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Standardization and quality evaluation of millet based nachos

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Abstract

The present research investigation was designed to develop a nachos based on millet considering the nutritional and health advantages that come from these ingredients. The physicochemical, nutritional, functional and sensory qualities of the selected raw materials such as corn flour, wheat flour, chickpea flour, foxtail millet flour and barnyard millet flour were examined. The proportions of corn flour, chickpea flour, wheat flour, foxtail millet flour and barnyard millet flour were also used to standardize the recipe and the desired product was obtained via taking trials i.e. T0 (40:10:50:00:00), T1 (40:10:40:05:05), T2 (40:10:30:10:10), T3 (40:10:20:15:15), and T4 (40:10:10:20:20). The prepared product evaluated for organoleptic evaluation by 9 point hedonic scale with the panel of semi-trained judges for acceptability. The incorporation of millets with the formulations revealed the significant enhancement in mineral and crude fibre content. The fibre composition of selected sample significantly improved the textural properties with respect to its crispiness. Shelf stability of T3 sample carried out for 120 days in high-density polyethylene standing pouch at room temperature and it was found minimal physicochemical changes by the end of 120 days. The selected (T3) sample has total energy value of 386.71 Kcal/100g. The production cost was economical at Rs. 167.76 per kilogram, highlighting its potential for commercial use.

Keywords: Corn flour, Millet, Nachos, Sensory qualities, Texture

1. Introduction

The tortilla chips known as nachos are prepared with either corn flour or wheat flour. It was originated in Mexico and popular in their cuisine. Nachos made from with frying or baking process. In America, Colombia, and Mexico, it is the most significant food. It varies in different forms like triangular, square etc. Depending on the individual's preferences, nachos can be served with or without sauces and spices. The nachos is popular due to its high content of carbohydrates, protein, and fats, this snack has good sensory and nutritional qualities. (Pratik and Nisha, 2023) ^[16]. In recent years, the rising demand for appetizing snacks like nachos has emphasized the need for mechanized production and standardized processes to meet market requirements as well as nutritional requirement (Farooqui *et al.*, 2023) ^[15].

Millets are a group of highly variable small seeded grasses, widely grown around the world as cereal crops or grains for fodder and human food. Millets have been main staples of the people of semi-arid tropics of Asia and Africa for centuries where other crops do not grow well. Since ancient times, millet has been widely consumed in Asia and India as well (Karuppasamy 2015) ^[9]. They are highly nutritious and climate compliant crops. The major reasons of decrease in consumption are the lack of awareness of nutritional merits, inconveniences in food preparation, lack of processing technologies (IIMR, 2017). Millets are renowned for their balanced macronutrient and micronutrient composition. They are typically rich in carbohydrates, accounting for approximately 60-70% of their dry weight and minerals like calcium, magnesium, phosphorus etc. (Smith & Johnson, 2023) ^[20].

2. Objectives of the Study

- 2.1. Development of millet based nachos
- 2.2. To analyse the sensory quality of the developed Nachos.
- 2.3. Estimation of proximate composition of the control and selected sample of nachos.

3 Materials and Methods

3.1. Procurement of raw materials

The research unfolded its insights in the Department of Food Process Technology at College of Food Technology, VNMKV, Parbhani. Essential ingredients, such as corn, wheat flour, foxtail millet, barnyard millet, baking powder, spices and oil, were sourced from the regional markets of Parbhani.

3.2 Processing treatment on raw materials

Raw material gives different pre-treatments on raw materials such as barnyard millet and foxtail millet gives a soaking treatment as well as corn gives a nixtamalized (alkaline) treatment. The corn gives alkaline treatment for 30 min at 85-90 °C and steeping up to 16 hours then drying at 60 °C and grinding by using a mini flour mill to get powder. The effect of treatment gives different periods such as barnyard millet and foxtail millet gives soaking time was 10 hours and drying at 60 °C and each raw material was further grinding by using a mini flour mill to get powder.

3.3 Standardization of formulation of nachos

The nachos were prepared by adding corn flour, barnyard millet flour, foxtail millet flour, wheat flour, chickpea flour, salt, Spices and water.

Table 1: Formulation of millet-based nachos

Sr. no	Ingredients	Quantity (g)				
		T ₀	T ₁	T ₂	T ₃	T ₄
1.	Corn Flour	40	40	40	40	40
2.	Chickpea Flour	10	10	10	10	10
3.	Wheat Flour	50	40	30	20	10
4.	Barnyard Millet Flour	0	5	10	15	20
5.	Foxtail Millet Flour	0	5	10	15	20
5	Oil (ml)	5	5	5	5	5
6.	Spices	4	4	4	4	4
7.	Baking Powder	1.5	1.5	1.5	1.5	1.5
8.	Salt	1	1	1	1	1

T₀= 40g corn flour, 10g chickpea flour, 50g wheat flour

T₁ = 40g corn flour, 10g chickpea flour, 40g wheat flour, 5g barnyard millet flour, 5g foxtail millet flour

T₂ = 40g corn flour, 10g chickpea flour, 30g wheat flour, 10g barnyard millet flour, 10g foxtail millet flour

T₃ = 40g corn flour, 10g chickpea flour, 20g wheat flour, 15g barnyard millet flour, 15g foxtail millet flour

T₄ = 40g corn flour, 10g chickpea flour, 10g wheat flour, 20g barnyard millet flour, 20g foxtail millet flour

3.4 Preparation of nachos

The nachos were prepared in the laboratory. The basic ingredients used for making nachos are corn flour, chickpea flour, wheat flour, barnyard millet flour and foxtail millet flour blended with 70 ml water, 5ml oil, 1g salt, 1.5 baking powder and 4g spices.

3.5 Sensory evaluation of Nachos

The sensory characteristics like color, appearance, taste, flavor and overall acceptability of prepared millet-based nachos in the control sample prepared with corn flour, wheat flour, chickpea flour. The sensory evaluation was carried out by 10 semi-trained panel members on a 9-point hedonic scale. Judgments were made by rating products on a 9-point hedonic scale with corresponding descriptive terms ranging

from 9 'like extremely' to 1 'dislike extremely' (Nayaka et al. 2015) ^[11].

3.6 Nutritional analysis of millet based nachos

The nutritional analysis involved triplicate assessments using established A.O.A.C. (2000) ^[12] methods. Crude fiber content was evaluated using acid alkali method. Carbohydrate content was computed by deducting the sum of moisture, protein, fat, and ash content from 100 per 100g of the sample. Moisture content was determined via a hot air oven at 98 to 100 °C, protein content using the kjeldahl method, fat was determined by solvent extraction method, ash by using of muffle furnace.

4. Result and Discussion

4.1 Sensory evaluation of prepared nachos

Table 2: Sensory evaluation of prepared nachos

Sample	Organoleptic attributes				
	Color	Flavor	Taste	Texture	Overall acceptability
Control	8.2	8.2	8.5	7.9	8.2
T ₀	8.1	8.1	8.4	8	8.2
T ₂	8.3	8.3	8.3	8.2	8.3
T ₃	8.5	8.6	8.6	8.2	8.4
T ₄	8.3	7.9	7.9	8.1	8.1

When compared to the control (T₀) and other treatment samples, the sample (T₃) had an excellent score of 8.4 for overall acceptance. This sample content 40g corn flour, 10g chickpea flour, 20g wheat flour, 15g barnyard millet flour, 15g foxtail millet flour. Therefore, it was regarded as a standardized ingredient combination and used for additional research. In terms of each aspect of sensory attribute, the nachos sample (T₃) was determined to be much better than the other samples. The study also revealed that due to fibrous nature of foxtail millet and barnyard millet the prepared product was crispy in texture. To determine the proximate composition and energy value of selected T₃ sample.

4.2 Proximate composition of nachos

Table 3: Proximate composition of nachos

Parameters (%)	Control (T ₀)	Selected Sample (T ₃)
Moisture	8.74±0.44	8.62±0.46
Protein	12.03±0.05	10.97±0.04
Fat	7.42±0.16	9.59±0.12
Ash	1.28±0.04	1.36±0.04
Carbohydrate	67.61±0.56	64.13±0.56
Crude fibre	2.93±0.04	5.33±0.07

*Each value is an average of three determinations

The results are presented in above Table 3. The control sample (T₀) and test (T₃) samples moisture content were 8.74±0.44% and 8.62±0.46% respectively. The amount of protein in the control sample (T₀) was 12.03±0.05% and in the (T₃) sample content was 10.97±0.04%. The protein content of the selected sample (T₃) was less than that of the control sample (T₀) due to addition of millet its content less amount of protein than other cereal like wheat. The control sample (T₀) and the T₃ sample showed fat contents of 7.42±0.16% and 9.59±0.12% respectively. The carbohydrate content found in the (T₃) sample was 64.13±0.56% as well as in the control sample (T₀) 67.61±0.56%. Nachos made from millet decreases the amount of protein and carbohydrates

while concurrently increasing the amount of crude fibre, ash and fat. It was found that the (T₃) sample crude fibre content was higher than that of the control sample (T₀), having $5.33 \pm 0.07\%$ and $2.93 \pm 0.04\%$. The control sample (T₀) had an ash content of $1.28 \pm 0.04\%$ and (T₃) sample of $1.36 \pm 0.04\%$. As compared to the control sample, the selected sample was

found to had a higher ash content it relatively to increase amount of mineral due to addition of millet contents good source as well as fibre content. According to the data collected, the sample (T₃) had a high amount of ash, crude fibre and fat and was an excellent source of nutrients.

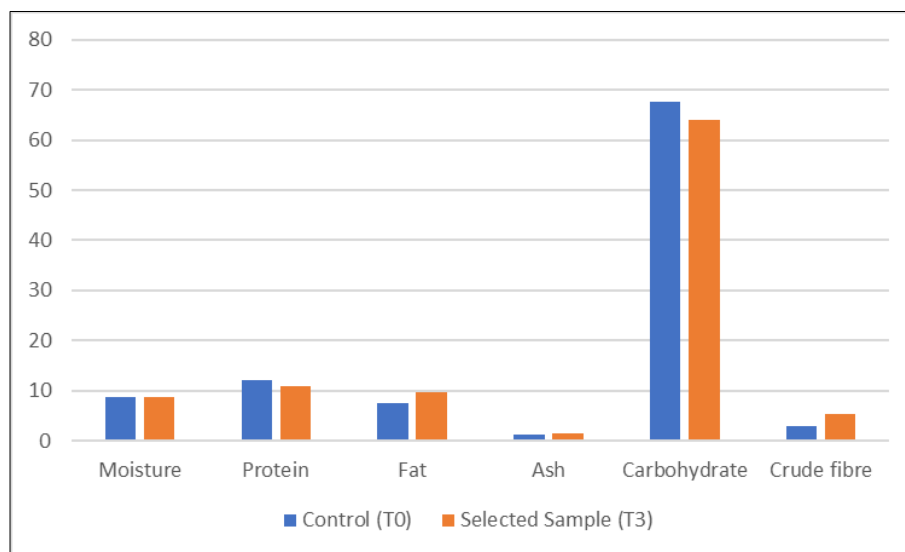


Fig 1: Proximate composition of nachos

4.3 Total energy value of nachos

The information on nachos energy value was compiled in Table 4.17 Theoretically, the total energy value (Kcal) of the sample was determined by multiplying the carbohydrate, protein, and fat by 4, 4, and 9, respectively.

Table 4: Total energy value of nachos

Sample	Carbohydrate	Fat	Protein	Total Energy value (Kcal)
Control (T ₀)	67.61	7.42	12.03	385.34
Selected Sample (T ₃)	64.13	9.59	10.97	386.71

The data obtained from the Table 4.17 revealed that the control sample of nachos contains 385.34 kcal total energy per 100g. The total energy of the selected sample T₃ was found to be good source of energy with 386.71kcal per 100g respectively. The energy content of selected sample was found to be high because of the high concentration of fat in prepared sample.

5. Conclusion

From the present study, it could be concluded that millet based nachos developed from (Corn flour:40%, chickpea flour:10%, wheat flour:20%, barnyard millet flour:15%, foxtail millet flour:15%) had better sensory attributes. It is highly nutritious snack with low carbs, protein and rich in fiber and mineral content. Hence millet based nachos can be successfully used in snacks with baking process such as nachos with high nutritional value.

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