IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 14, Issue 4 Ser. IV (April. 2020), PP 01-05
www.iosrjournals.org

Comparative Studies On The Percentage Yield Of Soft Cheese Produced From Various Animals's Milk Using Different Coagulants

A O. OGUNLADE[1], V O. OYETAYO[2], A O. OJOKOH[2] and O M. ALADEJANA[3]

[1]*Department of Food Technology, The Federal Polytechnic Ado-Ekiti, Ekiti State, Nigeria*
[2]*Department of Microbiology, Federal University of Technology Akure, Nigeria.*
[3]*Department of Biological Sciences, Microbiology Unit, Kings University, Odeomu, Osun State Nigeria.*

Abstract
The comparative study of the percentage yield of soft cheese produced from different animal's milk was done. Soft cheese was produced from cow, sheep and goat using six different coagulants of plant origin: Calotropis procera, Carica papaya, lemon juice and steep water from maize, millet and sorghum. The objective of this study was to compare the yield of the soft cheese produced from these coagulants. The result revealed that for cow milk, Calotropis procera had the highest percentage yield (27.3%) while steep water from millet had the lowest percentage yield (5.1%). For sheep milk, Calotropis procera also had the highest percentage yield (25.6%) while steep water from maize had the lowest percentage yield (3.8%). However, for goat milk, Carica papaya had the highest percentage yield (23.3%) while steep water from millet had the lowest percentage yield (7.4%). In conclusion, this study suggests that soft cheese from goat milk can be an alternative to the commonly used cow milk in terms of percentage yield. Coagulants such as Carica papaya is a better alternative to the commonly used Calotropis procera in cheese making industry.

Keywords: *Percentage yield, soft cheese, animals, coagulants*

Date of Submission: 11-04-2020 Date of Acceptance: 26-04-2020

I. Introduction

Milk has been recognized as an important food for infant and growing children (Obizoba and Anyika, 1995), because milk is an excellent source of nutrients such as vitamins, amino acids, fats, minerals, proteins and sugar. (Akinyele *et al*., 1999). Cheese 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 and the addition of starter culture to produce lactic acid. The addition of rennet or coagulating agents has been greatly used in the coagulation of milk for the production of cheese which is an excellent source of protein. In Nigeria and most West African countries, soft cheese called wara is usually produced by the Fulani pastoralist and coagulated with extract of Sodom apple plant (*Calotropis procera*). This plant contains an organic acid called calotropin which is the coagulating agent. The flower and other parts of *Calotropis procera* can also be used for the treatment of different ailments such as cold, cough, catarrh, asthma, stomach pains, and headaches. It is interesting to know however that despite the fact that *Calotropis procera* is very useful medicinally and in cheese making industry, it is not being cultivated commercially (Adetunji and Salawu, 2008). If *Calotropis procera* should therefore go into extinction or there is reduction in the population of the plant due to unfavourable weather, or there is higher demand because of its wide range of usefulness, or better still, if its other potentials and usefulness are discovered, there is definitely going to be a compulsion on cheese makers to source for alternative coagulants. It is therefore highly imperative to source for alternative (possibly better alternative) plants in West Africa that can be of suitable replacement for *Calotropis procera* hence the use of other coagulants such as *Carica papaya* extract, lemon juice extract and steep water from grains such as maize, millet and sorghum. Cow's milk has been used for the production of soft cheese but recently the use of goat and sheep milk has proven very nutritious and of health benefit in the production of cheese. (Ogunlade, 2019). Goat milk differs from cow or human milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine and human nutrition (Park and Chukwu, 1989; Park, 1994). Sheep milk has higher specific gravity, viscosity, refractive index, titratable acidity, and lower freezing point than average cow milk (Haenlein and Wendorff, 2006), probably due to the nature of their nutrition. The cheese yield is directly related to the final moisture content of the finished cheese, where a high moisture cheese gives high yield and a low moisture one gives low yield. It can be influenced by the composition of milk, moisture content of the final

cheese and the degree of recovery of the fat and casein by the curd during cheese processing. Therefore the objective of this study is to compare the percentage yield of soft cheese produced from different animal's milk using different coagulants.

II. Materials And Methododlogy

Milk collection

Fresh milk was obtained from cow, sheep and goat at Aba Baba Medinat, a Fulani farm settlement along Afao road, Ado-Ekiti, Nigeria (Lat 07^{o} 38^{l} N Long 05^{o} 15^{l} E). The udders of the cows were first washed with soap and water before milking; the milk was collected in a clean sterile container and immediately transported to the laboratory for analysis.

Preparation of coagulants

Ten grams (10g) of sodom apple leaves (*Calotropis procera*) were thoroughly washed with 1 Litre of clean water. The extract was obtained by crushing the leaves and stems of *Calotropis procera* plant. A clean muslin cloth was used to sieve the mashed leaves to get the pure extract which was poured into a clean bowl and labeled as sample A.

Pawpaw leaves (*Carica papaya*): The leaves and stems of *Carica papaya* were washed thoroughly and mashed in order to get the extract using a mortar and pestle. A clean muslin cloth was used to sieve and separate the extract from the macerated leaves to get a pure extract. This was poured into a clean bowl and labeled as sample B.

Sorghum, Millet and Maize: These grains were bought from the local market in Ado Ekiti and were sorted to remove debris which might lead to contamination of the products. The grains were then washed and soaked in clean water separately for 3days, after which it was milled with the aid of milling machine and was left for 2 days prior to the production. The steep water was used as coagulants. These were labeled as samples C, D and E respectively.

Lemon fruits was brought from the local market and washed. The fruits were cut and the juice was squeezed into a bottle ready to be used as coagulant. This was labeled as sample F.

Processing of soft cheese

Raw milk (1000mL) from cow, sheep and goat were heated slowly for approximately 45-50^{o}C for 30-40 minutes. The milk was stirred gently during the heating process. 4ml of the extracts from samples A-F were added to the warm milk and the mixture was then heated with intermittent stirring to about 95^{o}C and kept at this temperature until there was coagulation and separation of the curd and whey and the heating was stopped. The signs of coagulation were observed within the range of 9-20 minutes from the time that the coagulants were added. It was then poured into a local raffia basket to facilitate whey drainage and also gives it a characteristic shape.

Determination of percentage yield

The quantity of cheese produced from each experiment was weighed with electric weighing scale and recoded as yield. Percentage yield was calculated as shown below:

$$Percentage\ yield\ of\ cheese = \frac{grams\ of\ cheese\ produced}{grams\ of\ milk\ used} \times 100\%$$

III. Results

Percentage yield for cow, sheep and goat milk coagulated with different coagulants

Figures 1, 2 and 3 show the percentage yield of cheese obtained from cow milk, sheep milk and goat milk coagulated with different coagulants. The results revealed that cow and sheep milk coagulated with *Calotropis procera* had the highest yield (27.3%. 25.6%) while cheese produced by steep water from millet had the lowest yield for cow milk (5.1%) and cheese produced by steep water from maize had the lowest yield from sheep milk (3.8%). Goat milk coagulated with *Carica papaya* had the highest yield (23.3%), while the goat milk coagulated with steep water from millet had the lowest yield (7.4%).

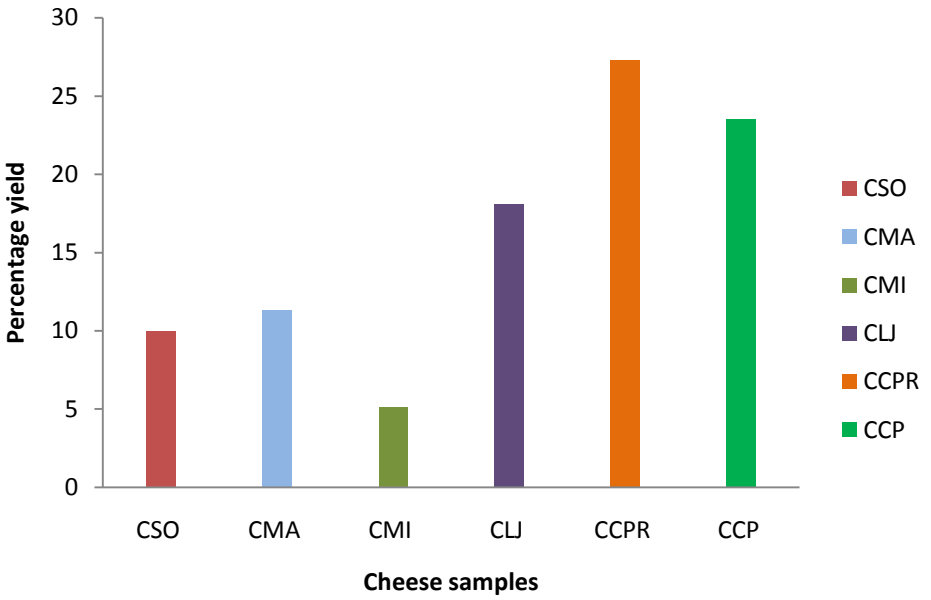

Fig 1: Percentage yield of cheese obtained from cow milk coagulated with different coagulants

Key: **CSO** – cow milk coagulated with steep water from sorghum
CMA - cow milk coagulated with steep water from maize
CMI - cow milk coagulated with steep water from millet
CLJ - cow milk coagulated with steep water from lemon juice
CCPR - cow milk coagulated with *Calotropis procera*
CCP - cow milk coagulated with *Carica papaya*

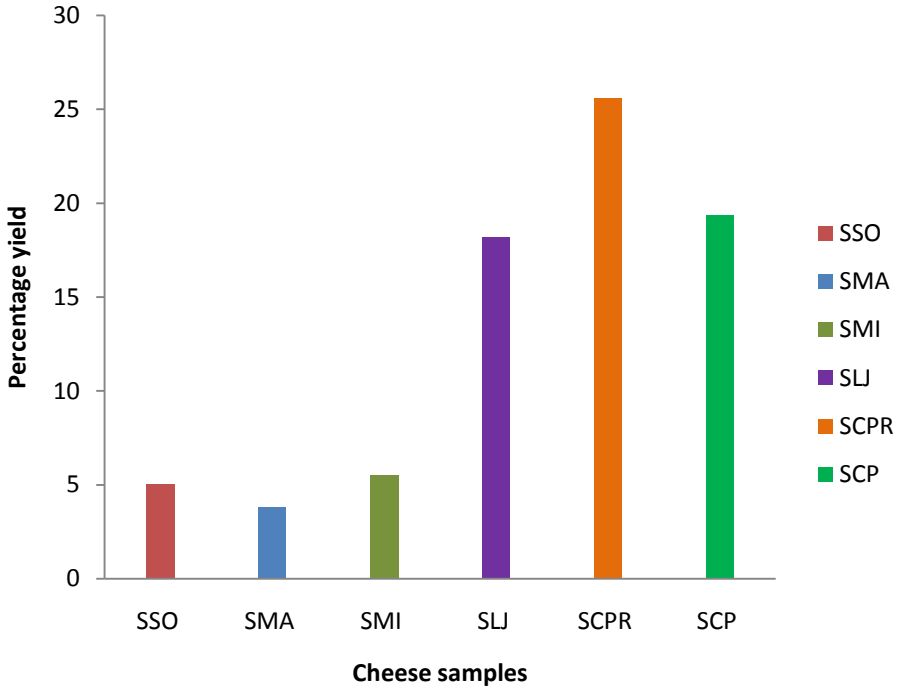

Fig 2: Percentage yield of cheese obtained from sheep milk coagulated with different coagulants

Key: **SSO** – sheep milk coagulated with steep water from sorghum
SMA - sheep milk coagulated with steep water from maize
SMI - sheep milk coagulated with steep water from millet

SLJ - sheep milk coagulated with steep water from lemon juice
SCPR - sheep milk coagulated with *Calotropis procera*
SCP - sheep milk coagulated with *Carica papaya*

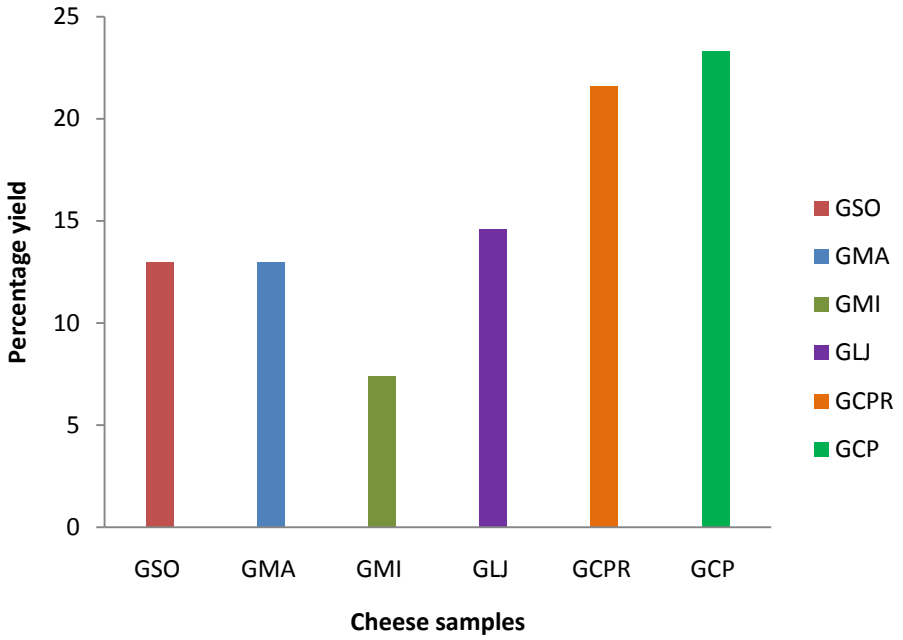

Fig 3: Percentage yield of cheese obtained from goat milk coagulated with different coagulants

Key: **GSO** – goat milk coagulated with steep water from sorghum
GMA - goat milk coagulated with steep water from maize
GMI - goat milk coagulated with steep water from millet
GLJ - goat milk coagulated with steep water from lemon juice
GCPR - goat milk coagulated with *Calotropis procera*
GCP - goat milk coagulated with *Carica papaya*

IV. Discussion

In this study, the local cheese was gotten from cow, sheep and goat milk and it was coagulated with six different coagulants which are *Calotropis procera* leaf extract, *Carica papaya* extract, lemon juice extract and steep water from grains (maize, millet and sorghum). Percentage yield of the local cheese was carried out and it was observed that the local cheese produced varied in their yield due to different coagulants used. Soft cheese (wara) is an unripened cheese consumed in several parts of West Africa. The yield of cheese produced from both cow milk and sheep milk using *Calotropis procera* as coagulants were significantly higher ($p > 0.05$) than others and very similar to the ones produced using *Carica papaya* as coagulants. Thus, the yield of cheese obtained from cow milk coagulated with *Calotropis procera* in this study was higher than the ones reported by Akinloye and Adewumi (2014) and O'Connor (1993) who recorded 25.59% and 20% respectively but lower than the one reported by Omotosho *et al*, 2011 who recorded 32.75%. The variation in this study and that of Akinloye and Adewumi (2014) could be as a result of raw extract used in this experiment instead of supernatants used by the researchers cited above.

The higher values of yield obtained in the cheese made from sheep milk when compared with that of goat milk may possibly be due to the fact that sheep milk has higher total solid fat and protein content than goat milk (George, 2001). There was no significant difference in the yield of *Calotropis procera* processed cheese and *Carica papaya* processed cheese for both cow and sheep milk. This suggests that with respect to yield as observed in this study, *Carica papaya* extract could compete favourably well with *Calotropis procera* extract which is a widely used coagulant. On the contrary, lemon juice, steep water from maize, millet and sorghum may not compete favourably well with *Calotropis procera* and *Carica papaya* extracts because the yield of cheese produced by using lemon juice extract and steep water from maize, millet and sorghum were significantly lower than the other 2 coagulants. Observation from percentage yield may be dependent on the level of available protein for curdling by the enzyme (Okorie and Adedokun, 2013). The fact that there is

significant difference in cheese coagulated with extracts from plants and the steep water from grains indicated that the coagulants under consideration differ substantially in their coagulating capability.

V. Conclusion

In conclusion soft cheese produced from *Carica papaya* gave a relatively high percentage yield after the commonly used *Calotropis procera* and therefore can be used in its place in case *Calotropis procera* is not available. Goat milk can also be used instead of the commonly used cow milk for a soft cheese of high percentage yield.

References

[1]. Adetunji, V.O. and Salawu, O.T. (2008). "West African soft cheese 'wara' processed with *Calotropis procera* and *Carica papaya*: A comparative assessment of nutritional values. *International Journal of Dairy Science*, 6(1): 58 – 65.

[2]. Akinloye, A. M. and Adewumi, O. O. (2014). Effects of local coagulants on the yield of cheese using cow and sheep milk. *International Journal of Development and Sustainability*, **3**(1):150-161.

[3]. Akinyele, B.J, Fawole, M.O and Akinyosoye, F.A. (1999) Microorganisms associated with fresh cow milk, wara, and nono; two local milk products hawked by Fulani women in Ilorin, Kwara state, Nigeria. Nigerian Food Journal.; 17: 11-17.

[4]. George, F.W. (2001), "*The nutritional value of sheep milk*", Sheep 101 info. 1-2

[5]. Haenlein, G.F.W., Wendorff, W.L. (2006). Sheep milk—production and utilization of sheep milk. In: Park, Y.W., Haenlein, G.F.W. (Eds.), Handbook of Milk of Non-Bovine Mammals. Blackwell Publishing Professional, Oxford, UK, and Ames, Iowa, USA, pp. 137– 194.

[6]. O'Connor, C. B.(1993). *Traditional Cheese Making Manual*. ILCA (International Livestock Center for Africa), Addis Ababa, Ethiopia. 43 2

[7]. Obizoba, I.C. and L. Anyika (1995). Effects of germination, dehulling and cooking on the nutritive value of cowpea (Vigna unguiculata) flour. J. Food Sci., 5: 1371-1372.

[8]. Ogunlade A.O (2019). Comparative Studies on the Amino acid Content of Soft Cheese Produced from Cow and Goat Milk using Different Biocoagulants. *International Journal of Science and Research*, 8 (1): 2143-2147

[9]. Okorie S. U. and Adedokun, I. I. (2013). Effect of Partial Substitution of Fresh Cow Milk with Bambaranut Milk on Nutritional Characteristics and Yield of Soft ('Unripe') Cheese-'Warankashi'.Advance *Journal of Food Science and Technology*, **5**(6): 665-670.

[10]. Okorie S. U. and Adedokun, I. I. (2013). Effect of Partial Substitution of Fresh Cow Milk with Bambaranut Milk on Nutritional Characteristics and Yield of Soft ('Unripe') Cheese-'Warankashi'.Advance *Journal of Food Science and Technology*, **5**(6): 665-670.

[11]. Omotosho, O. E., Oboh, G. and Iweala, E. E. J. (2011), "Comparative effects of local coagulants on the nutritive value, in vitro digestibility and sensory properties of wara' cheese*". International Journal of Dairy Science*, **6 (**1): 58 - 65.

[12]. Park, Y.W. (1994). Hypo-allergenic and therapeutic significance of goat milk. Small Rumin. Res. 14, 151–161.

[13]. Park, Y.W., Chukwu, H.I. (1989). Trace mineral concentrations in goat milk from French-Alpine and Anglo-Nubian breeds during the first 5 months of lactation. J. Food Compos. Anal. 2, 161–169.

A O. OGUNLADE,etal. "Comparative Studies On The Percentage Yield Of Soft Cheese Produced From Various Animals's Milk Using Different Coagulants." *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 14(4), (2020): pp 01-05.