

NUTRITIONAL AND CHEMICAL PROPERTIES OF CHHANA SPREAD PREPARED FROM COW MILK

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ABSTRACT : Among milk products Chhana is gaining momentum in its production and consumption. Chhana is heated and acid coagulated indigenous milk product which forms the base of several popular Indian sweets like Rasogulla, Sandesh, Rasamalai and Chumchum etc 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 (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 milk cow as (M₁) were used for making chhana spread and three different coagulant temperature 60°C, 65°C, 70°C as T₁ T₂ T₃ and three salt levels 1%, 1.5%, 2% S₁, S₂, S₃ were used in the present experimental work. 9 treatment combinations used in the experiment namely M₁T₁S₁, M₁T₁S₂, M₁T₁S₃, M₁T₂S₁, M₁T₂S₂, M₁T₂S₃, M₁T₃S₁, M₁T₃S₂, M₁T₃S₃ and replicated three times. The experiment treatment combination (M₁T₁S₃) chhana spread contained highest percentage of moisture (65.61). The experiment treatment combination (M₁T₃S₁) contained highest percentage of fat (19.30). The highest percentage of protein (17.14) was found in the treatment combination (M₁T₂S₁). The highest percentage of lactose (3.08) was found in the treatment combination (M₁T₂S₁). The treatment combination (M₁T₃S₁) contained highest percentage of ash (3.08). The highest percentage of calcium (479.63) was found in the treatment combination (M₁T₂S₁). The highest energy value of 253.26 was found in the treatment combinations (M₁T₃S₁). 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.

Key words : Chhana spread, coagulation temperature, salt levels, storage periods.

INTRODUCTION

Today the average per capita availability of milk in India has reached 246 gm per day, when the world milk production in 2008 is around 700 million tones, out of which India has produced 106 million tones. The goals of the 11th five year plan for the live stock sector are expected to achieve an overall growth is estimated to 5% per annum from 100 million tones from 2008 to 126.46 million tones by 2011-12 (Dairy Man, 2009). According to a recently 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 flavour 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, 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 arachidonic 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).

MATERIALS 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.

Preparation of chhana spread

Chhana was prepared from cow milk standardized to 3.5% fat & 8.5% 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.

Treatment combinations

The cow milk as (M_1) chhana spread and three different coagulant temperature 60°C, 65°C, 70°C 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. Chhana prepared from different treatment combinations were compared with each other. The different combinations used in the experiment were represented as follow :

S.No.	Treatments	Combinations
1	$M_1T_1S_1$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 60°C and using 1% salt level.
2	$M_1T_1S_2$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 60°C and using 1.5% salt levels
3	$M_1T_1S_3$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 60°C and using 2% salt levels
4	$M_1T_2S_1$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 65°C and using 1% salt levels
5	$M_1T_2S_2$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 65°C and using 1.5% salt levels
6	$M_1T_2S_3$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 65°C and using 2% salt levels.
7	$M_1T_3S_1$	Chhana spread prepared from cow milk containing 3.5 % milk fat and 8.5 % SNF and coagulation of milk at 70°C and using 1% salt levels
8	$M_1T_3S_2$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 70°C and using 1.5% salt levels.
9	$M_1T_3S_3$	Chhana spread prepared from cow milk containing 3.5% milk fat and 8.5% SNF and coagulation of milk at 70°C and using 2% salt levels.

Chemical testing of chhana spread

The procedure given in Manual in Dairy Chemistry, ICAR (1972) for sampling was followed.

Analytical technique

Chhana spread will be analyzed for moisture content using AOAC (1980) method. Total nitrogen will be determined by micro-kjedahl method. For fat content in milk, Gerber's method of BIS (1981) will be used. The fat, ash and content was determined using AOAC (1980) procedures. Lactose, calcium content was estimated by AOAC (1980).

Determination of total energy

Kcal/100gm = (4 X protein %) + (4 X CHO %) + (9 X fat %).

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).

RESULTS AND DISCUSSION

In Table 1 cow milk the effect of temperature indicated that lowest content of moisture was recorded at 70°C, while low temperatures contained higher moisture percentage. The salt level of 2% showed the maximum moisture content by 63.13%, while 1% salt level showed minimum content *i.e.* 62.37%. The milk, coagulation temperature and levels of salt changes in the experiment of moisture content of chhana spread was also changed in prepared product *i.e.* variation of milk, temperatures and levels of salts was found significant at 5% level of significance. The interaction effect between milk, coagulation temperatures and levels of salts (MxTxS) was found significant.

The effect of milk different coagulation temperatures and salt levels on fat content of chhana spread in cow milk presented in Table 2 the effect of temperature was found 70°C, which contained the highest content of fat which was highest 19.21% as compared to low

temperatures 60°C and 65°C as 15.17 and 16.08%, respectively. In salt levels 1% showed the maximum fat content was 16.90%, while minimum as 16.74% at highest salt level *i.e.* 2%.

Table 3 shows the effect of milk different coagulation temperatures and salt levels on protein content of chhana spread. In cow milk the maximum content of protein was noticed 17.06% at 70°C, while 60°C and 65°C showed minimum as 13.47 and 14.29%, respectively. Likewise in salt level 1% showed the maximum protein content *i.e.* 15.00% and minimum as 14.87 per cent at 2% salt level. The effect between milk, coagulation temperatures and levels of salts (MxTxS) was found dependent as interaction was recorded significant.

Average lactose content of various samples of chhana spread has been given in Tables 4, which shows the effect of different milk, coagulation temperatures and salt levels on lactose contents of chhana spread. In cow milk on an average lactose content of chhana spread with respect of different coagulation temperatures were recorded 3.05, 3.17 and 2.88 per cent at 60°C, 65°C and 70°C. Likewise in salt level 1% showed the minimum lactose content was 2.97 per cent and maximum was

Table 1 : Average moisture content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁	S ₂	S ₃	
Moisture	T ₁ (60°C)	65.61	65.77	65.92	65.75
	T ₂ (65°C)	63.81	64.13	57.73	61.89
	T ₃ (70°C)	57.71	58.87	58.17	58.25
	Mean	62.37	62.69	63.13	62.73
Factors	M	T	S	MxTxS	
SE(m) ±	0.012	0.012	0.012	0.038	
C.D. at 5%	0.036	0.036	0.036	0.180	

Table 2 : Average fat content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Fat	T ₁ (60°C)	15.24	15.17	15.10	15.17
	T ₂ (65°C)	16.16	16.08	16.01	16.08
	T ₃ (70°C)	19.30	19.21	19.13	19.21
	Mean	16.90	16.82	16.74	16.82
Factors	M	T	S	MxTxS	
SE(m) ±	0.002	0.002	0.002	0.006	
C.D. at 5%	0.006	0.006	0.006	N.S	

Table 3 : Average protein content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Cow milk(M ₁)	T ₁ (60°C)	13.53	13.47	13.41	13.47
	T ₂ (65°C)	14.35	14.29	14.23	14.29
	T ₃ (70°C)	17.14	17.06	16.99	17.06
	Mean	15.00	14.94	14.87	14.93
Factors	M	T	S	MxTxS	
SE(m) ±	0.006	0.006	0.006	0.019	
C.D. at 5%	0.002	0.002	0.002	0.006	

Table 4 : Average lactose content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Lactose	T ₁ (60°C)	3.07	3.05	3.04	3.05
	T ₂ (65°C)	3.19	3.18	3.16	3.17
	T ₃ (70°C)	3.08	2.74	2.73	2.88
	Mean	3.11	2.99	2.97	3.02
Factors	M	T	S	MxTxS	
SE(m) ±	0.005	0.005	0.005	0.016	
C.D. at 5%	0.015	0.015	0.015	0.045	

Table 5 : Average ash content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Ash	T ₁ (60°C)	2.55	2.54	2.53	2.54
	T ₂ (65°C)	2.65	2.64	2.62	2.63
	T ₃ (70°C)	2.75	2.12	2.98	2.61
	Mean	2.65	2.43	2.71	2.59
Factors	M	T	S	MxTxS	
SE(m) ±	0.006	0.006	0.006	0.018	
C.D. at 5%	0.017	0.017	0.017	0.052	

noticed 3.11 per cent at 2% salt level. The effect between milk, coagulation temperatures and levels of salts was found dependent as interaction (MxTxS) was recorded significant.

The results of chhana spread in respect to ash content have given in Table 5, which exhibited the effect of different types of milk, coagulation temperatures and salt levels and on ash content of chhana spread. In cow milk, the maximum content of ash was noticed as 2.98 percent at 70°C and minimum as 2.53 at 60°C. Likewise in salt

level 2% showed the maximum ash content 2.71 per cent and minimum 2.43 at 1.5% salt level and the value was significant at par. The effect between types of milk, coagulation temperatures and levels of salts was found dependent as interaction (MxTxS) was recorded significant.

The results of chhana spread in respect to calcium content have given in Table 6 this showed the effect of different types of milk, coagulation temperatures and salt levels on calcium content of chhana spread. In cow milk

Table 6 : Average calcium content of chhana spread in percent on account of milk various coagulation temperatures and different levels of salt.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Calcium	T ₁ (60°C)	479.11	479.07	479.62	479.27
	T ₂ (65°C)	479.12	479.52	479.43	479.36
	T ₃ (70°C)	479.49	479.55	479.54	479.52
	Mean	479.24	479.38	479.53	479.38
Factors	M	T	S	MxTxS	
SE(m) ±	0.004	0.004	0.004	0.012	
C.D. at 5%	0.012	0.012	0.012	0.036	

Table 7 : Average energy content of chhana spread in percent on account of milk various coagulation temperatures.

Cow milk (M ₁)					
Nutrient	Coagulation Temperatures	Different levels of Salt (S)			Mean
		S ₁ (1%)	S ₂ (1.5%)	S ₃ (2%)	
Energy	T ₁ (60°C)	203.56	203.63	201.70	202.96
	T ₂ (65°C)	215.60	214.60	213.65	214.61
	T ₃ (70°C)	253.26	252.09	251.05	252.13
	Mean	224.14	223.44	222.13	223.23
Factors	M	T	S	MxTxS	
SE(m) ±	0.006	0.006	0.006	0.018	
C.D. at 5%	0.017	0.017	0.017	0.052	

on an average calcium means of chhana spread with respect of different coagulation temperatures were recorded 479.27, 479.36 and 479.52 at 60°C, 65°C and 70°C, respectively. The values recorded at variation of coagulation temperatures were showed significantly at par value. The calcium content was of chhana spread with respect of levels of salt were 479.24, 479.38 and 479.53 recorded at 1%, 1.5% and 2%, respectively. There was non significant differences observed at levels of salt, values recorded at par.

Table 7 shows the effect of milk different types of coagulation temperatures and salt levels on energy content of chhana spread. In cow milk the maximum content of energy was noticed as 252.13 at 70°C. Coagulation temperature 60°C and 65°C recorded low values *i.e.* as 202.96 and 214.61, respectively. Likewise in salt level 1.5% showed the maximum energy content *i.e.* 224.14 and minimum as 222.13 at 2% salt level. The milk, coagulation temperatures and levels of salt changes in the experiment of an average energy content of chhana spread was also changed in prepared product *i.e.* variation of milk, temperatures and levels of salts was found significant. The effect between types of milk, coagulation temperatures and levels of salts was found dependent as interaction (MxTxS) was recorded significant.

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