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Quality Evaluation of Instant Chakli Mix

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ABSTRACT

Chakli is a coiled- round, salty, deep-fried snack commonly prepared in different occasion in tribal belt from rice and chickpea flour paste seasoned with turmeric and chili powder. In the present study various cheapest legume dhal flours viz., soybean and field pea were used to make more nutritious chakli. Instant chakli mixes and control were evaluated on sensory, nutritional and storability parameters and standardized as per desired acceptable sensory characteristics. Based upon the sensory evaluation, the optimized level of supplementation was found to be 25% supplementation of legume dhal flour in rice flour. Soybean blended mix showed better nutritional quality in comparison to other mixes in respect of higher contents of protein, calcium and phosphorus content. The prepared chakli mixes could be safely stored for 6 months at room temperature in polyethylene bags at ambient conditions as monitored by changes in moisture content, free fatty acids and sensory quality. Soybean and field pea blended instant mixes were low in rate as compare to chickpea blended mix. Hence, it was concluded that rice based instant chakli mixes blended with soybean or field pea as per local availability could easily be formulated having high nutritional quality, low in cost and six months shelf life at local household level for developing acceptable quality of chakli. This rice based instant chakli mixes being a rich source of nutrients could be incorporated in the daily diets of poor families as a remedial measure for eradication of malnutrition.

Keywords: Flavor, Sensory evaluation, Shelf life

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INTRODUCTION

Nutrition plays an important role for normal growth of body and helps to maintain physical and mental fitness throughout one's life. The effect of malnutrition on human performance, health and survival have been the subject of extensive research for several decades and studies showed that malnutrition affects physical growth, morbidity, mortality, cognitive development, reproduction and physical work capacity (Pelletier and Frongillo, 2002). Protein Energy Malnutrition (PEM) and micro nutrient deficiencies are been noticed among different age groups of children, pregnant and lactating women by various organizations such as UNICEF and World Health Organization (WHO). Faruque *et al.* (2008) reported the findings of WHO that malnutrition results in 60% of all deaths of kids below than five years in developing countries. The improvement of nutrition therefore, is the main prerequisite for the reduction of high infant and under five mortality rates, the assurance of physical growth, social and mental development of children as well as academic achievement (Anwar *et al.*, 2010). PEM is also associated with a number of co-morbidities such as lower respiratory tract infections including tuberculosis, diarrhea diseases, malaria and anemia (Ejaz and Latif, 2012).

A number of snack food items are prepared for different occasions and meals using a combination of flours. Ready to eat products like chakli is very popular being crisp and friable in texture. Chakli is a coiled- round, salty, deep-fried snack commonly prepared in different occasion in tribal belt from rice and chickpea flour paste seasoned with turmeric and chilli powder. Murukku is very popular savoury crunchy snack in India which is typically made from rice and black gram dhal flour and is called chakli when prepared from rice and bengal gram flour (en.m.Wikipedia.org/wiki/murukku). Murukku are exclusively south Indian niche product but different versions of murukku are made in western India in the name of chakli produced out of Bengal gram dhal and sold as packaged savory (Masshoud, 2011). Previously it was prepared during Deepavali but now a day it is consuming all over the year. Ingredients used for the murukku preparation are rice flour, black gram dhal, chilli powder, cumin seeds, king's cumin, turmeric, salt and oil (Prakash and Chopra, 2016).

The present investigation was planned with an objective to incorporate low-cost available flour at different levels to standardized the instant chakli mixes and study its effect on proximate, sensory and shelf-life characteristics of developed mixes and products.

MATERIALS AND METHODS

The present study was carried out on standardization of chakli mixes using a combination of rice and legume dhal flour and then development of product and nutritional evaluation of product. The raw materials such as rice, chickpea, soybean and field pea, oil, salt, essential spices and polythene bags etc. were purchased from local market.

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Processing of rice grains

Rice grains was cleaned to remove the dust and foreign materials. The grains were washed in water and then shade dried for 1-2 days. The dried grains were grinded in an electric grinder to make coarse flour and sieved by 60-80 mesh sieves. The obtained flour was stored in air-tight container for further uses.

Processing of chickpea / field pea grains

Grains of chickpea and field pea pulses individually was cleaned to remove the dust and foreign materials, moistened with water for 4-6 hrs and then dried for 3-4 days in sunlight till the materials are completely dried having 6-8 % moisture content. The dried grain was pearled in a hand operated chakki for removal of husk. Then, the obtained dhal grain was ground in an electric grinder to make flour and sieved by 80-100 mesh sieves. The obtained flour was stored in air-tight container for further uses.

Processing of soybean grains

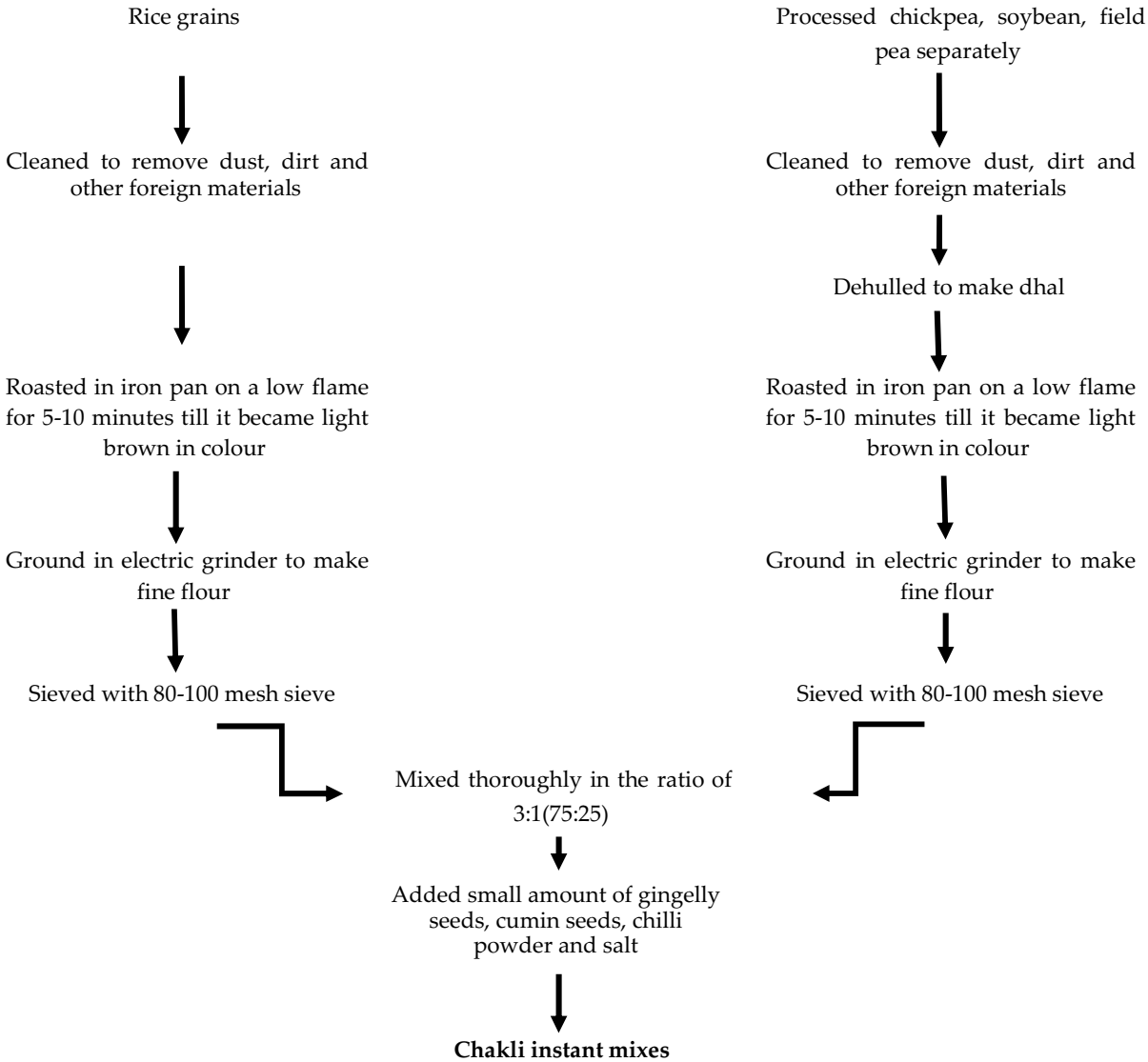
Soybean grain was thoroughly cleaned to remove the dust and foreign materials. The cleaned grains were soaked in water for 4-6 hrs and then autoclaved for 5-10 minutes in a pressure cooker. Soybean was then removed and dried in sunlight for 3-4 days till the material is completely dried having 6-8 % moisture content. The obtained grains were then ground in an electric grinder to make fine flour and sieved by 80-100 mesh sieves. The obtained flour was stored in air-tight container for further uses.

Roasting of flours

Roasting of different kinds of individual flours was carried in deep iron pan on a low flame till it became brownish in colour and then used for preparation of instant mixes of different type.

Preparation of Chakli

Chakli was made from roasted rice flour in combination with various kinds of roasted legume dhal flours namely soybean and field pea in the ratio of 75:25 when using one legume dhal flour or 75:12.5:12.5 when using with chickpea combination. The products were labeled as products I to V. As control, roasted rice flour and roasted chickpea flour in the ratio of 75:25 was taken. The detailed procedure for preparation of instant mixes and its products chakli have been presented in Flow sheet 1 and 2.



Flow Sheet 1: Preparation of chakli instant mixes

100 g of instant mix I

↓

Mixed thoroughly with 2% salt, 2% red chilli powder, 0.5 % gingelly seeds, 0.5 % cumin seeds, 5% oil

↓

Added sufficient luke warm water to make a dough

↓

Extruded the dough into hot oil with hand operated machine

↓

Deep fried till it became light creamish to golden brownish in colour and attained crisp texture

↓

Removed and cooled

↓

RTE *chakli*

Flow sheet 2: Preparation of chakli from instant mixes

Analysis

Sensory characteristics of developed chakli were evaluated for different sensory attributes by a group of semi-trained panelists. Sensory attributes like colour, appearance, texture, flavor, taste and overall acceptability for all samples was assessed using nine-point hedonic scales. The samples were coded to avoid any bias judgments. The coded sample of developed treatments was given to the panel members and the average sensory scores were calculated.

On the basis of sensory evaluation of RTE chakli, the final instant mixes based on rice flour for development of chakli were formulated and developed in the ratios of 75:25. The standardized instant mixes and their ready to eat products were analyzed for proximate content employing standard methods of AOAC (AOAC, 2000). Storage of instant mixes in polyethylene bags, sealed and stored in air tight containers at ambient temperature (25- 35° C) for twelve months. Instant mixes were analyzed on moisture content, free fatty and sensory evaluation parameter periodically after 180 and 360 days. The data on all the parameters viz. organoleptic evaluation, proximate content, shelf life was analyzed statistically on the basis of their mean value and statistical significance.

RESULTS AND DISCUSSION

The rice based nutritious instant chakli mixes with varied kinds of legume dhal flours was prepared. Roasted rice flour and roasted chickpea flour in the ratio of 75:25 was taken as control.

Sensory Evaluation of developed chakli

In this study, the various cheapest legume dhal flours viz., soybean and field pea were used to make more nutritious chakli and subjected to sensory evaluation. The prepared chakli were served to semi trained panelists for the evaluation of colour and appearance, body and texture, taste and flavour and overall acceptability on a nine-point hedonic scale (Amerine *et al.*, 1965) with a scores ranging from 9 to 1 where scores 9 to 1 represented like extremely to dislike extremely. The quality parameters of all coded samples were quantified and the mean scores were calculated.

The results showed that sensory scores of various chakli were found to vary in the range of 8.1 to 8.7 in comparison to control

Table 1: Sensory evaluation of chakli made from rice based instant mixes (roasted rice flour and various roasted legume dhal flours)

Products	Kinds of instant mixes used	Proportion	RTE chakli					Av. Mean
			Colour & appearance	Taste	Flavor	Texture	Overall Acceptability	
Control	Rice : Chickpea dhal	75:25	8.6	8.2	8.6	8.5	8.4	8.5
Product I	Rice : soybean dhal	75:25	8.5	8.3	8.7	8.3	8.4	8.4
Product II	Rice : field pea dhal	75:25	8.4	8.1	8.4	8.5	8.3	8.3
Product III	Rice : chickpea :soybean dhal	75:12.5:12.5	8.6	8.5	8.3	8.4	8.5	8.5
Product IV	Rice : chickpea : field pea dhal	75:12.5:12.5	8.6	8.7	8.5	8.4	8.2	8.5
Av. Mean			8.5	8.4	8.5	8.4	8.4	
SEM±			0.061	0.044	0.067	0.058	0.067	
CD at 5%			0.176	0.127	0.193	0.166	0.193	
F Cal			0.72	10.01	1.87	0.71	0.97	
F Tab			3.48	3.48	3.48	3.48	3.48	
S/NS			NS	S	NS	NS	NS	

All the products contained essential spices and 2% salt and cooked in vegetable oil

Table 2: Proximate composition of various kinds of instant chakli mixes

Nutrients (g/100 g)	Kinds of instant chakli mixes					Av. Mean	SEM±	CD at 5%	F Cal	F Tab	S/ NS
	Chickpea blended (Control)	Soybean blended (Product I)	Field pea blended (Product II)	Chickpea :soybean blended (Product III)	Chickpea :field pea blended (Product IV)						
Crude protein	11.74	17.24	12.24	14.53	12.03	13.56	0.007	0.020	37293.61	3.48	S
Crude fat	1.90	4.75	0.67	3.85	1.28	2.49	0.0169	0.049	3539.59	3.48	S
Total carbohydrates	78.70	67.10	79.01	73.47	78.85	75.43	0.021	0.062	19739.58	3.48	S
Total ash content	1.22	1.56	1.42	1.52	1.32	1.41	0.013	0.037	40.52	3.48	S
Total crude fibre	0.52	1.04	0.62	0.88	0.57	0.73	0.012	0.033	121.16	3.48	S
Calcium (mg)	25	62	25	60	25	39.4	0.558	1.611	417.11	3.48	S
Phosphorus (mg)	227	285	256	275	241	256.8	0.919	2.655	223.24	3.48	S
Iron (mg)	4.3	2.90	1.35	3.35	2.28	2.84	0.016	0.048	1515.03	3.48	S

(rice-chickpea chakli) which varied in between 8.2 to 8.6 (Table 1). All the products were liked very much by the panelists. This indicates that other legume flours either as alone or in combinations could be blended for making chakli instant mixes without any adverse effect on the sensory quality characteristics of the products.

Kumari *et al.* (2016) reported that T1 composite flour consisting of 45:5:35: 10:5 (Wheat flour: Ragi flour: Soyabean flour: green gram dhal flour: Groundnut flour) could be considered the best for preparation of good quality of chakli. The chakli prepared from using multigrain flour was found to be more acceptable (Jagdale and Ghodke, 2020).

Proximate composition of various kinds of instant chakli mixes

The proximate assay of different rice based instant mixes in Table 2 revealed that soybean blended mix showed significant higher amount of protein (17.24%), crude fat (4.75 %), crude fiber (1.04%), calcium (62 mg/100 g) and phosphorus (285 mg/100 g) respectively. This indicated that soybean blended products were more nutritious, rich in protein, crude fibre and minerals. Hoitinkim *et al.* (2014) conducted studies on the proximate compositions for the rice chakli and reported that the carbohydrate content ranged from (46.45%-50.61%), the crude fiber content ranged from (3.32-3.75%), the ash content of chakli ranged from (2.46-3.19%). The above results were comparable with results reported by another scientist (Chavan *et al.*, 2016). Also, Patekar *et al.* (2017) reported to formulate sorghum: finger millet chakli in the ratio of 10:40 (S1), 20:30 (S2) and 30:20 (S3) and (S4) 40:10 and the (S0) control. The results indicated that protein and fat content varied in the ranged from (11.20-14.75%) and (26.49 to 30.13%) respectively. The mineral composition of chakli has calcium content (322.30-342.02), phosphorus (144.05-158.01), and iron content (1.93-2.53) mg/100g of product. He reported that formulated chakli has significantly improved nutritional value as compare to control.

Important nutrients in ready-to-eat chakli

The nutritional analysis of RTE chakli showed that soybean blended product contained higher amount of protein (13.26%), calcium (48 mg/100 g), phosphorus (219 mg/100 g) as compared to other products (Table 3). The control product made from rice-chickpea dhal flour showed lower values for all nutrients except iron (3.30 mg/100g). The calorific value of all the chakli did not vary too much (457 to 462 Kcal/100 g) Thus, soybean blended chakli were more nutritious and cheapest than other chakli. Similar results were also

Table 3: Important nutrients in RTE chakli

Nutrients (g/100 g)	RTE chakli					Average Mean	SEM±	CD at 5%	F Cal	F Tab	S/NS
	Chickpea blended (Control)	Soybean dhal blended (Product I)	Field pea blended (Product II)	Chickpea: soybean bean blended (Product III)	Chickpea: field pea blended (Product IV)						
Protein	9.03	13.26	10.35	11.17	9.25	10.61	0.012	0.035	6778.66	3.48	S
Ash	0.94	1.20	1.09	1.17	1.01	1.08	0.015	0.043	17.89	3.48	S
Calcium (mg)	19	48	19	46	19	30.21	0.615	1.777	207.47	3.48	S
Phosphorus (mg)	174	219	196	211	185	197	0.803	2.320	174.84	3.48	S
Iron(mg)	3.30	2.23	1.04	2.57	1.75	2.18	0.031	0.089	252.34	3.48	S
Total energy Kcal	459	457	461	462	460	459.8	0.651	1.880	2.91	3.48	NS

Shelf-life of instant chakli mixes

Table 4: Changes in moisture content of chakli instant mixes during storage

Kinds of instant mixes	Storage Period (months)			Av. Mean	SEM±	CD at 5%	F Cal	F Tab	S/ NS
	0	6	12						
Rice:Chickpea(Control)	8.13	8.15	8.35	8.21	0.011	0.030	44.4	5.14	S
Rice:Soybean blended mix	7.95	7.99	8.15	8.03	0.039	0.112	2.48	5.14	NS
Rice:Field pea blended mix	6.95	7.08	7.25	7.09	0.014	0.039	40.74	5.14	S
Rice:Chickpea:Soybean blended mix	7.85	7.84	7.95	7.88	0.013	0.037	7.4	5.14	S
Rice:Chickpea:Field pea blended mix	6.83	7.15	7.25	7.08	0.011	0.032	131.72	5.14	S

Values expressed in g/100 g instant mix

observed (Hadimani *et al.*, 1995) on rice based chakli. Kumari *et al*. (2016) reported that the chakli prepared from flours of green gram, soybean, whole wheat, ragi, roasted groundnut contains high amount of energy, protein, calcium, phosphorus, iron and carotene content as compared to control. Chakli of garden gram, rice and green cress was found to be significantly improved in nutritional value, it is nutritionally enriched with protein and antioxidant respectively (Phuge *et al.*, 2019).

Changes in moisture content

Table 4 showed changes in moisture content of various kinds of instant mixes. It varied from 6.83 to 8.35%. During storage, the moisture content was observed to increase from 1.46 to 6.44 % in different kinds of mixes.

Changes in free fatty acid acidity

The free fatty acid acidity of different kinds of instant mixes ranged from 0.110 to 0.215 mg KOH/100 g of instant mix during storage as shown in Table 5. The enhancement of free fatty acid acidity was observed to increase from 11.29 to 18.38% with a maximum in soybean blended mixes.

During storage of instant mixes, the moisture content and free fatty acid acidity did not significantly vary during 6 months lapse of storage time. This may be due to well packaging of mixes in polyethylene bags and storage at an ambient condition. However, during 12 months of storage, the free fatty acid acidity increased significantly. Soybean and chickpea blended products were found to have more free fatty acid acidity. Thus, it could be summarized that instant mixes could be used safely up to the period of 6 months without any significant deterioration of quality.

Table 5: Changes in free fatty acid acidity of chakli instant mixes during storage

Kinds of instant mixes	Storage Period (months)			Average Mean	SEM±	CD at 5%	F Cal	F Tab	S/ NS
	0	6	12						
Rice:Chickpea(Control)	0.110	0.120	0.128	0.119	0.003	0.008	3.50	5.14	NS
Rice:Soybean blended mix	0.136	0.138	0.161	0.145	0.001	0.004	42.37	5.14	S
Rice:Field pea blended mix	0.124	0.127	0.138	0.130	0.001	0.003	13.58	5.14	S
Rice:Chickpea:Soybean blended mix	0.182	0.180	0.211	0.191	0.002	0.006	26.56	5.14	S
Rice:Chickpea:Field pea blended mix	0.188	0.187	0.215	0.197	0.002	0.006	31.63	5.14	S

Sensory evaluation of products developed from stored chakli instant mixes

Table 6 showed the sensory quality characteristics viz., taste, flavor and overall acceptability of RTE chakli prepared from various stored chakli instant mixes. The results showed that all the products developed from 6 month stored mixes were good and accepted by the panelists. However, due to lower values in taste and flavor, the products developed from 12 months stored materials were not accepted by the panelists. Therefore, it could be concluded that instant mixes could be used up to the period of 6 months without any deterioration of the quality of products.

Table 6: Average values of sensory attributes of RTE chakli developed from stored instant mixes

Products developed	Period of storage	Sensory attributes of RTE products			Average Mean	SEM±	CD at 5%	F Cal	F Tab	S/ NS
		Taste	Flavor	Overall acceptability						
Cheela	6	8.4	8.5	8.6	8.5	0.050	0.145	1.33	5.14	NS
	12	6.8	6.3	6.2	6.43	0.047	0.136	15.44	5.14	S

CONCLUSION

It can be concluded from the results that the incorporation of locally available leguminous dhal flour in the rice based nutritious mixture adds variety in traditional food product

chakli. The present study revealed that, various kinds of rice based instant mixes could be formulated by incorporation of roasted rice flour and roasted pulse flour in the ratio of 75:25 either alone or in combination with chickpea flour. The developed RTE product shows an acceptable sensory quality characteristic. The products based on soybean and field pea were found to be good acceptable as control product. Further, it shows a remarkable increase in nutritive value of both instant mixes and ready to eat product. Soybean blended product had higher nutritional quality in terms of protein, crude fibre, and minerals particularly calcium and phosphorus. However, field pea blended products had a lower value than soybean blended products but higher than control. The storage of different kinds of flours in polyethylene bags at ambient condition revealed that there were no changes in the moisture content and fatty acid acidity of the flours and sensory characteristic within six months of storage. The cost analysis of mixes showed that the soybean and field pea blended mixes had lower costs in comparison to chickpea blended mixes. Therefore, soybean and field pea flours could be successfully used to formulate chakli mixes having low cost and better nutritional quality. Hence, it was concluded that rice based instant mixes blended with soybean or field pea as per local availability could be easily formulated having high nutritional quality, low in cost and six months shelf life can be prepared at local household level for developing acceptable quality of chakli. Also, it may further be recommended that this rice based chakli instant mixes being a rich source of nutrients could be incorporated in the daily diets of poor families as a remedial measure for eradication of malnutrition.

REFERENCES

Amerine MA, Pangborn RM and Roessler EB.1965. Principle of Sensory Evaluation of Foods, (Academic Press, New York), p. 602.

Anwar F, Khomsan A, Sukandar D, Riyadi H and Mudjajanto ES.2010. High participation in posyandu nutrition program improved children nutritional status. *Nutr. Res. Pract.* **4** (3):208-214.

AOAC.2000. Official Methods of Analysis 17th Ed. Association of Official Analytical Chemists, Inc. Maryland.

Chavan UD, Jagtap YK, Shinde MS and Patil JV.2016. Preparation and nutritional quality of sorghum Chakli. *Int. J. Recent Scientific Res.* **7** (1):8404-8411.

Ejaz MS and Latif N.2010. Stunting and micronutrient deficiencies in malnourished children. *J. Pak. Med. Assoc.* 60 (7):543-547.

Faruque ASG, Ahmed AMS, Ahmed T, Islam MM, Hossain MI, Roy SK, Alam N, Kabir I and Sack D A.2008. Nutrition: basis for healthy children and mothers in Bangladesh. *J. Health Popul. Nutr.* **26** (3): 325-339.

Hadimani NA, Ali SZ and Malleshi NG.1995. Physico – chemical composition and processing characteristics of pearl millet varieties. *J. Food Sci. Technol.* **32** (3):193-198.

Hoitinkim S, Shradha GS, Mirmala B and Yenagi ST.2014. Documentation of chakli recipies and evaluation of commercial chakali for physic- chemical and sensory attributes. *J. Agri. Sci.* **27** (2):208-212.

Jagdale YD and Ghodke SV.2020. Development of innovative flour based indian traditional product: multigrain chakli. *International Research Journal of Engineering and Technology* **7** (5):4161-4168.

Kumari R, Gupta A and Sheikh S.2016. Development and sensory optimization of low-cost micronutrient rich nutritious products by using locally available food resources. *International Journal of Food and Nutritional Science* **5** (1):23-27.

Masshoud FAB.2011. The effect of addition of fish and chicken on production of "murukku". B. Sc. Project Report, University Technology MARA (Malaysia).

Patekar SD, More DR and Satwadhar PN.2017. Studies on preparation and nutritional quality of sorghum-fingermillet chakli. *Int. J. Curr. Microbiol. App. Sci.* **6** (7): 1381-1389. doi: https://doi.org/10.20546/ijcmas.2017.607.165

Pelletier DL and Frongillo EA.2002. Changes in child nutrition survival are strongly associated with changes in malnutrition in developing countries. *The Journal of Nutrition* **133** (1):107-119.

Phuge T, Peter S, Parimita and Sharma S.2019. Development and quality assessment of chakli (crunchy snack) prepared incorporating garden cress seed, green gram flour and rice flour. *International Journal of Food Science and Nutrition* **4**(5): 23-25.

Prakash K and Chopra R.2016. Enhancement of nutritional and sensory attributes of murukkus by accomplishment of malted finger millet (Eleusine coracana). *Asian Journal of Science and Technology* 7 (6):3038-3043.

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