino acids and phytochemicals. They boast a low glycaemic index which makes them an ideal food for the diabetics. Further, the absence of gluten in foxtail millets makes them suitable for consumption by celiac-affected patients. They also act as antioxidants due to the presence of phenolics which scavenges free radicals in the body. They are also known for their ability as reducing agents, metal chelators and reactive oxygen quenchers. With such abundant nutritional and health promoting components it is suggested that foxtail millet can be potential ingredient in food production (Divakar and Prakash, 2021) [3].

Cassava is a staple crop in many tropical regions. This crop is an abundant source of carbohydrate, primarily composed of starch consisting of both amylose (20%) and amylopectin (70%). Cassava has a high content of dietary fiber, magnesium, sodium, riboflavin, thiamine, nicotinic acid, and citrate. However, it lacks in protein and fat. A

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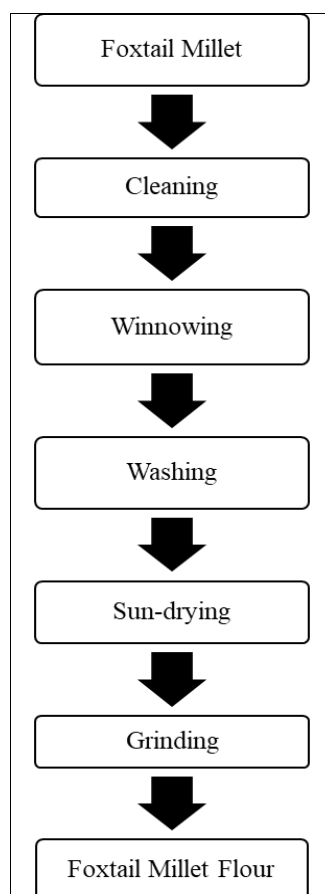
major limitation of cassava is the presence of toxin called cyanogens, which can be alleviated through processing techniques. Unfermented cassava flour, commonly called High quality cassava flour (HQCF), has been successfully used as a partial and complete replacement for wheat flour in bread, cookies and other confectionery (Okoko *et al.*, 2020) [4].

Halwa is a sweet Indian traditional dessert/snack usually prepared with semolina or whole wheat flour (atta) as the main ingredient. The incorporation of foxtail millet and cassava flour in whole wheat flour for the preparation of this snack will elevate its nutritional quality. As halwa is widely consumed by the population, the use of composite flour for its preparation can help address health issues and promote sustainability.

### Materials and Methods

The study was conducted in the Nutrition Research Laboratory, Department of Food Nutrition and Public Health, Ethelind College of Home Science, Sam Higginbottom University of Agriculture Technology and Sciences (SHUATS), Prayagraj. The raw materials such as wheat flour and miscellaneous ingredients were sourced from the local market of Prayagraj while cassava flour and foxtail millet were sourced from Garo Hills, Meghalaya.

### Preparation of Foxtail Millet Flour



**Source:** Poongodi V. T. and Jemima B. M. (2009), Formulation and Characterization of Millet Flour Blend incorporated Composite Flour.

**Fig 1:** Flowchart diagram displaying the steps in preparation of foxtail millet flour.

### Preparation of the Snack – Halwa

The food product was developed by using a composite blend of the three flours – Wheat Flour, Foxtail Millet Flour and Cassava Flour. The standard recipe of the products served as the control (T<sub>0</sub>) and treatments were prepared with varying proportions of composite flour as follows – whole wheat flour, foxtail millet flour and cassava flour in the ratio 80:10:10 (T<sub>1</sub>); 70:15:15 (T<sub>2</sub>); and 60:20:20 (T<sub>3</sub>) respectively. The other ingredients used were ghee, sugar and water.

### Sensory Evaluation

Sensory Evaluation of the food products was conducted by a panel of 5 judges on a score card based on a 9-point Hedonic Rating Scale. Attributes such as colour and appearance, texture, taste and flavor and overall acceptability of the developed food products were evaluated and scored by the judges (B. Srilakshmi, 2018) [11].

### Nutritional Composition

The nutritional composition of the food products were estimated based on the food composition table provided by C. Gopalan *et al.*, (2010) [1] in the booklet Nutritive Value of Indian Foods.

### Formula used

$$\text{Nutrient per 100 g of product} = \frac{\text{Ingredient used in (g)} \times \text{Nutritive value of the ingredient}}{100}$$

### Cost Calculation

The product expenses were computed by evaluating the collective cost of each individual raw ingredient employed in crafting the food items, based on the current market prices.

### Statistical Analysis

Statistical data analysis involved employing techniques such as Analysis of Variance (ANOVA), Critical Difference assessment, and other suitable statistical methods. The acquired data was then interpreted to draw meaningful conclusions. (Gupta *et al.*, 2018) [2].

### Results and Discussion

#### Sensory Analysis of the Product – Halwa

The sensory evaluation of the product revealed that T<sub>3</sub> (Whole Wheat Flour + Foxtail Millet Flour + Cassava Flour in the ratio of 60:20:20) was the most acceptable treatment in terms of color and appearance, body and texture, taste and flavour and overall acceptability as shown in Fig. 1. In terms of colour and appearance, the sensory panel members agreed T<sub>3</sub> had the most desirable colour. The body and texture of T<sub>3</sub> was the most acceptable among the three treatments which may be attributed to the incorporation of cassava flour. Taste and flavour of T<sub>3</sub> had a rich nutty flavour with an earthy undertone owing to addition of foxtail millet flour and therefore was most preferred by the judges. Thus, T<sub>3</sub> had the highest overall acceptability as compared to the rest of the treatments. In summary, the combination of whole wheat flour, foxtail millet flour and cassava flour in ‘halwa’ gives depth and complexity to its texture and flavor imparting a nutty and sweet taste while giving an appealing caramelised colour.

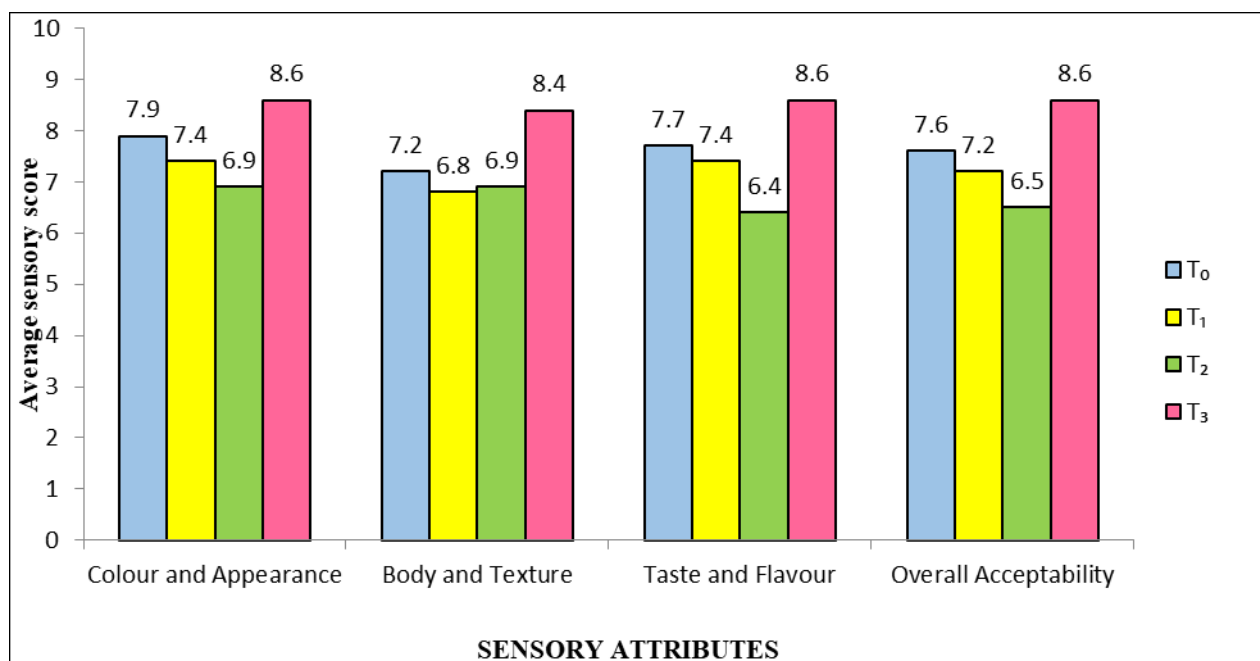


Fig 2: Average Sensory Scores for Various Attributes of the Product "Halwa".

### Nutritional Composition of the Prepared Snack – Halwa

The nutritional profile of the developed product 'halwa' was estimated using the food composition table provided by C. Gopalan *et al.* (2010) [1]. As seen in Table 1, the most accepted treatment T<sub>3</sub> shows a higher nutritional value in terms of energy, carbohydrate, dietary fibre and calcium as compared to the rest of the treatments. The elevated values of carbohydrate and dietary fibre are attributed to the addition of cassava flour, an abundant source of carbohydrate and fibre and also foxtail millet which influences the fibre content. However, the control (T<sub>0</sub>) had the highest nutritional values in terms of protein, fat and iron.

Table 1: The nutritional composition of control and treated samples of 'Halwa' on the basis of ingredients per 100g

Nutrients	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Energy (kcal)	390.4	392.92	394.18	395.44
Protein (g)	5.23	4.67	4.4	4.12
Carbohydrate (g)	58.62	59.24	59.55	59.86
Fat (g)	16	15.9	15.89	15.84
Dietary Fibre (g)	4.28	4.3	4.31	4.32
Calcium (mg)	17.2	18	18.4	18.8
Iron (mg)	1.48	1.34	1.28	1.21

### Cost Calculation

The calculated cost per treatment according to the ingredients utilized per kg were – T<sub>0</sub> (Rs. 12.81), T<sub>1</sub> (Rs. 14.29), T<sub>2</sub> (Rs. 15.04) and T<sub>3</sub> (Rs. 15.89). This indicates that T<sub>3</sub> (Wheat Flour + Foxtail Millet Flour + Cassava Flour in the ratio of 60:20:20) has the highest cost at Rs. 15.89 as compared to the other three samples, with T<sub>0</sub> holding the lowest cost of production at Rs. 12.81.

### Conclusion

Based on the research findings, it can be deduced that integration of a composite flour blend comprising foxtail millet flour and cassava flour into whole wheat flour served to be an effective functional ingredient in the development of the snack – Halwa. The organoleptic evaluation of the product revealed that among the treatments, T<sub>3</sub> with a flour blend ratio of 60:20:20 received the highest preference from the

panellists. The nutrient value parameters namely energy, carbohydrate, dietary fibre and calcium were found to be maximum in T<sub>3</sub> as compared to the rest. The incurred cost was highest in the preparation of T<sub>3</sub> at Rs. 15.89 and the cost increased with increase in ratio of composite flour.

### References

- Gopalan C, Sastri BVR, Balasubramanian SC, Rao BSN, Deosthale YG, Pant KC. Nutritive value of Indian foods. National institute of nutrition, Hyderabad, India: Indian Council of Medicine Research; c2010.
- Gupta SC, Kapoor UK. Fundamentals of applied statistics 4<sup>th</sup> edition, Chand and Son; c2018. p. 51-85.
- Divakar SA, Prakash J. Nutritional and Bioactive Properties of Foxtail Millet Based Composite Flour. Indian Journal of Nutrition. 2021;8(1):223.
- Okoko J, Alonge A, Ngoddy P. High quality-cassava flour (HQCF) composites: Their thermal characteristics in retrospect. IOP Conf. Ser.: Earth Environ. Sci. 2020;445:012043.
- Verma KC, Joshi N, Rana AS, Bhatt D. Quality Parameters and Medicinal Uses of Foxtail Millet (*Setaria italic* L.): A Review. Journal of Pharmacognosy and Phytochemistry. 2020;9(4):1036-1038.
- Marak NR, Malemnganbi CC, Marak CR, Mishra LK. Functional and antioxidant properties of cookies incorporated with foxtail millet and ginger powder. Journal of Food Science and Technology. 2019;56(11):5087-5096.
- Niharika Sachdev, Sangeeta Goomer, Laishram R. Singh. Foxtail millet: A potential crop to meet future demand scenario for alternative sustainable protein. Journal of the Science of Food and Agriculture. 2021;101(3):831-842.
- Regina A, Anthony B, Zhongyi L, Rahman S. Bioengineering Cereal Carbohydrates to Improve Human Health. Cereal Foods World. 2007;52(4):182.
- Patangare SS, Pawar VS, Syed HM, Shinde ST. Study on physical properties and nutritional profile of Foxtail Millet. The Pharma Innovation. 2019;8(3):286-288.
- Sharma N, Keshavan N. Foxtail millet: Properties, processing, health benefits, and uses. Food Reviews

International. 2017;34(4):329-363.

11. Srilakshmi B. Food Science. 8<sup>th</sup> Edition, Delhi: New Age International Limited, Publishers; c2023. p. 70-71.
12. Poongodi T Vijayakumar, Mohankumar JB. Formulation and characterization of Millet flour blend incorporated composite flour. International Journal of Agriculture Sciences. 2014;1(2):46-54.
13. Poongodi T Vijayakumar, Mohankumar JB, Srinivasan T. Quality Evaluation of Noodles from Millet Flour Blend incorporated Composite Flour. Journal of Scientific & Industrial Research. 2010;69:48-54.