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Development of protein rich Dhokla mix with a high satiety value for women on ritualistic fasts

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Abstract

The need to develop new products is driven by the widening tastes of consumers, who are looking for convenience, value-for-money and variety, without compromising on the nutritional aspect. The value added instant dhokla mix was developed by using buckwheat and pumpkin seed powder focusing on women keeping ritualistic fasts. Five variations were performed and were organoleptically evaluated in comparison with the basic variation. The most accepted variation of developed dhokla was analysed for nutritional quality and was used for preparation of a ready-to-cook dhokla mix. The mix was surveyed for satiety and compliance by women through a questionnaire method. Sample of the mix was then stored in polythene packets and evaluated for shelf life. The mix contains protein (31.5g), fat (53.7g), carbohydrate (111.7g), energy (1056.1kcal), iron (20.72mg), calcium (308mg) per 160g. The mix was stored for a period of six months. Storage studies revealed that the moisture content and peroxide value increased significantly while protein and fat content decreased significantly. Total mineral, iron and calcium content too decreased but were non-significant. Thus the developed mix was of benefits to women on ritualistic fasts.

Keywords: Ritualistic Fast, Buckwheat, Pumpkin Seed Powder, Dhokla, Women

1. Introduction

Legume based fermented foods constitute an important part of human diet in developing countries, including India. Dhokla, a lactic acid fermented cake, is one such food having its origin in Gujarat, India. Dhokla is prepared from a batter of coarsely ground rice (*Oryza sativa*) and Bengal gram dhal (*Cicer arietinum*), fermented at low temperature, steamed in a pie dish, cut and seasoned. During recent years, importance of B complex vitamins, β -carotene and vitamin C, has been realized in terms of their antioxidative properties. Foods containing carotene are reported to prevent skin diseases, eye disorders and cancer. Incorporation of β -carotene rich foods in human diet is therefore considered a cost effective approach to vitamin-A related health problems. Pumpkins (*Cucurbita moschata*) that are high in β -carotene, carbohydrates and minerals are used in traditional medicine system for several ailments. Germination and fermentation could reduce ant-nutritional materials and affect pharmacological activities of pumpkin. Buckwheat (*Fagopyrum esculentum*) is an annual crop; it is a pseudocereal but its grains belong to cereals because of their similar use and chemical composition. Among a variety of buckwheat species, nine have agricultural and nutritional value. Experiments with animal models have demonstrated that buckwheat flour may alleviate diabetes, obesity, hypertension, and hypercholesterolemia. A number of nutraceutical compounds exist in buckwheat grains and other tissues. These are a rich source of starch, proteins, antioxidants, and dietary fibre as well as trace elements. The biological value of buckwheat proteins is comparable to biological value of other protein sources. Besides high-quality proteins, buckwheat grains contain some components with prophylactic value: flavonoids, fagopyrins, or thiamine binding proteins.

The term 'instant food mix' refers to products wherein some of the ingredients are premixed. It is simple, convenient, easy to use and fast to prepare. Instant food mixes provide an easy and readily available homemade option. Instant food mixes can be used for preparation of various snack foods & sweets. It helps to save very important resources like time and energy. Elevation of nutritional value and saving of time can be achieved by development of instant mix. Therefore, an attempt is made to develop value added instant dhokla mix.

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In view of the above nutritional and therapeutic facts on pumpkin seed and buckwheat grains, they were selected for the development of a value added instant dhokla mix.

2. Materials and methods

Selection and procurement of ingredients

The raw materials of the recipe were buckwheat flour, pumpkin seed powder, curd, oil, desiccated coconut, sugar. The ingredients used for development of dhokla were purchased from the local market. The ingredients were cleaned and stored for further use.

Preparation of flours

Rind, fibrous matter and seeds of pumpkin were removed from flesh and were washed thoroughly under running tap water. The seeds were sun dried for about five days and then sieved through a mesh. Pumpkin seed flour was then kept in an air tight container until time of use. Buckwheat flour was used as it is for the dhokla mix.

Preparation of value added dhokla and dhokla mix

With reference to the basic recipe of preparing dhokla, the base flour should be between 90-100g. Hence, the first two variations were considered for finalizing the base flour between buckwheat flour and pumpkin seed powder. Buckwheat flour was taken as the base flour and variations were done in the composition of the pumpkin seed powder. Curd was incorporated as a main ingredient in the variations as it enhanced the taste and improved the calcium content of the product.

The prepared dhokla was organoleptically evaluated by semi trained 25 panel members; who keep ritual fasts often; for its acceptability using nine point hedonic scale. The age group of the panel members was between 25-40years. The raw ingredients of highly accepted dhokla were selected for dhokla mix preparation.

Table 1: Ingredients for basic dhokla

Ingredients	Amount
Gram Flour (Besan)	90g
Semolina	90g
Refined oil	1tsp
Sour curd	1 cup
Sugar	2tbsp
Eno	1tsp
Mustard seeds	1tsp
Desiccated coconut	2tbsp
Curry leaves	6-7

Table 2: Composition of ingredients in dhokla variations

Ingredients	A	B	C	D	E
Buckwheat flour (gm)	50	100	100	100	100
Pumpkin seed powder(gm)	100	60	50	60	70
Curd (gm)	-	-	100	100	100
Eno	1tsp	1tsp	1tsp	1tsp	1tsp
Mustard seeds	1tsp	1tsp	1tsp	1tsp	1tsp
Desiccated coconut	2tbsp	2tbsp	2tbsp	2tbsp	2tbsp
Curry leaves(pieces)	6-7	6-7	6-7	6-7	6-7

Preparation of dhokla mix and studying its satiety and compliance

The best accepted variation of buckwheat flour and pumpkin

seed powder were used to make the dhokla mix. The dhokla mix was prepared, packaged, sealed and then sent to panel members so that they can fill up the questionnaire provided to them for studying the satiety and compliance of the dhokla mix. The questionnaire was later analyzed to form the results.

Nutritional evaluation of value added dhokla and dhokla mix

The variations of value added dhokla and dhokla mix were analysed for nutritional quality. The parameters analyzed were moisture, protein, total minerals, carbohydrate, total fat, calcium, and iron. The values were calculated by using the food composition tables. The methods used for analysis were-

- Moisture, Total minerals, Total fat- AOAC procedures (2000)
- Protein – Biuret method
- Carbohydrate- Colorimetric: Anthrone method
- Calcium, Iron- Calcium and Iron Assay kit

Shelf life study of formulated value added dhokla and dhokla mix

The shelf life study of the dhokla was done by keeping the dhokla in the refrigerator as well as in a controlled and monitored room temperature. The dhokla was checked after the 2nd, 4th day and 6th day and observed for changes in the physical attributes of the product. Microbiological analysis was conducted in the microbiological laboratory for determining the cause of the deterioration. Fungal and gram staining was done to identify the microorganism responsible for deterioration.

The shelf life study of the dhokla mix was done by packing it in polythene zip lock pouches and stored for a period of six months at ambient temperature (20.8 to 32.48 °C). The samples were drawn fortnightly for assessing the quality in terms of moisture and organoleptic evaluation. Peroxide value was also determined by the AOAC procedure (2000).

3. Results and discussion

Development of value added dhokla

The scores for overall rating of the variation of dhokla are presented in Table 3. The data revealed that the mean scores of overall acceptability ranged from 6.2, 6.8, 8.1, 7.6, and 7.9. Though the acceptability, according to the sensory scores variation C was highest, yet it did not meet the high protein demands of women on ritual fast and was nutritionally insufficient. The porosity decreased with increase in the amount of pumpkin seed powder. Comparatively, on the other hand variation E had the highest content of protein and was sufficiently high in other macronutrients too. The acceptability of this variation was tried to increase by lowering the pungency odour of the pumpkin seed powder by roasting it prior to incorporation. The taste and odour was enhanced. Therefore, the final accepted product was variation E.

Table 3: Overall acceptability scores of the dhoklas

Variations	A	B	C	D	E
Overall rating	6.2	6.8	8.1	7.6	7.9

The findings indicate that utilization of nutritious ingredients such as pumpkin seed powder and buckwheat powder helped to increase all nutrients of the value added dhokla.

Table 4: Nutritional composition of the dhoklas

Variation	Protein(g)	Fat(g)	CHO(g)	Energy(kcal)	Calcium(mg)	Iron(mg)
A	30.47	62.7	80.8	1009.8	142	14.42
B	25.9	45	107.16	937.7	154	19.9
C	26.57	44.3	108.6	939.3	298	19.6
D	29	49	110.1	997.7	299	20.17
E	31.5	53.7	111.7	1056.1	308	20.72

Development of value added dhokla mix

To enhance the shelf life and provide convenience to the consumer, a ready to cook dhokla mix was prepared using variation E which got the maximum score with regards to sensory evaluation and nutrient content. The prepared dhokla mix was distributed amongst fasting women and a questionnaire circulated amongst them to assess the acceptability and satiety scores of the mix.

Satiety and compliance of dhokla mix

Figure 1 shows the satiety scores using Burgoon (1998) hunger/satiety scale for respondents after consumption of dhokla mix. From the figure we see that highest satiety mean score was (7.6) in case of immediately after consumption of the meal, followed by a score of (7) after an hour interval, (6.7) after 2hr interval and (5) after 3hr interval of consumption of meal. The result concluded that a high protein dhokla mix provided great satiety for over three hours as compared to consumption of sweets and fruits.

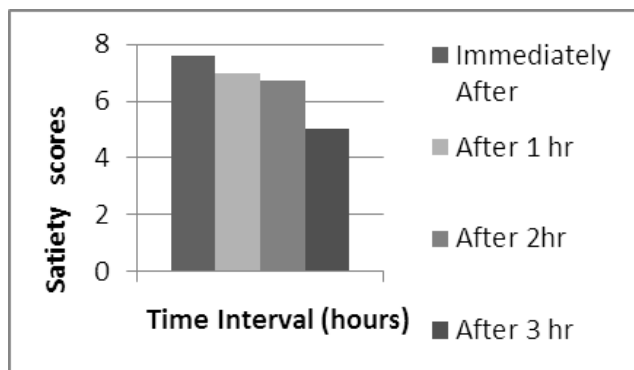


Fig 1: Bar graph showing satiety scores using Burgoon (1998) hunger/satiety scale for respondents after consumption of dhokla mix.

Shelf life study of formulated value added dhokla and dhokla mix

Effect of storage on biochemical parameters of value added instant dhokla mixes are presented in Table 5. Results indicated that significant increase was observed in moisture content of the 180th day old sample of value added instant

dhokla mix during storage than the first day sample. The data revealed that moisture content of dhokla mix had an initial value of 5.7% per cent which was increased gradually up to 10.6% at the end of the storage period. The peroxide value of the product at the end of the storage period was found to increase from initial 2.6meq/M to 18meq/M. The statistical analysis revealed that there was significant increase in peroxide value during storage of dhokla mix.

Table 5: Effect of storage on biochemical parameters.

Parameters	Initial	Final
Moisture	5.7%	10.6%
Peroxide value	2.6 mEq/M	18 mEq/M
Mineral content	24.8%	24.4%
Iron	363.5µg/dl	334.5µg/dl
Protein	16.64mg/dl	13.95mg/dl
Fat	11.65%	10.25%
Calcium	21.4mg/dl	17.82mg/dl

Mineral content of the two samples showed slight non-significant difference. The mineral content of the fresh sample (24.8%) had a slightly higher content whereas the 180th sample (24.4%) had slight deterioration in its mineral content. Changes were considered non-significant.

There was significant difference seen in the iron content of both the samples. The iron content of the fresh sample had a slightly higher content (363.5µg/dl) whereas the 180th sample showed deterioration (334.5µg/dl) in its iron content.

There was no significant difference seen in the calcium content of both the samples. The calcium content of the fresh sample had a slightly higher content (21.4mg/dl) whereas the 180th day old sample showed deterioration (17.82mg/dl) in its calcium content. Changes were considered non-significant.

There was significant difference seen in the fat content of both the samples. The fat content of the fresh sample had a higher fat content (11.65%) than the 180th day old sample (10.25%). The decrease was maybe due to lipolytic activity of enzymes i.e. lipase and lipoxidase.

There was significant difference seen in the protein content of both the samples. The protein content of the fresh sample had higher content (16.64mg/dl) than the 180th day old sample (13.95mg/dl). The observation may be attributed to the proteolytic activity of enzymes.

Table 6: Presence of microbial colonies

Sample	Observation	10 ⁻¹ dilution	10 ⁻² dilution	10 ⁻³ dilution	10 ⁻⁴ dilution	10 ⁻⁵ dilution	10 ⁻⁶ dilution
Initial day (1 st day)	1st	Present	Present	Present	Absent	Absent	Absent
	2nd	Present	Present	Absent	Absent	Absent	Absent
	3rd	Present	Present	Absent	Absent	Absent	Absent
Final day (180 th day)	1st	Present	Present	Absent	Present	Absent	Absent
	2nd	Present	Present	Present	Absent	Absent	Absent
	3rd	Present	Present	Present	Absent	Absent	Absent

The serial dilution technique for shelf life study showed presence of significant microbial colonies till the 10⁻³ dilution of the 180th day old sample and till 10⁻² dilution of the fresh sample. The load of microorganism was within the ISI

specification hence it shows that though there were slight presence of microbial colonies observed yet both the samples are safe to consume. *Staphylococcus aureus* is the pathogenic microorganisms responsible for causing food poisoning. The

results showed that the dhokla mix did not contain *Staphylococcus aureus* during the storage of six months. Hence the dhokla mix developed was safe for consumption up to six months of storage under hygienic conditions due to low initial moisture percentage, hygienic conditions maintained during the process of development of mixes and appropriate packaging material used for storage.

4. Conclusion

Thus this study assesses the satiety and compliance of developed dhokla mix on women who keep frequent religious fasts. In the process of development, incorporations of pumpkin seed powder in varying percentages had a significant impact on chemical, physical and sensory properties of the prepared dhokla.

Pumpkin seed powder incorporated dhokla showed significant increase in all parameters as compared to the basic dhokla. Results showed that protein and nutrient rich dhokla mix was indeed satisfying than consumption of fruits, sweets or other alternative options on the fasting day. It is much easier to follow and respondents experienced no loss in energy, neither hunger pangs throughout the day and maintained their peace of mind.

The results analysed showed that after consuming some amount of sweets and fruits on their day of fast, 44% of the respondents felt hungry after an hour interval itself. 40% of the respondents stated that fruits and sweets does not satisfy hunger at all whereas only 16% respondents said that they feel extreme hunger after 2 hour interval. Highest satiety mean score of (7.6) was observed in case immediately after consumption of the meal. The result concluded that a high protein dhokla mix provided great satiety for over 3 hours as compared to consumption of sweets and fruits.

84% said that they were somewhat benefitting from the product, whereas 16% said that they are benefitting very much from the product. The results also showed that 55% said that their mood is neutral most of the time, while 45% reported that their mood is happy throughout the day of their fast. 76% were likely ready to buy the product and 36% were extremely keen on consuming dhoklas whereas 24% preferred something else over dhoklas as an alternative.

To sum up, as buckwheat grains and pumpkin seed have valuable chemical composition and biological activity, they are an important component in the diet and can play prophylactic or therapeutic roles.

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