

# Germinated Brown Rice: Processing and Value Addition for Development of Instant *Dhokla* Mix

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## Abstract

The present study focused on germination of brown rice and its potential utilization for value addition. The study involves formulation of an instant *dhokla* mix with germinated brown rice (GBR) flour at different concentrations of 10% (IDM<sub>1</sub>), 20% (IDM<sub>2</sub>), 30% (IDM<sub>3</sub>) and 40% (IDM<sub>4</sub>) and analysed for its sensory evaluation and proximate composition. Incorporation of GBR in instant *dhokla* mix resulted in a significant increase of nutritional ingredients. The IDM<sub>3</sub> was found to have fat (3.78%), protein (13.30%), fiber (1.09%) and ash (3.94%). Results of sensory evaluation showed that germinated brown rice can be utilized in formulation of instant *dhokla* mix up to 30 per cent (IDM<sub>3</sub>) was found to be well accepted.

**Keywords:** Germinated brown rice, value addition, instant *dhokla* mix, sensory evaluation.

## 1. INTRODUCTION

Germination of cereal grains is an economical processing technology that helps to improve nutritional value and health promoting functions. Germinated brown rice (GBR) is unpolished brown rice that has been allowed to germinate to improve the flavour and texture, and to increase its nutritional content profile. Recently, GBR has been emerged out as one of the most interesting germinated cereal products and it has received a great deal of attention, especially in Asian countries. During the germination process, hydrolytic enzymes are activated and this decomposes starch, non-starch polysaccharides and proteins, which lead to increase in oligosaccharides and amino acids (Manna *et al.*, 1995). Proteins and sugars broken down by enzymes produced during the germination process and impart a sweet flavour to the GBR (Kihara *et al.*, 2007). Germination could bring about the formation of new bioactive compounds, such as gamma-aminobutyric acid (GABA) which is said to protect the brain from harmful amino acids connected to Alzheimer's disease. It is also a powerful neurotransmitter, boosting the central nervous system's ability to support good sleep and reduce stress (Shiahs and Yatham, 1998.).

Instant food mixes are the food products wherein some of the ingredients are premixed and provides convenience to the consumer with an easy and readily available homemade option. Rapid urbanization, enlarged phenomenon of working women's and change in consumption pattern have led to the development of instant mixes of several Indian traditional foods. Elevation of nutritional value and time saving can be achieved by development of instant food mixes. GBR has outstanding potential to become innovative rice by preserving all nutrients in the rice for human consumption in order to create the utmost value from rice. Looking to the health benefits of GBR, an attempt was carried out to explore its potential utilization in value added food products. The aim of the present research study was to investigate the suitability for germinated brown rice (GBR) in development of instant *dhokla* mix to raise the bar of nutritional index with consumer acceptability.

## 2. MATERIALS AND METHODS

### 2.1 Materials

**2.1.1 Raw Materials:** Raw materials like raw brown rice, bengal gram, sugar, sodium bicarbonate, citric acid, turmeric, red chilli, salt etc. required during present investigation were procured from local market of Loni Kalbhor Pune.

**2.1.2 Chemicals:** Chemicals of analytical grade were made available in the laboratories of MIT College of Food Technology.

**2.1.3 Processing Equipment:** The analytical equipments like muffle furnace, soxhlet extraction apparatus, sieves shaker, incubator, spectrophotometer, laminar air flow cabinet were made available in the laboratories of MIT College of Food Technology.

## 2.2 Methods

### 2.2.1 Preparation of germinated brown rice flour

The brown rice was germinated by soaking it in water of 35–40 °C for about 24 h, then water drained out and kept in moist condition for 18 h, and during soaking period, changing the water every 3–4 h to prevent fermentation (which usually produces undesirable odour) and to maintain consistent water temperature. Then germinated brown rice was dried in cabinet drier at 40°C for 2-3 hrs. Dried GBR were ground in an electric grinder to make fine flour.

### 2.2.2 Formulation of instant *dhokla* mix

Formulation of instant *dhokla* mix was prepared as per given in table 1.

**Table 1 Formulation of Instant *dhokla* mix**

Treatments	Bengal gram flour	Brown rice flour	GBR
Control	60	40	-
IDM <sub>1</sub>	60	30	10
IDM <sub>2</sub>	60	20	20
IDM <sub>3</sub>	60	10	30
IDM <sub>4</sub>	60	-	40

Control- Bengal gram: Raw brown rice (60:40)

IDM<sub>1</sub>- Bengal gram: White rice: GBR (60:30:10)

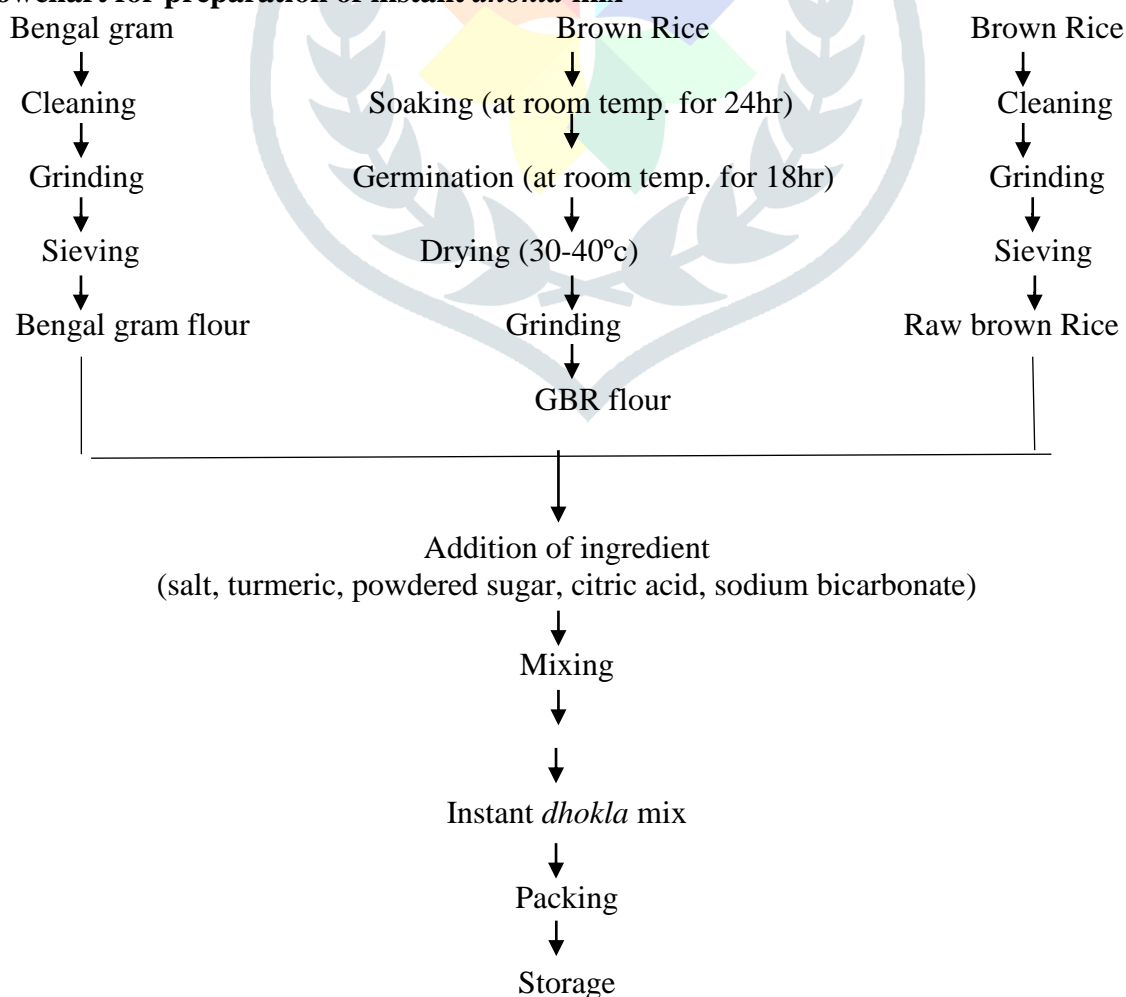
IDM<sub>2</sub>- Bengal gram: White rice: GBR (60:20:20)

IDM<sub>3</sub>- Bengal gram: White rice: GBR (60:10:30)

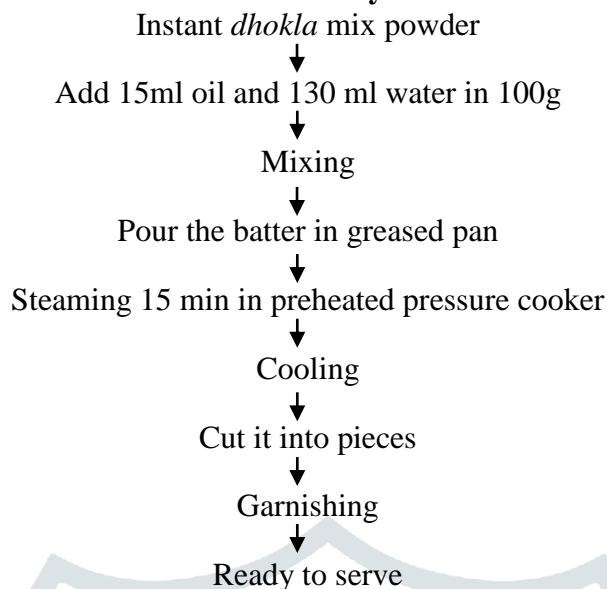
IDM<sub>4</sub>- Bengal gram: GBR (60:40)

For preparation of spice mix; powdered sugar 6g, salt 1.5 g, sodium bicarbonate 1g, turmeric powder 0.5g, red chilli powder 0.5g and citric acid 0.5g were added to the instant *Dhokla* mix.

### 2.2.3 Flowchart for preparation of instant *dhokla* mix



## 2.2.4 Preparation of *dhokla* from instant *dhokla* mix by reconstitution



## 2.2.5 Sensory evaluation of *dhokla*

The sensory quality characteristics of *dhokla* prepared from various instant mixes were evaluated by panel of 10 semi- trained judges using nine-point hedonic scales as described by Amerine *et al.* (1965).

## 2.2.6 Proximate composition of instant *dhokla* mix

The instant *dhokla* mix formulations and control sample were analyzed by standard method for moisture, total fat, crude protein, ash and fiber (AOAC 2007). The carbohydrate content was calculated by difference method.

## 2.2.7 Statistical analysis

The data obtained from various experiments were statistically analyzed. A complete randomized design was adopted for statistical analysis of data by following the procedure as described by Panse and Sukhatme (1963).

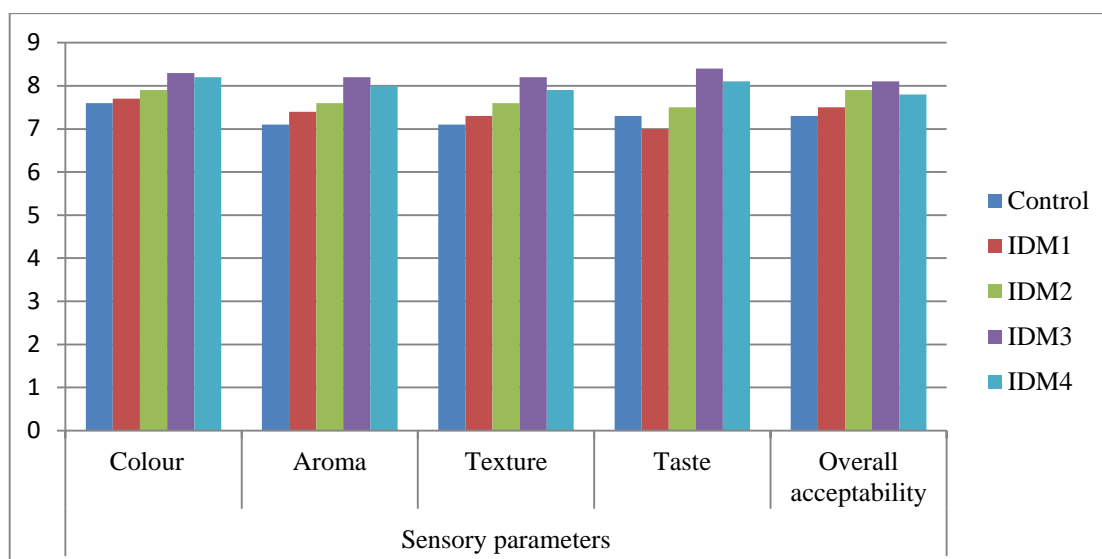
# 3. RESULT AND DISCUSSION

## 3.1 Sensory evaluation of *dhokla* prepared from instant *dhokla* mix

*Dhokla* prepared with different formulations of instant *dhokla* mix were subjected for sensory evaluation to evaluate maximum acceptability of the product. The obtained results are presented in graph 1.

The data revealed that the *dhokla* prepared from formulation IDM<sub>3</sub> i.e. instant *dhokla* mix incorporated with 30 per cent germinated brown rice scored highest scores for all sensory parameters viz, colour (8.3), aroma (8.2), texture (8.2), taste (8.4) and overall acceptability (8.1) as compared to other four formulations.

The highest score for colour was secured by IDM<sub>3</sub> sample (8.3) while lowest score by IDM<sub>1</sub> (7.6). The probable reason for these results could be the partial replacement of raw brown rice (brown colour) with GBR (Creamish colour). At moderate level of GBR addition in *Dhokla*, aroma was found to be appreciable and treatment IDM<sub>3</sub> received highest score (8.2), even more than control. Texture score values also showed significant variation across the treatments as the level of GBR flour was increased in *dhokla*. This might be due to the specific textural properties of GBR. Brown rice after germination considerably influences the volume and texture of bread, porridge, cookies and other products. The taste of *dhokla* was significantly influenced due to the addition of GBR in product. The treatment IDM<sub>3</sub> has got a maximum rating (8.4) for taste. It might be due to the fact that GBR is soaked and germinated which gives a unique light taste as compared to raw brown rice, GBR upon addition in *dhokla* gives a different taste.

Graph 1 sensory evaluation of *dhokla* prepared with instant *dhokla* mix

These results are in good agreement with the findings of Mounika *et al.* (2017) who revealed that organoleptically acceptable nankhatai can be prepared by supplementing with 30 per cent GBR in food products as an ingredient. Also, GBR would be acceptable to consumers and the food industry as a promising foodstuff that contains more nutritional and bio-functional components than ordinary rice products, as well as for improving sensory properties (Patil and Khan, 2011).

### 3.2 Proximate composition of instant *dhokla* mix fortified with GBR

The prepared instant *dhokla* mixes were further analyzed for proximate composition and obtained results are depicted in Table 2.

Table 2 Proximate composition of instant *dhokla* mix fortified with GBR

Treatments	Proximate composition (%)					
	Moisture	Crude fat	Crude protein	Crude fiber	Ash	Carbohydrate
Control	8.3	4.03	13.14	0.97	3.60	70.23
IDM <sub>1</sub>	7.99	3.95	13.21	1.03	3.71	70.11
IDM <sub>2</sub>	7.94	3.89	13.26	1.06	3.78	70.09
IDM <sub>3</sub>	7.90	3.78	13.30	1.09	3.94	69.99
IDM <sub>4</sub>	7.85	3.71	13.35	1.12	4.02	69.95
SE $\pm$	0.29	0.14	0.49	0.04	0.15	2.60
CD @ 5%	0.88	0.43	1.49	0.12	0.45	7.85

\*Each value is the average of three determinations.

It is evident from Table 2 that moisture content of instant *dhokla* mixes varied from 8.3 to 7.85 per cent with a lowest value in IDM<sub>4</sub> (7.85%) and highest in control sample. Results reported that fat content of *dhokla* mix for control, IDM<sub>1</sub>, IDM<sub>2</sub>, IDM<sub>3</sub>, and IDM<sub>4</sub> sample were found to be 4.03, 3.95, 3.89, 3.78 and 3.71 per cent respectively. It can be concluded that addition of germinated brown rice into instant *dhokla* mixes will decrease the fat content. The protein content of different instant *dhokla* mix samples ranged between 13.14 per cent to 13.35 per cent. The protein increased with increasing proportion of germinated brown rice as compared to control. It's due to brown rice as source of protein contribute on increasing protein content.

Results in above table revealed that there was significant increase in the protein, fiber and ash content of instant *dhokla* mix. The fiber content in instant *dhokla* mix was found to be lowest in control sample as 0.97 per cent and highest in IDM<sub>4</sub> sample as 1.17 per cent. Total ash content in various instant *dhokla* mixes varied from 3.60 per cent to 4.02 per cent. The highest amount of ash was recorded in IDM<sub>4</sub> sample i.e. 4.02 per

cent. The increasing of ash content in instant *dhokla* mix was might be due to increase in per cent of germinated brown rice. A decrease in carbohydrate content was observed with the increased percentage of GBR in instant *dhokla* mix formulations. The carbohydrate content was found to be highest in control sample as 70.23 per cent whereas lowest carbohydrate was found in IDM4 sample as 69.95 per cent.

The findings indicated that utilization of nutritious ingredients such as raw brown rice and GBR flour helped to elevate the nutritional profile of instant *dhokla* mix in terms of protein, fibers and ash content. Similar findings for improved nutritional properties with germinated brown rice were observed by Morita et al. (2007) in bread. The utilization of germinated brown rice as an ingredient in bakery products such as cookies, breads, and cakes are one of the approaches to improve their nutritive and bioactive qualities (Chalermchaiwat et al. 2015).

#### 4. Conclusion

It can be concluded that germinated brown rice flour can be successfully incorporated in the formulation of instant *dhokla* mix for improved nutritional quality with acceptable sensory attributes. The *dhokla* prepared from instant *dhokla* mix with addition of 30 per cent germinated brown rice (IDM<sub>3</sub>) was found to be ideal in terms of nutritive and sensory parameters as compared to other formulations. The IDM<sub>3</sub> was found to have fat (3.78%), protein (13.30%), fiber (1.09%) and ash (3.94%). This could be a step towards new product development by germinating brown rice which helps to enhance the nutritional status of the population.

#### 5. Future Prospectus

This research work is expected to open new avenues for developing value added products with potential utilization of germinated brown rice and generate greater interest in germinated brown rice research.

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