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Research Article

Development, Organoleptic Evaluation and Acceptability of Products Developed by Incorporating Foxtail Millet

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Abstract

Millets have been neglected despite the nutritive value and therapeutic use. Foxtail millet is highly nutritious, non-glutinous and non-acid forming food. They are a rich source of protein, fiber and neutraceutical components. Hence, they are soothing and easy to digest. The aim of the present study was to incorporate foxtail millet into six different recipes namingly, laddu, peanut chutney, panjeri, kheer, cutlet and chakli. Among these chakli was excluded due to its less acceptability. Remaining five recipes laddu, panjeri, kheer, cutlet, peanut chutney were well accepted. The products were evaluated by numerical scoring by 38 semi-trained panelists to asses overall acceptability. While considering these products, the highest score for overall acceptability was 84.2 for variation 1 in case of laddu, then 83.4 for variation 1 in case of kheer, 83.4 for variation 2 in case of panjeri and 82.6 for variation 1 in case of peanut chutney. The most acceptable products, namely laddu, kheer, peanut chutney, panjeri were subjected to hedonic rating test with 51 semi-trained panelists. The result showed that in case of kheer, variation 2 was more acceptable with the score of (8.10 ± 0.92) followed by (7.96 ± 0.85) for variation 1. In case of laddu, variation 2 was more acceptable with the score of (8.75 ± 0.52) followed by (8.33 ± 0.65) for variation 1. In case of peanut chutney, variation 1 was more acceptable with the score of (8.10 ± 0.67) followed by (7.94 ± 0.95) for variation 2. In case of panjeri, variation 2 was more acceptable with the score of (8.37 ± 0.85) followed by (8.16 ± 0.83) for variation 1. Data was analyzed using ANOVA, which shows a significant difference between variation 1 and variation 2 of laddu and kheer at 1% and 5% level of significance and no significant difference was observed between variation 1 and variation 2 of peanut chutney and panjeri at 1% and 5% level of significance. Hence, from the present study it can be concluded that foxtail millet can easily be incorporated into various recipes without affecting the sensory and nutritional qualities.

Keywords: Foxtail millet; Laddu; Panjeri; Kheer; Peanut chutney; Cutlet

1. Introduction

Triggered by increasing industrialization, urbanization and the phenomenon of "Working women", recent years have witnessed a spurt in the growth of the convenience foods market and breath-taking changes have taken place both in terms of quality and quantity (variety) of convenience products available, and the packaging as well as the processing technologies involved [1-2]. Among the minor millets, Foxtail millet has been tried by several workers in the development of various foods, which include bread [3], cakes [4], traditional foods [5-6], weaning foods [7-8], popped, extruded, roller-dried and flaked products [9], noodles [10]. The foxtail millet rice can be used instead of rice in the preparation of all the traditional products like bisibele bath, chakkali, pongal, dosa, idli, and laddus. Thus, besides its traditional use in making *chapatti* and porridge, millet can be exploited for the development of low GI therapeutic food products like biscuits. The nutritional composition of Foxtail millet per 100 gm is fat (4.3 gm), minerals (3 gm), protein (12.3 gm), calcium (31 mg %), carbohydrate (60.9 gm), phosphorous (290 mg%) and dietary fibre (14 gm). The amino acid profile is balanced and the dietary fiber content is very high compared to other cereals. Further studies are needed to determine long term effects of consumption of foxtail millet biscuits on blood lipid profile and glycosylated haemoglobin of diabetics and cardiovascular patients. Even though the nutritional qualities of millet have been well recorded [11], its utilization for food is confined to the traditional consumers in tribal populations, mainly due to non-availability of consumer-friendly, ready-to-use or ready-to-eat products, as are found for rice and wheat [12]. In recent times, there has been a renewed interest in millets. This study was conducted to incorporate foxtail millet in commonly consumed food recipes.

2. Materials and Methods

Foxtail millets were procured from a supermarket named BALAJI at Basheer bagh, Hyderabad. The raw materials required for the preparation of the products were procured from local markets of abids, Hyderabad.

2.1 Standardization of the recipe

Standardization is the process where a recipe is tested number of times and found a satisfactory quantity and yield. It is a gradual trial process. The standardization procedure was carried out by repeated trials till an acceptable recipe for the preparation of the product was obtained. The amounts were finalized by assessing the appearance, texture and taste of the variations. The finalized products were laddu, panjeri, kheer, cutlet, peanut chutney [5] (Figures 1-5 and Tables 1-5). Amounts of all the ingredients in the formulation of different products,

Basic		**Variation I**		**Variation II**	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Milk	200 ml	Milk	200 ml	Milk	200 ml
Rice	30 g	Rice	20 g	Rice	10 g
-	-	Foxtail Millet	10 g	Foxtail Millet	20 g
Sugar	100 g	Sugar	100 g	Sugar	100 g
Resin	10 g	Resin	10 g	Resin	10 g

Cashew	10 g	Cashew	10 g	Cashew	10 g
Ghee	10 g	Ghee	10 g	Ghee	10 g

Table 1: Ingredient and amount used in the development of Kheer.

Basic		**Variation I**		**Variation II**	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Peanuts	30 g	Peanuts	20 g	Peanuts	10 g
-	-	Foxtail Millet	10 g	Foxtail Millet	20 g
Cumin seeds	10 g	Cumin seeds	10 g	Cumin seeds	10 g
Curry Leaves	10 g	Curry Leaves	10 g	Curry Leaves	10 g
Oil	5-10 ml	Oil	5-10 ml	Oil	5-10 ml

Table 2: Ingredient and amount used in the development of Peanut Chutney.

Basic		**Variation I**		**Variation II**	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Potatoes	200 g	Potatoes	150 g	Potatoes	100 g
Onion	50 g	Onion	50 g	Onion	50 g
-	-	Foxtail Millet	50 g	Foxtail Millet	100 g
Coriander	10 g	Coriander	10 g	Coriander	10 g
Green Chilly	10 g	Green Chilly	10 g	Green Chilly	10 g
Oil	20 ml	Oil	20 ml	Oil	20 ml

Table 3: Ingredient and amount used in the development of Cutlet.

Basic		**Variation I**		**Variation II**	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Wheat Flour	100 g	Wheat Flour	100 g	Wheat Flour	100 g
Besan	100 g	Besan	50 g	Besan	25g
Sugar	100 g	Sugar	100 g	Sugar	100 g
-	-	Foxtail Millet	150 g	Foxtail Millet	175 g
Almonds	50 g	Almonds	50 g	Almonds	50 g
Ghee	50 g	Ghee	50 g	Ghee	50 g
Honey	20g	Honey	20 g	Honey	20 g

Table 4: Ingredient and amount used in the development of laddu.

Basic		**Variation I**		**Variation II**	
Ingredient	Quantity	Ingredient	Quantity	Ingredient	Quantity
Powdered Almond	50 g	Powdered Almond	50 g	Powdered Almond	50 g
Powdered Cashew	50 g	Powdered Cashew	50 g	Powdered Cashew	50 g
-	-	Foxtail Millet	50 g	Foxtail Millet	75 g
Powdered Pista	50 g	Powdered Pista	50 g	Powdered Pista	50 g
Powdered Walnut	50 g	Powdered Walnut	50 g	Powdered Walnut	50 g
Sugar	100 g	Sugar	100 g	Sugar	100 g
Ghee	100 g	Ghee	100 g	Ghee	100 g
Powdered Makhana	50 g	Powdered Makhana	50 g	Powdered Makhana	50 g

Table 5: Ingredient and amount used in the development of Panjeri.

2.2 Method of preparation

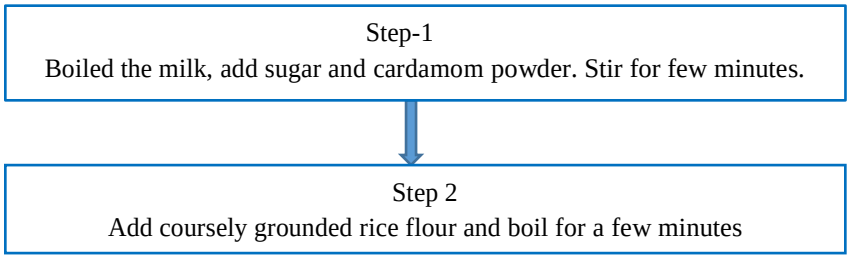

Figure 1: Method of preparation of Kheer (basic).

2.2.1 Variations: To the above recipe, soaked, roasted and coarsely grounded foxtail millet was added along with grounded rice flour in variation 1 and 2.

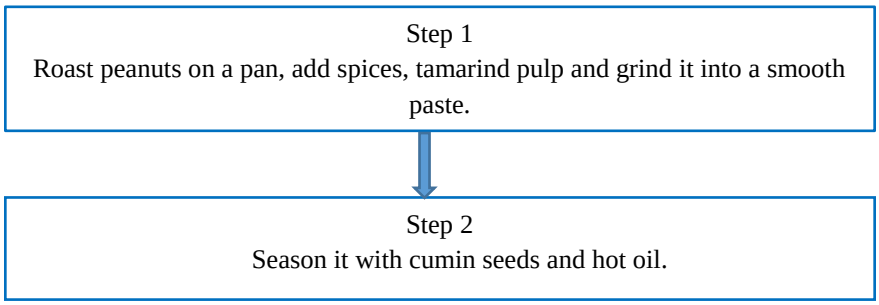

Figure 2: Method of preparation of Peanut Chutney (basic).

2.2.2 Variation: To the above recipe, soaked, roasted and finely grounded foxtail millet was added along with grounded peanuts in variation 1 and 2.

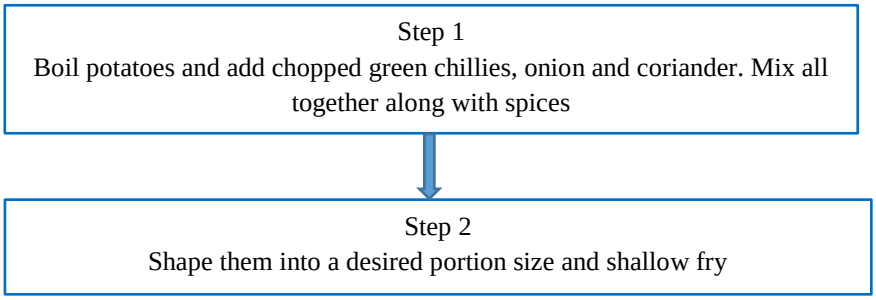

Figure 3: Method of preparation of Cutlet (basic).

2.2.3 Variation: To the above recipe, pressure-cooked and mashed foxtail millet was added along with potatoes in variation 1 and 2.

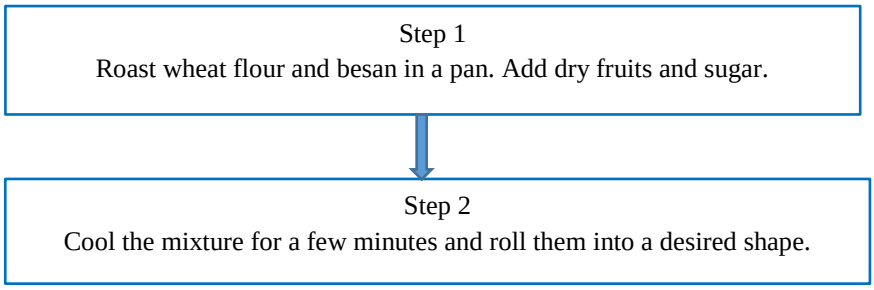

Figure 4: Method of preparation of Laddu.

2.2.4 Variation: To the above recipe, finely grounded foxtail millet was added along with wheat flour and besan of variation 1 and 2.

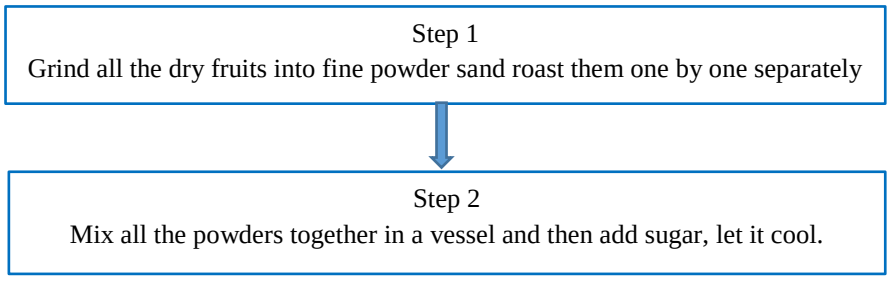

Figure 5: Method of preparation of Panjeri (basic).

2.2.5 Variation: To the above recipe, finely grounded and roasted foxtail millet was added along with other dry fruit powders in variation 1 and 2.

2.3 Sensory evaluation of the developed products

The sensory evaluation of the five developed samples (laddu, kheer, panjeri, cutlet, peanut chutney) was carried out by 38 semi-trained panelists for numerical scoring and 51 semi-trained panelists made hedonic evaluation of the samples and were asked to assess the laddu, kheer, panjeri, peanut chutney for overall acceptability based on the appearance, color, taste, flavor and texture.

3. Results and Discussion

It was found that the mean score of kheer for color of variation 2 (8.27 ± 0.85) was greater than variation 1(8.10 ± 0.03). The flavor of variation 2 (8.02 ± 0.95) was greater than variation 1 (7.82 ± 0.95). The texture of variation 2 (8.06 ± 0.88) was greater than variation 1 (8.20 ± 1.02). The taste of variation 2 (8.02 ± 0.95) was greater than variation 1 (7.86 ± 0.96). The overall acceptability of variation 2 (8.10 ± 0.92) was greater than variation 1 (7.96 ± 0.85). The data was analyzed using analysis of variance ANOVA test and the calculated value is (11.60) which is more than the table value. Hence, there was significant difference observed at 1% and 5% level of significance. The mean score for peanut chutney given by the panelists for color for variation 1 (8.14 ± 0.72) is greater than variation 2 (8.06 ± 0.92). The flavor of variation 1 (7.96 ± 0.75) is greater than variation 2 (7.92 ± 0.91). The texture where variation 1 (8.04 ± 0.80) is greater than variation 2 (7.92 ± 1.06). The taste where variation 1 (8.06 ± 0.79) is greater than variation 2 (7.82 ± 0.93). The overall acceptability for variation 1 (8.10 ± 0.76) is greater than variation 2 (7.94 ± 0.95). The data was analyzed using analysis of variance ANOVA test and the calculated value is (0.014) which is less than the table value. Hence, there was no significant difference observed at 1% and 5% level of significance.

The mean score of laddu given by the panelists for color where variation 2 (8.63 ± 0.63) is greater than variation 1 (8.41 ± 0.64). The flavor of variation 2 (8.63 ± 0.60) was greater than variation 1 (8.27 ± 0.78). The texture of variation 2 (8.59 ± 0.73) was greater than variation 1 (8.33 ± 0.71). The taste of variation 2 (8.65 ± 0.63) was greater than variation 1 (8.31 ± 0.79). The overall acceptability of variation 2 (8.75 ± 0.52) was greater than variation 1 (8.33 ± 0.65). The data was analyzed using analysis of variance ANOVA test and the calculated value is (10.9) which is more than the table value. Hence, there was significant difference observed at 1% and 5% level of significance. The mean score of panjeri given by the panelists for color of variation 2 (8.47 ± 0.83) was greater than variation 1 (8.33 ± 0.79). The flavor of variation 2 (8.22 ± 0.90) was greater than variation 1 (8.04 ± 1.00). The texture of variation 2 (8.35 ± 0.89) was greater than variation 1 (8.20 ± 0.87). The taste of variation 2 (8.33 ± 0.86) was greater than variation 1 (8.08 ± 1.00). The overall acceptability of variation 2 (8.37 ± 0.85) was greater than variation 1 (8.16 ± 0.83). The data was analyzed using analysis of variance ANOVA test and the calculated value is (0.03) which is less than the table value. Hence, there was no significant difference observed at 1% and 5% level of significance.

4. Conclusion

It was concluded that all the products that were developed were calculated for energy, protein, fat, carbohydrate, iron and calcium. Consumption of these nutrient dense products will not only improve the nutritional status of the

population, but also sustain the production of minor millets, which are on the extinct, ultimately leading to a more holistic approach in sustaining precious agro bio-diversity. It's promising nutritional facts gives warranty for further studies to increase the dietary use of these food products. Hence, a bright future is envisaged for use of Foxtail millet in convenience foods, particularly traditional convenience mixes to meet the challenges of the modern dynamic food industry.

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