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Optimized buffalo milk chhana spread on the basis of organoleptic attributes

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Abstract
The value of milk as a food is well established over the world particularly in our country where large sections of the population are lacto-vegetarians. Milk, therefore, play an import- ants role in the diets of our children the aged, pregnant and nursing mothers and others nutritionally vulnerable sections of the population. Chhana or paneer, means the product obtained from cow or buffalo milk or a combination of them by precipitation with sour milk, Ebe less than 50% of the dry matter (PFA, 1976). The study was conducted in the Student's Training Dairy and Research Laboratory of Warner School of Food and Dairy Technology, SHIATS Allahabad. The buffalo milk as (M_2) were used for making chhana spread and three different coagulant temperature 60^0C, 65^0C, 70^0C asT_1 T_2 T_3 and three salt levels 1%,1.5%, 2% S_1, S_2, S_3 were used in the present experimental work. 9 treatment combinations used in the experiment namely $M_2T_1S_1$ $M_2T_1S_2$, $M_2T_1S_3$, M2T2S1, M2T2S2, M2T2S3, M2T3S1, M2T3S2, $M_2T_3S_3$ and replicated three times. The experiment treatment combination ($M_2T_1S_3$) chhana spread contained highest percentage of moisture (54.66). The experiment treatment combination ($M_2T_3S_1$) contained highest percentage of fat (25.98).The highest percentage of protein (15.29) was found in the treatment combination ($M_2T_2S_1$). The highest percentage of lactose (3.06) was found in the treatment combination ($M_2T_2S_1$). The treatment combination ($M_2T_3S_1$) contained highest percentage of ash (3.07).The highest percentage of calcium (479.63) was found in the treatment combination ($M_2T_1S_3$). The highest energy value of (253.26) was found in the treatment combinastions ($M_2T_2S_1$). Chhana spread is still in its infancy and needs various parameters to be fixed and tested before its commercial use and large scale productions by organized sector. Considering the popularity characteristics and nutritive values of chhana and to develop cheap technology for its spread production and with longer self-life.

Keywords: Chhana spread, coagulation temperature, salt levels, storage periods.

1. Introduction
According toa conducted survey by BM Birla Heart Research Institute (Chakarvarti, 2005). India is fast emerging as the country with the highest number of cardiac cases in the World. Reduced fat formulations need to be developed for such individuals, while preserving their basic food selection patterns. Researchers and medical boards have considered milk fat is a more saturated as compared to vegetable oils containing PUFA. Excessive fat (saturated) intake is a major causative factor in high blood pressure, coronary heart disease and has been linked to a number of other disorders as well. Reports revealed that high dietary fat intake shortens clotting time of blood. High intake of fat increase risk of heart attack because of high proportions of saturated fats in the diet. Many nutritionists believe that if fat intake is reduced to provide less than 30 per cent of the calories through fats and oil dietary fat would not be heart disease. Milk is an ideal food. It is one of the best source of body building proteins, bone forming minerals and health promoting vitamins, energy giving lactose and milk fat as such it can be consumed with beneficial effect in amounts recommended in table of nutrients allowances. Among milk products. Chhana or paneer, means the product obtained from cow or buffalo milk or a combination of them by precipitation with sour milk, lactic acid or citric acid. It shall not contain more than 70% of the moisture, and the milk fat not be less than 50% of the dry matter as defined by (PFA, 1976). Nutritive value of Chhana is fairly high as it contains almost all the protein present in milk besides quantity of minerals and vitamins. It possesses a nutty flavor with slightly sour and sweet taste which makes it palatable to Indian palate. It is an ideal food for expectant and nursing mothers, infants, growing children's, adolescents and adults. Being rich source of animal protein, it is a good source of all the essential amino acids to the vegetarians. Its fat content renders the fat soluble vitamin A and D, essential fatty acid (linoleic, linolenic and arachedonic acid) and energy. With its high protein and low sugar content, it is highly recommended to the diabetic patients. It has also particular food value for those who possess the problem of milk intolerance. Chhana retains about 90% of fat and protein, 50% ash and 10% lactose of the original milk. The energy value of cow chhana

ranges from 2886 to 3748 calories per kg and chhana also retains appreciable proportion of fat soluble vitamins A and D (Ray and De 1953).

2. Material and Methods

The present investigation was conducted in the Student's Training Dairy and Research Laboratory of Warner School of Food and Dairy Technology and Nutrition Research Laboratory of Ethelind school of Home science, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed - to – be – University), Allahabad, U.P.

A. Preparation of chhana spread

Chhana was prepared from buffalo milk standardized to 6 % fat & 9% SNF as per method suggested by Ray and De (1953). Cow milk was heated at 90°C for 15 minutes and cooled down to 60°C and therefore, added warm coagulant solution (1%) at 60°C to effect proper coagulation. Traditional method was used to drain the free whey from the coagulated mass. The curd along with whey was transferred on a muslin cloth and whey was allowed to drain by hanging technique till trickling of free whey was stopped. The curd sample obtained by this method was subjected for chhana spread making. The curd from traditional method was converted into chhana spread by using method suggested by Tiwari and Sachdeva (1991). In this case chhana was broken into pieces and blended in domestic blender along with 10 percent whey and specified salt level

S. No.	Treatments	Combinations
1	$M_2T_1S_1$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9 %SNF and coagulation of milk at 60^0C and using 1 % salt level
2	$M_2T_1S_2$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9 %SNF and coagulation of milk at 60^0C and using 1.5 %salt levels
3	$M_2T_1S_3$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9 %SNF and coagulation of milk at 60^0C and using 2 % salt levels
4	$M_2T_2S_1$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9 %SNF and coagulation of milk at 65^0C and using 1 % salt levels
5	$M_2T_2S_2$	Chhana spread prepared from buffalo milk containing 6% milk fat and 9 %SNF and coagulation of milk at 65^0C and using 1.5 % salt levels
6	$M_2T_2S_3$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9 %SNF and coagulation of milk at 65^0C and using 2 % salt levels
7	$M_2T_3S_1$	Chhana spread prepared from buffalo milk containing 6% milk fat and 9 %SNF and coagulation of milk at 70^0C and using 1 % salt levels
8	$M_2T_3S_2$	Chhana spread prepared from buffalo milk containing 6% milk fat and 9%SNF and coagulation of milk at 70^0C and using 1.5 % salt levels
9	$M_2T_3S_3$	Chhana spread prepared from buffalo milk containing 6 % milk fat and 9%SNF and coagulation of milk at 70^0C and using 2 % salt levels

B. Treatment Combinations: The buffalo milk as (M_2) chhana spread and three different coagulant temperature 60^0C,65^0C,70^0C as T_1, T_2, T_3 and three salt levels 1%,1.5%, 2% as S_1, S_2, S_3, respectively, were used in the present experimental work. Channa prepared from different treatment combinations were compared with each other. The different combinations used in the experiment were represented as follow

C. Organoleptic Attributes: Sensory evaluation of chhana spread was done by a panel of five judges by using "9 point score card" (Hedonic Scale). Scores were allocated for various parameters. The samples were placed before the judges with sample code by random number table to avoid positional or order biasness. The panel of judges graded the coded samples of the product**.**

D. Statistical Analysis: The order to study the effects of milk, various temperature, levels of salts and preservatives of chhana spread, a laboratory experiment was conducted and required data were collected. Analysis of variance of these data was worked out on the basis of factorial completely randomized design (Federer, 1963).

3. Results and Discussion

Table 1.1: Average flavor &Taste Scores of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt

Buffalo milk (M_2)					
Sensory Attribute	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S_1 (1%)	S_2 (1.5%)	S_3 (2%)	
Flavour &Taste	T_1 (60^0C)	5.73	6.64	5.92	6.10
	T_2 (65^0C)	5.77	6.89	5.95	6.20
	T_3 (70^0C)	5.83	6.82	5.71	6.12
	Mean	5.77	6.78	5.86	6.14

Factors	M	T	S	MxTxS
SE(m) ±	0.0568	0.0127	0.0568	0.1705
CD at 5%	0.1575	N.S	0.1575	N.S

In above table 1.1 buffalo milk on an average of flavor and taste the coagulation temperature slightly improved scores in 65^0C on 6.20 in comparison to 60^0C and 70^0C but it was not significant. The significant lowest score of flavor and taste was recorded by 6.10 at tested temperature of 60^0C. Low salt percent i.e. 1% showed as 5.77 score which was low over the higher percentage of 1.5% and 2% salt levels. The coagulation temperature variation changes in the experiment of flavor and taste of chhana spread is not change i.e temperatures variation was not significant. The type of milk, and levels of salt changes in the experiment of flavor and taste of chhana spread was also changed in prepared product i.e variation of milk, and levels of salts was found significant at 5 per cent level of significance. The interaction (MxTxS) effect between types of milk, coagulation temperatures and levels of salts was found not significant.

Table 1.2: Average Body &Texture Scores of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt

Buffalo milk (M_2)					
Sensory Attribute	**Coagulation Temperatures**	**Different levels of Salt (S)**			**Mean**
		S_1 (1%)	**S_2 (1.5%)**	**S_3 (2%)**	
Body & texture	T_1 (60^0C)	7.35	7.29	6.73	7.12
	T_2 (65^0C)	6.76	7.23	7.07	7.02
	T_3 (70^0C)	6.70	7.44	6.93	7.02
	Mean	6.93	7.32	6.91	7.05

Factors	M	T	S	MxTxS
SE (m) ±	0.0704	0.0704	0.0704	0.2114
CD at 5%	0.1954	N.S	0.1954	0.5862

The effect of milk different coagulation temperatures and salt levels on body and texture scores of chhana spread in buffalo milk presented Table 1.2 the maximum score i.e. 7.12 was obtained at 60^0C in comparison to maximum tested temperatures of 65^0C and 70^0C, but it was not significant. Low salt percent i.e. 1% showed as 6.40 score which was lower over the higher percentage of 1.5% and 2% salt levels. milk and levels of salt changes in the experiment of body and texture of chhana spread was also changed i.e. variation of milk, levels of salts was found significant at 5 per cent level of significance. The interaction (MxTxS) effect between types of milk, coagulation temperatures and levels of salts was found significant.

Table 1.3: Average colors & Apperences Scores of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt

Buffalo milk (M_2)					
Sensory Attribute	**Coagulation Temperatures**	**Different levels of Salt (S)**			**Mean**
		S_1 (1%)	**S_2 (1.5%)**	**S_3 (2%)**	
Colors & Apperences	T_1 (60^0C)	6.77	7.88	7.01	7.22
	T_2 (65^0C)	6.87	7.04	6.75	6.88
	T_3 (70^0C)	6.72	7.48	6.90	7.03
	Mean	6.78	7.46	6.88	7.04

Factors	M	T	S	MxTxS
SE (m) ±	0.0790	0.0790	0.0790	0.2370
CD at 5%	N.S	N.S	0.2190	N.S

Table 1.3 shows the of buffalo milk, the coagulation temperature slightly improved the score i.e.7.22 at 60^0C as comparison to 65^0C and 70^0C but it was not significant. The significant lowest score of colour and appearance was recorded by 6.89 at tested temperature of 65^0C. Low salt percent i.e. 1% showed as 6.78 score which was low over the higher percentage of 1.5% and 2% salt levels. The maximum score of colour and appearance was noticed as 7.46 at 1.5%level of salt. The interaction (MxTxS) effect between types of milk, coagulation temperatures and levels of salts was found not significant.

Table 1.4: Average Spread ability Scores of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt

Buffalo milk (M_2)					
Sensory Attributes	**Coagulation Temperatures**	**Different levels of Salt (S)**			**Mean**
		S_1 (1%)	**S_2 (1.5%)**	**S_3 (2%)**	
Spread ability	T_1 (60^0C)	7.33	7.68	6.75	7.25
	T_2 (65^0C)	6.84	7.30	7.15	7.09
	T_3 (70^0C)	6.59	7.55	7.08	7.07
	Mean	6.92	7.51	6.99	7.13

Factors	M	T	S	MxTxS
SE (m) ±	0.071	0.071	0.071	0.215
CD at 5%	0.199	0.199	0.199	0.597

Average spread ability scores of various samples of chhana spread has been given in Tables 1.4 which shows the effect of different milk, coagulation temperatures and salt levels on spread ability scores of chhana spread. In buffalo milk on an average maximum score of spread ability was obtained as 7.25 on 60^0C in comparison to other highest tested temperatures of 65^0C and 70^0C. but it was not significant. Low salt percent i.e. 1% showed as 6.92 score which was lower over the higher percentage of 1.5% and 2% salt levels. The type of milk, coagulation temperatures and levels of salt changes in the experiment of spread ability of chhana spread was also changed i.e variation of milk, temperatures and levels of salts was found significant. The interaction (MxTxS) effect between types of milk, coagulation temperatures and levels of salts was found significant.

Table 1.5: Average overall acceptability scores of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt

Buffalo milk (M_2)					
Sensory Attribute	**Coagulation Temperatures**	**Different levels of Salt (S)**			**Mean**
		S_1 (1%)	**S_2 (1.5%)**	**S_3 (2%)**	
Overall Acceptbility	T_1 (60^0C)	6.72	7.42	6.37	6.83
	T_2 (65^0C)	6.38	7.26	6.74	6.79
	T_3 (70^0C)	6.56	7.00	6.77	6.77
	Mean	6.55	7.22	6.62	6.79
Factors	M	T	S	MxTxS	
SE (m) ±	0.060	0.060	0.066	0.182	
CD at 5%	0.168	N.S	0.168	N.S	

The results of chhana spread in respect to overall acceptability score have given in Table 1.5 which exhibited the effect of different types of milk, coagulation temperatures and salt levels and on overall acceptability score of chhana spread. In buffalo milk, In case of buffalo milk the maximum score was contained in 60^0C i.e. 6.83 in comparison to maximum tested temperatures of 65^0C and 70^0C. But it was not significant. Low salt percent i.e. 1% showed as 6.55 score which was lower over the higher percentage of 1.5% and 2% salt levels. The coagulation temperature variation changes in the experiment of overall acceptability of chhana spread is not changed i.e temperatures variation was not significant. The type of milk and levels of salt changes in the experiment of overall acceptability of chhana spread was also changed i.e variation of milk, levels of salts was found significant at 5 per cent level of significance. The interaction (MxTxS) effect between types of milk, coagulation temperatures and levels of salts was found significant.

4. Conclusion

It was concluded that chhana spread can be successfully prepared by the buffalo milk different Kinds coagulation temperature and levels of salt the recipe is standardized for chhana spread. Chhana spread prepared from cow milk having 6% fat and 9%SNF, respectively. The experimental treatments $M_2T_3S_2$ (6.71) (7.53) was found highest score in flavor and taste and overall acceptability respectively. In term body and texture experiment treatments $M_2T_2S_3$ (6.99) was found most acceptable. The experimental treatment $M_2T_3S_2$ (7.65) (7.53) was highest score in colour and appearance and spread ability Score respectively, to be superior to other 6 treatments with regard to the flavor &taste, body& texture, colour & appearance, spread ability and overall acceptability.

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