

INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES

IMPACT FACTOR ~ 1.021



Official Journal of IIFANS

DEVELOPMENT OF VALUE ADDED INSTANT 'DHOKLA' MIX

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Received on: 21st August 2014

Accepted on: 3rd September 2014

ABSTRACT

The value added instant *dhokla* mix was developed by using ingredients viz. soybean, ragi and garedencress seed. Four variations were performed and were organoleptically evaluated in comparison with basic variation. The most accepted variation of developed mix & basic *dhokla* mix was analysed for nutritional quality. Best accepted *dhokla* mix was stored in polythene and laminated aluminium pouch and evaluated for shelf life. The findings revealed that among all variations the variation D scored highest scores for colour (4.8), texture (4.8), taste (4.6), flavour (4.6) and overall acceptability (4.75). Value added instant *dhokla* mix found to contain more protein (18.39g), fat (4.95g), total minerals (3.97g), fiber (1.31g), iron (8.52mg), calcium (123.28mg) and phosphorus (313.33mg) per 100g which was increased by 3.57g, 2.02g, 1.37g, 0.69g, 4.6mg, 83.18mg and 74.67mg respectively over the basic mix. The *dhokla* was organoleptically acceptable after six months storage period. Effect of storage revealed that the moisture content was not increased significantly. Peroxide value and reducing sugar were significantly increased while total and non reducing sugar was significantly reduced after storage period. The microbial population of *dhokla* mix was initially low and it was increased on 180th day of storage.

Key words: Value Addition, Dhokla, Instant Mix, Soybean, Finger millet, Garden Cress Seed.

INTRODUCTION

The term 'instant food mix' wherein some of the ingredients are premixed. It is simple, convenient, easy 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 such as time and energy.

Dhokla is a vegetarian food item that is made with a fermented batter derived from rice or semolina and chickpea. *Dhokla* can be eaten for breakfast, as a main course, as a side dish or as a snack and is usually tangy and slightly sweet in taste. It is liked by all age groups, soft in texture therefore is suitable even for old people and children. However, as it is prepared by using only either rice or semolina and chickpea it is essential to convert the traditional *dhokla* into nutritious *dhokla* with enhanced content of nutrients by value addition, so that, it can be used as nutritional supplement in addition to the daily diet. Traditional *dhokla* preparation takes longer time as overnight fermentation is necessary for getting the desired texture. Preparation of *dhokla* from instant mix may not require fermentation and hence can be prepared

immediately. Elevation of nutritional value and time saving can be achieved by development of instant mix. Therefore, an attempt is made to develop value added instant *dhokla* mix.

Value addition by utilization of iron, protein and energy rich foods viz., soybean, finger millet and garden cress seed is possible. Soybean is significantly known not only for its nutrient content but also for its health related benefits and it is usually identified as a 'Miracle golden bean'. Thus soy protein is very useful in enhancing growth and development in human beings. The ratio of poly unsaturated fatty acid to saturated fatty acid is 82:18 which is highly conducive to lower the blood cholesterol (Tripathi and Mishra 2005). Finger millet commonly known ragi is rich in protein, iron, calcium, phosphorus, fiber and vitamin content. The calcium content is higher than all cereals and iodine content is said to be highest among all the food grains (Gopalan *et al.*, 2004). Garden cress is richest an important source of iron, folic acid, calcium, vitamin E and A. The Garden cress seeds are high in calories and protein. Since, it is best source of iron it often helps to cure anaemic conditions. It is used as a

laxative for gastrointestinal disorders, prevention of cancers since it has the ability to trap free radicals, memory booster as it contains essential fatty acids such as arachidonic and linoleic fatty acids (Saravanan *et al.*, 2012). Apart from this it is a rich source of omega 3 fatty acids which help to lower cholesterol in hypercholesterolemic patients (Golay *et al.*, 1990 and Parameshwari and Nazni, 2012). In view of the above nutritional and therapeutic facts these food ingredients are selected for development of value added instant *dhokla* mix.

MATERIALS AND METHODS

SELECTION AND PROCUREMENT OF INGREDIENTS

The ingredients used for development of value added instant *dhokla* mix were purchased from the local market of Parbhani. The ingredients viz. bengal gram dhal, semolina, soybean, ragi, garden cress seeds, turmeric, sugar, citric acid, sodium bicarbonate and salt were used for development of the product. The ingredients were cleaned and stored for further research.

PREPARATION OF FLOURS

For obtaining soy flour the whole soybean was soaked in tap water for 2 hours and dried. The dried soybean was roasted for 5 min at 80°C and made into dhal with the help of hand grinder. Prepared soy dhal, bengal gram dhal, ragi, garden cress seeds & sugar were powdered separately into a fine powder with the help of electric grinder. The powders were sieved through a scientific sieve of BS 40-mesh size. The garden cress seed powder was roasted at 90°C for 3 minutes. All the powders were stored in airtight containers for further use.

STANDARDIZATION OF BASIC INSTANT DHOKLA MIX

The basic instant *dhokla* mix was standardized using the ingredients such as bengal gram dhal, semolina, turmeric, sugar, citric acid, sodium bicarbonate and salt. Three variations were tried by changing the proportion of ingredients which are used for commonly prepared *dhokla* (Table 1). The prepared *dhokla* was organoleptically evaluated by semi trained 20 panel members for its acceptability using five point ranking scale (Amerine *et al.*, 1965). The highly accepted *dhokla* was selected as basic variation for further comparison.

Table 1 - Ingredient composition of basic instant *dhokla* mix (g)

Ingredients	Variation I	Variation II	Variation III
Bengagram dhal flour	63	60	57
Semolina	25	30	35
Salt	02	02	02

Turmeric	0.5	0.5	0.5
Sodium bicarbonate	01	01	01
Citric acid	0.5	0.5	0.5
Powdered sugar	08	06	04

PREPARATION OF VALUE ADDED INSTANT DHOKLA MIX

The four variations of value added instant *dhokla* mix were formulated by changing the ingredient composition of basic *dhokla* mix and by utilizing the ingredients selected for value addition (Table 2) and the products were prepared. The prepared *dhokla* was organoleptically evaluated in comparison with basic variation by semi trained 20 panel members using five point ranking scale.

Table 2 - Ingredient composition of value added instant *dhokla* mix (g)

Ingredients	Basic	A	B	C	D
Bengagram dhal flour	60	50	45	55	40
Semolina	30	20	20	20	20
Soy powder	-	15	15	-	15
Ragi powder	-	-	10	10	10
Gardencress seed powder	-	05	-	05	05
Salt	02	02	02	02	02
Turmeric	0.5	0.5	0.5	0.5	0.5
Sodium bicarbonate	01	01	01	01	01
Citric acid	0.5	0.5	0.5	0.5	0.5
Powdered sugar	06	06	06	06	06

PROCEDURE FOR PREPARATION OF VALUE ADDED INSTANT DHOKLA

Add 125ml warm (60°C) water in 100 gm of developed value added instant *dhokla* mix. Immediately pour batter in greased pan & steam in preheated pressure cooker for 10 minutes. After cooling cut *dhokla* in to pieces, (optional) add seasoning and garnish with fresh coriander leaves and fresh coconut. (Seasoning – Heat 5 ml oil, add mustard seeds, green chilies and 25 ml water).

PHYSICAL QUALITY ASSESSMENT

The most accepted value added instant *dhokla* mix and the *dhokla* prepared out of it was evaluated for the physical parameters such as particle size, weight, height, preparation time, porosity, volume and bulk density (Anon 1983).

NUTRITIONAL EVALUATION OF VALUE ADDED INSTANT DHOKLA MIX

The most accepted variation of value added instant *dhokla* mix and standardized basic *dhokla* mix were

analysed for nutritional quality. The parameters analysed were moisture, protein, total minerals, total fat, fiber, calcium, phosphorus, iron, zinc, copper, manganese and β carotene by AOAC procedures (1990). Apart from these the in-vitro protein digestibility of the products was determined using the method described by Mouliswar *et al.*, (1993). The values of carbohydrate, energy, water soluble vitamins such as B₁, B₂, niacin were calculated by using the food composition tables (Gopalan *et al.*, 2010).

SHELF LIFE STUDY OF FORMULATED VALUE ADDED INSTANT DHOKLA MIX

The variation of value added instant *dhokla* mix having best acceptability was selected for shelf life study. It was packed in polythene pouches (P1) of 100 gauge & laminated aluminium pouches (P2). The samples were 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, reducing and non reducing sugar were estimated at the beginning and at the end of storage period by Nelson-Somogyi method (Hawk *et al.*, 1952).

MICROBIAL EVALUATION

At the initial and final day of storage period microbial population was analyzed in both the packages by serial dilution agar plate technique given by Dubey and Maheshwari (2004).

STATISTICAL ANALYSIS

To analyze the data 't' test and analysis of variance (ANOVA) were used to compare the differences in organoleptic scores and the differences in nutritional composition of products. The statistical analysis was carried out by following the procedures prescribed by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

STANDARDIZATION OF BASIC DHOKLA MIX

The scores for sensory parameters of basic recipe of the *dhokla* are presented in Table 3. The data revealed that the mean scores of colour, texture, taste, flavour and overall acceptability ranged from 4.35 to 4.60; 4.15 to 4.70; 4.10 to 4.60; 4.05 to 4.55 and 4.10 to 4.65 respectively. There was statistical significant difference in the scores for texture at 1 per cent level of significance and for overall acceptability difference was recorded at 5 per cent level. No significant difference was found in scores for colour, taste and flavour between three variations. Variation II secured higher scores for all the parameters than other two variations therefore the ingredient composition of variation II was selected as standardized basic *dhokla* mix.

Table 3- Sensory evaluation scores of standardization of basic *dhokla*

Variation	Colour	Texture	Taste	Flavour	Overall acceptability	Total
I	4.45	4.45	4.40	4.30	4.35	21.95
II	4.60	4.70	4.60	4.55	4.65	23.1
III	4.35	4.15	4.10	4.05	4.10	20.75
Mean	4.46	4.43	4.36	4.30	4.36	21.91
F value	0.88 ^{NS}	4.38**	2.63 ^{NS}	2.36 ^{NS}	3.47*	
SE \pm	0.13	0.13	0.15	0.16	0.14	
CD	0.36	0.36	0.42	0.44	0.40	

** Significant at 1 percent

* Significant at 5 percent

NS - Non Significant

DEVELOPMENT OF VALUE ADDED INSTANT DHOKLA MIX

Four variations of value added instant *dhokla* mix were formulated by using the selected ingredients. For choosing the best variation amongst four product of all the variations was prepared and it was evaluated for its sensorial attributes against basic recipe and the results are presented in Table 4. The scores of basic variation for

colour, texture, taste, flavour and overall acceptability are 4.90; 4.85; 4.65; 4.75 and 4.80 respectively. The sensory scores for different variations of value added instant *dhokla* showed that next to the basic variation the variation 'D' scored highest scores than other variations for all sensory characters viz., colour (4.80), texture (4.80), taste (4.60), flavour (4.60) and over all acceptability (4.75).

Table 4- Sensory evaluation scores of value added instant *dhokla*

Variation	Colour	Texture	Taste	Flavour	Overall acceptability	Total
Basic	4.90	4.85	4.65	4.75	4.80	23.95
A	4.55	4.55	3.95	3.60	3.60	20.25
B	3.55	4.75	3.90	3.65	3.75	15.85
C	3.40	3.70	3.20	2.90	3.10	16.3

D	4.80	4.80	4.60	4.60	4.75	23.56
Mean	4.24	4.53	4.06	3.90	4.00	20.73
F value	28.57**	15.13**	16.29**	31.46**	31.88**	
SE±	0.13	0.12	0.14	0.13	0.13	
CD	0.36	0.33	0.40	0.37	0.36	

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

The nutrient composition of the basic and value added instant *dhokla* mix is presented in Table 5. Results evidenced that the moisture content of basic *dhokla* mix and value added instant *dhokla* mix was 5.49 and 5.24 per cent, protein 14.82 and 18.39 per cent, fat 2.93 and 4.95 per cent, total minerals 2.60 and 3.97 per cent, fibre 0.62 and 1.31 per cent, carbohydrate 73.52 and 65.96 per cent, energy 380.13 & 382.00 k.cal, calcium 40.10 & 123.28 mg, phosphorus 238.66 & 313.33 mg, Iron 3.92 & 8.52 mg, zinc 0.66 & 3.26 mg, copper 0.07 mg & 0.99 mg, manganese 0.12 mg & 1.92 mg, and β carotene 73.33 & 126.2 μ g per 100g respectively to basic and value added instant *dhokla* mix. In-vitro protein digestibility of basic *dhokla* mix was 58.79 per cent and value added *dhokla* mix was 64.21 per cent. The scrutiny of the data indicate that there was significant increase in the protein, fat, fiber, total minerals, iron, calcium, phosphorus, zinc, copper, manganese, β carotene, in-vitro protein digestibility of value added *dhokla* mix. Increase in energy and

phosphorus content of value added *dhokla* mix was non significant. The findings indicate that utilization of nutritious ingredients such as soy, ragi and garden cress seed powder helped to increase all nutrients of value added *dhokla* mix. The effect of storage on sensory parameters of developed value added instant *dhokla* mix (Table 6) showed that on first day of storage mean scores for colour, texture, taste, flavour and overall acceptability were 4.8, 4.8, 4.6, 4.6 and 4.75 for both polythene pouch (P1) & laminated aluminium pouch (P2) packed mixes. The mean scores were found to be decreased for all sensory parameters at the end of the storage period which was for colour 3.6 & 3.9, texture 3.6 & 3.75, taste 3.5 & 3.65, flavour 3.4 & 3.6 and overall acceptability 3.5 & 3.8 respectively for polythene pouch and laminated aluminium pouch packed mixes. The data indicated that though scores were found to be decreased after storage of six months the mixes were found to be organoleptically acceptable at the end of storage period.

Table 5- Nutrient composition of instant *dhokla* mixes

Nutrients	Basic mix (Mean±SD)	Value added mix (Mean±SD)	Increase / Decrease	't' value Basic vs Value added
Moisture (g)	5.49±0.40	5.24±0.56	-0.25	0.63 ^{NS}
Protein (g)	14.82±0.64	18.39±0.47	+3.57	7.72**
Fat (g)	2.93±0.26	4.95±0.42	+2.02	6.92**
Total minerals (g)	2.60±0.43	3.97±0.44	+1.37	3.82*
Fiber (g)	0.62±0.25	1.31±0.12	+0.69	4.23*
Calcium (mg)	40.10±2.39	123.28±9.22	+83.18	15.12**
Phosphorus (mg)	238.66±3.51	313.33±11.23	+74.67	0.21 ^{NS}
Iron (mg)	3.92±0.41	8.52±0.54	+4.6	11.65**
Zinc (mg)	0.66±0.05	3.26±0.24	+2.6	17.87**
Copper (mg)	0.07±0.02	0.99±0.08	+0.92	17.82**
Manganese (mg)	0.12±0.05	1.92±0.07	+1.8	33.48**
β carotene (μ g)	73.33±5.61	126.2±9.82	+52.87	8.09**
Protein digestibility (%)	58.79±1.11	64.21±0.97	+5.42	6.36**
Calculated values				
Carbohydrate (g)	73.52±0.67	65.96±0.37	+7.56	17.08**
Energy (k.cal)	380.13±1.13	382.00±3.65	+1.87	0.84 ^{NS}
Vitamin B1(mg)	0.32	0.39	+0.07	
Vitamin B2(mg)	0.11	0.18	+0.07	
Niacin (mg)	1.93	2.59	+0.66	

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

Table 6-Effect of storage on sensory parameters of developed value added instant *dhokla*

Parameters	Polythene pouch (P1)		't' value	Laminated aluminium pouch (P2)		't' value
	First day (Mean±SD)	180 th day (Mean±SD)		First day (Mean±SD)	180 th day (Mean±SD)	
Colour	4.8±0.52	3.6±0.50	7.43**	4.8±0.52	3.9±0.55	5.31**
Texture	4.8±0.41	3.6±0.50	8.29**	4.8±0.41	3.75±0.55	6.84**

Taste	4.6±0.59	3.5±0.51	6.30**	4.6±0.59	3.65±0.48	5.58**
Flavour	4.6±0.59	3.4±0.50	6.93**	4.6±0.59	3.6±0.50	5.78**
Overall acceptability	4.75±0.44	3.5±0.51	8.29**	4.75±0.44	3.8±0.61	5.64**

**Significant at 1 percent

*Significant at 5 percent

NS - Non Significant

The effect of packaging material on sensory parameters of value added instant *dhokla* mix is presented in (Table 7). The sensory scores given for value added instant *dhokla* prepared from mix stored in both pouches for all organoleptic parameters were statistically at par. However, slight numerical increase was observed in the sensory scores obtained by product prepared out of instant value added *dhokla* mix packed in laminated aluminium pouch. This finding indicated that both the packaging material are suitable for packing value added instant *dhokla* mix however, aluminium pouch is more suitable for packing value added instant *dhokla* mix.

Table 7- Effect of Packaging material on sensory parameters of developed value added instant *dhokla*

Parameters	Polythene pouch (P1)	Laminated aluminium pouch (P2)	't' value
	180 th day (Mean±SD)	180 th day (Mean±SD)	
Colour	3.6±0.50	3.9±0.55	1.80 ^{NS}
Texture	3.6±0.50	3.75±0.55	0.90 ^{NS}
Taste	3.5±0.51	3.65±0.48	0.95 ^{NS}
Flavour	3.4±0.50	3.6±0.50	1.26 ^{NS}
Overall acceptability	3.5±0.51	3.8±0.61	1.68 ^{NS}

** Significant at 1 percent

* Significant at 5 percent

NS - Non Significant

Effect of storage on biochemical parameters of value added instant *dhokla* mixes are presented in Table 8. Results indicated that the non significant increase was observed in moisture content of the value added instant *dhokla* mix during storage in both the packaging materials. The data revealed that moisture content of instant *dhokla* mix had an initial value of 5.24 per cent which was increased gradually up to 6.05 for P1 packed mix and 5.78 for P2 packed mix at the end of the storage period.

The peroxide value of the product at the end of the storage period found to be increased from initial 0.39meq/kg to 0.65meq/kg for P1 and to 0.59 meq/kg for P2 packaging material used for storage. The statistical analysis revealed that there was significant increase in peroxide value during storage of value added instant *dhokla* mix in both the packaging materials. The effect of packaging material on peroxide value indicated that there was significant increase in peroxide value of developed instant *dhokla* mix which was stored in polythene pouch over the mix which was stored in laminated aluminium pouch.

The results indicated that the initial reducing sugar content of the value added *dhokla* mix was 0.78 g/100g which was increased up to 1.11 g/100g for P1 packaging material and up to 1.00 g/100g for P2 packaging

material on 180th day of storage. Statistically significant increase in reducing sugar at 1 per cent level of significance was observed on storage of mix in both packaging materials. Initially the non reducing sugar content of value added instant *dhokla* mix was 5.49g/100g which was reduced up to 4.36g and 4.33 during storage in P1 and P2 packaging materials respectively. The reduction in the non reducing sugar during storage was statistically significant at 1 per cent level of significance for both the P1 and P2 packed mixes.

Table 8- Effect of storage and packaging material on biochemical parameters of value added instant *dhokla* mix

Parameters	Storage packaging material		't' value
	Polythene pouch (P1) (Mean±SD)	Laminated aluminium pouch (P2) (Mean±SD)	
Moisture (g)			
Initial	5.24±0.56	5.24±0.56	NS
Final	6.05±0.56	5.78±0.56	0.59 ^{NS}
't' value	1.77 ^{NS}	1.18 ^{NS}	
Peroxide value (meq/kg)			
Initial	0.39±0.005	0.39±0.005	NS
Final	0.65±0.01	0.59±0.01	8.08**
't' value	40.74**	30.51**	
Reducing sugar (g/100g)			
Initial	0.78±0.02	0.78±0.02	NS
Final	1.11±0.01	1.00±0.01	13.83**
't' value	25.56**	16.80**	
Non reducing sugar (g/100g)			
Initial	5.49±0.17	5.49±0.17	NS
Final	4.36±0.13	4.33±0.15	0.23 ^{NS}
't' value	9.16**	8.86**	
Total Sugar (g/100g)			
Initial	6.28±0.15	6.28±0.15	NS
Final	5.47±0.12	5.33±0.14	1.31 ^{NS}
't' value	7.30**	8.01**	

** Significant at 1 percent

* Significant at 5 percent

NS - Non Significant

Initially the value added *dhokla* mix had total sugar 6.28g/100g and at the end of the storage period the total sugar content was 5.47g/100g for P1 and 5.33g/100g for P2 stored mix. A decrease in the amount of total sugar during storage of value added instant *dhokla* mix was observed and reduction was significant at 1 per cent level of significance.

The microbial population of instant *dhokla* mix stored in different packaging materials i.e. in polythene pouch (P1) and laminated aluminium pouch (P2) is given in Table 9. Initially the microbial population of value

added instant *dhokla* mix was found to be below the detectable level. However, it was increased up to 5×10^{-2} for *dhokla* mix packed in polythene pouch and 4×10^{-2} for the mix packed in laminated aluminium pouch at the end of the storage period. Both the packed samples had low microbial population and hence were fit for consumption after storage.

The *dhokla* prepared from 100g of developed value added instant *dhokla* mix weighed 212 gm, 4.5cm height, and 10.5cm diameter, with 400 ml of volume, 68 pores/cm² and 0.53 g/cm³ bulk density (Table 10).

Table 9- Effect of storage on total bacterial count of value added instant dhokla mixes

Days of storage	Polythene pouch (P1)	Laminated aluminium pouch (P2)
Initial (1 st day)	BDL	BDL
Final (180 th day)	5×10^{-2}	4×10^{-2}

BDL – Bellow Detectable Level

Table 10- Preparation parameters of value added instant dhokla

Sr. No.	Product parameters	Observations
1	Weight of raw material	100g
2	Particle size	40 mesh
3	Water required	125 ml
4	Cooking time	8 - 10 min
5	Diameter of pot	10.7 cm
6	Height of batter	2.5 cm
7	Height of <i>dhokla</i>	4.5 cm
8	Diameter of <i>dhokla</i>	10.5 cm
9	Weight of <i>dhokla</i>	212g
10	Volume of <i>dhokla</i>	400 ml
11	Bulk density	$0.53 \text{g} / \text{cm}^3$
12	Porosity	$68 / \text{cm}^2$

SUMMARY AND CONCLUSION

It can be concluded from the results of the present study that the value addition of soya flour, ragi flour and garden cress seed flour helped to enhance protein, total minerals, iron, fiber, calcium, phosphorus, zinc and *In-vitro* protein digestibility of *dhokla*. Storage study indicated that developed instant *dhokla* mix can be stored up to six months. Moisture absorption and peroxide value was low in laminated aluminium pouch (P1) than polythene pouch (P2) stored mix. Microbial study showed that both the stored samples had safe microbial population and hence were fit for consumption. The regular use of value added instant *dhokla* mix may help to upgrade the nutrient security of the population.

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