

Sensory Evaluation and Cost of Production of Kheer Prepared from Cow Milk Blended with Sweet Potato (*Ipomea batatas* L.)

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Abstract: Kheer was prepared from cow milk blended with sweet potato (*Ipomea batatas* L.) in the Dairy Technology laboratory, Department of Animal Husbandry and Dairy Science, Dr. PDKV, Akola. Kheer was prepared from five different combinations of cow milk and sweet potato paste i.e 97:50 per cent cow milk with 2.50 per cent rice T₁ (control), 95:05(T₂), 90:10(T₃), 85:15(T₄) and 80:20 (T₅) was evaluated for various sensory attributes and it was found that kheer prepared from cow milk blended with 10 per cent sweet potato paste was superior as compare to other treatments, considering the cost of ingredients it was found that cost of preparation of kheer was decreased with increase in level of sweet potato.

Keywords: Cow milk, Sweet potato, Rice, Kheer, Sensory evaluation, Economics.

INTRODUCTION

Kheer is a traditional Indian dairy product. It occupies a special position in Indian diet due to high nutritional and sensory properties, since ancient time. The Hindu kheer is derived from the Sanskrit word 'Ksheer' for milk and 'Kshrika' for any dish prepared with milk (Aneja *et al.* 2002). Kheer is popular all over the country, as a pre-eminent milk delicacy. It has been associated with festivities and celebrations from the time immemorial. 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, 'Phirni' in Northern region and 'Kheech' in Mewar region of Rajasthan (Thompson, 1995). It is considered to be a nutritious food for people of all ages and is characterized by sweet, nutty and pleasant flavour that is highly acceptable to the Indian palate.

Sweet potato was grown as starchy food crop throughout the tropical, subtropical and frost-free temperate climatic zone in the world. Besides starch

they were rich in dietary fibers, vitamin A, C, B₆. Tubers are utilized for canning, dehydrating and flour manufacture and are also important source of glucose, pectin, sugar, syrup and cheapest source of calories in India. In India sweet potato mostly eaten during fast (Anonymous 2012). All cultivars were more or less sweet flavoured. Despite the name "sweet", it is actually a good food for diabetes the tuber was used to treat asthma. Considering the nutritional and medicinal value of sweet potato, an efforts were made to find out its effect on sensory evaluation and economics of kheer.

MATERIALS AND METHODS

Method of preparation of kheer suggested by De *et al.* (1976) was used with slight modification. While preparing sweet potato kheer, the cow milk was taken in an iron karahi and heated on gentle fire. Then gentle boiling of milk was done till the evaporation of 40 per cent of cow milk. At the time of boiling, milk was stirred with the help of stainless steel ladle in a circular manner. At this stage the

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sweet potato or rice was added as per treatment, as control treatment T₁ - 97.50% cow milk + 2.50% rice and other treatments with combination of cow milk + sweet potato as 95 + 5, 90 + 10, 85 +15 and 80+20 per cent as T₂, T₃, T₄ and T₅ respectively and mixed properly. Cane sugar was used @ 8% of volume of cow milk in all treatments.

Kheer was analyzed for sensory evaluation by offering the product to the team of ten judges. Modified 100 points numeric score card on kheer as suggested by Pal and Gupta (1985) was used for judging different quality attributes of kheer. The cost structure (Rs./kg) of product was worked out by taking into consideration the prevailing retail rates of ingredients. Data obtained from all five treatments with five replications was statistically analyzed with completely randomized design by adopting standard method of analysis of variance as suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Sensory Evaluation of Kheer

The data obtained for various attributes of sensory evaluation *i.e.* flavour, body and texture, colour and appearance and overall acceptability were tabulated and presented in Table 1.

Flavour

It is observed from Table 1 that, the average score obtained for flavour of kheer prepared from cow milk blended with sweet potato were 37.80, 39.14, 43.18, 40.94 and 36.60 under treatments T₁, T₂, T₃, T₄ and T₅ respectively. The highest score 43.18 was recorded by T₃ *i.e.* kheer prepared 10% sweet potato paste seems to be significantly superior than other treatments. It was observed that the decrease in the flavour score by increase in level of sweet potato.

These observations are in agreement with Salunke (2012) who reported the flavour score by utilization of carrot (*Daucus carota*) for kheer preparation that, increases carrot level for blending in cow milk decreases the flavour score. Dadge (2013) studied on preparation of sweet potato kheer prepared from buffalo milk and sweet potato blends which supports the present results.

Table 1
Effect on various sensory attributes of kheer prepared from cow milk blended with sweet potato. (Mean Score values of ten judges for five replications)

Treatments	Flavour (Max. 45)	Body and texture (Max. 35)	Colour and appearance (Max. 20)	Overall acceptability (Max. 100)
T ₁	37.80	31.54	16.56	85.90
T ₂	39.14	32.10	17.44	88.68
T ₃	43.18	33.74	19.46	96.38
T ₄	40.94	32.94	18.34	92.22
T ₅	36.60	29.14	17.94	83.68
SE(M) ±	0.688	0.539	0.104	1.029
CD at 5%	2.030	1.592	0.309	3.036
F' test	Sig.	Sig.	Sig.	Sig.

Body and texture

The average score obtained for body and texture of kheer prepared from cow milk blended with sweet potato were 31.54, 32.10, 33.74, 32.94 and 29.14 under treatments T₁, T₂, T₃, T₄ and T₅ respectively. The treatment T₃ was significantly superior over treatments T₁, T₂, T₄ and T₅. It was observed from above finding that 10 per cent sweet potato paste blended kheer gave good body and texture score. The lowest score was observed for kheer prepared by addition of 20 per cent sweet potato. Salunke (2012) observed that utilization of carrot (*Daucus carota*) for kheer preparation and he was reported that increases carrot level beyond the limit for blending in cow milk decreases the body and texture score. Dadge (2013) studied on preparation of sweet potato kheer blended with buffalo milk and observed that addition of sweet potato in kheer decrease body and texture score.

Colour and appearance

The average score obtained for colour and appearance of kheer prepared from cow milk blended with sweet potato for treatments T₁, T₂, T₃, T₄ and T₅ were 16.56, 17.44, 19.46, 18.34 and 17.94 respectively. The treatment T₃ got higher score and significantly superior over the treatments. The colour and appearance was significantly changed due to addition of sweet potato. These indicates that higher level of sweet potato imparts stronger colour and appearance which decrease its score. Barela (2011) reported the colour and appearance score for

Table 2
Cost production of kheer prepared from cow milk blended with sweet potato (Rs/kg.)

Sr. No.	Particular	Cost (Rs/lit /kg)	T ₁		T ₂		T ₃		T ₄		T ₅	
			Qt (ml/g)	Amount (Rs)	Qt (ml/g)	Amount (Rs)	Qt (ml/g)	Amount (Rs)	Qt (ml/g)	Amount (Rs)	Qt (Per ml/kg)	Amount (Rs)
1.	Cow milk	35	1490	52.15	1448	50.68	1365	47.77	1281	44.83	1190	41.94
2.	Rice	50	37.25	1.86	-	-	-	-	-	-	-	-
3.	Sweet potato	20	-	-	50	1.00	100	2.00	150	3.00	200	4.00
4.	Sugar	30	80	2.40	80	2.40	80	2.40	80	2.40	80	2.40
5.	Cardamom	1500	1	1.50	1	1.50	1	1.50	1	1.50	1	1.50
6.	Labour charges			15		15		15		15		15
7.	Fuel charges			5		5		5		5		5
8.	Miscellaneous charges			10		10		10		10		10
9.	Total cost per lit			87.91		85.58		83.67		81.73		79.64

kheer prepared from cow milk blended with 20 per cent coconut milk was observed maximum score. Salunke (2012) studied on colour and appearance score by utilization of carrot (*Daucus carota*) for kheer preparation and reported that increase carrot level up to 15 per cent blending in cow milk increases the colour and appearance score. The present investigation was with close agreement with this author.

Overall Acceptability

It is observed from Table 1 that, the kheer prepared from T₁, T₂, T₃, T₄ and T₅ treatments were having 85.90, 88.68, 96.83, 92.22 and 83.68 score respectively. The treatment T₃ (96.83) was significantly superior over T₁, T₂, T₄ and T₅ treatments. The overall acceptability score was highest in treatment T₃ while lowest score was recorded in treatment T₅ (83.68). Kheer with 10 per cent sweet potato paste has obtained highest and significantly superior score may be due to peculiar flavour, smooth body and texture and good colour and appearance, appreciated by the panel of judges.

Economics of Kheer Preparation

The prevailing cost of each ingredient and services were taken into consideration and the cost of production of preparation of kheer was worked out by using the standard economic procedure as presented in Table 2.

It is observed from Table 2 that, the cost of production of kheer prepared from cow milk blended with sweet potato ranges from 87.91 to 79.64 Rs./Kg. The cost of production was found Rs. 87.91, 85.58, 83.67, 81.73 and 79.64 for treatments T₁, T₂, T₃, T₄ and T₅ respectively. It is noticed that the cost of production of kheer was decreased with increase in level of sweet potato.

Kheer prepared with 10 per cent sweet potato obtained maximum score for sensory/acceptability costing Rs. 83.67/- which was decreased over the control treatment (T₁). Narwade *et al.* (2003) calculated the cost structure of kheer prepared from different blends of buffalo milk with safflower milk. These results supports the trend of present investigation.

CONCLUSION

The sensory quality kheer having highest score (96.38) was observed in treatment T₃ i.e 10 per cent sweet potato. Good quality kheer can be prepared by using 90:10 cow milk to sweet potato paste ratio with 8% sugar level which had pleasant flavour, smooth body and texture and light yellowish to milky colour. Though the production cost of kheer decreases with the increase in level of the sweet potato. The cost of most acceptable treatment prepared in proportion 90:10 cow milk to sweet potato (T₃) was Rs. 83.67 per kg.

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