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Chemical Composition of Soft Cheese Coagulated with Different Coagulants

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Abstract

The study is aimed to determine the chemical composition of soft cheese precipitated with different coagulants. The results for the proximate analysis shows that the moisture content of the samples ranges between 39.883±0.130% and 49.366±0.563%, with an average value of 45.902% and no significant difference between the samples. The ash content ranges from 1.676±0.128% and 1.825±0.035%, with an average value of 1.782%, the result shows that there was a significant difference at level of significance of ($P<0.05$) between the values of the sample X and Y. The protein content of cheese ranged from 18.613±0.357% to 26.350±0.395% with an average value of 21.792%, no significant difference at ($P>0.05$) between the samples. For the minerals, the Potassium content was the highest followed by Calcium and Sodium the least. The result of overall acceptability in the sensory evaluation shows that there were no significant differences between sample X, Y, and Z. The highest value was found in sample X with a value of 6.00 where Sample X was overall acceptable. The Soft cheese that was coagulated with Lime Juice (Y) has the highest sensory score. The study concluded that the Soft cheese which was coagulated with Sodium apple (X) has high nutritional value, it contains good amounts of protein, contains all the essential amino acids.

Keywords

Nutritional Value, Coagulants, Precipitate

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1. Introduction

Soft Cheese has been defined as a product made from the curd obtained from milk by coagulating the casein with the help of rennet or similar enzymes in the presence of lactic acid produced by added microorganisms, from which part of the moisture has been removed by cutting, cooking and/or pressing, which has been shaped in a mould, and then ripened by holding it for some time at suitable temperature and humidity. It is the fresh or ripened solid or semi-solid product obtained from coagulating milk. Most cheese types are made by the use of rennet to coagulate the casein micelles in the milk [1] and the addition of starter culture to produce lactic acid [2]. The addition of rennet or coagulating agents has been greatly used in the coagulation of milk for the production of cheese. Rennet is a general term that describes a variety of enzymes of animals (especially calves), plant or microbial origins used to coagulate milk during cheese preparation. Acids such as acetic acid, citric acid, vinegar, and lemon juice have also been used as milk coagulants [3].

The essential ingredients of cheese are milk, coagulants (coagulants cause the liquid to thicken or transforms the liquid into a soft semi-solid mass), bacterial cultures and salt. The coagulant causes the milk protein to aggregate and ultimately

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transform fluid milk into a semi-firm gel. When this gel is cut into small pieces (curds), the whey (mostly water and lactose) begins to separate from the curds. Acid production by bacterial cultures is essential to aid expulsion of whey from the curd and largely determines the final cheese moisture, flavor, and texture. Cheese is a concentrated source of many of the nutrients in milk. The cheese production process is governed by the temperature, acidity, and calcium content of the milk as well as other factors [4]. This production process determines the texture and functional properties of cheese alongside its formulation, therefore desirable cheese is usually achieved through the cheese composition and process conditions [5, 6]. Factors such as calcium, fat content, moisture content, pH and nitrogen fractions can directly influence the meltability (capacity to melt on application to heat) [7, 8] while the stretchability (the ability to elongate and form strings under the effect of the applied forces and temperatures,) can be influenced by several factors from the raw milk to post-manufacturing conditions, being the curdling stage used to obtain the linearity of protein chains in its structure [9]. Like most dairy products, cheese is a rich source of minerals, protein, vitamin, fat, and carbohydrate. In general, cheese supplies a great deal of calcium and phosphorus [10] and generally, cheese have the following characteristics: Moisture content from 46% to 57%, protein content from 15% to 21%, fat content from 20% to 29%, salt content from 1 to 3% and pH from 5.3 to 6.5 [11, 12, 1]. Compositional and other characteristic has been reported by [1] on Aro cheese, by [13] on Ras cheese, while [14] reported on Sudanese white cheese and [15] reported with different coagulants (soursop, passion fruit, baobab, pineapple, and tamarind) on soy cheese.

Thus, this study aimed to evaluate the chemical properties, mineral and sensory properties of soft cheese coagulated with different coagulants.

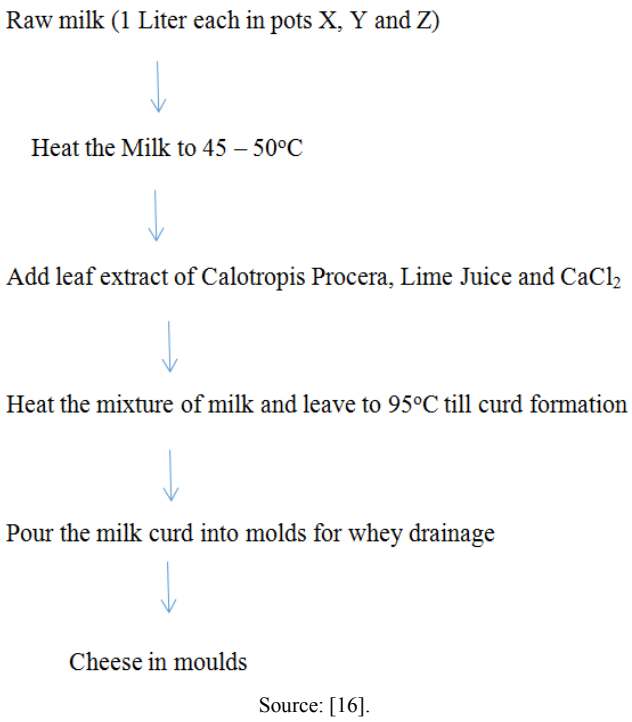
2. Material and Method

2.1. Material

The cow milk and Calotropis Procera was purchased from local Fulani at Gaa in Ede. Lime juice and Calcium Chloride was gotten from Osogbo, Osun state.

2.2. Method

Soft Cheese Processing



Source: [16].

Figure 1. Flow chat of soft cheese processing.

The proximate analysis, minerals was determined according to the standard method of [17] and the result was subjected to SPSS version 23.

3. Result and Discussion

Table 1. Proximate Composition (%) of Soft Cheese.

Sample	Moisture	Ash	Protein	Fat	Fibre	Carbohydrate
X	48.457^{a}±0.522	1.825±0.035	26.350±0.395	18.076±0.138	0.016±0.011	5.287±0.113
Y	39.883±0.130	1.846±0.087	18.613±0.357	17.843±0.263	0.024±0.006	21.789±0.699
Z	49.3666±0.563	1.676±0.128	20.413±0.03	19.956±0.095	1.323±0.096	7.264±0.331

Means within the same column bearing the same letter (s) are not significantly different (P≥0.05).
X = Soft Cheese Coagulated with Sodom Apple; Y = Soft Cheese Coagulated with Lime Juice; Z = Soft Cheese Coagulated with Calcium Chloride.

3.1. Proximate Composition

The result of the proximate analysis of soft cheese is shown in table 1 the moisture content of the samples ranges between 39.833 ± 0.130% and 49.366 ± 0.563%, with an average value of 45.902%. The result shows that there was no significant difference (P≥ 0.05) between the values gotten. The sample coagulated with Lime Juice (Y) has the least moisture content while the sample coagulated with Calcium Chloride (Z) has the highest percentage of moisture the result contradicts [18] which reported 82.3% for her moisture content and also contradicts [1] which reported 59.04% to

63.67% for moisture content while the result reported by [15] with a range of 38.88% to 42.92% are similar in value with this study.

The protein content result shows that there was no significant difference (P≥0.05) between the values ranging from 18.613 ± 0.357% to 26.350 ± 0.395% with an average value of 21.792%. The sample coagulated with Lime Juice (Y) has the least protein content while the sample coagulated with Sodom Apple (X) has the highest percentage of protein and the result contradicts [18] which reported 2.6% for her protein content, while [1] reported a range of 14.04% to 16.91% for the protein content and [15] reported 13.93% to 16.78% which are both close in value to this study.

The fat content found in the samples ranges between 17.843 ± 0.263% and 19.956 ± 0.095%, with an average value of 18.291%. The result shows there was a significant difference (P≥0.05) in the value of the samples. The sample coagulated with Lime Juice (Y) has the least fat content while the sample coagulated with Calcium Chloride (Z) has the highest percentage of fat the result contradicts [18] which reported 2.0% for her fat content and it is higher in value compared to the values reported by [1] but lower compared to the value reported by [15].

The carbohydrate content obtained from the result ranges between 5.287 ± 0.113% and 21.789 ± 0.699%, with an average value of 11.446%. There was no significant difference (P≥0.05) in the values. The Soft Cheese coagulated with Sodom Apple (X) has the least percentage of carbohydrate while the soft cheese coagulated with Lime Juice (Y) has the highest percentage of carbohydrate.

3.2. Mineral Composition of Soft Cheese

The result of the mineral analysis of soft cheese is shown in table 2. The sodium content of the samples ranges between 16.48± 0.7 mg/L and 25.95± 0.07 mg/L, with an average value of 20.4 mg/L. There was no significant difference ($p \geq 0.05$) in the values. The soft cheese coagulated with Sodom Apple (X) has the least value for sodium while the soft cheese coagulated with calcium chloride (Z) has the highest value for sodium

The calcium content of the samples ranges between 22.74± 0.79 mg/L and 31.90 ± 0.06 mg/L, with an average value of 26.76mg/L. The result shows there was no significant difference ($p \geq 0.05$) in the value of the samples. The sample coagulated with sodium Apple (X) has the least calcium content while the sample coagulated with calcium (Z) has the highest value of calcium within the samples and the result was in relation with [18] in her study

The potassium content of the sample ranges between 25.95 ± 0.07mg/L and 50.94 ± 0.12mg/L, with an average value of 34.61mg/L. the result shows there was no significant difference ($p \geq 0.05$) in the value of the samples. The sample coagulated with Sodom Apple (X) has the least potassium content while the sample coagulated with calcium chloride (Z) has the highest value of potassium within the samples.

Table 2. Mineral composition (mg/l) of soft cheese.

Sample	Na	Ca	K
X	16.48 ±0.78	22.74±0.79	25.95 ±0.07
Y	19.91±0.07	25.66±0.50	26.94±0.07
Z	25.05±0.12	31.90±0.06	50.94±0.12

Means within the same column bearing the same letter (s) are not significantly different ($p \geq 0.05$). X = soft cheese coagulated with Sodom Apple Y= soft coagulated with lime Juice Z= soft cheese coagulated with calcium chloride.

3.3. Sensory Evaluation of Soft Cheese

The result of the sensory evaluation of soft cheese is shown in Table 3 There were significant differences in all the sensory attributes evaluated in all the samples.

Colour is an important quality of many foods and it influences the sense of judgment of consumers. Colour plays an important role in food. The result of the colour obtained shows that there was no significant difference in the samples. The value ranges from 4.70 to 5.95. Sample Y which was coagulated with lime juice has the least values while sample X which was coagulated with Sodom apple has the highest value for the colour. Thus sample Y was neither liked nor disliked while sample X was liked slightly.

Taste is also an important parameter in food. The result of taste shows that there was no significant difference in the value of the samples. The result ranges from 3.80 to 5.45. Sample Y which was coagulated with lime juice has the least values while sample X which was coagulated with sodium apple has the highest value for taste. Thus sample Y was disliked slightly while sample X was liked slightly.

The texture of the soft cheese is related to the external appearance which implies smoothness or toughness. The result of the texture obtained shows that there was no significant difference in the samples. Sample Y which was coagulated with lime juice has the least values with 3.05 while sample X which was coagulated with Sodom apple has the highest value of 5.75 for texture. Thus sample Y was disliked slightly while sample X was liked slightly.

The flavor is also an important parameter in food. The result of the flavor obtained shows that there was no significant difference in the samples. The values range from 4.20 to 5.50. Sample Y which was coagulated with lime juice has the least

values while sample X which was coagulated with Sodom apple has the highest value for flavor. Thus sample Y was neither liked nor disliked while sample X was liked slightly.

The result for overall acceptability shows that there were no significant differences between sample X, Y and Z. the highest value was found in sample X with a value of 6.00 where sample X was overall acceptable.

The soft cheese that was coagulated with lime juice (Y) has the lowest sensory score while the soft cheese coagulates with Sodom apple (X) have the highest sensory score.

Table 3. Mean sensory evaluation scores of soft cheese.

Product	Colour	Taste	Texture	Flavour	Overall acceptability
X	5.95±0.69	5.45±1.28	5.75±1.12	5.50±1.00	6.00±1.00
Y	4.70±1.17	3.80±1.40	3.05±1.47	4.20±1.20	4.35±1.50
Z	5.65±0.93	5.30±0.98	4.45±1.54	4.75±1.29	4.95±1.00

There is no significant difference ($p \geq 0.05$) between the samples.
X = soft cheese coagulated with Sodom Apple Y= soft cheese coagulated with lime juice.
Z = soft cheese coagulated with calcium chloride.

4. Conclusion and Recommendation

4.1. Conclusion

This study has shown that the coagulates which were used in the coagulation i.e. the Sodom apple, lime, and calcium chloride all formed curd during the preparation of the samples with the coagulant calcium chloride being the fastest forming coagulants while Sodom apple follows suits and lime being the least forming coagulations.

From the result obtained in this study, it can be concluded that the soft cheese which was coagulated with Sodom apple (X) has high nutritional value, it contains good amounts of protein, contains all the essential amino acids. The sample also has the highest value of being like slightly in the sensory attributes colour, taste, texture, flavor and also overall acceptable by the people in the sensory evaluation done. The pH level of this sample is also at the normal range compared to the other two samples which were slightly acidic.

The soft cheese which was coagulated with calcium chloride (Z) carried the highest values for minerals and also has higher moisture content and fat content.

The soft cheese coagulated with lime juice (Y) has lower moisture content i.e. less effect of spoilage and also has the highest carbohydrate content.

4.2. Recommendation

It is recommended that the soft cheese coagulated with soft cheese which is widely used by most soft cheese producers and sellers which is rich in essential nutrients that the body needs for consumption. Also, it is recommended that the coagulated calcium chloride should also be adopted because of its high mineral contents as shown in this study.

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