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Quality evaluation of Dehrori (Traditional product of Chhattisgarh) prepared by partial replacement of rice flour with corn flour

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Abstract

Dehrori is the traditional product of Chhattisgarh which is generally prepared by the batter of rice flour and curd. It is then left for overnight for fermentation and then deep fried in oil and coated with jaggery syrup. In this work, rice flour is partially replaced with the corn flour to increase its nutritional value and for taste enhancement. The formulation used under this work includes control which was prepared by 100% rice flour and with three experimental treatments which replaced rice flour with corn flour at the ratios of 50:50, 60:40 and 70:30. The effects of partial replacement were evaluated for chemical analysis (Carbohydrate, Protein, Fat, Ash, Moisture, Acidity and Crude fiber), microbial analysis (Standard plate count, Yeast and mold count and Coliform count) and sensory analysis on the basis of colour and appearance, body and texture, flavour and taste and overall acceptability which was evaluated by the selected panellist using 9-point hedonic scale. The replacement of rice flour with corn flour shows its influence in the product significantly ($p < 0.05\%$), showing enhancement in protein, fat and its sensory characteristics. According to the result obtained, the treatment formed by 60:40 was found to be most acceptable for replacement in Dehrori.

Keywords: Dehrori, partial replacement, traditional product, deep fried, fermented

Introduction

Traditional fermented foods are defined as foods produced by native people using their inherited knowledge and skilful technology from vicinity available plant or animal raw (Rawat *et al.*, 2018) [8]. Fermentation process in the foods leads to the enhancement of organoleptic characteristics, enrichment, health promoting traits such as proliferation of digestibility, breakdown of complex carbohydrates into simpler one, improves bioavailability essential amino acids, vitamins, and minerals (Sanlier *et al.*, 2017) [10].

In India each state is comment by their very own various conventional dishes and culinary. The state of Chhattisgarh which is arranged at Central East of India, which is also called "Rice Bowl of India" or "Dhan ka Katora". Every state has its very own pride of ethnic food likewise Chhattisgarh has additionally its very own pride for its customary social cooking styles.

Dehrori is one of the unique and popular traditional cuisine of Chhattisgarh. The origin of Dehrori is from Chhattisgarh yet it is dissipated in different states as well. It is a sweet delicacy and heavenly which is normally arranged during the festive period of Holi and Diwali. It is the sweet ball which is deep fried, covered with jaggery syrup. Dehrori is made with batter of rice flour (New rice which is freshly harvested in the month of November) and curd which is left over night for aging and after that it is deep fried and covered with jaggery syrup. In certain spots of Chhattisgarh it is soaked in sugar syrup also. The flavor of Dehrori is sweet and marginally tartish and its surface is to some degree hard and granular because of the rice flour.

With intend to value addition people are trying for replacement of flour in the food products. Different research workers attempted to make partial replacement with corn flour in their respective food products such as Wheat flour was partially replaced with pumpkin seeds flour in cupcakes filled with carob (Batista *et al.*, 2018) [3]. Wheat flour was partially replaced with whey and soy proteins to analyse the effect of rheological properties on dough and cookie making quality (Tang & Liu, 2017) [13]. Wheat flour was partially replaced with Cassava flour in bread (Eleazu *et al.*, 2014) [6].

Corn Flour (*Zea mays* L.) is one of the most important crop in the world which is rich in nutritional properties like, carbohydrate (71.88 g), protein (8.84 g), fat (4.57 g), fiber (2.15 g),

ash (2.33 g), phosphorus (348 mg), sodium (15.9 mg), riboflavin (0.10 mg), sulphur (114 mg), amino acids (1.78 mg), minerals (1.5 g), calcium (10 mg), Iron (2.3 mg), potassium (286 mg), thiamine (0.42 mg), vitamin C (0.12 mg), magnesium (139 mg) (Shah *et al.*, 2016) [11]. The presence of vitamins A, C, and K together with beta-carotene and selenium helps to improve the functioning of thyroid gland and immune system. Potassium is a major nutrient present in maize which has diuretic properties. It also has a potential to improve blood pressure, support liver functioning, and produce bile (Kumar *et al.*, 2013) [7].

Earlier studies have been conducted for using corn flour as a substitute for nutritional enhancement such as, rice flour was partially replaced with corn flour for manufacturing of banana bread (Tiwari & Shukla, 2015) [14] which showed improvement in physico-chemical properties of the product. Wheat flour is partially replaced with corn flour for bread

manufacturing (Begum *et al.*, 2013) [4] which resulted in increase in nutritional value with acceptable physical and sensory attributes.

The basic aim of this study was to evaluate its nutritional composition of Dehrori with its value addition by partial replacement of rice flour with corn flour as no attempts were made earlier to explore the nutritional value of this product therefore, attempt had been done for "Quality evaluation of Dehrori (Traditional product of Chhattisgarh) prepared by partial replacement of rice flour with corn flour".

Materials and Method

The experiment was conducted in the laboratory of Dairy Technology in Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh.

Treatment combinations

Treatments	Rice Flour (%)	Corn Flour (%)
T ₀	100	0
T ₁	50	50
T ₂	60	40
T ₃	70	30

*Curd used was 33% of total flour in all the treatments.

*Sodium bicarbonate was used at the rate of 0.2% by weight of batter

*Jaggery was used to make jaggery syrup of 65° Brix

* Refined oil was used for frying

Method of Dehrori preparation

Dehrori was prepared by mixing the appropriate ratios of rice flour and curd was added to make batter and left it for overnight fermentation. After 8 hrs of fermentation sodium bicarbonate was added at the rate of 0.2% of total flour for softening the texture of Dehrori. Small balls were made out of the fermented batter which was deep fried till golden brown. Jaggery syrup was prepared by heating the solid jaggery at 105 to 108 °C with water till the 65° Brix consistency of the jaggery syrup was achieved. The fried dumplings were added to the jaggery syrup and mixed it well for proper coating.

Treatment combination

- T₀ - Control Dehrori prepared by using rice flour (100:0)
- T₁ - Dehrori prepared by partial replacement of rice flour from corn flour (50:50)
- T₂ - Dehrori prepared by partial replacement of rice flour from corn flour (60:40)
- T₃ - Dehrori prepared by partial replacement of rice flour from corn flour (70:30)

Chemical analysis

Dehrori was homogenised by mortar and pestle and this homogenised Dehrori was used for further chemical analysis. The carbohydrate of Dehrori was estimated by using calculation method by AOAC (2005) [1], protein was estimated by using Kjeldahl method (AOAC, 1995) [1], fat

was estimated by Soxhlet method (1998) [2], ash content was estimated by procedure described in (Rangana, 1986) [9], moisture content was estimated by gravimetric method (IS: SP: 18 Part XI, 1981), acidity in terms of percentage lactic acid was estimated by titration method (IS: SP: 18 Part XI, 1981) and crude fiber was estimated by using AOAC method (1975).

Microbial analysis

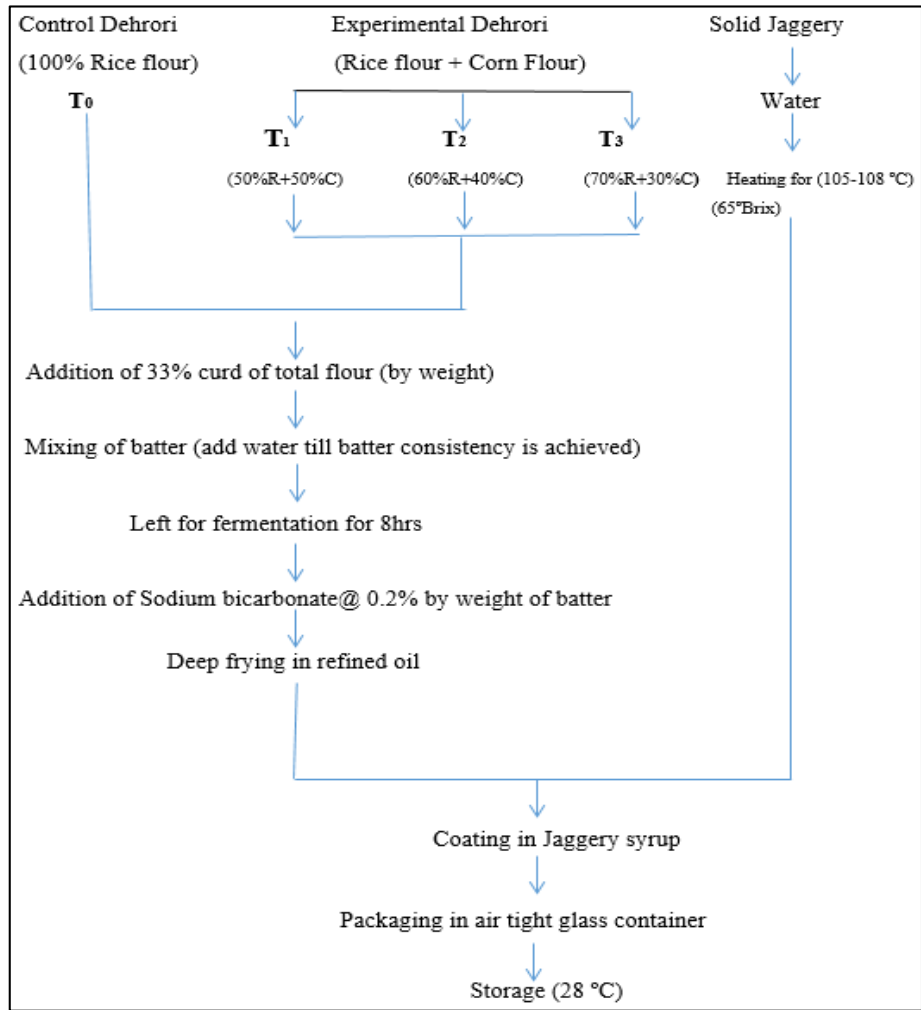
The different treatments of Dehrori was analysed for microbial analysis such as Standard plate count, Yeast and mold count and Coliform count using standard procedure as described in manual of Dairy Bacteriology ICAR (1972).

Sensory evaluation

The Dehrori sample was served at ambient temperature to the selected panelist. They were asked to carefully examine the following attributes of the Dehrori samples and award scores on a 9- point Hedonic scale as per their level of liking for: colour, appearance, flavour and taste, body, texture and overall acceptance (Amerine *et al.*, 1965) [2].

Statistical analysis

During the course of investigation the data obtained were statistically analysed by using Analysis of Variance (ANOVA) and Critical Difference (CD) in WASP software.



Flow-diagram for preparation of Dehrori prepared by partial replacement of rice flour from corn flour

Results and Discussion

Chemical analysis of Dehrori

The compositional attributes of Dehrori such as carbohydrate, protein, fat, ash, moisture, acidity and crude fibre were statistically significant ($p < 0.05$) as shown in table 1.

The average percentage (on wet bases) of five trials carried out for carbohydrate, protein, fat, ash, moisture, acidity (% L.A), and crude fiber were shown in table 1. The carbohydrate percentage of Dehrori ranges from 56.89 to 52.28 per cent. The highest per cent of carbohydrate was found in control Dehrori (T_0). The protein percentage ranges

from 5.61 to 6.57 per cent. The highest protein content was found in treatment T_1 due to addition of corn flour. The fat per cent was found to be in range of 14.58 to 13.66 in which highest fat content was found to be in treatment T_1 . The ash ranges from 1.07 to 0.50 per cent. Moisture percentage found to be in the range of 25.49 to 23.33, treatment T_1 shows highest per cent of moisture. The acidity of Dehrori in terms of per cent lactic acid was found to be in the range of 0.96 to 0.81 in which control sample of Dehrori was found to be highest in acidity. The crude fiber increased from 1.37 to 1.76, treatment T_1 showed highest crude fiber content.

Table 1: Chemical evaluation of Dehrori on wet bases (Mean)

Parameters	Treatments				C.D.at 5%	Result
	$T_0(100:0)$	$T_1(50:50)$	$T_2(60:40)$	$T_3(70:30)$		
Carbohydrate	56.89	52.28	53.63	54.49	0.43	Significant
Protein	5.61	6.57	6.37	6.18	0.15	Significant
Fat	13.66	14.58	14.10	13.97	0.28	Significant
Ash	0.50	1.07	0.95	0.83	0.05	Significant
Moisture	23.33	25.49	24.93	24.51	0.23	Significant
Acidity	0.96	0.81	0.90	0.93	0.02	Significant
Crude fiber	1.37	1.76	1.60	1.52	0.06	Significant

*Average of five trials

Microbial analysis of Dehrori

The Standard plate count (SPC), Yeast and mold count and Coliform count was of different treatments were shown in table 2. The standard plate count ($\times 10^3/g$) ranges from 13.42 to 14.48 in which treatment T_1 showed highest SPC count i.e.

14.48. The yeast and mold count was found highest in treatment T_1 i.e. 3.8. The Coliform count was found to be absent in all the treatments, therefore the product was found to be safe for consumption.

Table 2: Microbiological count of Dehrori (Mean)*

Parameters	Treatments				C.D at 5%	Result
	T ₀ (100:0)	T ₁ (50:50)	T ₂ (60:40)	T ₃ (70:30)		
SPC($\times 10^3$ /g)	13.42	14.48	14.02	13.84	1.53	Non-significant
Yeast and mold (cfu/g)	3	3.8	3	3	0.85	Non-significant
Coliform	Nil	Nil	Nil	Nil	-	-

* Average of five trials

Sensory evaluation of Dehrori

The score for colour and appearance, body and texture, flavour and taste and overall acceptability was shown in table 3. The colour and appearance of Dehrori was found to be non-significant and the highest score was obtained for treatment T₁

and T₂ which was same i.e. 8. The body and texture in treatment T₂ obtained highest score i.e. 8.14. The flavour and taste score of Dehrori found to be highest in treatment T₂. The overall acceptability score ranges from T₂>T₃>T₀>T₁ i.e. 8.11>7.98>7.61>7.49.

Table 3: Sensory evaluation score of Dehrori (Mean)*

Parameters	Treatments				C.D at 5%	Result
	T ₀ (100:0)	T ₁ (50:50)	T ₂ (60:40)	T ₃ (70:30)		
Colour & Appearance	7.8	8	8	7.9	0.22	Non-significant
Body & Texture	7.51	7.7	8.14	7.9	0.21	Significant
Flavour & Taste	7.59	7.32	8.36	8.23	0.28	Significant
Overall acceptability	7.61	7.49	8.11	7.98	0.08	Significant

*Average of five trials

Conclusion

The work on, "Process Optimization of Dehrori (Traditional product of Chhattisgarh) prepared by partial replacement of Rice flour with Corn flour" has been successfully performed. It was concluded that the Dehrori with, 60% rice flour and 40% corn flour (T₂) treatment was found to be the most acceptable as per sensory attributes. Dehrori made with 50% rice flour and 50% corn flour (T₁) showed comparatively higher percentage of chemical constituents like protein and fat. The microbial attributes were found satisfactory for all the treatments. Therefore, Corn flour can be a substitute for Dehrori for better taste and nutritional enhancement. Further studies can be done to increase its shelf life and make it commercially available.

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