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Quality Attributes of Kachhagolla -A Delicious Indigenous Milk Product of Bangladesh

[1]M.M. Alam, [2]S.M.R. Rahman, [3]A.K.M.A. Mannan and [4]M. Shams-ud- Din
[1]Livestock Development Program, Proshika, Mirpur–2, Dhaka-1216, Bangladesh
[2]Agricultural Technology Transfer Project , Proshika, Mirpur–2, Dhaka-1216, Bangladesh
[3]Department of Dairy Science, [4]Department of Food Technology and Rural Industries,
Bangladesh Agricultural University, Mymensingh, Bangladesh

Abstract: The present study aimed to prepare an acceptable quality of Kachhagolla and compare the quality of laboratory made Kachhagolla with that of Kachhagolla collected from five selected famous sweetmeat shops in Natore district of Bangladesh. Samples were judged by panel of experts by organoleptic qualities and also were analyzed for chemical and bacteriological properties. Significant difference ($P< 0.01$) was found in case of laboratory made Kachhagolla interns of organoleptic characteristics. Statistical analysis showed that total solid, moisture, fat, protein, carbohydrate and ash of laboratory made Kachhagolla were significantly ($P< 0.01$) higher than that of other samples of market kachhagolla. Total viable bacteria differ significantly among the treatment but coliform bacteria were not significantly differing among the treatments. Physiological, chemical, microbiological examination revealed that the laboratory made Kachhagolla was more superior to other samples and sample B was better than other sweetmeat shop in Natore district.

Key words: Quality attributes, Kachhagolla, delicious, indigenous, milk product

Introduction

The various sweetmeats available in the markets are Channa-based milk products. The sweetmeats are delicious, wholesome, nutritious and very fame items in Bangladesh. From birth to death in each sphere of life milk sweetmeats have occupied a significant place in our society. On occasions like birthdays, marriages, funeral ceremonies, religious festivals and guest entertainment, everywhere milk sweetmeats are inevitable. Different types of famous sweetmeats are available in different areas of Bangladesh. For example, Manda at Muktagacha (Mymensingh), Chomchom at porabari (Tangail), Malaikari in Comilla, *Kachhagolla* in Natore etc. Among sweetmeats Kachhagolla is a very much popular sweetmeat to many people of Bangladesh particularly to the people of Natore District. Various types of Sandesh are sold in the market which are broadly classified into three main grades on the basis of their moisture contents; viz, Kachhagolla (high moisture grade), Narampak (medium moisture grade) and Karapak (low moisture grade). In three varieties of Sandesh, the origin of Kachhagolla is claimed to be the oldest (Sen and Rajorhia, 1989a). Since Kachhagolla is a Chhana based sweetmeat, it is very nutritious on account of its fairly high protein and fat content, minerals, specially calcium and phosphorus and also fat soluble vitamins particularly vitamin A and D.

There are about 51200 milch cows (including 12100-crossbred cow) and nine ton milk is produced per day in Natore District (Natore, 1997). A part of produced milk used for the preparation of chhana and finally for sweetmeats especially for Kachhagolla making. There are about 30 sweetmeat shops in Natore district town those are making Kachhagolla and they are selling about 1200kg Kachhagolla per day. This highly demandable Kachhagolla is produced traditionally in the sweetmeat shop of Natore district town. There is no set standards and regulation for production of quality Kachhagolla. Although the actual preparation and standards depend on manufacturing practices of the experienced producers. No research work has yet been done on the quality of Kachhagolla available in Natore. The present research was undertaken to monitor the quality of kachhagolla with following objectives:

i. Study the comparison of the physical, chemical and bacteriological characteristics of Kachhagolla available in Natore with that of Kachhagolla prepared in the Dairy Science Laboratory of the Bangladesh Agricultural University (B.A.U.).
ii. Evaluate the organoleptic quality of the Kachhagolla.

Materials and Methods

Background of the experiment: The experiment was conducted at Dairy and Microbiology laboratory of Bangladesh Agricultural University, Mymensingh. Kachhagolla sample was prepared at Dairy Technology and Microbiology laboratory of BAU, Mymensingh. At the same time the samples of Kachhagolla were collected from five famous sweetmeat shops in Natore district of Bangladesh. These were Joykali Mistanno Bhandar (B), Anuqul Mistanno Bhandar (C), Janani Mistanno Bhandar (D), Ratan Mistanno Bhandar (E) and Nimtali Mistanno Bhandar (F) respectively. A stands for laboratory was made.

Manufacture of laboratory made kachhagolla: The appropriate quantity of Chhana was broken into bits and was kneaded. It was then mixed with cane sugar at the rate of 30% by weight of Chhana in an iron pan and cooked at controlled heating in a low flame with continuous stirring and scraping with a ladle. This process was continued until the mixture develops its characteristic sticky granular texture and flavour. Finally it was poured into a tray. The mixture was allowed to cool for 2-3 hours for setting. No artificial colour was added to avoid masking of the original colour. A little amount of dust cardamon was mixed with Kachhagolla to give the aroma of Cardamon spice to the mixture. No packaging material was used for experimental product. In the experiment each treatment was repeated 3 times. A schematic presentation for preparation of laboratory made Kachhagolla is shown in Fig. 1.

Parameter study procedure: After preparing and collecting the kachhagolla samples were kept in the refrigerator until further experimental work. The samples were subjected to physical (flavour, body and texture, colour and appearance, sweetness), chemical (total solid, moisture, protein, carbohydrate and fat content) and microbiological evaluations (coliform , total count). The kachhagolla was also analyzed in the laboratory to know the moisture, total solids, fat, protein and ash content. Anonymous (1982) method was used for analysis. The kachhagolla was evaluated for sensory quality by a team of experienced judges. Microbiological parameters were determined by standard plate count (SPC) method as per Anonymous (1967).

Statistical analysis: All experimental materials were completely homogenous and statistical analysis was done as per Steel and Torrie (1984) by using Completely Randomized Design. Analysis of variance test was done to find statistical differences between the treatments. LSD value was also calculated to see the difference within the means.

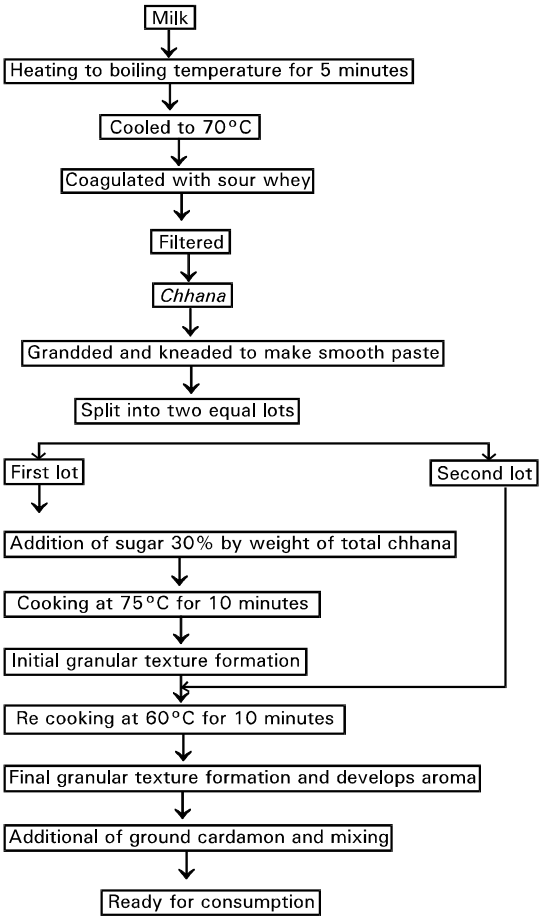

Fig. 1: Schematic representation for preparation of laboratory made Kachhagolla

Results and Discussion

Physical parameters: The scores of flavour, body and texture, color and appearance, sweetness and overall final scores of kachhagolla are given in Table 1. The flavour scores of kachhagolla samples A B, C, D, E & F were 41.75± 0.25, 38.417± 0.381, 37.5± 0.50, 36.5± 0.50, 37.167± 0.50 and 35.167± 1.04 respectively. Significant difference (P< 0.01) was found in respect of flavour of the samples (Table 1). Similar trend was found in case of body & texture, colour & appearance, and sweetness scores of kachhagolla samples. The overall scores of six samples were determined on the basis of the average scores recorded for different sensory attributes and the results are presented in Table 1. Significant differences (P < 0.01) was found in respect of overall score of the samples (Table 1). The overall score of sample A was the highest among six samples and the overall score of sample B was the highest among Natore made kachhagolla samples. Judging from the results of all physical parameters, it may be said that sample A was better than market kachhagolla and sample B was better than that of other market samples of kachhagolla.

Chemical parameters: The total solid content of kachhagolla sample of A, B, C, D, E & F were 66.297± 0.87, 62.190± 2.22, 61.770± 1.53, 60.053± 0.80, 63.14± 0.74 and 60.40 ± 0.67 per cent respectively. There was a significant difference (P< 0.01) in total solid contents of the samples (Table 2). Table 2 indicates that the total solid content of sample A was the highest among six samples and the sample E was the highest among Natore made kachhagolla. Increased level of total solids in kachhagolla due to effect of pure Chhana and time of cooking. Sen (1992) found that the average total solid contents of kachhagolla samples of Calcutta and Delhi market were 66.11 and 65.04 per cent respectively which are closely similar to our findings.

The moisture percentage of kachhagolla samples A, B, C, D, E & F were 33.70± 0.87, 37.18± 2.22, 38.23± 1.53, 39.94± 0.80, 36.86± 0.74 and 39.60± 0.67 respectively. There was a significant difference (P< 0.01) in moisture content of the samples (Table 2). There was little difference between laboratory and Natore made kachhagolla. The maximum moisture content was noticed in sample D and the lowest moisture content was found in sample A. Increased level of moisture content in kachhagolla due to effect of impure Chhana and duration of cooking. Similar results were also reported by Sen (1992) who found that the average moisture content of kachhagolla samples of Calcutta and Delhi market were 33.89 and 34.9 per cent respectively.

The fat percentage of kachhagolla samples A, B, C, D, E & F were 17.78± 0.68, 6.60± 0.57, 10.08± 0.52, 4.05± 0.78, 5.24± 0.95 and 3.40± 0.93 respectively. Statistical analysis showed that there was a significant difference (P< 0.01) in fat content within different samples (Table 2). Table 2 demonstrates that fat content of the samples were not similar. The fat content of laboratory kachhagolla nearly agrees with the findings of Sen (1992), who found that the average fat content of kachhagolla samples of Calcutta and Delhi market were 15.50 and 12.57 percent respectively. On the other hand the fat content of Natore made *kachhagolla* were very low than that of laboratory made kachhagolla samples which indicates that low fat milk was used in preparation of kachhagolla . Similar results were also obtained by Sen and Rajorhia (1989b).

The percentage protein content of kachhagolla samples A, B, C, D, E & F were 13.52± 0.65, 9.96± 0.60, 7.23± 0.40, 8.14± 0.46, 12.30± 0.90 and 12.49± 1.51 respectively. There was a significant difference (P< 0.01) in protein content of the samples (Table 2). So protein content of kachhagolla deferred for different kachhagolla samples because protein content of kachhagolla sample depend upon the quality of Chhana . Sen (1992) found that the average protein content of kachhagolla sample was 12.75 and 11.93 for Caltutta and Delhi market, which almost coincides with the present findings.

Carbohydrate content of laboratory made kachhagolla and market made k*achhagolla* samples were 33.36± 0.87 and 43.25± 0.99-46.59± 0.46 respectively. Statistical analysis showed that there was a significant difference (P< 0.01) in carbohydrate content within six different samples (Table 2). Carbohydrate content of kachhagolla samples depended upon the addition of sugar and starchy materials. Wide variation carbohydrate content of Natore made kachhagolla samples were observed which was almost similar with the findings of Sarkar (1975) . He reported soft and hard grade Sandesh sample of Calcutta market having wide variation in respect of sucrose content. Carbohydrates content of kachhagolla samples depend upon the addition of sugar and starchy materials. It was reported that sugar is the only preservative in Sandesh (Banerjee and Sarker ,1977) . In this contest of view, more sugar was mixed in Nator made kachhagolla samples. The results agree with the work of Sen(1992) who found that carbohydrate content of kachhagolla sample of Calcutta and Delhi market were 35.75 and 38.41 percent respectively.

The percentage of ash content of kachhagolla samples A, B, C, D, E & F were 1.63± 0.02, 1.36± 0.04, 1.20± 0.02, 1.26± 0.03, 1.13± 0.01 and 1.18± 0.01 respectively. Significant difference (P< 0.01) was found in respect of ash content of the samples (Table 2). Sen (1992) found that the average ash content of kachhagolla samples of Calcutta and Delhi market were 1.43 and 1.41 percent respectively which are closely similar to the finding of present study.

Bacteriological Parameters: The number of total viable count per gram of samples were 35 x 10^4, 85 x 10^4, 120 x 10^4, 150 x 10^4, 88 x 10^4 and 220 x 10^4 respectively for A,B,C,D,E and F samples. Statistically it was found that there was a significant difference (P< 0.01) within the total viable bacteria of different types of

Table 1: Comparison of average score of various organoleptic characteristics of laboratory made kachhagolla and the kachhagolla of five different sweetmeat shops in Natore

Physical Parameters	Samples A	B	C	D	E	F	Level of significance
Flavor (45)	41.75a± 0.25	38.417b± 0.381	37.50c± 0.50	36.50d± 0.50	37.167cd± 0.50	35.167e± 1.04	**
Body and Texture (30)	28.633a± 0.125	25.417b± 0.381	24.917bc± 0.877	25.333b± 0.629	25.333b± 0.629	24.00c± 0.901	**
Color and appearance (15)	14.00a± 0.50	12.417b± 0.520	11.917b± 0.520	11.667bc± 0.763	11.667bc± 0.629	10.583c± 0.629	**
Sweetness (15)	9.127a± 0.125	7.25b± 0.25	7.117b± 0.625	6.633bc± 0.464	7.067b± 0.513	6.283c± 0.407	**
Overall final score (100)	93.51a± 0.424	83.50b± 1.145	81.450c± 1.325	80.133c± 0.768	81.067c± 1.597	76.033d± 1.338	

**The means with different superscripts within the rows are significantly different at P < 0.01.

Table 2: Comparison of average score of various chemical composition of laboratory made kachhagolla and the kachhagolla of five different sweetmeat shops in Natore.

Physical Parameters	Samples A	B	C	D	E	F	Level of significance
Total solids(%)	66.927a± 0.878	62.190bc± 2.229	61.770bc± 1.537	60.053c± 0.800	63.140b± 0.741	60.400c± 0.675	**
Moisture (%)	33.703c± 0.878	37.810ab± 2.229	38.230ab± 1.537	39.947a± 0.800	36.860b± 0.741	39.600a± 0.675	**
Fat (%)	17.780a± 0.680	6.600c± 0.576	10.087b± 0.524	4.057de± 0.789	5.247cd± 0.953	3.407e± 0.933	**
Protein (%)	13.520a± 0.650	9.967b± 0.609	7.233c± 0.402	8.146c± 0.463	12.307a± 0.905	12.497a± 1.513	**
Carbohydrate (%)	33.367c± 0.873	44.263b± 0.966	43.250b± 0.991	46.593a± 0.460	44.457b± 0.694	43.317b± 0.787	**
Ash (%)	1.630a± 0.020	1.360b± 0.040	1.200d± 0.020	1.260c± 0.030	1.130e± 0.01	1.180de± 0.010	

**The means with different superscripts within the rows are significantly different at P < 0.01.

Table 3: Comparison of Bacterial status of laboratory made kachhagolla and the kachhagolla of five different sweetmeat shops in Natore.

Physical Parameters	Samples A	B	C	D	E	F	Level of significance
Coliform/g (x 100)	0.00	1.333± 0.577	1.333± 0.577	1.667± 0.577	1.333± 1.154	2.000± 1.00	NS
Total count/g (x 10000)	35.0d± 3.0	85.0c± 4.582	120.0bc± 2.00	150.0b± 3.00	88.0c± 8.717	220.0a± 5.291	

NS = Not significant; The means with different superscripts within the rows are significantly different at P < 0.01; Note : A = Laboratory made kachhagolla, B= kachhagolla of Joykali Mistanno Bhandar, C = kachhagolla of Anuqul Mistanno Bhandar, D = kachhagolla of Janani Mistanno Bhandar, E = kachhagolla of Ratan Mistanno Bhandar and F = kachhagolla of Nimtali Mistanno Bhandar.

kachhagolla sample (Table 3).

The number of coliform per gram of samples were 0, 1.333 x 10^2, 1.333 x 10^2, 1.667 x 10^2, 1.333 x 10^2 and 2.000 x 10^2 respectively for A,B, C, D, E, and F sample . Statistical analysis showed that there was no significant difference of coliform content within six different samples (Table 3). Coliform bacteria are one of the major indications of hygienic condition of milk (Rahman *et al.*, 2000). Higher coliform bacteria indicate that proper hygienic measures were not usually taken by the above mentioned kachhagolla sample during the *Kachhagolla* preparation. Sen (1992) reported that the average coliform number in kachhagolla samples of Calcutta and Delhi market were 3.7 x 10^1 and 6.2 x 10^1 respectively which is indicating that the kachhagolla samples of Natore were under more hygienic conditions than the Calcutta and Delhi market kachhagolla samples while coliform content in the laboratory made kachhagolla samples were nil.

From the results of all parameters (physical, chemical and bacteriological) it was observed that the laboratory made kachhagolla was better than the *Kachhagolla* available in Natore. This may be attributed to addition of pure Chhana obtained from fresh milk, optimum level of sugar, control heating and maintenance of strict hygienic measures during preparation of kachhagolla in the laboratory. With higher moisture and carbohydrate content and with lower fat level in Natore made kachhagolla indicated that the manufacturers had adulterated their products. The possible adulteration may be addition of Skim milk Chhana, wheat flour and high level of sugar in the kachhagolla formulation.

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