Physio-Chemical Properties of Buffalo Milk Pudding Developed with Different Level of Egg

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ABSTRACT

In this experimental an attempt was made to determine the optimum level of egg in the manufacture of buffalo milk pudding. For this purpose pudding samples were prepared at Dairy Technology and Microbiology Laboratory of the Department of Dairy Science, Bangladesh Agricultural University, Mymensingh. Milk samples collected from Senbari of Trishalthana under Mymensingh district. Pudding was prepared with different levels of eggs (40, 30 and 20% by weight) and a constant level of corn flour (4%). So, three types of pudding samples were prepared. Quality of pudding was monitored by using physical, chemical and microbial test. From the result of physical study (smell and taste, body and consistency, color and appearance) it was found that pudding containing 40% egg obtained the best score (97.50 ± 3.77) followed by 30% egg containing pudding (83.96 ± 2.52) and 20% egg containing pudding (74.93 ± 1.01). The differences within the overall score with different level of egg ha significant effect. Chemical analysis showed that the significant differences ($p < 0.01$) existed within the total solids (TS) (340.61 ± 1.72, 334.18 ± 2.10 and 327.48 ± 2.61) moisture (659.39 ± 1.72, 665.82 ± 2.10 and 672.52 ± 2.61), fat (79.37 ± 1.90, 76.43 ± 2.76 and 73.47 ± 3.62), protein (60.43 ± 0.90, 53.82 ± 0.57 and 47.07 ± 0.25), carbohydrate (194.02 ± 1.07, 197.33 ± 1.17 and 200.57 ± 1.21) and pH (6.90 ± 0.00, 6.93 ± 0.21 and 6.87 ± 0.22) but no significant differences was found in ash (6.78 ± 0.14, 6.58 ± 0.13 and 6.38 ± 0.01) and acidity percentage (0.071 ± 0.00, 0.071 ± 0.00 and 0.071 ± 0.00%). From the results of all parameters it may be concluded that maintaining the standard corn flour level only different egg levels can change the quality of pudding samples and containing 40% egg by weight with 4% constant corn flour seems better for manufacture of buffalo milk pudding.

Keywords: Pudding, Buffalo milk, Egg

INTRODUCTION

Milk is the most complete and nutritious food and a common article of diet for human being. It is the first food of the newly born human being and other mammals.Milk is used to manufacture different kinds of delicious products, even more useful for health. Pudding is one of the most important milk products. All over the world the demand and production of pudding are increasing day by day.Pudding is dessert prepared by addition of suitable quantity of egg to whole milk or concentrated milk or condensed milk. If needed any suitable

sweetener and thickening materials could be added to the mixture.The main source of milk in the world is cows. But there is an actual shortage of milk in Bangladesh. The second source of milk is buffaloes. In India nearly half of the milk processed by the organized dairies comes from buffaloes (Mudgal, 1989). Buffalo milk fat has less cholesterol and more tocopherol which is a natural antioxidant. Buffalo milk is richer in calcium and phosphorus content and lower in sodium and potassium than cow milk, which accounts for the natural preservation of buffalo milk (Mudgal, 1989). Buffalo milk is better tea/ coffee whitener and makes richer, firmer curd and yoghurt (Mudgal, 1989).All most all milk product including long-life milk, dried milk, infant milk foods, cultured milk etc. can be made from buffalo milk without any changes in the equipment (Aneja, 1990; McDowell *et al.* 1995).The buffalo milk requires less time to coagulate with stands heating. As the pudding is prepared by coagulation with stand heating so, it is an advantage to use buffalo milk for pudding manufacture.Pudding is widely accepted by people in our country. If it is prepared maintaining proper hygienic conditions and compositional standards, this milk product could be an excellent supplementary food item in our diet. So, as a rich source of milk fat and protein, pudding may play a very important role to alleviate the protein-caloric malnutrition problem in our country.From the above discussion it is clear that pudding is very important food item. But unfortunately there were a very limited research work performs on pudding in our country. In the aspect of Bangladesh extensive research work is essential to evaluate the feasibility of using different egg levels for manufacturing pudding. Therefor the purpose of the study is to manufacture acceptable quality of pudding from buffalo milk using different levels of egg and to recommend acceptable level of egg for the manufacture of buffalo milk pudding.

MATERIALS AND METHODS

The present study was carried out at the Dairy Technology and Microbiology Laboratory of the Department of Dairy Science, Bangladesh Agricultural University (BAU), Mymensingh. Whole milk of buffalo was collected from Senbari at Trisalthana under Mymensingh district. Chicken eggs, corn flour and sugar were collected from the KR market, BAU, Mymensingh.

Before preparation of various types of puddings whole milk, eggs and corn flour used in this study were analyzed in the laboratory to monitor the quality.Specific gravity test was performed by using Quevenne lactometer, according to the method described by Aggarwala and Sharma (1961).The total solids and moisture contents of milk and different types of samples were determined by oven drying method according to AOAC (2003). Fat percent of milk was determined Babcock method using the procedure described by Aggarwala and Sharma (1961). Fat percent of different pudding sample was determined by Ether Extraction method, protein was determined by Kjeldahl procedure according to AOAC (2003). Ash content of milk and pudding samples was determined by burning with muffle furnace according to AOAC (2003). Carbohydrate was determined by the calculation method. Acidity was determined by titrating with N/10 sodium hydroxide solution using the procedure of Aggarwala and Sharma (1961). P^H was measured with the help of P^H meter-215 (Ciba Corning Diagnostic Ltd. Sudhury, Suffolk, England Co 106 X D).

The sugar and corn flour was mixed into the whole milk and then stirred thoroughly with the help of spoon. After proper mixing different levels of eggs (40%, 30% and 20% by weight) was added to it followed by blending. The mix was then taken in the mould and covered properly. The mould was placed in the pan half-full of water and kept for 1-1.5 hours until the mix coagulated. The pudding was then prepared. After optimum cooling at room temperature, the mould was placed in the refrigerator for about 2 hours for cooling and the pudding was ready to serve. The following three samples were found:

Sample A: 300ml whole milk +200gm eggs +4% corn flour +15% sugar
Sample B: 350ml whole milk +150gm eggs +4% corn flour +15% sugar
Sample C: 400ml whole milk +100gm eggs +4% corn flour +15% sugar

Testing of pudding

Organoleptic, chemical and microbiological tests were done immediately after preparation.A panel of experienced judges examined the samples according to the following organoleptic parameters.

i. Smell and taste (50 marks)
ii. Body and consistency (20 marks)
iii. Color and Appearance (30 marks)

All the samples were chemically analyzed for measuring the following parameters.

i. Total solids (TS) content (g/kg)
ii. Moisture content (g/kg)
iii. Fat content (g/kg)
iv. Protein content (g/kg)
v. Ash content (g/kg)
vi. Carbohydrate (g/kg)
vii. Acidity (%)
viii. P^H value

Data analysis

Design: Completely Randomized Design (CRD)
Treatment: 3 and Replication: 3
Data obtained from different parameters were analyzed statistically. To find out the statistical difference between different treatments analysis of variance test (ANOVA) was done. To show the relationship between mean values, the Least Significant Difference (LSD) test was done (Gomez *et al*, 1984). Statistical program MSTAT (Microsoft Statistics) used for data analysis.

RESULTS AND DISCUSSION

The initial quality of buffalo milk was analyzed. The average specific gravity of experimental buffalo milk samples was 1.031 ± 0.001. This result agrees with the findings of Sethi*et al.* (1996). The mean fat content and standard deviation in buffalo milk collect from Senbari at Trishalthana was 81.00 ± 6.56 g/kg. Normally butter fat of buffalo milk varies from 4.4 to 8.9% (Faruque, 1996). The average protein content of buffalo milk samples was 37.5 ± 0.5 g/kg. This result agrees with one findings of Sultana (20007). The average ash content of buffalo milk samples was 7.03 ± 0.06. This result agrees with Sharma *et al.* (1980). Average total solids (TS) content of eggs samples was 254.08±1.67 g/kg. Haque and Sultana (2003) found 24.67% total solids in chicken egg which is slightly lower than that obtained in present study.The physical properties of the pudding prepared in the laboratory were evaluated and presented in (Table 1).Average smell and taste scores of pudding samples prepared by adding 40, 30 and 20% egg were 48.78 ± 3.27, 42.83 ± 1.89 and 39.57 ± 1.60 respectively. Statistical analysis showed that there were significant difference ($p<0.01$) among the smell and taste score of different pudding samples. This result also indicates that the highest score was for A sample (i.e. 40% egg) and the lowest score for C sample (i.e. 20% egg). The average body and consistency of pudding samples prepared by different levels of eggs such as 40%, 30% and 20% were 19.41 ± 0.66, 17.70 ± 1.41 and 14.28 ± 0.95 respectively. Statistical analysis showed that there were significant differences ($p < 0.01$) among the body and consistency of different pudding samples.From the results it was clear that the highest body and consistency score for A sample containing 40% egg level and lowest for C sample with 20% egg level. Judges also prefer the pudding sample prepared by adding 40% egg. So, the body and consistency of pudding sample was influenced by egg.

Table 1: Average score of various physical characteristics of different types of pudding containing different levels of egg

Parameters studied	Types of pudding A (40% egg)	B (30% egg)	C (20% egg)	LSD	Level of significance
Smell & Taste (50)	48.78^{a}±3.27	42.83^{b}±1.89	39.57^{c}±1.60	2.108	**
Body and Consistency (20)	19.41^{a}±0.66	17.70^{b}±1.41	14.28^{c}±0.95	0.884	**
Color and appearance (30)	29.31^{a}±0.82	23.43^{b}±0.76	21.08^{c}±1.37	0.986	**
Overall Score (100)	97.50^{a}±3.77	83.96^{b}±2.52	74.93^{c}±1.01	2.509	**

Means with different superscript in the same row differ significantly

** = Significant at 1% level

Average color and appearance scores of different pudding samples are presented in Table 1. It was found that average color and appearance scores for 40, 30 and 20% egg containing pudding samples were 29.31 ± 0.82, 23.43 ± 0.76 and 21.08 ± 1.37 respectively. Statistically there were significant differences ($p < 0.01$) among the color and appearance score of different sample.From the result of this experiment it was found that the average color and appearance score was influenced by egg levels.The average overall score of pudding samples

(40%, 30% and 20% egg) on the basis of smell and taste, body and consistency, color and appearance were 97.50 ± 3.77, 83.96 ± 2.52 and 74.93 ± 1.01 respectively. Statistical analysis showed that there were significant differences ($p < 0.01$) among the overall scores of different types of pudding sample. Highest score was obtained by 40% egg added pudding and lowest score was given do 20% egg added pudding.From this experiment overall score also indicated that different levels of were important regarding the overall score of physical parameters for pudding samples and also physical qualities of pudding were influenced by egg levels. It was observed that 40% egg added pudding was better chosen by the panel lists.

The average total solids (TS) content of different types of pudding samples are presented in (Table 2). From this experiment it was found that average TS content of 40, 30 and 20% egg containing pudding samples were 340.61 ± 1.72, 334.18 ± 2.10 and 327.48 ± 2.61 g/kg ($p < 0.01$) among the TS content of different samples. The highest value was observed incase of 40% egg added sample and lowest value incase of 20% flour added sample. As the total solids content is higher in egg than milk so, the total solids (TS) content was increased in pudding when egg ratio was increased in manufacturing pudding. The average moisture content of different types of pudding samples are presented in (Table 2).

Table 2: Average chemical composition of different types of pudding samples prepared with different egg levels

Parameters studied	Types of pudding			LSD	Level of significance
	A (40% egg)	B (30% egg)	C (20% egg)		
Total solids (g/kg)	340.61^{a}±1.72	334.18^{a}±2.10	327.48^{b}±2.61	9.439	**
Moisture (g/kg)	659.39^{c}±1.72	665.82^{b}±2.10	672.52^{a}±2.61	4.728	**
Fat (g/kg)	79.37^{a}±1.90	76.43^{ab}±2.76	73.47^{b}±3.62	4.106	**
Protein (g/kg)	60.43^{a}±0.90	53.83^{b}±0.57	47.07^{c}±0.25	5.449	**
Carbohydrate (g/kg)	194.02^{c}±1.07	197.33^{b}±1.17	200.57^{a}±1.21	2.061	**
Ash (g/kg)	6.78±0.14	6.58±0.13	6.38±0.10	1.675	NS
Acidity (%)	0.071±0.00	0.071±0.00	0.071±0.00	-	NS
pH	6.90^{b}±0.00	6.93^{a}±0.21	6.87^{c}±0.22	0.191	**

Means with different superscript in the same row differ significantly

** = Significant at 1% level

NS = Non significant

The average moisture content found in this experiment of 40, 30 and 20% egg containing pudding samples were 659.39 ± 17, 665.82 ± 2.10 and 672.52 ± 2.61 g/kg respectively. Statistically there were significant differences ($p < 0.01$) among the moisture content of different pudding samples. Milk contain more moisture than egg and from this experiment it was observed that moisture level is low for A sample because it contain more egg level (40%) than other pudding samples and less milk. Similarly C sample contain highest moisture than other due to less egg level.The mean fat content of 40%, 30 and 20% egg content were 79.37 ± 1.90, 76.43 ± 2.76 and 73.47 ± 3.62 g/kg in (Table 2). Statistically there were significant differences ($p < 0.01$) among the fat content of different pudding samples. In this experiment,

chemical analysis of pudding revealed that pudding prepared by 40% egg contained the highest amount of fat than other pudding samples. This is due the fact that egg contain more fat than buffalo milk and pudding prepared 40% egg contained the highest level of egg and lower milk than other pudding samples. Thus the fat content of pudding increased with increasing of egg level.The mean protein content of 40%, 30 and 20% egg containing pudding samples were 60.43 ± 0.90, 53.83 ± 0.57 and 47.07 ± 0.25 g/kg in (Table 2). Statistically there were significant differences ($p < 0.01$) among the protein content of different pudding sample. In this experiment, chemical analysis of pudding revealed that pudding prepared by 40% egg contained the highest amount of fat than other pudding samples. This is due the fact that egg contain more protein than buffalo milk and pudding prepared 40% egg contained the highest level of egg and lower milk than other pudding samples. Thus the protein content of pudding increased with increasing of egg level.The mean carbohydrate content of 40%, 30% and 20% egg containing pudding samples were 194.02 ± 1.07, 197.33 ± 1.17 and 200.57 ± 1.21 g/kg respectively. Statistically there were significant differences ($p <0.01$) among the carbohydrate contents of different pudding samples. This is due to the addition of different level of eggs. As the sample C contains more milk and less egg level (20%) so, it contains more carbohydrate than other sample. Similarly sample A (40% egg) contain the lowest carbohydrate than other sample due to containing less milk and more egg level. The average ash content of 40%, 30% and 20% egg containing different pudding samples were 6.78 ± 0.14, 6.58 ± 0.13 and 6.38 0.10 g/kg respectively. Statistically there were no significant differences among the ash content of different pudding sample. It indicated that the different levels of egg had no significant effect on ash content of pudding sample.Acidity percentage of 40, 30 and 20% egg containing pudding samples were 0.071 ± 0.00, 0.071 ± 0.00 and 0.071 ± 0.00 respectively. Statistical analysis showed that there was no significant effect among the acidity percentage of different pudding samples. This study indicated that the different level of eggs had no significant effect on the acidity percentage of pudding samples.pH value for 40, 30 and 20% egg containing pudding were 6.90 ± 0.00, 6.93 ± 8.21 and 6.87 ± 0.22 respectively. Statistically there were significant differences ($p < 0.01$) among the pH value of different pudding samples. It indicates that pH value of pudding samples was influenced by different levels of egg.

From the present study it clear that 40% egg is suitable for the manufacture of buffalo milk pudding in the point of physical properties and also more nutritious in the point of chemical parameters. On this experiment it is evident that 40% egg level with a constant level of corn flour (4%) seems better for the manufacture of buffalo milk pudding.

CONCLUSION

From the results of all parameters it may be concluded that by maintaining the standard corn flour level only different egg levels can change the quality of pudding samples and containing 40% egg by weight with 4% constant corn flour seems better for manufacture of buffalo milk pudding. As there was a limited research work on buffalo milk pudding so, there is a huge opportunity to improve the quality of pudding and to standardize their quality. Therefore, steps should be taken to increase the standard of pudding throughout Bangladesh and create more skilled personnel who could make the best quality pudding.

CONFLICT OF INTEREST STATEMENT

The author declares that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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