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Sensory, physical and nutritional quality evaluation of value added fermented *Dhokla* from finger millet (*Eleusine coracana*)

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Abstract

Value added finger millet *dhokla* was developed by preparing five variations of *dhokla* with varying levels of incorporation of finger millet at 0, 10, 15, 20 and 25 percent in the standardized *basic dhokla*. For selecting the acceptable level of incorporation of finger millet among all the variations, they were evaluated for sensory, physical and nutrient parameters. Incorporation of 25 percent finger millet in *dhokla* was significantly accepted in the sensory parameters, colour (4.0), taste (4.6) and overall acceptability (4.3). Observations of physical quality evaluation showed that incorporation of 25 percent finger millet in *dhokla* has well in all the physical quality parameters. Fifth variation of finger millet *dhokla* of 25 percent incorporation of finger millet was rich in fibre (1.67 g), calcium (160 mg) and manganese (2.04 mg) content and these were increased significantly than basic *dhokla*.

Keywords: Finger millet, value addition, *Dhokla*, Bengal gram dhal, incorporation, sensory evaluation, physical quality, nutritional composition

Introduction

Fermented foods of cereals and pulses combination constitute important part of the diet in India. *Dhokla* is one of the popular fermented foods in India. *Dhokla*, a lactic acid fermented product, originated in Gujrat, India which is mainly consumed as breakfast or snack food having tangy and slightly sweet in taste (Joshi *et al.*, 1989; Roy *et al.*, 2009) [5, 7]. The demand and consumption of snack foods is increasing day by day among people, especially teen agers and children, hence it is important to develop innovative nutritious food products for providing quality diet and health benefits to society. In the present study, an attempt was made to develop value added finger millet *dhokla* of improved sensory, physical and nutritional quality.

Finger Millet (*Eleusine coracana*) also known as Ragi is important millet grown extensively in various regions of India and Africa. Finger millet is considered one of the most nutritious cereals. Finger millet contains about 5-8% protein, 1-2% ether extractives, 65-75% carbohydrates, 15-20% dietary fiber and 2.5-3.5% minerals. Finger millet has low fat content (1.3%) and contains mainly unsaturated fat.

Finger millet is known for several health benefits and some of its health benefits are attributed to its polyphenol and dietary fibre contents. Finger millet is rich in calcium (344mg/100g) and iron (3.9mg/100g). The calcium content is higher than all cereals and iodine content is said to be highest among all the food grains. It has best quality protein along with the presence of essential amino acids, vitamin A, vitamin B and phosphorus (Gopalan *et al.*, 2007) [4].

It contains high soluble fibres and low fat. It is rich source of several phytochemicals, polyphenols are the most important phytochemical of finger millet because of their nutraceutical potentials such as antioxidant activity, anti diarrhea, antiulcer and anti cardiovascular properties (Sripriya *et al.*, 1996) [8]. As finger millet is rich in calcium and iron, it helps to overcome the calcium deficiencies such as bone and teeth disorder and iron deficiency anemia. Finger millet is non acid forming, and hence easy to digest. High dietary fiber and phenolic content makes finger millet very beneficial for diabetic patients. Apart from this it also has low glycemic index (GI) that makes it an ideal snack to prevent late night food thirst and help to maintain blood sugar at a constant ratio (Chandra *et al.*, 2016) [3]. Being non-glutinous, finger millet is safe for people suffering from gluten allergy and celiac disease.

In view of the above health benefits, nutritional content and considering therapeutic facts of finger millet a super food were selected and utilized for preparation of value added fermented finger millet *dhokla*.

Materials and Methods

1. Selection and procurement of ingredients

All the necessary ingredients required for the development of *dhokla* viz. Finger millet, bengal gram dhal, rice, salt, sugar, curd, oil, baking soda, coconut, turmeric, mustard seeds, cumin seeds, coriander and curry leaves were procured from the local market of Parbhani.

2. Cleaning and storing of ingredients

The above food stuffs used for preparation and development of finger millet *dhokla* were cleaned to remove the stones, dust, woods and any other foreign materials from the grains. The cleaned ingredients were stored for further use.

3. Standardization of basic *dhokla*

The basic *dhokla* was standardized using raw materials used for preparation of *dhokla*. Four variations were tried by changing the proportion of bengal gram dhal and rice which are used commonly for preparation of *dhokla*. The sensory quality parameters of prepared *dhokla* were evaluated by 15 semi trained panel members for its acceptability. The highly accepted standardized *dhokla* was selected and served as basic.

4. Procedure for preparation of finger millet *dhokla*

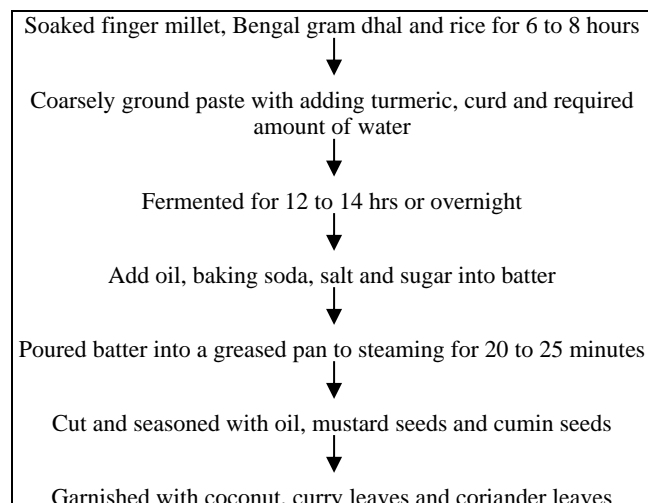


Fig 1: Procedure for preparation of finger millet *dhokla*

5. Development and formulation of value added finger millet *dhokla*

For development of value added *dhokla*, finger millet was utilized with different proportion by changing proportion of Bengal gram dhal. The five variations of finger millet *dhokla* were prepared with incorporation 0, 10, 15, 20 and 25 percent finger millet in the standardized basic *dhokla* to increase micronutrient content of *dhokla*.

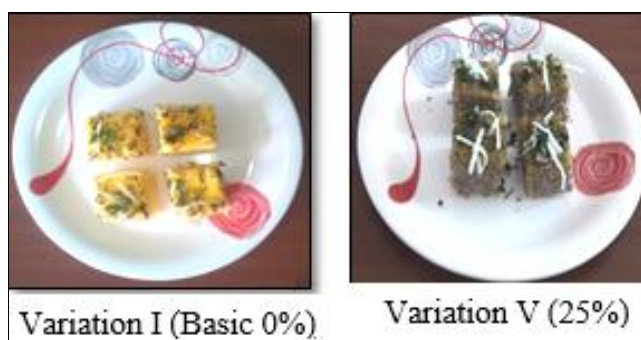
Table 1: Ingredient composition of finger millet *dhokla* (g)

Ingredients (g)	Variation I (0%)	Variation II (10%)	Variation III (15%)	Variation IV (20%)	Variation V (25%)
Bengal gram dhal	50	40	35	30	25
Finger millet	0	10	15	20	25
Rice	20	20	20	20	20
Sugar	5	5	5	5	5
Salt	3	3	3	3	3
Curd	8	8	8	8	8
Turmeric	0.5	0.5	0.5	0.5	0.5
Baking soda	0.2	0.2	0.2	0.2	0.2
Mustard seeds	1	1	1	1	1
Cumin seeds	0.5	0.5	0.5	0.5	0.5
Coconut	3	3	3	3	3
Oil	5	5	5	5	5
Curry leaves	2	2	2	2	2
Coriander leaves	2	2	2	2	2

6. Sensory evaluation of value added *dhokla*

The prepared value added finger millet *dhokla* with different levels of incorporation were evaluated by 15 selected panel members for its acceptability. The judges were score the prepared value added *dhokla* by using five point ranking scale

in which point 5 represent excellent, 4 represent very good, 3 represent good, 2 represent fair and 1 represent poor (Amerine *et al.*, 1965) [2]. The highly accepted finger millet *dhokla* variation and standardized basic *dhokla* were analyzed for nutritional and physical quality.



7. Physical quality assessment

The most accepted variation finger millet *dhokla* (V_5) i.e. 25% incorporation of FM and basic *dhokla* (V_0) were evaluated for the physical quality parameters such weight, height, diameter, preparation time, porosity, volume of *dhokla* and bulk density.

8. Nutritional evaluation

The most accepted variation of finger millet *dhokla* and standardized basic *dhokla* were analyzed for proximate composition and mineral content. The nutrient analysis consisted of moisture, fat, protein and total minerals. Minerals (calcium, iron, copper, zinc & manganese) and crude fibre was estimated by standard AOAC procedures (1984) [1]. Calcium content was estimated by EDTA method. Iron, copper, zinc and manganese were estimated by atomic absorption spectrophotometer and carbohydrate content by difference method.

9. Statistical analysis

The data obtained from sensory evaluation and nutrient content of value added finger millet *dhokla* and standardized basic *dhokla* were consolidated, tabulated and analyzed statistically. Analysis of variance (ANOVA) was used to

compare sensory scores to select the most accepted variation of the product. Student's 't' test was used to compare the differences in nutritional composition of basic *dhokla* and developed value added finger millet *dhokla*. The statistical analysis was carried out by following the procedures prescribed by Panse and Sukhatme (1985) [6].

Results and Discussion

Sensory evaluation of finger millet *dhokla*

Five variations of value added finger millet *dhokla* were prepared with selected levels of incorporation of finger millet at 0, 10, 15, 20 and 25 percent. *Dhokla* prepared without incorporation of finger millet was served as basic *dhokla*. For choosing the best variation amongst five variations of finger millet *dhokla* were evaluated for sensorial attributes against basic *dhokla* and the results are presented in Table 2. The sensory scores for different variations of finger millet *dhokla* shows that variation V scored highest than other variation prepared with incorporation of finger millet. Variation V with incorporation of finger millet at 25 percent in standardized basic *dhokla* was excellent in all the sensory parameters, colour (4.0), texture (4.7), taste (4.6), flavour (4.8) and overall acceptability (4.3).

Table 2: Sensory evaluation scores of Finger millet *dhokla*

Variations	Level of incorporation of finger millet (%)	Mean sensory score				
		Colour	Texture	Taste	Flavour	Overall acceptability
I (Basic)	0	4.6	4.8	4.8	4.7	4.8
II	10	4.3	4.4	4.3	4.3	4.1
III	15	4.2	4.5	4.2	4.5	4.2
IV	20	4.0	4.6	4.4	4.6	4.0
V	25	4.0	4.7	4.6	4.8	4.3
	CD	0.370	0.352	0.385	0.346	0.358
	S.E±	0.131	0.124	0.136	0.122	0.126
	F-value	4.070**	1.635 ^{NS}	2.925*	2.284 ^{NS}	5.361**

** Significant at 1 percent

* Significant at 5 percent

NS- Non significant

Physical quality parameters of Finger millet *dhokla*

The observations of physical quality parameters of finger millet *dhokla* and basic *dhokla* depicts in Table 3. There was a slight increase in the weight of finger millet *dhokla* batter (146 g) than basic *dhokla* batter (140 g) but when weight taken after cooking it was observed that weight of basic *dhokla* (138 g) was more compare to finger millet *dhokla* (126 g). Height of batter before fermentation was same (2.0 cm) for both the *dhokla* i.e. accepted variation of finger millet *dhokla* and basic *dhokla* whereas; height of *dhokla* batter after fermentation was increased in finger millet *dhokla* (2.4 cm)

than basic *dhokla* (2.2 cm). Height of cooked finger millet *dhokla* was increased (2.8 cm) compared to basic *dhokla* (2.6 cm). The time require for cooking was same (20 min.) for basic and accepted variation of finger millet *dhokla*. As same pot used for cooking *dhokla*, diameter of both the *dhokla* were same (8.5 cm). Bulk density and porosity of accepted finger millet *dhokla* was slightly increased from 1.21 g/ml to 1.23 g/ml and from 63 cm² to 65 cm² than basic *dhokla*. Incorporation of 25 percent finger millet in *dhokla* has good in all the physical quality parameters.

Table 3: Physical quality parameters of Finger millet *dhokla*

Sr. no.	Physical Parameters	Observations	
		Basic <i>dhokla</i>	Finger millet <i>dhokla</i>
1	Weight of batter (g)	140	146
2	Height of batter before fermentation (cm)	2.0	2.0
3	Height of batter after fermentation (cm)	2.2	2.4
4	Cooking time (min)	20	20
5	Height of cooked <i>dhokla</i> (cm)	2.6	2.8
6	Weight of <i>dhokla</i> (g)	138	126
7	Diameter of <i>dhokla</i> (cm)	8.5	8.5
8	Bulk density (g/ml)	1.21	1.25
9	Porosity (cm ²)	63	64

Nutrient analysis of Finger millet *dhokla*

The data pertaining to nutrient content of 25 percent incorporation of finger millet *dhokla* and without incorporation of finger millet i.e. basic *dhokla* is presented in Table 4. The moisture content was 43.80±0.56 and 44.20±0.84 percent in basic and accepted finger millet *dhokla* respectively. The protein content of basic *dhokla* and value added finger millet *dhokla* was 14.43±0.61 and 14.88±1.22 percent. The total mineral content of basic *dhokla* and value added finger millet *dhokla* was 2.11±0.07 and 2.23±0.02 percent. The iron content of basic *dhokla* and value added finger millet *dhokla* was 3.99±0.03 and 4.56±0.23 percent. The fibre, calcium and manganese content of basic *dhokla*

were 1.18±0.02 g, 85.03±2.501 mg, 0.93±0.005mg per 100 g respectively which was increased in value added finger millet *dhokla* to 1.67±0.05 g, 160.68±1.17 mg and 2.04±0.07 mg per 100 g, these were significantly increased with incorporation of finger millet. The fat, carbohydrate, energy, copper and zinc content of basic *dhokla* and value added finger millet *dhokla* were 9.11±0.01 and 8.30±0.04 percent, 29.38±0.09 and 28.74±2.00, 257.25±2.192 and 249.25±3.46, 0.64±0.98 and 0.49±0.007, 1.29±0.001 and 1.20±0.001 percent, respectively. Fat, carbohydrates, energy, copper and zinc content of value added finger millet *dhokla* was decreased compare to basic *dhokla*.

Table 4: Nutrient content of Finger millet *dhokla* (per 100 g)

Nutrients	Basic <i>dhokla</i>	Accepted finger millet <i>dhokla</i>	‘t’ Value	Increase/ decrease in nutrient content
	Mean±SD	Mean±SD		
Moisture (g)	43.80±0.56	44.20±0.84	0.40 ^{NS}	+ 0.4
Protein (g)	14.43±0.61	14.88±1.22	1.04 ^{NS}	+ 0.45
Fat (g)	9.11±0.01	8.30±0.04	2.00 ^{NS}	- 0.8
Total minerals (g)	2.11±0.07	2.23±0.02	1.94 ^{NS}	+ 0.11
Fibre (g)	1.18±0.02	1.67±0.05	10.96 ^{**}	+ 0.48
Carbohydrates (g)	29.38±0.09	28.74±2.00	0.47 ^{NS}	- 0.64
Energy (kcal)	257.25±2.19	249.25±3.46	2.00 ^{NS}	- 8.00
Calcium (mg)	85.03±2.501	160.68±1.17	80.55 ^{**}	+ 75.64
Iron (mg)	3.99±0.03	4.56±0.23	4.07 ^{NS}	+ 0.57
Copper (mg)	0.64±0.98	0.49±0.007	3.02 ^{NS}	- 0.14
Zinc (mg)	1.29±0.001	1.20±0.001	0.00 ^{NS}	- 0.03
Manganese (mg)	0.93±0.005	2.04±0.07	19.01 [*]	+ 1.11

** Significant at 1 percent * Significant at 5 percent NS- Non significant

Summery and Conclusion

Incorporation of finger millet in traditional *dhokla* recipe had a significant impact on sensory, physical and nutritional quality of basic *dhokla*. The sensory evaluation revealed that 25 percent finger millet incorporation in standardized basic *dhokla* was very well accepted by panel members in terms of overall acceptability. Finger millet *dhokla* with 25 percent incorporation of finger millet has excellent in all the physical quality parameters compared to basic *dhokla*. Observation of physical quality parameters showed that accepted finger millet *dhokla* had more porosity and bulk density compared to basic *dhokla*. Incorporation of 25 percent finger millet elevate the nutrient content of basic *dhokla* with particular reference to calcium (160.68±1.17), fibre (4.56±0.23) and manganese (2.04±0.07) significantly and moisture, protein, total mineral and iron content increased numerically. Fat, carbohydrate, energy, copper and zinc content were decreased non significantly.

It can be concluded from the present study that value addition with finger millet at 25 percent level of incorporation helps to improve calcium, fibre, manganese, protein, total minerals and iron content of basic *dhokla*. Incorporation of 25 percent finger millet in *dhokla* was found to be ideal in terms of sensory, physical and nutritional quality parameters.

References

1. AOAC. Official Methods of Analysis. Association of Official Analytical Chemists. 15th Edition. Washington, D. C; c1984.
2. Amerine M A, Pongborn RM, Roessler ED. Principles of sensory evaluation of food. Academic Press., New York; c1965.
3. Chandra Dinesh, Chandra Satish, Pallavi, Sharma AK.

Review of Finger millet (*Eleusine coracana* (L.) Gaertn): A power house of health benefiting nutrients. Food Science and Human Wellness. 2016;5:149-155.

4. Gopalan C, Ramashastry BV, Balasubramaniam S. Nutritive value of Indian foods. National Institute of Nutrition, (ICMR), Hyderabad; c2007.
5. Joshi N, Godbole SH, Kanekar P. Microbiological and biochemical changes during *dhokla* fermentation with special reference to flavor compounds. Journal of Food Science and Technology. 1989;26:113-115.
6. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. ICAR publications, New Delhi; c1985. p. 58-60, 97-110.
7. Roy A, Bijoy M, Prabir SK. Survival and growth of food borne bacterial pathogens in fermenting batters of *dhokla*. Journal of Food Science and Technology. 2009;46:132-135.
8. Sripriya G, Chandrashekhara K, Murty VS, Chandra TS. ESR spectroscopic studies on free radical quenching action of finger millet (*Eleusine coracana*). Food chem. 1996;57:537-540.
9. Avuwa GO, Gershon JF, Antip TM, Nanbyen D, Salahudeen I, Sunday SJ. Comparative nutritional analysis of the flours of finger millet (*Eleusine coracana*), fonio (*Digitaria exilis*) and their composite in federal college of education Pankshin, Pankshin local government area of Plateau state.