



Nutritional and Organoleptic Properties of Oat Milk Dessert Enriched with Paneer and Standardized Milk

Akanksha Yadav, Ramesh Chandra¹, Luxita Sharma²

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ABSTRACT

Background: Dessert with good nutritional value could play an important role in the physical and mental growth and development of infants, children and teenagers as well as great tasty food choice of adult and ageing. The aim of the present study was to evaluate the nutritional and organoleptic quality of oat milk dessert. Nine types of dessert prepared from an admixture of oat milk and standardized milk having different ratio of 1:1, 1:2 and 1:3 indicate as TO₁, TO₂ and TO₃, respectively and three different levels of paneer i.e. 5% 10% and 15% indicated as P₁, P₂ and P₃ respectively were compared to each other.

Methods: The study was executed in the Research Laboratory of Warner School of Food and Dairy Technology, SHUATS during 2012 - 2013. Dessert prepared from standardized milk with addition of 10 percent paneer which served as T₀P₂ (control). The experiment was replicated three times and the data was statistically analyzed by using analysis of variance ANOVA and critical difference (C.D) techniques. Dessert were determined according to the AOAC methods and their organoleptic acceptability by using 9 point Hedonic Scale.

Result: Nutritional content of oat milk dessert experimental sample (TO₃P₃) showed that protein (9.23%), carbohydrate (28.55%), ash (2.13%) and fat (12.96%). Oat milk dessert gained acceptability in terms of sensory attributes hence was concluded to be a potential nutritious dessert for all vulnerable age group as nutrient-dense food.

Key words: Dessert, Oat milk, Organoleptic properties, Paneer, Standardized milk.

INTRODUCTION

With increase in health awareness among the population and oats being prescribed by healthcare professionals like physicians and nutritionists, as an adjunct therapy for various chronic degenerative diseases, the popularity of oats is on rise. Demand of oat-based product has been increased due to increased knowledge about the many nutritional benefits of oats. Thus promoting its use in functional food products based on oat such as oatmeal, granola bars, oat flour, oat milk ice cream, oat bread, biscuits and cookies, oat milk, oat paneer, oat based probiotic drink, oat based breakfast cereals, flakes and infant food. Oats are good source carbohydrates and quality protein with contribution good amino acid balance, vitamins, minerals unsaturated fatty acid and phyto-chemicals (Head *et al.*, 2010). Oats are also rich source of antioxidant compound such as tocopherols, flavonoids and phenolic compounds that may be contributing factors to potential health benefits of the consumers. Oats have been widely shown to provide a vast range of human health benefits such as manage the level of fasting blood sugar and also controlled the weight gain in patients with Gestational Diabetes Mellitus (GDM) (Shahzeidi *et al.*, 2019).

Oat milk is a recommended dairy milk substitute for individuals who suffer from Irritable Bowel Syndrome (IBS) and Inflammatory Bowel Disease (IBD) (Olendzki *et al.*, 2014). The Beta-glucan content present in oat milk was responsible for the decreased plasma cholesterol and LDL cholesterol concentrations, but the effect could also be due to a replacement of saturated fat in the customary diet by unsaturated fat. Therefore, oat milk can be used as an

Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Shree Guru Gobind Singh Tricentenary University, Gurgaon-122 505, Haryana, India.

¹Warner School of Food and Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Formerly Allahabad Agricultural Institute, Allahabad, Prayagraj-211 007, Uttar Pradesh, India.

²Department of Dietetics and Applied Nutrition, Amity Medical School Amity University, Gurgaon-122 505, Haryana, India.

Corresponding Author: Akanksha Yadav, Department of Nutrition and Dietetics, Faculty of Allied Health Sciences, Shree Guru Gobind Singh Tricentenary University, Gurgaon-122 505, Haryana, India. Email: akankshayadav5@gmail.com

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alternative to other milk drinks by consumers who would benefit from reduced the risk of non communicable diseases. Paneer is a fairly high source of protein and available at a comparatively lower cost and also forms an important source for vegetarians. Over and above its high protein content and digestibility, the biological value of protein in paneer is in the range of 80 to 86 (Khan and Pal, 2011).

Milk and dairy products are rich in nutrients like calcium and vitamin D that are required for building strong bones in childhood and for their maintenance during adulthood with the aim to reduce osteoporosis and bone fractures in older

age. Whereas low-fat, calcium-rich dairy products are associated with a lower risk of blood pressure.

Desserts are well known in many cultures of the society as sweet courses that typically come at the end of a meal. They usually comprise of sweet and creamy food and, consequently, high in sugar and saturated fat content (Alija and Talents, 2012). However, as long as changing dietary patterns and sedentary lifestyles have led to an increase in worldwide obesity, as a result, people have come to expect something healthy from their diet in recent decades (Seuss-Baum, 2007). Thus, largely influenced by health-related concerns, there has been advised on the food industry to reduce the amount of saturated and trans fat, sugar, salt and certain additives in the diet (Alija and Talents, 2012; Nikzade *et al.*, 2012).

The product innovation of oat milk admixture with standardized milk and paneer based, in the form of healthy products, is essential with the aim of producing nutritious dessert. This product then can be used to overcome the problem of nutrition-health, especially for non-communicable diseases. Besides containing calories, nutritious dessert has protein, carbohydrate, total solids, antioxidants, vitamins and minerals, which are important for the human body. However, the development of healthy products from oat milk and paneer, in the form of dessert, is less studied.

Aim of the study

The aim of the present study was to develop a suitable methodology for the preparation of a dessert and to determine its organoleptic properties with the nutritional composition.

MATERIALS AND METHODS

Locale of the study

The study was executed in the Research Laboratory of Warner School of Food and Dairy Technology, SHUATS, Allahabad, UP. Whole milk was procured from the Student's Training Dairy, SHUATS, Allahabad for each replication and other ingredients (Paneer, Sugar and Cardamom), packaging materials were also purchased from the local market of Allahabad and oat was purchased from IARI, Pusa, New Delhi. The different treatment combinations used in the experiment have been listed in Table 1. The total numbers of trials were 30 in this study.

Method of preparation of oat milk

Oat milk was prepared according to the enzymatic method. About 1 kg of rolled oats was ground into a laboratory food processor to produce finely granulated oat flour and then mixed with 2.7 kg of water. Calcium chloride at a concentration of 0.04% (w/w) was added as a catalyst for the enzyme. Oat groat slurry was treated with α -amylase (77.78 mg/kg of rolled oats) for liquefaction for 49 min at 75EC. The liquefied Oat solids were then filtered through a muslin cloth to get the oat milk. At the end of the treatment, the enzyme was inactivated by heating at 100EC for 5 min.

Table 1: Details of control and experiment treatment combinations of dessert.

Treatments	Standardized milk	Oat milk and standardized milk	Paneer
T ₀ P ₂	100%	-	10%
TO ₁ P ₁	-	1:1	5%
TO ₁ P ₂	-	1:1	10%
TO ₁ P ₃	-	1:1	15%
TO ₂ P ₁	-	1:2	5%
TO ₂ P ₂	-	1:2	10%
TO ₂ P ₃	-	1:2	15%
TO ₃ P ₁	-	1:3	5%
TO ₃ P ₂	-	1:3	10%
TO ₃ P ₃	-	1:3	15%

Sample code - T₀P₂ - Served as Control (Admixture of standardized milk and paneer) while TO₁P₁, TO₁P₂, TO₁P₃, TO₂P₁, TO₂P₂, TO₂P₃, TO₃P₁, TO₃P₂ and TO₃P₃ - Served as experiment (Addition of paneer at different levels with oat and standardized milk at different ratios as given Table 1).

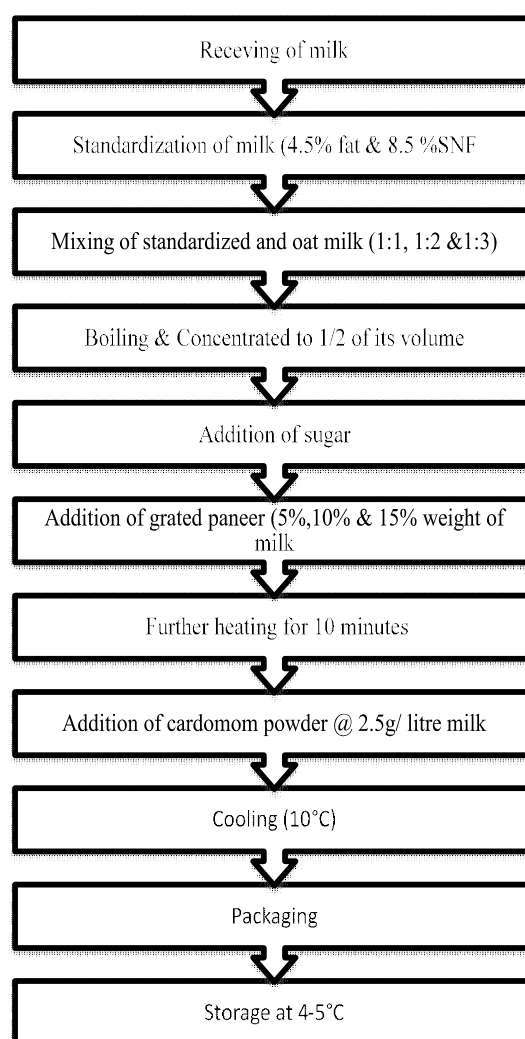


Fig 1: Flow diagram of preparation of oat milk dessert.

The total yield was (78%) estimated as the percentage of the filtrate obtained.

Preparation of oat milk dessert

Following procedure was used for the preparation oat milk dessert (Fig 1).

Nutritional analysis of oat milk dessert

Protein and fat were determined according to the procedure described in AOAC (2000). The moisture content of oat milk desserts was determined as per the procedure given in exercise 31 of the Manual in Dairy Chemistry, ICAR (1972). The total Carbohydrate was calculated by the difference method (FAO, 1998; AOAC, 2000). Ash content of oat milk dessert was determined according to the method described in AOAC IS2333: 1997 (1980). The total solid content in the dessert was determined according to the method described in IS: 1479, 1960 (ISI (1968)).

Organoleptic properties of dessert

The products developed were subjected to organoleptic evaluation by a panel of five judges. The evaluation of the product was carried out by using the 9-point Hedonic scale (Srilakshmi, 2007). Organoleptic evaluation of nutritious dessert was done for the color and appearance, consistency, flavor and taste as also for overall acceptability.

Statistical analysis

All the experiments were carried out in triplicate and represented as mean \pm standard deviation (SD). The data obtained for various parameters were analyzed statistically using Two-way Analysis of Variance (ANOVA) and Critical Difference (C.D.) techniques.

RESULTS AND DISCUSSION

Proximate composition

Nutrient analyses of different treatment combinations of samples are presented in (Table 2). It includes the analysis of the sample for moisture, total solids, carbohydrate, protein, fat and ash. The results obtained after the analysis of desserts and conclusions there from are as follows: -

Moisture percentage in oat milk dessert

The maximum amount of moisture content among the different treatment combinations of oat milk dessert was found in TO₁P₁ (54.73%) followed by TO₂P₁ (53.35%), TO₃P₁ (52.86%), TO₁P₂ (52.13%), TO₂P₂ (50.56%), TO₁P₃ (50.34%), TO₂P₂ (50.22%), TO₃P₂ (48.55%), TO₂P₃ (48.47%) and lowest amount of moisture was recorded in TO₃P₃ (47.13%) (Table 2). Statistical analyses revealed that the moisture content of the treatment combinations was significantly different from each other.

Fat percentage in oat milk dessert

The highest fat content was recorded in sample TOP₂ (13.43%) followed by TO₃P₃ (12.96%), TO₃P₂ (11.54%), TO₂P₃ (11.32%), TO₂P₂ (10.49%), TO₁P₃ (10.33%), TO₃P₁ (9.57%), TO₁P₂ (9.35%) and TO₂P₁ (8.60%), while the lowest

crude fat content was observed in TO₁P₁ (7.64%). Statistical analysis of the crude fat content revealed that the difference was observed to be significant in most of the treatment combinations. Oat milk can be used as a supplementation of the product as well as who would benefit from reduced LDL cholesterol values (Onning *et al.*, 1998).

Protein percentage in oat milk dessert

The highest protein content was found in TOP₂ (10.27%) followed by TO₃P₃ (9.23%), TO₃P₂ (8.48%), TO₂P₃ (8.36%), TO₃P₁ (7.41) %, TO₂P₂ (7.28%), TO₁P₃ (6.72%), TO₂P₁ (6.53%) and TO₁P₂ (6.14%), whereas least protein content was recorded in TO₁P₁ (5.45%). Statistical analysis proved that all treatment combinations of oat milk desserts were significantly different from one another.

Carbohydrate percentage in oat milk dessert

The highest carbohydrate content of oat milk dessert was noted to be 30.68% in TO₁P₃ followed by TO₁P₂ (30.52%), TO₁P₁ (30.41%), TO₂P₃ (29.85%), TO₂P₂ (29.71%), TO₂P₁ (29.63%), TO₃P₃ (28.55%), TO₃P₂ (28.45%) and TO₃P₁ (28.24%) while the lowest carbohydrate content was observed in TOP₂ (24.30). Statistical analysis indicated that the carbohydrate content differed significantly in most of the treatment combinations.

Total solids percentage in oat milk dessert

The maximum amount of total solids content among the different treatment combinations of oat milk dessert was found in TO₃P₃ (52.87%) followed by TO₂P₃ (51.53%), TO₃P₂ (50.45%), TOP₂ (49.78%), TO₁P₃ (49.66%), TO₂P₂ (49.44%), TO₁P₂ (47.87%), TO₃P₁ (47.14%), TO₂P₁ (46.65%) and lowest content of total solids was recorded in TO₁P₁ (45.27%). Statistical analyses revealed that total solids content of the treatment combinations were significantly different from each other.

Ash percentage in oat milk dessert

The ash content of the different treatment combinations of oat milk dessert ranged from 2.13 - 1.77%. The highest ash of 2.13 was recorded in TO₃P₃ followed by TO₂P₃ (2.00%), TO₃P₂ (1.98%), TO₂P₂ (1.96%), TO₁P₃ (1.93%), TO₃P₁ (1.92%), TO₂P₁ (1.89%), TO₁P₂ (1.86%), TOP₂ (1.78%) and lowest content of Ash was recorded in TO₁P₁ (1.77%). Statistical analyses found that the ash content of the treatment combinations was significantly different from each other.

Organoleptic properties of oat milk dessert

The organoleptic characteristics of oat milk dessert produced are presented in (Table 3). Desserts were evaluated for color and appearance, consistency, flavor and taste and overall acceptability. (Shivendra *et al.*, 2018) found that sensory evaluation of channa kheer had highly acceptable by consumers.

Color and appearance

The highest color and appearance score of 8.72 was recorded in TOP₂ and the lowest in TO₁P₁ (7.15). Due to different ratios of oat milk and standardized milk along with

Table 2: Nutritional composition of different treatment combinations of oat milk dessert.

Parameters	T ₀ P ₂ (Control)	Experimental treatment combination of samples										CD at 5%
		TO ₁ P ₁	TO ₁ P ₂	TO ₁ P ₃	TO ₂ P ₁	TO ₂ P ₂	TO ₂ P ₃	TO ₃ P ₁	TO ₃ P ₂	TO ₃ P ₃		
Moisture(%)	50.22 ±0.01	54.73±0.11	52.13±0.02	50.34±0.04	53.35±0.07	50.56±0.16	48.47±0.20	52.86±0.19	48.55±0.01	47.13±0.05		0.161*
Total solids(%)	49.78 ±0.06	45.27±0.02	47.87±0.01	49.66±0.13	46.65±0.05	49.44±0.18	51.53±0.11	47.14±0.27	50.45±0.01	52.87±0.15		0.525*
Fat(%)	13.43 ±0.18	7.64±0.23	9.35±0.15	10.33±0.04	8.60±0.21	10.49±0.09	11.32 ±0.07	9.57±0.03	11.54±0.32	12.96±0.14		0.283*
Total carbohydrate (%)	24.30±0.26	30.41±0.14	30.52 ±0.18	30.68 ±0.07	29.63±0.16	29.71±0.34	29.85±0.05	28.24±0.11	28.45±0.4	28.55±0.19		0.149*
Protein(%)	10.27±0.13	5.45±0.09	6.14±0.26	6.72±0.31	6.53 ±0.18	7.28±0.1	8.36±0.05	7.41±0.06	8.48±0.15	9.23 ±0.25		0.273*
Ash(%)	1.78±0.01	1.77±0.12	1.86±0.17	1.93±0.32	1.89±0.08	1.96±0.05	2.00±0.19	1.92±0.14	1.98±0.10	2.13±0.04		0.042*

*Values are presented Mean ± SD and the data obtained from all the parameter of different treatment combinations sample are significantly different (Pd<0.05).

Table 3: Organoleptic evaluation of different treatment combinations of oat milk dessert.

Parameters	T ₀ P ₂ (Control)	Experimental treatment combinations of sample										CD at 5%
		TO ₁ P ₁	TO ₁ P ₂	TO ₁ P ₃	TO ₂ P ₁	TO ₂ P ₂	TO ₂ P ₃	TO ₃ P ₁	TO ₃ P ₂	TO ₃ P ₃		
Color and appearance	8.72±0.01	7.15±0.11	7.23±0.02	7.37±0.04	7.56±0.07	7.44±0.16	7.50±0.20	8.44±0.19	8.29±0.01	8.17 ±0.05		0.361*
Consistency	8.62±0.06	6.92±0.02	7.11±0.01	7.19±0.13	7.32±0.05	7.48±0.18	7.54±0.11	8.38±0.27	8.54±0.01	8.00±0.15		0.121*
Flavor and Taste	8.61±0.18	7.14±0.23	7.28±0.15	7.47±0.04	7.39±0.21	7.57±0.09	7.66±0.07	8.59±0.03	8.38±0.32	7.82 ±0.14		0.115*
Overall acceptability	8.65±0.26	7.07±0.14	7.21±0.18	7.34±0.07	7.42±0.16	7.49±0.34	7.56±0.05	8.47±0.11	8.40±0.4	7.99±0.19		0.190*

*Values are presented Mean ± SD and the data obtained from organoleptic evaluation.

paneer level in different treatment combinations, it was observed that there was a significant difference in the most treatment combinations.

Consistency

Mean organoleptic mean score for the consistency of different treatment combinations of oat milk dessert ranged from 6.92-7.8.62. The maximum score of 8.62 was found in sample TOP₂ and a minimum score of 5.43 observed in sample TO₁P₁. The difference was observed to be significant in most of the treatment combinations.

Flavour and taste

Flavour and taste are important criteria for deciding the quality of the product, which in term determines its acceptability. The sensory score for the flavor and taste of oat milk dessert as affected by different ratios of oat and standardized milk and also different levels of paneer are presented in Table 1. It was observed that the average flavor and taste score was highest in TOP₂ (8.61) and lowest in TO₁P₁ (7.14). The difference was found to be significant in most of the treatments. (Bakshi *et al.*, 2019) found that the use of milk, bottle gourd and rice powder for milk-based dessert was acceptable in flavor and taste.

Overall acceptability

The highest overall acceptability score of 8.65 was found in TOP₂ as compared to other treatments. Lowest overall acceptability was seen for treatment TO₁P₁ (7.07) respectively. The difference was found to be significant in most of the treatment combinations. (Batawy *et al.*, 2019) found that oat milk could be used as good raw material as functional food.

CONCLUSION

From our study, it can be concluded that the addition of oat milk and paneer enhances the nutritional content and sensory properties of oat milk dessert. The nutritional value of the sample (TO₃P₃) was found to be rich in carbohydrate, total solids, ash but low in fat, protein and moisture content as compared to sample TOP₂ (control). Thus, oat milk dessert can be preferred as a healthy natural food product for all vulnerable age groups as well as under nutrition.

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Conflict of Interest

There is no conflict of interest among the authors.

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