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## Physico-chemical composition of millet based *kheer* blended with paneer

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### Abstract

Present study investigated the research work on effect of different combinations of finger millet flour on chemical composition of composite cow milk *kheer* blended with paneer 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*) T<sub>0</sub> (2.5%), T<sub>1</sub> (1% finger millet flour *kheer* blended with paneer), T<sub>2</sub> (1.5% finger millet flour *kheer* blended with paneer) and T<sub>3</sub> (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 product was analyzed for moisture, fat, and protein, acidity, total solids, carbohydrates, crude fiber and ash. Results revealed that increased level of finger millet flour leads to significant decrease in moisture and fat contents. But the change in protein, ash, carbohydrates, total solids, crude fiber and lactic acidity content as the levels of finger millet flour changed.

**Keywords:** Millet, paneer shreds, *Kheer*, physico-chemical, proximate composition etc.

### Introduction

India ranks first in milk production, accounting for 18.5% of world production, achieving annual output about 187.7 million tons during 2018-2019. (Anonymous, 2018) [2]. 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) [8]. *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) [7]. 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) [11].

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 (7.7 gm), fiber (3.6 gm), ash (2.7 gm), iron (6.3 gm), calcium (344 mg), phosphorus (250 mg), manganese (3.5 mg) for 100 gm of each cereal. (Verma, 2013) [15]. 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 crossbreed 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 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:** Different levels Studied (Pre experimental trials)

Sr. No.	Ingredients	Different levels was studied	Quantity of levels was 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;

T<sub>0</sub>: Rice *Kheer* (Control) 2.5% Rice flour

T<sub>1</sub>: 1% of finger millet flour in *kheer* blended with paneer

T<sub>2</sub>: 1.5% of finger millet flour in *kheer* blended with paneer

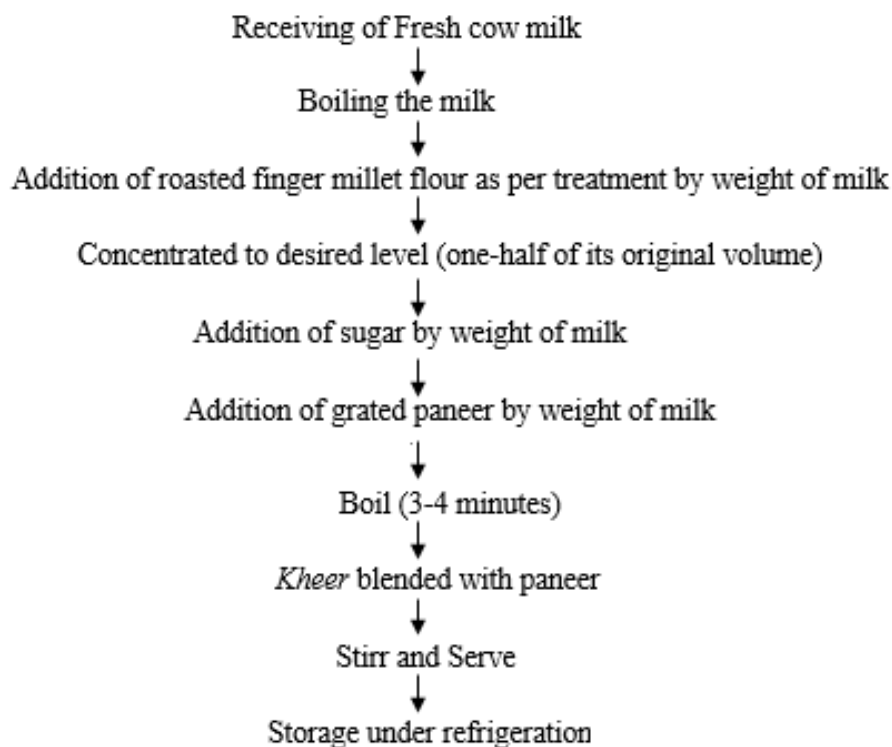
T<sub>3</sub>: 2% of finger millet flour in *kheer* blended with paneer

### Preparation of Rice *Kheer*:

Rice *Kheer* was prepared by the per the procedure given by De (1985)

### Procedure

**Preparation of *kheer*:** As per flow diagram given below;



**Fig 1:** Flow chart for preparation of *kheer*

The observations were recorded for Moisture, total solids, fat, protein, ash, crude fiber, carbohydrates and acidity content. Fat content was determined by Mojonnier fat extraction method and recorded (Anonymous, 1977) <sup>[5, 6]</sup>. Protein content was estimated by Micro-kjeldahl's method (Anonymous, 1961) <sup>[3]</sup>. Total solids was determined by gravimetric method (Anonymous, 1961) <sup>[3]</sup>. Solids not fat content was estimated by subtraction method i.e. Solids not fat = T.S. Percentage – fat percentage. Moisture content of *kheer* was determined by subtraction method i.e. Moisture (%) = 100 - Total solids (%). Ash content estimated (Anonymous, 1967) <sup>[4]</sup>. Statistical analysis was done as per method suggested by Snedecor and Cochran (1994).

## Results and Discussion

### A) Proximate Composition

Composition of minor millet *kheer* blended with paneer affected by the level of finger millet flour. The average values of moisture, fat, protein and ash contents of *kheer* observed in the study are shown in Table 2. The changes noted in the select constituent's viz., moisture, total solids, fat, ash, total protein, acidity, carbohydrates and crude fiber of having different levels of finger millet flour are presented in Table 2 and illustrated in figure 1.

### I. Moisture

The moisture content in *kheer* with different levels of treatments ranged from 65.45, 64.09, 63.92 and 63.76 per cent for treatments T<sub>0</sub> (Rice *kheer*), T<sub>1</sub> (1% finger millet flour *kheer* blended with paneer), T<sub>2</sub> (1.5 % finger millet flour *kheer* blended with paneer) and T<sub>3</sub> (2% finger millet flour *kheer* blended with paneer), respectively. The moisture content in burfi significantly decreased with increase in the different levels of finger millet flour. This might be due to increase in the blending of finger millet flour. The results are in agreement with previous research worker Solanki *et al.* (2018) <sup>[14]</sup> 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 (T<sub>0</sub>). Then further *kheer* was prepared with treatments T<sub>1</sub> (98:02), T<sub>2</sub> (96:04) and T<sub>3</sub> (94:06) buffalo milk to finger millet flour, respectively. Among the treatments (T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>) values decreased significantly as the level of finger millet flour increased from 2 to 4 per cent.

### II. Total Solids

The total solids content of *kheer* for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 34.55, 35.91, 36.08 and 36.24 per cent respectively. It was observed that the total solids content in *kheer* was in increasing range from treatment T<sub>1</sub> to T<sub>3</sub>. It was observed from moisture findings that as blending of finger millet flour and paneer were increased the total solids content of developed *kheer* from treatment T<sub>1</sub> to T<sub>3</sub>. The above results obtained of total solids following research worker. Gupta *et al.* (2020) <sup>[10]</sup> developed almond supplemented paneer *kheer*. Almond supplemented paneer *kheer* was prepared using different levels of almond milk paneer ratio and sugar levels to optimize. Control paneer *kheer* prepared with (Milk paneer ratio 900:100 and Sugar 3%) and optimized paneer *kheer* contains almond 6%, milk paneer ratio 900:100 and sugar 3%) respectively. Total solids content in control was 52.53% while almond supplemented paneer *kheer* contains 66.45%.

### III. Fat

The fat content in *kheer* with different levels of treatments ranged from 7.87, 7.61, 7.52 and 7.45 per cent for treatments T<sub>0</sub> (Rice *kheer*), T<sub>1</sub> (1% finger millet flour *kheer* blended with paneer), T<sub>2</sub> (1.5 % finger millet flour *kheer* blended with paneer) and T<sub>3</sub> (2% finger millet flour *kheer* blended with paneer), respectively. As finger millet flour level increase the fat content of *kheer* decrease significantly. This might be due to the lower fat content in finger millet i.e. 1.5%. The results obtained in present study were in close agreement with findings of Shivakumar *et al.* (2014) <sup>[12]</sup> who, prepared paneer (soft cheese) *kheer* blended with Foxtail millet and Finger millet flour. Control paneer *kheer* contains 7.58 per cent fat while the paneer *kheer* blended with 2% Foxtail millet and 1 % finger millet contain 7.46 and 7.50 per cent fat, respectively.

### IV. Protein

The mean values of protein content of treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 6.76, 7.91, 8.02 and 8.13 per cent, respectively and it was ranged from 6.76 to 8.13 per cent. As the finger millet flour increases the protein content also increases this might be due to 100gm of finger millet contains 7.7 gm protein and protein content in *kheer* increase is due to the blending with paneer. The results obtained in above study were in close agreement with findings of Solanki *et al.* (2018) <sup>[14]</sup> developed *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 (T<sub>0</sub>). Then further *kheer* was prepared with treatments T<sub>1</sub> (98:02), T<sub>2</sub> (96:04) and T<sub>3</sub> (94:06) buffalo milk to finger millet flour, respectively. The average protein content of finger millet *kheer* were 6.79 (T<sub>0</sub>), 7.18 (T<sub>1</sub>), 7.34 (T<sub>2</sub>) and 7.44 (T<sub>3</sub>).

### V. Ash

The ash content in *kheer* with different levels of treatments ranged from 1.39, 1.20, 1.26 and 1.33 per cent for treatments T<sub>0</sub> (Rice *kheer*), T<sub>1</sub> (1% finger millet flour *kheer* blended with paneer), T<sub>2</sub> (1.5 % finger millet flour *kheer* blended with paneer) and T<sub>3</sub> (2% finger millet flour *kheer* blended with paneer), respectively. As the finger millet content increase the ash content increase from T<sub>1</sub> to T<sub>3</sub> because finger millet content abundant source of minerals. The results of the above investigation compared with the findings of Solanki *et al.* (2018) <sup>[14]</sup> who, prepared *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 (T<sub>0</sub>). Then further *kheer* was prepared with treatments T<sub>1</sub> (98:02), T<sub>2</sub> (96:04) and T<sub>3</sub> (94:06) buffalo milk to finger millet flour, respectively. The ash content in treatments T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 1.43, 1.36, 1.38 and 1.41 per cent respectively.

### VI. Carbohydrates

The mean values of carbohydrate content of treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 18.53, 19.19, 19.28 and 19.32 per cent respectively and it was ranged from 18.53 to 19.32 per cent. The highest value of carbohydrates content was reported for treatment T<sub>3</sub> (19.32) per cent while lowest value observed for T<sub>0</sub> (18.53) per cent. It may be due to addition of finger millet flour in increasing order that contains 72.6 gm for 100gm cereal. The results received in the present study were in close agreement with findings of Solanki *et al.* (2018) <sup>[14]</sup> who,

prepared *kheer* by blending finger millet flour in buffalo milk. *Kheer* was developed with addition of 97.5 parts of buffalo milk and 2.5 parts of rice as control (T<sub>0</sub>). Then further *kheer* was prepared with treatments T<sub>1</sub> (98:02), T<sub>2</sub> (96:04) and T<sub>3</sub> (94:06) buffalo milk to finger millet flour, respectively. He recorded carbohydrates content for treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 22.43, 18.65, 20.99 and 24.88 per cent respectively.

### VII. Crude fiber

The mean values of fiber content of treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> were 0.030, 0.046, 0.048 and 0.051 per cent, respectively and it was ranged from 0.030 to 0.051 per cent. The highest value was reported for treatment T<sub>3</sub> (0.051) per cent while lowest value observed for T<sub>0</sub> (0.030) per cent.

The results are in close agreement with findings Shivakumar *et al.* (2014) [12] prepared paneer (soft cheese) *kheer* blended with Foxtail millet and Finger millet flour. Control paneer *kheer* contains 0.00 per cent fat while the paneer *kheer*

blended with 2% Foxtail millet and 1 % finger millet contain 0.173 and 0.046 per cent fat, respectively.

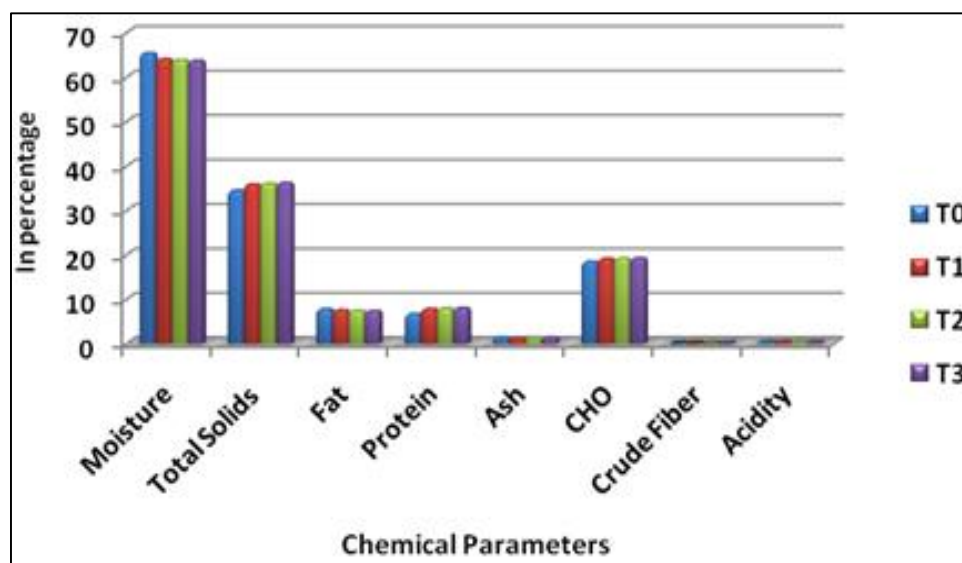
### VIII. Acidity

The acidity content in *kheer* with different levels of treatments ranged from 1.39, 1.20, 1.26 and 1.33 per cent for treatments T<sub>0</sub> (Rice *kheer*), T<sub>1</sub> (1% finger millet flour *kheer* blended with paneer), T<sub>2</sub> (1.5 % finger millet flour *kheer* blended with paneer) and T<sub>3</sub> (2% finger millet flour *kheer* blended with paneer), respectively. The results are in agreement with the findings of Shivakumar *et al.* (2014) [12] developed paneer (soft cheese) *kheer* blended with Foxtail millet and Finger millet flour. Fresh Control paneer *kheer* contains 0.33 per cent acidity while the Fresh paneer *kheer* blended with 2% Foxtail millet (T<sub>1</sub>), 1% finger millet (T<sub>2</sub>) and combination of 1 % Foxtail millet + 1% finger millet (T<sub>3</sub>) contain 0.30, 0.29 and 0.30 per cent acidity, respectively.

**Table 2:** Proximate composition of minor millet *kheer* blended with paneer

Constituents	Control T <sub>0</sub> (2.5% RF)	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	SE	CD at 5%
Moisture (%)	65.45 <sup>a</sup>	64.09 <sup>b</sup>	63.92 <sup>c</sup>	63.76 <sup>d</sup>	0.0138	0.0414
Total solids (%)	34.55 <sup>d</sup>	35.91 <sup>c</sup>	36.08 <sup>b</sup>	36.24 <sup>a</sup>	0.0138	0.0414
Fat (%)	7.87 <sup>a</sup>	7.61 <sup>b</sup>	7.52 <sup>c</sup>	7.45 <sup>d</sup>	0.0120	0.0361
Protein (%)	6.76 <sup>d</sup>	7.91 <sup>c</sup>	8.02 <sup>b</sup>	8.13 <sup>a</sup>	0.0111	0.0333
Ash (%)	1.39 <sup>a</sup>	1.20 <sup>d</sup>	1.26 <sup>c</sup>	1.33 <sup>b</sup>	0.0116	0.0350
Carbohydrates (%)	18.53 <sup>c</sup>	19.19 <sup>b</sup>	19.28 <sup>a</sup>	19.32 <sup>a</sup>	0.0207	0.0521
Crude fiber (%)	0.030 <sup>d</sup>	0.046 <sup>c</sup>	0.048 <sup>b</sup>	0.051 <sup>a</sup>	0.0004	0.0013
Acidity (%)	0.27 <sup>c</sup>	0.29 <sup>b</sup>	0.30 <sup>ab</sup>	0.31 <sup>a</sup>	0.0061	0.0183

Values with different superscripts differ significantly ( $P < 0.05$ )



**Fig 2:** Effect of different levels of finger millet flour on compositional characteristics of kheer blended with paneer

### Conclusion

It is concluded that sensorial superior, nutritional and healthy good quality *kheer* can be prepared by addition of 1.5% finger millet flour + 8 per cent paneer shreds with moisture 63.92 per cent, total solids 36.08 per cent, fat 7.52 per cent, protein 8.02 per cent, Ash 1.26 per cent, carbohydrates 19.28 per cent, crude fiber 0.048 per cent and acidity 0.30 per cent

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