Original Research Article   https://doi.org/10.20546/ijcmas.2019.806.239

Sensory Evaluation and Proximate Composition of Rice Based Traditional Food Products of India

A. Lavanya[*] and Boora Pinky

*Department of Foods and Nutrition, CCS Haryana Agricultural University,
Hisar, 125004, Haryana., India*

*Corresponding author

A B S T R A C T

The present study was undertaken with the view to evaluate the sensory attributes and proximate composition of rice based traditional food products like *dosa, idli, utthapam, khichadi* and *rice biryani* were prepared using different varieties of rice. The four different rice varieties namely permal (control), HB-2, HKR-48 and HKR-128 were selected for the study. The best acceptable variety (HKR-48) with best acceptable food products were selected organoleptically and evaluated for proximate composition. Highly significant ($P<0.05$) differences for crude protein content and crude fibre content were observed in food products prepared from HKR-48 variety while non-significant differences were observed for crude fat and ash content. Nutritional evaluation of rice based food products revealed that this product contains good amount of protein, carbohydrates and minerals. All the food products from HKR-48 rice variety were organoleptically acceptable as compared to other varieties.

Introduction

Traditional Indian foods have been prepared for many years and preparation varies across the country. *Khichadi* made from rice together with *dal* is highly nutritious. Traditional wisdom about processing of food, its preservation techniques, and their therapeutic effects has been established for many generations in India. Indian traditional foods are also recognized as functional foods because of the presence of functional components such as body-healing chemicals, antioxidants, dietary fibers and probiotics. These functional molecules help in weight management, blood sugar level balance and support immunity of the body. The functional properties of foods are further enhanced by processing techniques such as sprouting, malting and fermentation (Hotz and Gibson, 2007).

Fermented cereals have been noted for their superior nutritional value, shelf-life and digestibility compared to the unfermented counterpart (Coda *et al.,* 2011). Use of rice along with pulses *(black gram, bengal gram)* is necessary as a source of mixed natural microflora needed for efficient fermentation during preparation of *idli, dosa, dhokla*

batters. A group of microbes (natural or from starter culture) grow well in cereal based foods, biochemically and organoleptically transform the substrates, produce different metabolites, destroys or detoxifies the harmful products (phytates, tannins, and polyphenols) and enrich the food with different micro-nutrients (vitamins, minerals, amino acids, etc.), health beneficial edible microbes (i.e. probiotics), fermentable sugars (i.e. prebiotic), dietary fibers, phytochemicals and digestive enzymes.

Apart from basic nutrients, bioactive component exhibits significant beneficial effects on the intestinal micro environment, particularly modulating gut microbial composition and their functional behavior. Keeping this fact in view, the present study has been planned with objectives to utilize the newly released rice varieties to develop Indian rice based traditional food products and also to evaluate their sensory and nutritional composition.

Materials and Methods

Procurement and preparation of samples

Rice varieties namely HB-2, HKR-48, HKR-128 and Permal were procured in a single lot from Rice Research Station, Kaul (District Kaithal), CCS Haryana Agricultural University, Hisar after milling by using HULLER-MILLER JAPAN equipment. All the four rice varieties utilized for development of food products like *Dosa, Idli, Utthapam*, *Khichadi* and *Rice biryani.* The Permal locally grown common rice variety served as a control. The grain of the four rice varieties were cleaned and made free of dust, dirt and foreign materials prior to development of food products. All other food ingredients required for development of food products were purchased from local market in a single lot.

Preparation of food products

Batter preparation for *Dosa, Idli* and *Utthapam*

Ingredients - Quantity

Rice - 1 kg
Black gram - 500 g
Fenugreek seeds - 1 tsp
Water - 1 litre
Salt - 3 tsp

Method

The rice and *blackgram dhal* were soaked in one litre of water separately for 6 hours. Soaked ingredients were transferred in a mixer-grinder for grinding. Ground rice and *black gram* paste were mixed together. The ground mixture was kept for fermentation in incubator at temperature 20°C for overnight. The mixture was used in different consistency and viscosity according to the products.

Preparation of food products

Dosa

Ingredients - Quantity

Dosa batter - 150 ml
Oil - 5 ml

Method

Dosa is a crispy savoury pancake/crepe of South Indian cuisine. It is prepared by grinding rice and black gram dhal in a fixed proportion (2:1) fermented and then preparation on a flat *Dosa* pan.

Initially the oil was spread on the non-stick *Dosa* pan. The *Dosa* batter was spread on the pan finely to get the thin and crispy texture. Cooked for 3 minutes

Idli

Ingredients - Quantity

Idli batter - 150 ml

Method

Idli batter was placed on the plates in the *idli* cooker. Cooked upto the whistles.

Utthapam

Ingredients - Quantity

Thick batter - 150 ml
Oil - 5 ml

Method

Uthappam is a *dosa*-like dish made by cooking the fermented batter of rice and *black gram* dal on a pan. Unlike a *Dosa*, which is crisp and crepe-like, *Uttapam* is a thick pancake, with toppings cooked right into the batter. Initially the oil was spread on the non-stick dosa pan. The batter was spread on the pan to get thick *Utthapam.* Cooked for 4 minutes

Khichadi

Ingredients - Quantity

Rice - 110g
Whole *green gram dhal* - 50g
Splitted decorticated, *green gram dhal* - 20g
Spinach leaves - 20g
Turmeric powder - ½tsp
Water (water and rice 3:1 ratio) - 330ml

Method

The *Khichadi* is most common food and split decorticated *Moong dal* and rice is the popular combination of *Khichadi.* All the

above mentioned ingredients were pressure cooked for 20 minutes in pressure cooker.

Rice biryani

Ingredients - Quantity

Rice - 200 g
Cauliflower, peas, carrots, beans - 300 g
Onion and tomato - 200 g
Green chilli - 50 g
Ginger garlic paste (ginger and garlic1:1 ratio) - 100 g
Corriander and mint leaves - 40 g
Clove and dalchinni - 4 g
Curd - 2 tsp
Oil - 50 ml
Salt - required amount
Water (water and rice 2:1 ratio) - 400 ml

Method

Vegetable *Biryani* is an Indian dish made with highly seasoned rice and vegetables flavored with turmeric. Initially oil was added in a cooker. Dalchinni, clove, pudina, green chilli, onion, tomato and ginger garlic paste were fried in oil. All the vegetables were added (cauliflower, peas, carrot, beans) and mixed properly. Required amount of water was added and allowed for boiling. Rice was added into the boiling mixture and pressure cooked for 15 minutes.

Sensory evaluation

All the food products were subjected to sensory evaluation with respect to colour, appearance, aroma, texture, taste and overall acceptability by a semi-trained taste panel comprising of 10 judges using the 9 point Hedonic Rating scale. On the basis of mean scores of sensory evaluation obtained after feeding to the judges, the most acceptable products were selected for further nutritional studies.

Proximate composition

The proximate analysis of prepared samples was done in triplicates.

The proximate composition of rice samples were determined by employing the standard methods of analysis AOAC, (2000). The moisture content of the rice samples was determined after drying at 65°C until a constant weight was attained. The micro Kjeldahl method was employed to determine the total nitrogen and the crude protein (N x 5.95). The crude fat was extracted with petroleum ether, using Socsplus – SCS.08 RTS apparatus. The ash and crude fibre contents were determined based on methods outlined in AOAC (2000).

Statistical Analysis

The data for sensory evaluation, nutritional composition and in-vitro digestibility of food products were statistically analyzed for analysis of variance (ANOVA) at 95% probability to find out significant differences between control (permal) and accepted (HKR-48) rice varieties. Analysis was performed using completely randomized design (CRD) with three replications and variable treatments by OPSTAT software (Panse and Sukhatme, 1961).

Results and Discussion

Sensory evaluation

All the four rice varieties Permal, HB-2, HKR-48 and HKR-128 were used for the preparation of food products and subjected to sensory evaluation with respect to colour, appearance, aroma, texture, taste and overall acceptability.

The data in table 1 indicated that *Dosa* prepared from four different rice varieties namely control Dosa, HB-2 *Dosa,* HKR-48 and HKR-128 *Dosa* were fall in the category of "liked moderately" in overall acceptability whereas the aroma of control *Dosa* was "liked very much" and taste of HKR-128 *Dosa* was "liked slightly:" by panel of experts. Mean organoleptic scores for *Idli* showed in table 2 revealed that control *Idli,* HB-2 *Idli* and HKR-48 *Idli* were "liked moderately" in terms of all the sensory attributes. *Idli* prepared from HKR-128 rice variety was liked slightly in overall acceptability. The colour and appearance of control *Idli* was "liked very much" by the judges.

The mean scores depicted in table 3 showed the results of *Utthapam* prepared from Permal, HB-2 and HKR-48 falls in the category of "liked moderately" for all sensory attributes whereas *Utthapam* prepared from HKR-128 variety was "liked slightly" by the judges. The colour and appearance of control *Utthapam* was "liked very much" by the panel of experts.

The table 4 showed that the *Khichadi* prepared from four different rice varieties were fall in the category of "liked moderately" by judges. The appearance of control *Khichadi* was "liked very much" by panel of experts.

The data in table 5 depicted that Rice *Biryani* prepared from HKR-48 was "liked moderately" in overall acceptability. The colour of control *Biryani* was "liked very much" whereas all the other sensory attributes were "liked moderately" by the judges. The other three varieties of *Biryani* were also fall in the category of liked moderately in all the sensory attributes by the panel of experts. Overall results of sensory evaluation of food products prepared from different rice varieties revealed that HKR-48 was best acceptable rice variety for the preparation of rice based traditional food products of India.

Table.1 Sensory evaluation of *Dosa* prepared from different rice varieties

Variety	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control *Dosa*	7.70±0.42	7.90±0.31	8.20±0.33	7.90±0.35	7.60±0.34	**7.86±0.31**
HB-2 *Dosa*	7.40±0.27	7.50±0.22	7.50±0.31	7.20±0.25	7.20±0.33	**7.36±0.22**
HKR-48 *Dosa*	7.50±0.22	7.40±0.27	7.20±0.13	7.40±0.34	7.60±0.37	**7.42±0.22**
HKR-128 *Dosa*	7.10±0.23	7.10±0.18	7.30±0.21	7.00±0.15	6.90±0.18	**7.08±0.11**
CD(P<0.05)	**0.85**	**0.72**	**0.72**	**0.81**	**0.89**	**0.64**

Values are mean ± SE of three independent determinations

Table.2 Sensory evaluation of *Idli* prepared from different rice varieties

Variety	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control *Idli*	8.10±0.18	8.10±0.18	7.60±0.22	7.10±0.31	7.50±0.22	**7.68±0.16**
HB-2 *Idli*	7.20±0.25	7.50±0.31	7.10±0.31	7.10±0.31	7.30±0.37	**7.27±0.27**
HKR-48 *Idli*	7.60±0.16	7.60±0.16	7.20±0.29	7.10±0.31	7.20±0.33	**7.34±0.23**
HKR-128 *Idli*	6.80±0.25	6.80±0.25	6.70±0.26	6.30±0.33	6.50±0.43	**6.62±0.26**
CD(P≤0.05)	**0.61**	**0.66**	**0.78**	**0.91**	**0.98**	**0.67**

Values are mean ± SE of three independent determinations

Table.3 Sensory evaluation of *Utthapam* prepared from different rice varieties

Variety	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control *Utthappam*	8.10±0.18	8.10±0.18	7.60±0.22	7.10±0.31	7.50±0.22	**7.68±0.16**
HB-2 *Utthappam*	7.20±0.25	7.50±0.31	7.10±0.31	7.10±0.31	7.30±0.37	**7.27±0.27**
HKR-48 *Uthappam*	7.60±0.16	7.60±0.16	7.20±0.29	7.10±0.31	7.20±0.33	**7.34±0.23**
HKR-128 *Utthappam*	6.80±0.25	6.80±0.25	6.70±0.26	6.30±0.33	6.50±0.43	**6.62±0.26**
CD(P≤0.05)	**0.61**	**0.66**	**0.78**	**0.91**	**0.98**	**0.67**

Values are mean ± SE of three independent determinations

Table.4 Sensory evaluation of *Khichadi* prepared from different rice varieties

Variety	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
Control *Khichadi*	7.80±0.25	8.00±0.21	7.40±0.22	7.70±0.37	7.60±0.27	**7.70±0.22**
HB-2 *Khichadi*	7.50±0.22	7.10±0.18	7.40±0.22	7.40±0.22	7.40±0.22	**7.36±0.14**
HKR-48 *Khichadi*	7.70±0.26	7.70±0.30	7.50±0.22	7.30±0.15	7.30±0.21	**7.50±0.20**
HKR-128 *Khichadi*	7.60±0.22	7.30±0.21	7.40±0.22	7.20±0.29	7.50±0.27	**7.40±0.16**
CD(P≤0.05)	**0.68**	**0.66**	**0.63**	**0.77**	**0.69**	**0.51**

Values are mean ± SE of three independent determinations

Table.5 Sensory evaluation of *Rice Biryani* prepared from different rice varieties

Variety	Colour	Appearance	Aroma	Texture	Taste	Overall Acceptability
Control *Biryani*	8.00±0.15	7.80±0.25	7.70±0.21	7.50±0.27	7.50±0.27	**7.70±0.22**
HB-2 *Biryani*	7.30±0.21	7.20±0.25	7.40±0.37	7.20±0.25	7.20±0.29	**7.26±0.25**
HKR-48 *Biryani*	7.30±0.26	7.20±0.25	7.50±0.17	7.10±0.18	7.30±0.30	**7.28±0.19**
HKR-128 *Biryani*	7.20±0.20	7.20±0.25	7.10±0.23	7.00±0.20	7.20±0.20	**7.14±0.18**
CD(P≤0.05)	**0.60**	**0.68**	**0.73**	**0.69**	**0.76**	**0.60**

Values are mean ± SE of three independent determinations

Table.6 Proximate composition of food products from rice varieties (g/100g, on dry weight basis)

Products	°Moisture	Crude protein	Crude fat	Ash	Crude fibre
DOSA					
Control *Dosa*	35.52±0.15	3.44±0.03	2.48±0.25	2.12±0.37	**0.21±0.01**
HKR-48 *Dosa*	35.19±0.07	3.45±0.01	3.74±0.55	2.66±0.16	**0.63±0.12**
[tcal]	**NS**	**NS**	**NS**	**NS**	**NS**
IDLI					
Control *Idli*	73.27±0.59	3.56±0.06	0.36±0.06	1.99±0.12	**0.36±0.01**
HKR-48 *Idli*	73.22±0.47	3.78±0.06	0.43±0.10	1.52±0.17	**0.48±0.01**
[tcal]	**NS**	**NS**	**NS**	**NS**	**7.46□ □**
UTTHAPAM					
Control *Utthapam*	36.52±0.17	3.84±0.07	3.71±0.05	4.95±0.87	**0.45±0.03**
HKR-48 *Utthapam*	36.08±0.02	4.49±0.9	3.41±0.68	3.66±0.08	**0.57±0.08**
[tcal]	**NS**	**5.44□ □**	**NS**	**NS**	**3.81□**
KHICHADI					
Control *Khichadi*	80.49±0.11	5.22±0.11	1.05±0.28	6.04±0.08	**2.22±0.03**
HKR-48 *Khichadi*	80.02±0.01	6.29±0.12	1.54±0.54	5.12±0.04	**2.32±0.07**
[tcal]	**4.04□**	**6.13□ □**	**NS**	**9.47□ □**	**NS**
BIRYANI					
Control *Biryani*	69.27±0.02	13.58±0.09	14.88±0.30	3.51±0.37	**1.60±0.01**
HKR-48 *Biryani*	69.06±0.02	15.83±0.31	13.66±0.41	3.71±0.37	**1.86±0.01**
[tcal]	**6.15□**	**5.30□**	**NS**	**NS**	**22.63□ □**

Note: Values are mean ± SE of three independent determinations
*Significant difference at 5% level
**Significant difference at 1% level NS- Non significant
- Moisture content on fresh weight basis (g/100g)

**Plate.1** Batter preparation for *dosa, idli* and *utthapam*
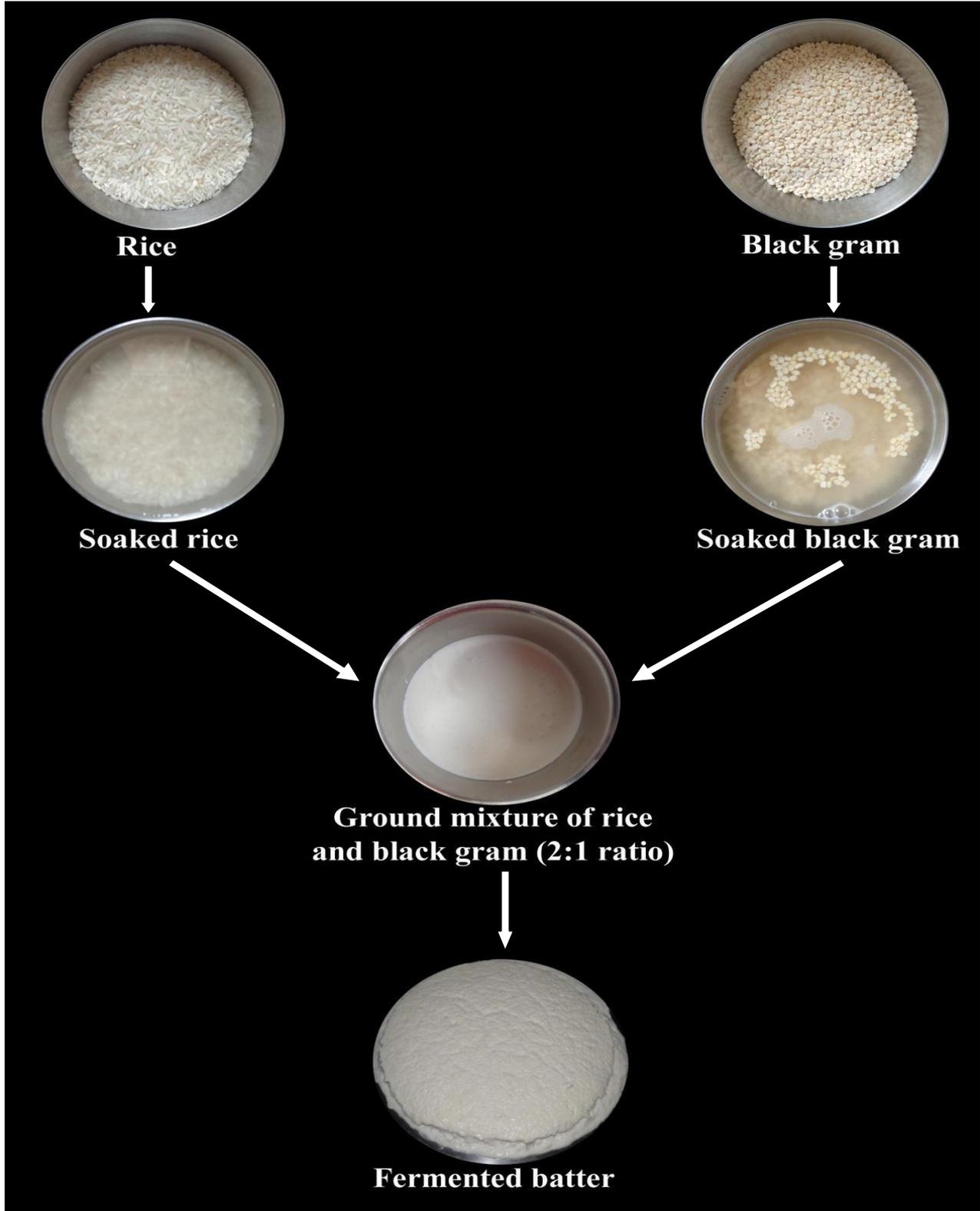
Plate 2. Dosa

Plate 3. Idli

Plate 4. Utthapam
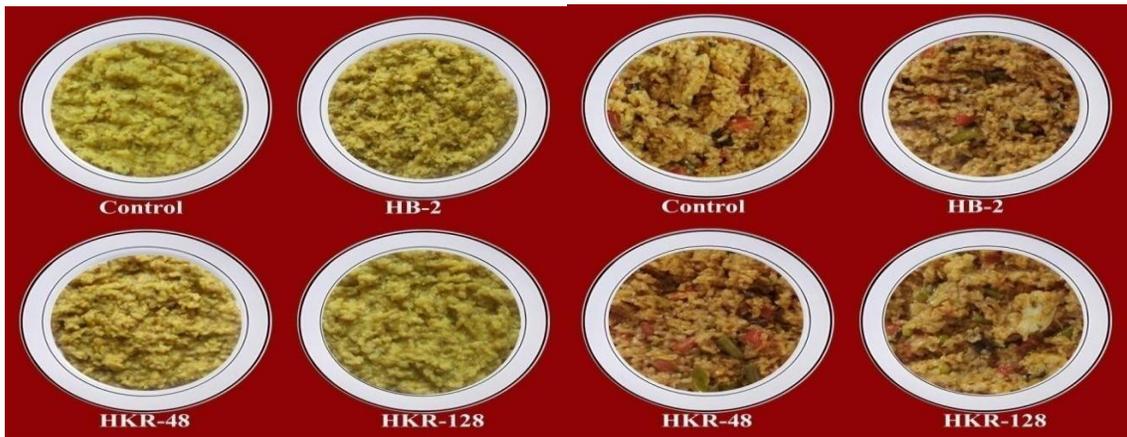
Plate 5. Khichadi

Plate 6. Biryani

Fig. 1: Organoleptic acceptability of rice based food products
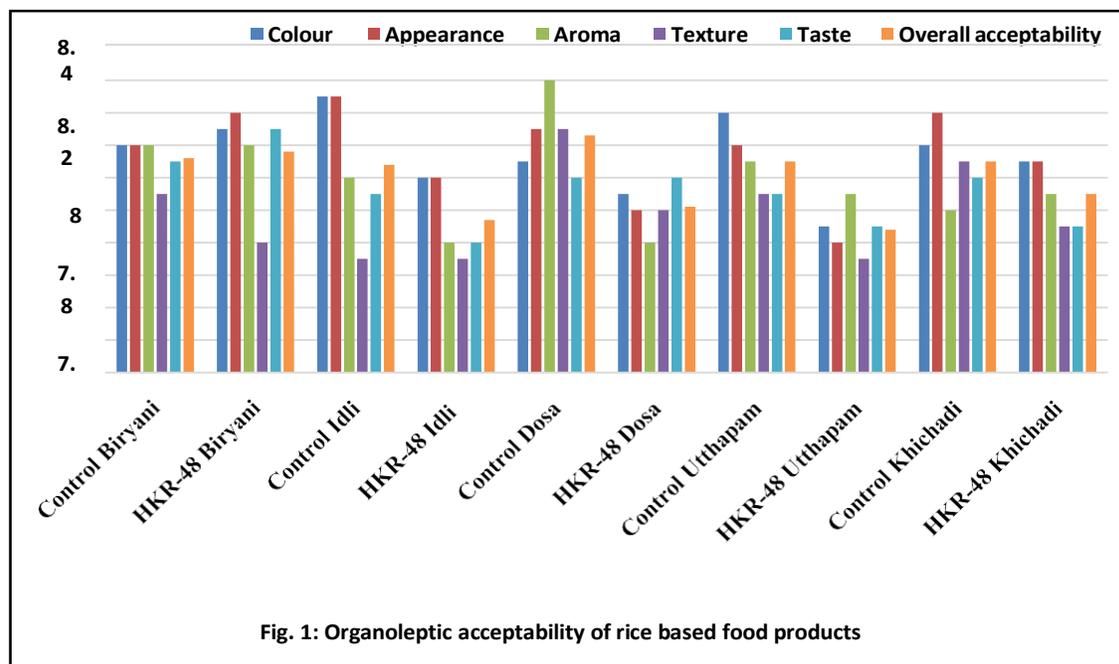
The figure 1 shows the comparison of sensory evaluation of food products prepared from permal (control variety) and HKR-48 rice variety. The organoleptic evaluation of various food products namely *dosa, idli, utthapam*, *khichadi* and *rice biryani* from control rice variety (Permal) and HKR-48 variety were liked moderately. A non-significant difference were observed in terms of overall acceptability of food products prepared from both varieties by panel of judges whereas the control counterparts of *dosa* (aroma), *idli* (colour and appearance), *utthapam* (colour), *khichadi* (appearance) were "liked very much". Significant (P<0.05) differences were observed in aroma of control and HKR-48 *dosa* (P<0.01), colour and appearance of control and HKR-48 *idli,* and in colour of control and HKR-48 *utthapam* (P<0.05).

Nutritional composition

Proximate composition

The results of proximate composition are furnished in table 6.

Moisture

The moisture content of HKR-48 *khichadi* (80.02 g/100g) and *biryani* (69.06 g/100g) was significantly (P<0.05) lower as compared to their control.

A non-significant difference in moisture content was observed between *dosa, idli* and *utthapam* prepared from control and HKR-48 rice varieties. The findings of the present study are comparable with those reported earlier in *dosa* and *utthapam* by Amreen (2008) and Beniwal and Jood (2015). The results of *Idli* are in line with those reported earlier by Teniola and Odunfa, (2001); Blandino *et al.,* (2003) and Moktan *et al.,* (2011).

A non-significant difference was observed in the moisture content of both control and HKR-48 *utthapam.* The moisture content of control *utthapam* and HKR-48 *utthapam* were 36.52 and 36.08 g/100g, respectively. The findings of *utthapam* are in line for moisture content of *utthapam* reported earlier by Amreen (2008).

Crude protein

The crude protein content of control *dosa* was 3.44 g/100g. The crude protein content of HKR-48 *dosa* was 3.45 g/100g. A non-significant difference was observed in crude protein content of both *dosa*. The results obtained from the present investigation are lesser than range reported for protein in *dosa* and *utthapam* earlier by krishnamoorthy *et al.,* 2013, Amreen (2008) and Beniwal and Jood (2015). The crude protein content of control *idli* was 3.56 g/100g. The crude protein content of HKR-48 *biryani* was 3.78 g/100g. A non-significant difference was observed in crude protein content of both *idli*. The findings of the present study are in line with those reported earlier by Teniola and Odunfa, (2001); Blandino *et al.,* (2003) and Moktan *et al.,* (2011).

The crude protein content of control *utthapam* was 3.84 g/100g. The crude protein content of HKR-48 *utthapam* was 4.49 g/100g. A significant difference was observed in crude protein content of both *utthapam.* The findings of the present study are closely agreement with results reported earlier by Ray and Swain (2013). The data revealed that the crude protein content of control *khichadi* was 5.22 g/100g. The crude protein content of HKR-48 *khichadi* was 6.29 g/100g.

A significant difference was observed in crude protein content of both *khichadi*. Rahangadale *et al.,* (2014) reported the protein content of *khichadi* was 6.73 %. The findings of the present study are in line for crude protein content of *khichadi* reported earlier by Rahangadale *et al.,* (2014) and Sethi (2003). The data revealed that the crude protein content of control *biryani* was 13.58 g/100g. The crude protein content of HKR-48 *biryani* was 15.83 g/100g. A significant difference was observed in crude protein content of both *biryani*.

Crude fat

A non-significant difference in fat content was observed between various food products prepared from control and HKR-48 rice varieties. A non-significant difference was observed in the crude fat content of both control and HKR-48 *dosa*. The results obtained for *dosa* investigation are lesser than range reported earlier by krishnamoorthy *et al.,* (2013) and Beniwal and Jood (2015). The findings of the *utthapam* are agreement with results reported earlier by Ray and Swain (2013). The findings of the present study are more or less close to results reported earlier by Rahangadale *et al.,* (2014) and Joshi and Srivastava (2016).

Ash

Similarly, A non-significant difference in ash content was observed between *dosa*, *idli, utthapam* and *rice biryani* prepared from control and HKR-48 rice varieties while HKR-48 *khichadi* (5.12g/100g) had significantly (P<0.01) lower ash content compared to control *khichadi* (6.04 g/100g). The findings of the present study are comparable with those reported earlier in *dosa* and *utthapam* by Amreen (2008), Asha *et al.,* (2005) and Beniwal and Jood (2015).

Crude fibre

The crude fibre content of HKR-48 *idli* (0.48 g/100g) and HKR-48 *biryani* (1.86 g/100g) was significantly (P<0.01) higher as compared to their control. A non-significant difference in crude fibre content was observed between *dosa* and *khichadi* prepared from control and HKR- 48 rice varieties, whereas HKR-48 *utthapam* (0.57 g/100g) had significantly (P<0.05) higher crude fibre content compared to control *utthapam* (0.45 g/100g). The crude fibre content of HKR-48 *biryani* (15.83 g/100g), *utthapam* (4.49

g/100g) and *khichadi* (6.29 g/100g) had significantly higher values compared to their control. The findings of the present study are in line with those reported earlier in *Dosa* and *Utthapam* by Amreen (2008) and Beniwal and Jood (2015). The findings of the present study are in line with those reported earlier for crude fibre content in *idli* by Deshmukh and Pawar (2016) and Kumari *et al.,* (2016). The findings of *kichadi* was more or less close to results reported earlier by Rahangadale *et al.,* (2014), Joshi and Srivastava (2016) and Sethi (2003). The findings of the present study for proximate composition of *biryani* was found to be higher as compared to results reported earlier by Verma *et al.,* (2015) and Umachandran *et al.,* (2018).

Nutritional composition of rice varieties revealed that this product contains good amount of protein. All the food products from HKR-48 rice variety were organoleptically acceptable as compared to other varieties. In addition, results suggest that by selecting specific varieties of rice it would be possible to improve the performance of rice to prepare traditional food products, and presumably sensory evaluation could also be a good tool to obtain new promising varieties for traditional food preparation.

Acknowledgment

References

Ambreen, A., 2008. Effect of oat based breakfast products on glycaemic response in NIDDM subjects. M.sc thesis. Department of foods and nutrition, Post Graduate and Research Centre, College of Home Science, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad-500 030.

AOAC, 2000. Official methods of Analysis, Association of Official Analytical Chemist. Washington, D.C.

Asha, V.B., Geetha, K., Sheela, K. and Dhanapal, G.N., 2005. Nutritional composition of sorghum and moth bean incorporated traditional recipes. J. Human Ecol. 17(3): 201-203.

Beniwal, P. and Jood, S., 2015. Development, chemical composition and Antioxidantn activity of *dosa* prepared using Bengal gram seed coat. International journal of advanced nutritional and health sciences. 3: 109-115.

Blandino, A., Al-Aseeri, M.E., Pandiella, S.S., Cantero, D. and Webb, C., 2003. Cereal-based fermented foods and beverages. Food Res Int. 36(6): 527–543.

Coda, R., Rizzello, C.G., Trani, A. and Gobbetti, M., 2011. Manufacture and characterization of functional emmer beverages fermented by selected lactic acid bacteria. Food Microbiol. 28: 526–536.

Deshmukh, G.P. and Pawar, P.P., 2016. Optimization of formulation and development of carrot fortified *Idli* and its physic-chemical characterization. International Journal of engineering science and research technology. 5(8): 783-786

Hotz, C. and Gibson R.S., 2007. Traditional food-processing and preparation practices to enhance the bioavailability

of micronutrients in plant-based diets. J.Nutr. 137(4): 1097-100.

Joshi, S. and Srivastava, S., 2016. Barnyard Millet as a Substitute of Rice in Preparation of khichadi for Diabetics. International Journal of Science and Research. 5: 1798-1802.

Krishnamoorthy, S., Kunjithapatham, S. and Manicham, L., 2013. Traditional Indian breakfast (*Idli* and *Dosa*) with enhanced nutritional content using millets. Nutrition and Dietetics. 70(3).

Kumari, A., Prajapati, J., Angmo, K. and Taweechotipatr, M., 2016. Traditional fermented foods. Composition and nutritive value. Indigenous fermented foods of southeast Asia. Editors Taylor and Francis group. LIC. p 227-257

Moktan, B., Roy, a. and Sarkar, P.K., 2011. Antioxidant activities of cereal-legume mixed batters as influenced by process parameters during preparation of *dhokla* and *idli*, traditional steamed pancakes. Int J Food Sci Nutr. 62: 360-369.

Panse, Y.G. and Sukhatme, P.U., 1961. Statistical methods of agricultural workers. 2nd Edn. Indian Council of Agricultural Research, New Delhi. pp. 12-87.

Rahangadale, H.K., Khan, M.A., Rana, G.K. and Dubey, A.D., 2014. Process Standardization and Quality Evaluation of Millets Fortified *Khichdi* for Diabetic patient. Department of Food Technology, College of Agriculture, J.N.K.V.V., Jabalpur (M.P.)

Ray, R.C. and Swain, M.R., 2013. Indigenous fermented foods and beverages of Odisha, India: An overview. In: Joshi, V.K. editor. Indigenous fermented foods of South Asia. USA: CRC Press.

Sethi, S., 2003. Development and nutritional evaluation of geriatric convenience foods. Ph.D Thesis. CCS HAU, Hisar.

Teniola, O.D. and Odunfa, S.A. 2001. The effects of processing methods on the level of lysine and methionine and the general acceptability of ogi processed using starter cultures. Int. J. Food Microbiol. 63: 1-9.

Umachandran, K., Sawicka, B., Nair, N.A.N. and Pasqualone, A., 2018. Nutritional features of biryani as the basis for the formation of an entrepreneurial mode in *biryani* market. Journal of Advances in Agriculture. 8(1): 1268-1278.

Verma, S. Srivastava, S and Tiwar, N., 2015. Comparative study on nutritional and sensory quality of barnyard and foxtail millet food products with traditional rice products. J Food Sci Technol. 52(8): 5147-5155.