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Influence of various coagulants on quality of paneer prepared from milk (Buffalo and Soy milk) and their blends

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ABSTRACT

The present study was undertaken with various proportion (0:100, 70:30, 55:45 and 100:0) of buffalo milk and soy milk (grinded soybean) soaking with 0.1 Soda bicarb (9 hours). After draining and washing the soybean cooked at 120^0C for 5 minutes, grinding with water followed by filtration were done for preparation of soy milk. Buffalo milk and soy milk after blinding (P_1- 0:100,P_2- 70:30, P_3- 55:45 and P_4- 100:00) the heating (80^0C and 95^0C) and cooling followed by $CaCl_2$ (2% and 5%),lactic acid (2% and 5%) and citric acid (2% and 5%). Cagulants were used for paneer making. The highest quality paneer production (219.7 g/L) was obtained P_4 proportion (100:0) using 2% $CaCl_2$ as coagulant at 95^0C temperature followed by (213.0 g/L) using 2% $CaCl_2$& 5% lactic acid at 80^0C temperature, (210.5 g/L) using 5% citric acid at 80^0C & 95^0C temperature. Lowest (133.0 g/L) production was obtained using 5% $CaCl_2$ as coagulant at 95^0C temperature.

Figure : 00 References : 09 Tables : 02
KEY WORDS : Buffalo milk, Coagulant, Paneer, Quality Production, Soy milk,

Introduction

Milk has long been considered as ambrosia of life. It provides all the nutrients right from infant just after delivery from mother which in turn nourishes the child in a proper way. In nut shell milk is a full source of nutrients and being relished by human beings since time immemorial. On an average milk contains nearly 3-8% fat, 87% water, 3-4% protein and nearly 5% sugar as lactose. Besides, milk contains a number of important vitamins and minerals. Milk is a good source of protein, unique in its richness in all essential amino acids and its supplementary value. Protein can also be obtained from plant sources in diet, but no single plant source can provide all the essential amino acids in adequate quantity

Among pulses, soybean is a highly proteineous and oil rich pulse seed having approximately 40% protein and 20% fat. The higher content of food quality protein and polyunsaturated fatty acids have offered an unique value of soybean in nutrition. The results of extensive studies with regard to amino acids, composition of soy protein appeared that for a deficiency of sulphur containing amino acids, it is very well balanced with others. Since the milk protein is rich in sulphur containing amino acids, its combination with soy protein through milk products will give complementary effect resulting in the enhancement of protein quality of the mixture. The protein value of soybean is significantly improved by optimal heat processing due to activation or destruction of a variety of anti-nutritional factors such as trypsin inhibitor, hemoglotinins, sapoinins isoflavone glycosides and anti-vitamin factor which are present in raw bean. It has been well established that soy milk is not only a good replacer of fluid milk protein but it could also be used as a substitute for preparing various protein rich dairy products such as paneer, chhana, rasagolla, khoa and dahi *etc.* Out of these dairy products, paneer stands first and exclusively produced in most part of the country for manufacturing of various confectionery

Paneer is a popular indigenous milk product of the country. According to P.F.A. act and Rules[9], paneer is a product obtained from the cow or buffalo milk or a combination there of by preparation with sour milk, lactic acid or citric acid. It does not contain more than 70% moisture and milk fat content should not be less than 50% of the dry matter. Paneer, obtained by acid coagulation of heated milk and subsequent drainage of whey is similar to cheese as it contains the same milk soilds (fat and protein) mainly and closely resembles to certain type of uncured cheese such as Neufchatel.

Various forms of indigenous milk products are related to the western products, clotted milk or paneer is a counter part of the western product cheese. The clot formed in cheese making is of calcium paracaseinate, while in paneer the clott is of casein, owing to the precipitation being done in an acid medium. There may be some depletion of calcium and phosphorous from the product. In India fluid milk and products are the only sources of good quality animal protein supplying all the essential amino acids required for human being. Paneer is one of the product quite rich in this type of protein.With a scarcity of milk and milk products being experienced in India day by day. It has become necessary to unearth the possibility of substituting some oil seed protein with milk protein. Soybean protein when converted into soy milk resembles with cow milk, so far as their nutritional value is concerned.

Materials and Methods

The present work was carried out in the Institute of Agricultural Sciences, Bundelkhand University, Jhansi (U.P.) with a view to examine the effects of various factors *i.e.* type of milk, blends, temperature of coagulation, concentration and type of coagulant on quality of paneer (Soy paneer). All efforts were made to minimise the error during preparation of product, handling and analysis and examination. The details of materials and method are as under.

Collection of milk samples

For the purpose buffalo and soy milks were used in present investigation. The samples of buffalo and soy milk were obtained from local producers of milk of Bichpuri and Laramada villages in morning preferably 6.00 am. The samples were immediately brought to the departmental laboratory and subjected to analysis (samples were tested for fat content) and preparation of paneer.

Preparation of Paneer (bends of buffalo milk and soy milk)

Preparation of soy milk:

The method suggested[6] and subsequently modified[5] was employed for the preparation of soy milk. For the purpose, dry soy been seeds purchased from Agra City, were used. In each trial 250g soy been seeds *(Glycin max)* were soaked overnight in 0.3% Sodium bicarbonate solution. After this soy been seeds were blended in boiling water for 60 minutes followed by cooling and dehulling, then two kg luke warm water (40-50°C) was added. The mixture was then ground and made into slurry which was then boiled for two minutes and filtered through double layers of muslin cloth to remove solid portion.

Preparation of blends of milk and soy milk

The milk and soy milk blends were prepared by mixing 0 : 100, 70 : 30, 55 : 45 and 100: 0 parts of buffalo milk and soy milk respectively. The required amount of buffalo milk was taken and mixed in the required proportion of soy milk so as to obtain one litre of each of all experimental milk and soy milk blends. The details of experimental chart are as under.

The product was prepared from each proportion/

TABLE-1: Blends and ratio of Buffalo and Soy milk.

Sr. No.	Treatment / Proportion	Blends and Ratio of Milk and Soy Milk (Buffalo and Soy milk)
1.	P_1	00 : 100
2.	P_2	70 : 30
3.	P_3	55 : 45
4.	P_4	100 : 00

blends using $CaCl_2$ and lactic acid of 2% and 5% concentrations at coagulation temperature of 80°C and 95°C in each case, respectively.

Preparation of paneer

The paneer was prepared by following the method as described[9]. The details of method are as under. Two Litres of blended milk was taken in a coagulation vessel. Then the vessel was transferred to the gas stove and heated to desired temperature. The milk was slowly stirred by a stainless steel ladel to prevent the burning and skin formation. As the temperature of milk reached near about the desired temperature. 2% and 5% solutions of required coagulant ($CaCl_2$ and Lactic acid) was added slowly to the milk with constant stirring till complete coagulation was obtained and the whey became yellowish green in colour. The vessels were removed from the flame. When the coagulation was completed stirring was stopped and the curd was allowed to settle down. The whey was drained out through a muslin cloth. During this period the temperature of paneer whey was not allowed to fall below 63 °C. Then the coagulum, thus, obtained was tied in muslin cloth and pressed by applying a pressure of 6 lbs/square inch in the Machine. This process of pressing was allowed

for about one hour.

Paneer was then transferred to chilled water to bring its temperature to 5°C to 10 °C. Deep chilling to low temperature was essential to prolong the shelf life. Chilled Paneer was then removed from the water and allowed to drain till all the loose water was removed.

Yield of paneer (g/L milk/blend)

The prepared product was weighed and the yield of the product was expressed as g/L of the blend (milk) of milk and soy milk.

Result and Discussion

It is evident from data (Table-2) the yield of paneer made from blend of buffalo and soy milk. In proportion P_1 the yield of paneer 147.0 g/L was using 5% $CaCl_2$ at 80 °C temperature followed by 147.0, 146.0, 144.75, 141.5 and 140.75 using 2% lactic acid, 2% calcium chloride, 5% and 2% citric acid. At 95 °C temperature the yield of paneer was 147.5 g/L using 5% calcium chloride followed by 147.5, 143.25, 141.0, 138.5 and 137.5 using 2% calcium chloride, 5% citric acid, 2% lactic acid, 2% citric acid and 5% lactic acid were observed. The blend of paneer yield 147.0 g/L was highest using 5% calcium chloride and paneer yield 140.7 g/L was lowest using 2% citric acid at the 80°C temperature was obtained while the blend of paneer yield 147.5 g/L was found statistically at par using 2% and 5% calcium chloride and paneer yield 138.5 g/L was minimum using 2% citric acid at the 95°C temperature was recorded. Our result are similar with earlier[3] concluded that yield of paneer decreased as concentration of soy milk in the paneer increased.In proportion P_2 the yield of paneer 186.5 g/L was highest using 2% calcium chloride at 80°C temperature followed by 186.0, 185.5, 184.0, 172.5 and

TABLE- 2 : Yield (g/L) of paneer manufactured from buffalo and soy milk in different ratio

Sr. No.	Particular		$CaCl_2$		Lactic Acid		Citric Acid	
	Different Ratio	Temp. (^{0}C)	2% (Mean± Sem)	5% (Mean ± Sem)	2% (Mean ± Sem)	5% (Mean ± Sem)	2% (Mean ± Sem)	5% (Mean ± Sem)
1.	00 : 100	80	146.0 ± 1.54	147.0± 0.36	147.0±1.95	141.5±1.4.8	140.7±2.77	144.7+2.05
		95	147.5 ± 1.48	145.5±0.44	141.0+1.04	137.5+1.48	138.5±2.66	143.2+1.55
2.	70 : 30	80	186.5 ± 0.25	172.5±0.41	186.0±0.70	185.5±0.43	170.0+0.41	184.0±0.22
		95	186.5 ± 0.43	133.0+0.50	185.7±0.74	185.0+0.43	168.7±0.41	184.0+0.22
3.	55 : 45	80	164.5 ± 0.82	163.0± 0.50	167.0±0.50	168.5±0.82	153.0±0.79	165.5±0.90
		95	166.5 ± 0.82	163.0±0.50	167.0±0.50	168.0±0.70	151.0±0.90	166.7+0.65
4.	100 : 00	80	213.0 ± 0.50	203.7+1.51	209.5±2.09	213.0±2.47	205.0+1.76	210.5±1.82
		95	219.7 ± 0.65	203.0+1.50	207.2+1.38	213.0+2.15	205.0±1.36	210.5±1.82

170.75 g/L using 2% and 5% lactic acid, 5% citric acid, 5% calcium chloride and 2% citric acid was recorded. At 95°C temperature the yield of paneer 186.5 g/L was highest using 2% calcium chloride followed by 185.75, 185.0, 184.0, 168.75 and 133.0 g/L using 2% and 5% lacticacid, 5% and 2% citric acid and 5% calcium chloride was recorded.

The blend of paneer produced 186.5 g/L was maximum using 2% calcium chloride and blend of paneer yield 170.7 g/L was lowest using 2% citric acid as 80°C temperature was observed. While the blend of paneer yield 186.5g/L was maximum using 2% calcium chloride and blend of paneer yield 133.0 g/L was minimum using 5% calcium chloride coagulant at the 95°C temperature was recorded. Our finding is similar[8] to reported earlier 22.10 and 22.00% yield of paneer made from reconstituted milk and whole buffalo dried milk.

In P_3 proportion the yield of paneer 168.0 g/L was highest using 5% lactic acid at 95°C temperature followed by 167.0, 166.75, 166.5, 163.0 and 151.0 g/L using 2% Mc acid, 5% citric acid, 2% and 5% calcium chloride and 2% citric acid was obtained. At 80°C temperature paneer yield 168.5 g/L was highest using 5% lactic acid followed by 167.0, 165.5, 165.0 164.5 and 153.0 g/L using 2% lactic acid, 5% citric acid, 2% and 5% calcium chloride and 2% citric acid was observed.

The blend of paneer yield 168.5 g/L was highest using 5% lactic acid and blend of paneer yield 153.0 g/L was lowest using 2% citric acid at the 80 °C temperature was obtained.While blend of paneer yield 168.0 g/I, was maximum using 5% lactic acid and blend of paneer yield 151.0 g/L was minimum using 2% citric acid at the 95°C temperature was observed. Our results are similar as reported earlier[4] that citric acid gave the highest yield and calcium lactate gave the lowest yield of product with highest total solids.

In P_4 proportion the yield of paneer 213.0 g/L was maximum using 2% calcium chloride at 80 °C temperature followed by 213.0, 210.5, 209.5, 205.0 and 203.75 gIL using 5% latic acid, 5% citric acid, 2% lactic acid and 5% calcium chloride was observed. At 95°C temperature the yield of paneer 219.75 gIL was highest using 2% calcium chloride at 95°C temperature followed by 213.0, 210.5, 207.25, 205.0 and 203.0 g/L using 5% lactic acid, 5% citric acid, 2% lactic acid, 2% citric acid and 5% calcium chloride were recorded in P_4 proportion of blend milk.

The blend of paneer yield 213.0 g/L was maximum statistically at par using 2% calcium chloride and 5% lactic acid and blend of paneer yield203.7 g/L was minimum using 5% calcium chloride at the 80 °C temperature was recorded. While blend of paneer yield 219.7 g/L was maximum using 2% calcium chloride and blend of paneer produce 203.0 g/L was lowest using 5% calcium chloride at the 95°C temperature was obtained.Our findings are similar[7] as reported that 18.24% yield of paneer was made from standardized buffalo milk (6% fat and 9.5% SNF).

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