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Suchita Bhosale
 Ph.D., Scholar, Department of
 Animal Husbandry and Dairy
 Science, Post Graduate Institute,
 M.P.K.V. Rahuri, Maharashtra,
 India

RJ Desale
 Associate Professor, Department
 of Animal Husbandry and Dairy
 Science, Post Graduate Institute,
 M.P.K.V. Rahuri, Maharashtra,
 India

Swati Shinde
 Senior Research Assistant,
 Department of Statistics, Post
 Graduate Institute, M.P.K.V.
 Rahuri, Maharashtra, India

Corresponding Author:
Suchita Bhosale
 Ph.D., Scholar, Department of
 Animal Husbandry and Dairy
 Science, Post Graduate Institute,
 M.P.K.V. Rahuri, Maharashtra,
 India

Studies on Preparation, sensory evaluation and cost configuration of minor millet *kheer* blended with paneer

Suchita Bhosale, RJ Desale and Swati Shinde

Abstract

The research work on effect of different combinations of finger millet flour on sensory quality of composite cow milk *kheer* was conducted during 2017-2020 in the Department of Animal Husbandry and Dairy Science, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The different concentrations of finger millet flour were and control (Rice *kheer*) T₀ (2.5%), T₁ (1% finger millet flour *kheer* blended with paneer), T₂ (1.5% finger millet flour *kheer* blended with paneer) and T₃ (2% finger millet flour *kheer* blended with paneer), 8 per cent constant rate sugar and 8 per cent constant proportion of paneer shreds were mixed for preparation of *kheer*. The different levels of finger millet flour had a definite effect on improving the sensory quality like body and texture, colour and appearance and flavour, also on total sensory score of *kheer*. The score regarding the quality minor millet *kheer* blended with paneer showed that the *kheer* prepared by utilizing 1.5% finger millet flour, 8 per cent sugar and 8 per cent paneer shreds had secured highest score (93.01) and ranked as most acceptable product by sensory panelist. Thus, it is inferred that a good quality *kheer* with utilizing finger millet flour and paneer shreds can be prepared by 1.5% finger millet flour + 8 per cent paneer shreds and 8 per cent sugar with cost of production 124.30 Rs./Kg.

Keywords: Composite cow milk, finger millet flour, paneer shreds, sensory evaluation, cost configuration

Introduction

India ranks first in milk production, accounting for 18.5% of world production, achieving annual output about 187.7 million tones during 2018-2019. (Anonymous, 2018). The per capita availability of milk in India has increased from 176 gram per day in 1990-91 to 394 grams per day by 2018-19.

Kheer is an Indian dessert prepared by the partial dehydration of whole milk in a karahi over a direct fire together with sugar and usually rice or occasionally semolina. (De *et al.*, 1976) [4]. *Kheer* has the status of royal treat. No feast is considered complete without *kheer*. Hindu mythology refers to *kheer* as the celestial nectar, "Amrit" and gives it a place of prominence among food as the secret of immortality – the life –giving food. The Hindu word *Kheer* is derived from the Sanskrit 'ksheer' for milk and 'kshirika' for any dish prepared with milk. *Kheer* is known by different names, in different parts of the country, such as '*kheer*' in North Western region, '*payasam*' in Southern region, '*payas*' in Eastern region, '*phirmi*' in Northern region, '*kheech*' in Mewar region and '*payesh*' in Bengal, (Aneja *et al.*, 2002) [1].

Paneer is an important heat and acid coagulated milk product which is used as a base material for the preparation of a large number of culinary dishes. Paneer provides an easy means of conserving and preserving valuable milk solids. Paneer represents one of the soft varieties of cheese family and is used in culinary dishes/snacks. About 5% of milk produced in India is converted into paneer (Chandan, 2007) [3]. It is used in several vegetable dishes like matar paneer, palak paneer, etc. The ability of paneer to be deep fried is one feature that has led to its wider acceptance and a favourite for making snacks, pakoras and fried paneer chunks. Due to the ever growing demand of paneer by varied health conscious consumers, it became necessary to develop value added products by utilization of paneer. (Joseph & Rao, 2019) [7].

Finger Millet (*Eleusine coracana*) is an annual plant widely grown as a cereal in the arid areas of Africa and Asia. It is commonly known as African finger millet, red millet, caracan millet, koracan and ragi. In Marathi it is 'Nachni'. Ragi also has some good number of Essential Amino Acids (EAA) which are essential for human body. Finger millet contains carbohydrates (72.6 gm), protein (7.7gm), fiber (3.6gm), ash (2.7gm), iron (6.3gm), calcium (344mg),

(344 mg), phosphorus (250mg), manganese (3.5mg) for 100 gm of each cereal. (Verma, 2013). Taking into account, the above facts, it is thought to prepare *Kheer* by addition of finger millet flour blended with paneer. So that it would serve as a nutritious food for consumers and simultaneously offer the same delicacy as traditional products.

Materials and Methods

The present study was conducted on the process optimization for the preparation of minor millet *kheer* blended with paneer at Department of Animal Husbandry and Dairy Science, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth, Rahuri. The material used and methods employed for conducting the experiments are as follows.

Materials

The fresh, clean composite milk of crossbred cows were procured from Research cum-Development Project (RCDP) on cattle, Dept. of AHDS, M.P.K.V., Rahuri. Bulk milk sample was obtained in stainless steel container from the morning milking and the milk was filtered through the muslin cloth to avoid dirt and extraneous matter. The milk sample was analyzed for different milk constituent's viz., fat, protein,

total solids, moisture and ash. Milk was standardized to 4 per cent by Pearson's formula. Finger millet, Sugar obtained from the local market of Rahuri. Different equipments viz., Karahi, Khunti, stainless steel vassals, mixer grinder, etc. were available in the department.

Preparation of Paneer

The standard cow's milk was heated to 90°C/no holds, and then cooled to 70 °C. The hot 2 gm citric acid was added to milk with vigorous stirring initially then gently stirring later till the completion of coagulation. Then coagulant added milk was left for 5 minutes without disturbing. Afterwards the clear whey was separated through muslin cloth and collected paneer curd was kept for pressing for 30 minutes and then dipped in chilled water for 1-2 hours and paneer was be used for preparation of millet blended paneer *kheer*.

Preparation of millet flour

The pre-cleaned millets was made in to powder form by grinding in mixer and to get fine powdered flour then was sieved by using ISI marked mesh. Roasted in a small amount of ghee.

Table 1: Pre experimental trials

Sr. No.	Ingredients	Different levels was studied	Quantity of levels will be selected for further experiment
1	Paneer levels	5%, 7%, 8%, 9% and 11% by the weight of milk.	One best level (Kept Constant)
3.	Finger millet flour	0.5%, 1%, 1.5%, 2% and 2.5% levels	Best Three levels
4.	Sugar levels	8%, 9%, 10% and 11% tried to optimize the sugar level.	One best level (Kept constant)

Optimization of levels of finger millet flour and paneer in preparation of *kheer*

On the basis of results of sensory evaluation, most acceptable level of finger millet (1%, 1.5% and 2%) and paneer (8%) with constant sugar i.e. 8% was selected for final experimental trials.

Treatment details

After optimization of levels of Finger millet flour and paneer, *kheer* was prepared.

Treatment details were as under;

T₀: Rice *Kheer* (Control) 2.5% Rice flour

T₁: 1% of finger millet flour in *kheer* blended with paneer

T₂: 1.5% of finger millet flour in *kheer* blended with paneer

T₃: 2% of finger millet flour in *kheer* blended with paneer

Preparation of Rice *Kheer*

Rice *Kheer* was prepared by the per the procedure given by De (1985) [5].

Procedure for preparation of *kheer*: as per flow diagram given below;

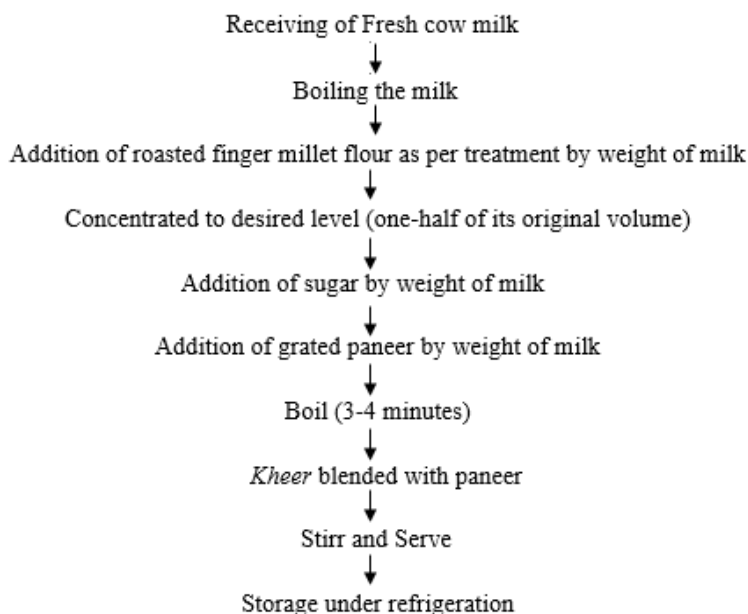


Fig 1: Flow chart for preparation of *kheer*

The observations were recorded for body and texture, colour and appearance, flavour, and overall acceptability (Total sensory score) by using 100-point scale (Pal and Gupta, 1985) [8]. Statistical analysis was done by using completely randomized design as per method suggested by Snedecor and Cochran (1994) [11].

A) Sensory evaluation of minor millet *kheer* blended with paneer

a) Body and texture

The data from table 2 showed that the score obtained for body and texture were 31.74, 30.51, 33.02 and 31.37 for treatments T₀ (Rice *kheer*), T₁ (1% finger millet flour *kheer* blended with paneer), T₂ (1.5% finger millet flour *kheer* blended with paneer) and T₃ (2% finger millet flour *kheer* blended with paneer), respectively. The highest score of 33.02 for body and texture was obtained by treatment with T₂ which was at par with treatment T₀ i.e. control (31.74). The lowest score of 30.51 was obtained by treatment T₁. Likewise similar result was reported by Deshmukh (2017) [6] who prepared poppy seeds *kheer* by using cow milk with 4 per cent fat and 8.5 per cent solids not fat. *Kheer* was prepared with addition of rice @ 2.5 per cent as control and poppy seeds @ 2 (T₂), 4 (T₃) and 6 (T₄) per cent by weight of milk. Scores obtained for body and texture T₁, T₂, T₃ and T₄ was 26.58, 30.43, 25.43 and 20.38 respectively.

b) Colour and appearance

The data from table 2 showed that the mean score for colour and appearance of *kheer* during various treatments T₀, T₁, T₂ and T₃ were 17.83, 17.65, 18.96 and 18.07 respectively. The highest score of 18.96 for colour and appearance was obtained by treatment T₂ with 1.5% finger millet flour *kheer* blended with paneer which was at par with treatment T₃ (18.07). The lowest score of 17.65 was obtained by treatment T₁. Treatment T₀ showed off white colour. While the other Treatments T₁, T₂ and T₃ showed tinge of brownish colour due to finger millet flour which content flavonoids and tannins. As the finger millet level increases the colour and appearance score decreases because of dull colour appear. Similar results were obtained by Shivakumar *et al.*, (2014) [9] revealed that highest color and appearance score was obtained in treatment T₂ (8.65) followed by T₁ (8.12), T₃ (6.37) and control T₀ (7.87).

c) Flavour

The data from table 2 showed that the score obtained for flavour were 36.52, 38.25, 41.04 and 42.38 for treatments T₀ (control – rice *kheer*), T₁, T₂ and T₃, respectively. The highest score of 42.38 for flavour was obtained by treatment T₃ (2% finger millet flour *kheer*) which was at par with treatment T₂ (1.5% finger millet flour *kheer* blended with paneer) (41.68). The lowest score of 36.52 was obtained by treatment T₀. The treatment T₃ had maximum score for flavour (42.38) and T₁ showed lowest scores (36.52). This might be due to the preference of finger millet flavour which was felt pleasant and attractive to the judges than other treatment contains lower

concentration of finger millet flour. Contrast result was obtained by Solanki *et al.* (2018) [12] made *kheer* by utilizing finger millet flour in buffalo milk. *Kheer* was prepared with addition of 97.5 parts of buffalo milk and 2.5 parts of rice as control (T₀). Then further *kheer* was prepared with treatments T₁ (98:02), T₂ (96:04) and T₃ (94:06) buffalo milk to finger millet flour, respectively. The flavour score for treatment T₃ was lowest i.e. (6.25) while for treatment T₀ it was highest i.e. (8.75)

B) Total (Sensory) Score

Kheer with treatment T₂ (93.01) was significantly superior over the rest of the treatment. The lowest score obtained by *kheer* prepared with addition of rice flour i.e control T₀ (86.09). The present results are in agreement with the results of Deshmukh (2017) [6] who prepared poppy seed *kheer* by using cow milk. *Kheer* was prepared with addition of rice at 2.5 per cent (T₁) and poppy seeds @ 2(T₂), 4(T₃), and 6(T₄) per cent by weight of milk. 6 per cent sugar was uniformly added to all the treatments. *Kheer* prepared with 2 per cent (T₂) poppy seed found superior over rest of treatments and total score obtained was 90.27.

C) Cost configuration of minor millet *kheer* blended with paneer

I) Cost of preparation of paneer

For preparation of minor millet *kheer* blended with paneer for that purpose the cost of paneer also taken into consideration. The cost for the preparation of paneer is presented in Table 3. The paneer prepared from 3 lit of cow milk given near about 380gm of paneer. The cost engrossed for preparation of paneer on account of raw material used i.e. cost of cow milk, citric acid, labour, fuel and miscellaneous charges etc. were taken into account for calculating the cost of production of paneer. Total cost required for preparation of paneer Rs.115.76.

II) Cost of preparation of *kheer*

The cost engrossed for preparation of *kheer* on account of raw material used i.e. cost of cow milk, local rice, finger millet, paneer, sugar, labour, fuel and miscellaneous charges etc. were taken into account for calculating the cost of production of *kheer* for different treatments. It may be seen from table 4 that the cost of production of 1kg *kheer* ranged from Rs. 93.24 to Rs. 123.32. The cost of production of different treatment combinations was Rs. 93.24, Rs. 125.47, Rs.124.47 and Rs. 123.32 for treatment T₀, T₁, T₂ and T₃, respectively. The results are in agreement with research worker Singh *et al.* (2018) prepared Chhana *Kheer* by using artificial sweetener aspartame. Four treatment samples were studied *viz.*, T₀ (Chhana *Kheer* Control) prepared from cow milk with sugar (@ 7%), T₁, T₂ and T₃ containing artificial sweetener aspartame at the rate of 0.010%, 0.015% and 0.020% respectively. The cost of production of Chhana *Kheer* for T₀ (Control) was Rs. 110.80, (T₁) Rs. 104.56, (T₂) Rs.100.98 and Rs. 97.44 (T₃) per Kg of Chhana *Kheer*.

Table 2: Effect of finger millet flour on sensory attributes and of *kheer* blended with paneer

Treatments	Body & Texture (35)	Parameters Color & Appearance (20)	Flavour (20)	Total Score
T ₀ (2.5% RF)	31.74 ^b	17.83 ^c	36.52 ^d	86.09 ^d
T ₁	30.51 ^d	17.65 ^d	38.25 ^c	86.41 ^c
T ₂	33.02 ^a	18.96 ^a	41.04 ^b	93.01 ^a
T ₃	31.37 ^c	18.07 ^b	42.38 ^a	91.84 ^b
SE (m) ±	0.087	0.014	0.076	0.128
CD at 5%	0.260	0.041	0.228	0.385

(RF – Rice flour,, T₁ - 1% of finger millet flour in *kheer* blended with paneer, T₂ - 1.5% of finger millet flour in *kheer* blended with paneer, T₃ - 2% of finger millet flour in *kheer* blended with paneer, * *P* < 0.05)

Table 3: Cost of preparation of paneer

Sr. No.	Details	
1.	Raw material (Cow Milk) Qty.lit	3 lit
2.	Cost of milk (34Rs/lit)	102
3.	Citric acid (Qty)	6 gm
4.	Cost of Citric Acid (Rs)	2.76
5.	Fuel (Rs)	1.50
6.	Labour (Rs)	3.00
7.	Depreciation on utensils (Rs)	3.00
8.	Miscellaneous charges	2.00
9.	Refrigeration	0.50
10.	Packaging	1.00
11.	Qty of Paneer obtained (gm) From 3 lit	380 gm
	Total Cost = (2+4+5+6+7+8+9+10)	115.76
12.	Cost for 80 gm Paneer	Rs 24.37

Table 4: Cost Configuration for one kg *kheer* prepared under various treatment

Sr. No	Items	T ₀	Values	T ₁	Values	T ₂	Values	T ₃	Values
		Qty(gm)	(Rs)	Qty(gm)	(Rs)	Qty(gm)	(Rs)	Qty(gm)	(Rs)
1.	Milk (1lit.) @ Rs. 34 /lit.	1000	34	1000	34	1000	34	1000	34
2.	Rice (Rs 35/kg OR Finger millet Rs. 32/ kg	25	0.87	10	0.32	15	0.48	20	0.64
3.	Sugar @ Rs.30/kg	80	2.40	80	2.40	80	2.40	80	2.40
4.	Paneer Cost- As Calculated	-	-	80	24.37	80	24.37	80	24.37
5.	Fuel Charges LPG (gm) Rs. 750/14.2 kg	300	15.00	300	15.00	300	15.00	300	15.00
6	Miscellaneous- depreciation @ 10% electricity, utensils etc. in Rs	-	3.00	-	3.00	-	3.00	-	3.00
7.	Labour Charges	-	10	-	10	-	10	-	10
8.	Weight of <i>kheer</i> obtained (gm)	700	-	710	-	718	-	725	-
9.	Cost of <i>kheer</i> (Rs.) (1+2+3+4+5+6+7)	-	65.27	-	89.09	-	89.25	-	89.41
10.	Cost of <i>kheer</i> / Kg (Rs.)	-	93.24	-	125.47	-	124.30	-	123.32

Conclusion

It may be inferred that the superior, nutritional and healthy quality *kheer* can be prepared by addition of 1.5% finger millet flour + 8 per cent paneer shreds and 8 per cent sugar with cost of production 124.30 Rs. /Kg.

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