

## **Evaluation of Physico-chemical Quality Parameters of Soft Cheese Made with Plant Enzyme (Mayo Gyi)**

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### **Abstract**

The aim of this research work is to prepare soft cheese from goat and cow milk. Milk samples were collected from different sources such as cow milk (Ngwe Sin Palei and Sein Lei Kan Thar Brands) from Hledan Market, Kamayut Township and native cow milk from Ywar Thit Village, Htantabin Township, Yangon Region. Similarly, native goat milk from Ywar Thit Village, Htantabin Township and Insein Township. Soft cheese was prepared from different milk samples. The physico-chemical characteristics, yield percent and shelf-life of prepared soft cheese were also investigated. In this research work, heating time and temperature, sodium chloride, calcium chloride and swallow-wort (Mayo Gyi) were important control parameters for preparation of soft cheese. It was observed that heating time (15min), heating temperature (60°C), sodium chloride (4%), calcium chloride (0.02%) and swallow-wort (2%) were the most suitable conditions for the preparation of soft cheese.

**Keywords:** soft cheese, heating time and temperature, sodium chloride, calcium chloride, swallow-wort (Mayo Gyi)

### **Introduction**

Milk is a unique substance which is both consumed as fluid milk with minimal processing and it is the raw material used to manufacture a wide variety of products. Milk also has a unique nutritional property that makes it an especially important food, particularly for the young. Milk and milk products have formed an important part of the diet of man (Winton and Winton, 2000). The milk from cows and goats will vary in composition and many other factors. These include the breed, individuality of the animal, age, stage of lactation, season of the year, the feed, time of milking, period of time between milking, the physiologic condition of the cow whether it is calm or excited, whether it is receiving drugs and so on (Eckles, 1982).

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Processing milk into a dairy product makes it more stable for storage over extended period of time. In the tropics where ambient temperatures are high and refrigeration is not readily available, milk may be concentrated by boiling or made into butter or ghee or other products which can be kept at room temperatures. When there is an abundant local supply, storage and marketing may have a low priority, leading to wastage. Processing helps eliminate wastage and also adds value (Edgar, 1995). Cheese is a product of milk, selectively concentrated from major milk components. It is generally rich in flavor and contains high quality nutrients. There are many varieties of cheese, all are produced in the following general manner. Raw or pasteurized milk is clotted by acid, rennet or both. The curd is cut and shaped into special form of cheese with or without pressing. Salt is added or the cheese is brined after pressing. The flavor and aroma of cheese are obtained by a partial break down of milk proteins and fat by the action of microbial, milk and rennet enzymes (Meyer, 1960).

The objectives of this research work were to convert milk, which is perishable, into soft cheese with a longer shelf-life whilst preserving most of its nutrients and to explore the possibility for the commercial production of soft cheese from cow and goat milks.

## **Materials and Methods**

### **Raw Materials**

Cow milk (Ngwe Sin Palei, Sein Lei Kan Thar and Ywar Thit Village), goat milk (Insein and Ywar Thit Village), full cream milk powder and low fat milk (skimmed milk) powder (PEP Brand) were used for the processing of soft cheese. Calcium chloride (BDH), was purchased from Academy Chemical Shop, Pabedan Township, Yangon Region. Starter culture (*Streptococcus Thermophilus* and *Lactobacillus Bulgaricus*) from MYANMA SUPER DRAGON GROUP CO., LTD was also used. Swallow-wort (Mayo Gyi) was grown in West Yangon University Campus.

### **Swallow-wort (Mayo Gyi)**

Family	: Asclepiadaceae, Milkweed family
English name	: Swallow-wort (Greater Celandine)
Myanmar name	: Mayo Gyi

Botanical name : *Calotropis gigantea* (L.)

The swallow-wort is distributed in tropical and sub-tropical of Asia and Africa. It is present in India by two species viz., *C. procera* and *C. gigantean*. *C. procera* is more common in southwestern and central India. The plant is popularly known because it produces large quantity of latex, which is easily collected from its green parts when the plant is wounded. The aspect of this natural secretion resembles that of rubber tree.

They are evergreen or partly deciduous tree that can grow 2-5m height with fleshy branches and copious latex. The various parts of this plant have been widely used in traditional systems of medicine. Leaves are broadly ovate, ovate oblong, elliptic or obovate, with a short abrupt acumination, cottony-pubescent when young at length glabrous. Flowers grow on the stalks which are fleshy and thick. Each flower is white pink or purpled spotted on the lobes.

It is found at banks, hedgerows, and walls, usually on waste ground new human habitation. Its foliage contains a distinctive, bright orange sap, containing enzymes that have proteolytic effects (Busarbarua, 2000).

### **Pasteurization and Homogenization of Milk**

1liter of cow milk (Sein Lei Kan Thar Brand) was poured into a stainless steel pot. The milk was heated up to 85°C for 15 minutes. The heated milk was homogenized by using magnetic stirrer for 10 minutes.

Similarly, cow milk (Ngwe Sin Palei Brand and Ywar Thit Village) and goat milk (Insein and Ywar Thit Village) were prepared in the same manner.

### **Preparation of Soft Cheese**

Pasteurized milk 1 liter and 70 g of full cream milk powder were placed in a sterilized stainless steel pot and stirred and heated at 95°C using a magnetic stirrer for 2 minutes. It was then cooled until it reached the required incubation temperature of 40-46 °C, critical temperature for starter culture growth. 15 g of starter culture and calcium chloride, 0.4 g (0.02%) were added to the milk and stirred thoroughly. The mixture was held at 43°C, for 4 - 5 hr to reach a pH range of 4.3 to 4.6. Swallow wort (mayogyi) 1.5% was also added to the mixture and it took about 15 min for coagulation to take place. A firm curd was formed at pH 4.7. The curd was cut with cheese knives into small cubes. Then it was cooked slowly to 35°C

and stirred thoroughly. After the cooking was completed, the whey was removed from the curd by decantation and filtration. The curd was stirred and salted with about 8 g of salt and tasted and placed in a refrigerator and ripened for about 2 days. Then the cheese was packed and placed in a refrigerator.

The same procedure was carried out by using low fat milk (skimmed milk) powder and the physico-chemical characteristics of prepared soft cheese were determined and recorded in Table (5).

### Results and Discussion

For the coagulation of milk to prepare cheese, locally available plant enzyme contained in swallow-wort (Mayo Gyi) was used instead of animal enzyme (Rennet) which has to be imported from foreign countries. Lipase activity of swallow-wort (Mayo Gyi) was determined by titrimetric method and the data are shown in Table (1). It was found that the lipase activity of swallow-wort (Mayo Gyi) was greater than that of castor and soybeans.

**Table 1. Comparison of Lipase Activity of Some Plants**

Sr.No.	Plants	Botanical names	Lipase activity x 10 <sup>-3</sup> (U/ml/min)
1	*Swallow-wort	<i>Calotropis gigantea</i>	10.37
2	**Castorbean	<i>Recimus communis</i>	7.25
3	**Soybean	<i>Glycine max</i>	9.42

\*Lipase activity was determined at Veterinary Assay Laboratory, Livestock Breeding and Veterinary Department, Ministry of Livestock, Fisheries and Rural Development, Insein, Yangon.

\*\* Maliks *et al* (2000)

The effect of swallow wort on the physical characteristics of soft cheese prepared from cow milk (Sein Lei Kan Thar Brand) is shown in Table (2). It was found that moisture content, pH, texture and taste of sample (2) were the most suitable condition. pH value of sample (2) reached

the range of literature value. It can be seen that the larger amount of swallow-wort gave the bitter taste.

**Table 2. Effect of Swallow Wort on the Physical Characteristics of Soft Cheese from Cow Milk (Sein Lei Kan Thar)**

Sr.No.	Physical Characteristics	*Literature Value	Prepared Soft Cheese		
			Sample 1 (1.5% sw)	Sample 2** (2.0% sw)	Sample 3 (2.5% sw)
1	Moisture (%w/w)	73-86	78.3	74.6	72.9
2	pH	4.5-5	4.3	4.8	5.3
3	Cheese type	Soft	Soft	Soft	Soft
4	Taste	-	Good	Good	Bitter

sw = swallow-wort

\*Winton, L.A., 2000

\*\*The most suitable condition

The experiments were conducted at the Laboratory of the Department of Industrial Chemistry, West Yangon University.

The effect of heating time and temperature on chemical characteristics of soft cheese are shown in Table (3). It was observed that heating time of 15 min and heating temperature of 60°C were the most suitable condition for the preparation of soft cheese. The highest fat content in soft cheese was 15.9% from heat treated milk at 60°C for 15 min. Soft cheese from heat treatment milk at 50°C for 15 min showed the highest protein content (7.9%), while soft cheese from heat treated milk at 70°C for 15 min had the lowest protein content (7.2%). The low protein content of heat treated milk cheese seemed to be caused by degradation of protein. The results showed that total solids content decreased as the temperature of heat treatment was increased. The ash content of soft cheese from heat treated at 50°C for 15 min scored the highest (2.0%), while cheese from heat treated at 60°C for 15 min had the lowest ash content (1.7%).

The effects of sodium chloride and calcium chloride on the chemical characteristics of soft cheese are also shown in Table (3). It was observed that the fat content was highest (16.5%) when cheese was made with 2%

**Table 3. Effect of Heating Time, Heating Temperature, Sodium Chloride and Calcium Chloride on Chemical Characteristics of Soft Cheese**

Sr. No.	Parameter		Total Solids (%w/w)	**Fat (%w/w)	**Protein (%w/w)	Lactic Acid (%w/w)	Ash (%w/w)
1	Heating time at 60°C (min)	10	27.1	14.2	7.9	1.35	2.1
		*15	25.4	15.5	7.5	0.83	1.6
		20	23.6	15.1	7.2	0.9	1.9
2	Heating temperature for 15min (°C)	50	27.1	14.2	7.9	1.35	2.0
		*60	26.5	15.9	7.7	0.82	1.7
		70	23.8	15.0	7.2	0.9	1.9
3	Sodium Chloride (%w/w)	2	24.7	16.5	6.8	0.5	0.8
		*4	25.4	15.6	7.7	0.7	0.9
		6	27.4	15.0	7.9	0.9	1.9
4	Calcium Chloride (%w/w)	0	27.6	14.5	8.2	1.3	2.5
		*0.02	25.4	15.5	7.0	0.8	1.6
		0.04	26.2	15.8	7.4	0.9	1.7

\*The most suitable condition

\*\*Fat and protein content were determined at SGS (Myanmar) Company limited.

The experiments were conducted at the Laboratory of Department of Industrial Chemistry, West Yangon University

sodium chloride and lowest (15.0%) when 6% sodium chloride was added to milk. The raw milk cheese with 6% sodium chloride gave the highest protein content (7.9%), while the lowest value was in cheese made of 2% sodium chloride (6.8%). The high total solids content of cheese with 6% sodium chloride could be explained by the fact that high sodium chloride levels inhibited the growth of microorganisms. Calcium chloride level did not affect the fat content of soft cheese. The protein content of soft cheese without calcium chloride was higher (8.2%) than that in which 0.02% and 0.04% calcium chloride were added. Soft cheese with no calcium chloride secured the highest ash content (2.5%) and lactic acid (1.3%).

**Table 4. Comparison of Physico-chemical Characteristics of Soft Cheese from Cow and Goat Milks**

Sr. No.	Characteristics	Soft Cheese (Cow Milk)			Soft Cheese (Goat Milk)		*Literature value
		Ngwe Sin Palei	**Sein Lei Kan Thar	Ywar Thit Village	Ywar Thit Village	Insein	
1	Fat content (%w/w)	12.4	15.5	12.0	12.3	13.2	>10
2	Protein content (%w/w)	7.2	8.5	5.7	6.7	7.1	5-10
3	Total solids content (%w/w)	22.1	25.4	20.5	20.6	21.3	14-27
4	Solid not fat (%w/w)	9.7	9.9	8.6	8.3	8.1	10-17
5	Ash content (%w/w)	0.73	0.85	0.63	0.74	0.78	0.7-0.9
6	Moisture content (%w/w)	2.5	2.2	2.3	2.3	2.4	< 3
7	pH	4.5	4.8	4.3	4.3	4.4	4.5-5
8	Cheese type	Soft	Soft	Soft	Soft	Soft	Soft
9	Taste	Good	Good	Good	Good	Good	-

Sr. No.	Characteristics	Soft Cheese (Cow Milk)			Soft Cheese (Goat Milk)		*Literature value
		Ngwe Sin Palei	**Sein Lei Kan Thar	Ywar Thit Village	Ywar Thit Village	Insein	
10	Yield percent (%w/v)	23.6	29.3	23.1	20.8	21.9	-
11	Shelf-life (month)	6	6	6	6	6	-

\*Winton, L.A., 2000

\*\*The

most suitable product

Fat and protein content were determined at SGS (Myanmar) Company limited.

The experiments were conducted at the Laboratory of the Department of Industrial Chemistry, West Yangon University.

The comparison of physico-chemical characteristics of prepared soft cheese are shown in Table (4). It was found that fat content (15.5%) and protein content (8.5%) were the highest and the moisture content (2.2%) was the lowest in soft cheese prepared from cow milk (Sein Lei Kan Thar Brand). The other samples contained lower amount of fat content and protein content.

**Table 5. Physico-chemical Characteristics of Soft Cheese from Milk and Low Fat Milk Powder**  
**Volume of milk = 1 liter**  
**Low fat milk powder = 70 g**

Sr. No.	Characteristics	Milk Source		*Literature value
		Sein Lei Kan Thar (cow milk)	Insein (goat milk)	
1	*Fat content (%w/w)	5.2	4.8	>10
2	*Protein content (%w/w)	8.2	6.9	5-10
3	Total solids content (%w/w)	20.0	19.2	14-27



Sr. No.	Characteristics	Milk Source		*Literature value
		Sein Lei Kan Thar (cow milk)	Insein (goat milk)	
4	Solid not fat (%w/w)	14.8	14.4	10-17
5	Ash content (%w/w)	1.4	1.1	< 2
6	Lactic acid content(%w/w)	0.71	0.73	0.7-0.9
7	Moisture content(%w/w)	80.0	80.8	73-86
8	pH	4.3	4.4	4.5-5
9	Cheese type	Soft	Soft	Soft
10	Taste	Good	Good	-

\*Winton, L.A., 2000

\*\*Fat and protein content were determined at SGS (Myanmar) Company limited.

The experiments were conducted at the Laboratory of Department of Industrial Chemistry, West Yangon University.

Soft cheese was also prepared by using low fat milk (skimmed milk) powder and the data are shown in Table (5). It was found that the fat content was lower than the literature value and the protein content was in the range of literature value. The physico-chemical characteristics of prepared soft cheese and commercial soft cheese are shown in Table (6). It was found that fat content (15.5%) and protein content (8.5%) of prepared soft cheese were higher than commercial soft cheese (Bega Brand) whereas the moisture content (74.6%) was lower.

**Table 6. Comparison of Physico-chemical Characteristics of Prepared Soft Cheese and Commercial Soft Cheese**

Sr. No.	Characteristics	Soft Cheese (Sein Lei Kan Thar)	Commercial Soft Cheese (Bega) (Australia made)
1	*Fat content (%w/w)	15.5	14.3
2	*Protein content (%w/w)	8.5	6.6

Sr. No.	Characteristics	Soft Cheese (Sein Lei Kan Thar)	Commercial Soft Cheese (Bega) (Australia made)
3	Total solids content (%w/w)	25.4	25.0
4	Solid not fat (%w/w)	9.9	9.8
5	Ash content (%w/w)	1.6	1.7
6	Lactic acid content (%w/w)	0.85	0.9
7	Moisture content (%w/w)	74.6	75.0
8	pH	4.8	4.8
9	Cheese type	Soft	Soft
10	Taste	Good	Good

\*Fat and protein content were determined at SGS (Myanmar) Company limited.

The experiments were conducted at the Laboratory of Department of Industrial Chemistry, West Yangon University.

### Conclusion

Standard fermented milk products are made from raw milk (Cow or Goat) that has good quality such as yield, fat, protein, total solids and pH. This means fresh, pure and clean milk from healthy animals and the milk should be free from odors and taints that could affect the quality of products. In my research work, soft cheese was prepared from cow milk as well as from goat milk. In the preparation of soft cheese, different ratio of swallow-wort (Mayo Gyi) was used. 2.0% of swallow-wort (Mayo Gyi) is suitable to prepare soft cheese. In the preparation of soft cheese, effect of heating time (10mins, 15mins, 20mins), effect of heat treatment (50°C, 60°C, 70°C), effect of sodium chloride content (2%, 4%, 6%) and calcium chloride content (0%, 0.02%, 0.04%) on chemical characteristics of soft cheese were investigated. Low fat soft cheese was also prepared. It was observed that the quality and yield percent of soft cheese from cow milk (Sein Lei Kan Thar Brand) are higher than that of soft cheese prepared from other milk samples.

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