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Effect of different level of guava pulp on sensory quality and cost of production of Kalakand

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Abstract
The present investigation entitled "Utilization of guava pulp for preparation of kalakand**"** was conducted at Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur with the chemical composition, to evaluate the sensory quality and to estimation the cost of guava pulp kalakand during the year 2020-2021. Present investigation was carried out with five treatments and four replications. The treatment details were T_1 control (70 part of cow milk khoa +30 part of sugar), T_2 (65 part of cow milk khoa + 5 part of guava pulp +30 part of sugar), T_3 (60 part of cow milk khoa + 10 part of guava pulp +30 part of sugar), T_4 (55 part of cow milk khoa + 15 part of guava pulp +30 part of sugar), and T_5 (50 part of cow milk khoa + 20 part of guava pulp +30 part of sugar). The kalakand prepared from combination of 55 per cent cow milk khoa and 15 per cent guava pulp (T_4) found acceptable scored significantly highest scores for flavour, body and texture, colour and appearance and overall acceptability which were found superior amongst all the treatments. The cost of production per kg of guava pulp kalakand was slightly decreased with increase in rate of addition of guava pulp i.e., Rs. 244 (T_1), Rs. 238.5 (T_2), Rs. 233 (T_3), Rs.227.5 (T_4) and Rs. 222 (T_5).

Keywords: cow milk khoa, guava pulp, blending, kalakand, sensory evaluation, cost of production

Introduction
Kalakand is a partially desiccated milk product with caramelized flavour and glanular texture prepared from acidified milk (David, 2009) [2]. Fortification of different milk product with fruit juice or pulp has been show to improve their acceptability to a considerable extend (Dhanawade *et al.* 2006) [3] Incorporation of fruit products in the milk products to render good flavour, increasing palatability and nutritive value is a very old practice. Guava (*Psidium guajava* L.) is an important fruit of family Myrtaceae, occupies an important place among the medium fruit plants and is grown throughout the world. Fruits are sweet in taste, with red or white flesh and many seeds within. Guava fruit contains 80% moisture, 20% dry matter, 1% ash, 0.7% fat and 1.5% protein (Cheng *et al.* 1983). The high level of antioxidant pigments like carotenoids and polyphenols as well as ascorbic acid present in guava increase its dietary value (Charles *et al.* 2006). Considering the value addition aspects present investigation was planned and under taken with the main objective to standardize the level of guava pulp in kalakand and work out the cost structure of guava kalakand.

Material and Methods
Whole, fresh, clean, cow milk was collected from Section of Animal Husbandry and Dairy Science, College of Agriculture, Nagpur. The Fresh ripened guava fruits were purchased form the Department of Horticulture, College of Agriculture, Nagpur. Citric acid was used as coagulant for preparation of Kalakand. Clean crystalline sugar purchased from local market was used as an ingredient of kalakand as sweetening and thickening agent. For preparation of Kalakand from fresh cow milk standard method described by De (2015) [1] was followed with slight modification. Looking to diversified benefits of guava and nutritional quality value of cow milk, guava pulp kalakand was prepared from cow milk khoa with various khoa with various treatment combinations. The treatment details were T_1 (70 part of cow milk khoa +30 part of sugar), T_2 (65 part of cow milk khoa + 5 part of guava pulp +30 part of sugar), T_3 (60 part of cow milk khoa + 10 part of guava pulp +30 part of sugar), T_4 (55 part of cow milk khoa + 15 part of guava pulp +30 part of sugar), and T_5 (50 part of cow milk khoa + 20 part of guava pulp +30 part of sugar) with five replications.

Sensory evaluation of guava kalakand
Sensory evaluation was performed by 9-point numeric score card as prescribed by Pal and Gupta (1985) [8].

Cost of production
Cost of production of kalakand was calculated by considering the prevailing rates of raw material, labour charges, gas, electricity and other miscellaneous charges, etc.

Statistical analysis
The experiment data obtained was statistically analyzed by CRD (Completely Randomized Design) as prescribed by Gomez K. A. and A. A. Gomez (1984) [4].

Results and Discussion

Sensory evaluation of guava pulp blended kalakand
In order to evaluate a good quality kalakand the panel of judges was selected and product was judged with the help of 9-point hedonic scale score cards and data generated were statistically processed and the results obtained are presented in the Table 1.

Table 1: Effect of different levels of guava pulp on sensory quality of Kalakand.

Treatments (Parts of cow milk khoa: guava pulp: sugar)	Mean values of scores obtained for five replications (*P<0.05)			
	Colour and Appearance	Flavour	Body and texture	Overall acceptability
T_1 (70:00:30)	8.35	8.55	8.55	8.61
T_2 (65:05:30)	7.63	7.38	7.63	7.50
T_3 (60:10:30)	8.15	8.15	8.03	8.16
T_4 (55:15:30)	8.75	8.70	8.88	8.65
T_5 (50:20:30)	8.13	8.13	7.80	7.99
'F' test	Sig.	Sig.	Sig.	Sig.
SE (m) +/-	0.130	0.107	0.142	0.061
CD at 5%	0.393	0.324	0.428	0.186

Colour and appearance of kalakand
Results from Table 1, indicates that increase the level of guava pulp resulted in better colour and appearance of kalakand up to a certain limit and thereafter it decreases proportionately. These results are in agreement with the results reported by Thikare *et al.* (2020) [11] observed that Standardization of strawberry enriched kalakand and he was reported that increased papaya pulp level beyond the limit for blending the maximum and minimum score for colour respectively. Manohar *et al.* (2018) [6] reported that the colour and appearance score for kalakand preparaed buffalo milk blended with papaya pulp and observed that the score of colour and appearance was decreased by increase in the level of papaya pulp in papaya pulp kalakand.

Flavour of kalakand
Kalakand blended with 15 per cent guava pulp T_4 recorded the highest score (8.70 out of 9) in respect of flavour for the treatment T_2 lowest score (7.38 out of 9). The result indicates that the kalakand prepared with 15 per cent guava pulp was superior over 0, 5,10, 20, per cent levels. The observation of present investigation was in agreement with Thikare *et al.* (2020) [11] reported that flavour score during utilization of strawberry pulp in kalakand preparation increases strawberry pulp level blended in cow milk khoa upto 15%, then after same was decreases beyond optimum level. Manohar *et al.* (2018) [6] reported that, the flavour score for kalakand prepared from buffalo milk blended with papaya pulp and observed that maximum and minimum score for flavour was recorded in treatment T2 (8.8) and T4 (7.6) respectively.

Body and texture of kalakand
It is observed from the table 1 that the body and texture score of kalakand was significantly affected due to addition of different level of guava pulp. The significantly highest score (8.88 out of 9) was obtained by kalakand prepared with 15 per cent (T4) guava pulp while lowest score (7.63) obtained by plain kalakand (T_2). Sawant *et al.* (2007) [9] observed utilization of mango pulp for kalakand preparation and he has reported that increase in the level of mango pulp beyond the limit of 15% for blending in buffalo milk decreases the body and texture score. Patel and Roy (2015) observed that the body and texture score of papaya pulp kalakand ranged between 8.75 to 8.36 in 9-point hedonic scale, while Nager *et al.* (2017) observed that standardization of papaya enriched kalakand and reported that increase papaya pulp level beyond the limit for blending the maximum and minimum score for body and texture was recorded in treatment T_6 (7.97) and T_9 (6.07) respectively.

Overall acceptability of kalakand
Result indicated that increase in the level of guava pulp resulted in better overall acceptability score of kalakand up to a certain limit and there after it decreases proportionately. It was revealed from above finding that 15 percent guava pulp blended kalakand recorded maximum score of overall acceptability with regard to flavour, body and texture, colour and appearance. The above results are in agreement with the results reported by following research workers. Nagar *et al.* (2017) [7] reported that, the overall acceptability score was varied significantly. The overall acceptability score was highest in treatment T6 (8.03) and the lowest value recorded in treatment T9 (6.47). Kumar *et al.* (2017) [5] reported that, the overall acceptability score was highest in treatment T3 (8.48) containing wood apple kalakand prepared by addition of 15 parts of wood apple pulp and 85 parts of khoa by weight basis with addition of 30 per cent sugar. Thikare *et al.* (2020) [11] reported that overall acceptability score during utilization of strawberry pulp in kalakand preparation increases strawberry pulp level blended in cow milk khoa upto 15%, then after same was decreases beyond optimum level.

Cost of production
From table 2 it was observed that the preparation of kalakand from cow milk blended with guava pulp, the cost was per kg kalakand decreased with increases level of guava pulp. On the basis of sensory evaluation, good quality kalakand was prepared from 55 percent cow milk khoa, 30 percent sugar and 15 per cent guava pulp having cost per kg Rs. 227.5. These result are in agreement with the results reported by

Sawant *et al.* (2006) [10] who observed that, the cost of production of kalakand was the highest at Rs 81.13 per kg of in case of T_0, however the treatment C_1S_1, (10% sapota pulp and 6% sugar) amounted to the value of Rs. 78.34 kg. The major portion of attributed to the cost in all the combine action may be attributed to the cost of milk. There was a considerable decreased in cost of the product with the addition of sapota fruit pulp.

Table 2: Estimation of cost structure of 1 kg kalakand production from cow milk blended with guava pulp

	Particular	T_1	T_2	T_3	T_4	T_5
1. Ingredients used						
a.	Cow milk khoa (gm.)	700	650	600	550	500
b.	Sugar (gm)	300	300	300	300	300
c.	Guava pulp (gm)	00	50	100	150	200
2. Cost						
a.	Cow milk khoa @ Rs 260/kg	182	169	156	143	130
b.	Sugar @ Rs 40/kg	12	12	12	12	12
c.	Guava pulp @ Rs 15/100 gm	00	7.5	15	22.5	30
3.	Cost of processing (i.e., utensil, handling, labour, etc)	50	50	50	50	50
4.	Total quantity @ /kg of kalakand	1	1	1	1	1
5.	Cost of production of 1 kg kalakand (Rs)	244	238.5	233	227.5	222

Conclusion

The guava kalakand prepared from 55 per cent cow milk khoa, 30 per cent sugar and 15 per cent guava pulp (T4) was most acceptable and recorded highest score 8.65 for overall acceptability. For cost of production of kalakand /Kg decreasing trend was found due to increase in rate of addition of guava pulp. Most acceptable level (T4) i.e., 15% strawberry pulp, 55% cow milk khoa and 30% sugar has cost of production Rs.227.5 /Kg of kalakand.

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