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THE EFFECT OF VARIOUS CURDLING AGENTS ON THE NUTRITIONAL QUALITY OF ANIMAL MILK AND CHEESE

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ABSTRACT

This study was carried out to assess the nutritional and organoleptic properties of local cheese (Wara) prepared by addition of three variants of natural curdling agents which include Ccilotropis procera, pap water and vinegar. All experiments were carried out under standard laboratory conditions. The following properties were determined and the result revealed fat 61-64%, protein 12-14%, moisture content 42-54%, carbohydrate2- 8%, calcium 29-32%, Ash 2-3%, general appearance, texture, color and taste. These were analyzed based on the various curdling agents used. The results of the proximate analysis showed differences in fat, protein, moisture content, carbohydrate, ash and calcium contents of the different samples prepared. From the results obtained, it can be concluded that

Introduction:

Milk is as ancient as mankind itself, as it the substance created to feed the mammalian infant. All species of mammals from humans to whales produce milk for this purpose. Many centuries ago, perhaps as early as 8000 - 1000 BC ancient people learnt to domesticated species of animals for the provision of milk to be consumed by them. These included cow (bos) buffaloes, sheep, goats and camels, all of which are still used in the various part of the world for the production of milk for human consumption (James 2013) Fermented products such as cheeses were discovered by accident but there history has also been

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pap water and Ccilotropis procera are promising and generally desirable local curdling agents in cheese production.

Key words: Curdling, Milk , Cheese, Nutritional Organoleptic.

documented for many centuries has the production of concentrated milk, butter, and even ice cream (Belewu 2006),

Technological advances have only come about recently in the history of milk consumption. The availability and distribution of milk and milk products today in the modern world is a blend of the century's old knowledge of traditional milk product with the application of modern milk science and technology (Ibhaze *et al*. 2014). The role of milk in the traditional diet has varied greatly in different regions of the world. The tropical countries have not been traditionally milk consumers, whereas the more northern regions of the world, Europe (especially Scandinavia) and North America have traditionally consumed far more milk and milk products in their diet. In tropical countries where high pressure and lack of refrigeration has led to the inability to produce and store fresh milk, milk has traditionally been preserved through means other than refrigeration, including immediate consumption of warm milk after milking, by boiling milk, or by conservation into more stable product such as fermented milk.

Cheese production helps in preservation of essential nutrients in milk. Cheese is a fresh originated product after coagulation and whey separation of milk, cream or partly skimmed milk, butter milk or mixture of these products. The best-known coagulant used by cheese maker for many varieties of cheese is rennet. (Badmos and Joseph 2012). Rennet is obtained from the fourth stomach (abomasum) of a young calf. In Nigeria sodom apple leave extract known as (ewe bomu bomu among the Yorubas) it is commonly used as coagulant for cheese making. The leaf contains an organic acid called Calotropain which has the ability to solidify or coagulate milk (Akinloye and

Adewumi 2014). Coagulation should be achieved by increase in the acidity, extended heating or enzyme activity (Adepoju et al 2012).

The aim of this study was to determine the effect of various curdling agent on the nutritional value of milk and cheese.

Materials and Method

Whole milk samples (6 L) were collected from cows and Calolropis procera plants were obtained from the environment of The Federal Polytechnic Bida, Niger State, Nigera in 2018. Three coagulant used in this work include calotropis pocera (sodam apple), steep water from pap production and vinegar. Materials also includes a source of heat, muslin cloth, pot and stirer

Production of cheese using Calotropis procera as coagulant

Two liters of fresh cow milk was put in a pot and was preheated to 50°C and 2.5 ml of calotropis extract juice was inoculated. The contents in the pot were allowed to boil for about 30 - 40 minutes at 100°C. The pot was removed from heat and the curd and they were poured into the raffia basket to drain the cheese for about 5-8 mins to give it its desired shape. The produced cheese was labelled A Production of cheese using steep water from pap as coagulant Two liters of fresh cow milk was put in a clean pot and was preheated to 50°C and 300ml of steep water from pap production was inoculated The contents in the pot were allowed to boil for about 30 - 40 minutes at 100°C. The pot was removed from heat and the curd and whey were poured into the muslin cloth to drain the cheese for about 5-8 minutes to give it its desired shape. The produced cheese was labelled B. Production of cheese using vinegar as coagulant

Two liters of fresh cow milk was put in a clean pot and was preheated to 50°C and 250ml of vinegar was inoculated. The contents in the pot was allowed to boil for about 30 - 40 minutes at 100°C. The pot was removed from heat and the curd and whey were poured

into (he muslin cloth to drain the cheese for about 5-8 minutes to give it its desired shape. The produced cheese was labelled C.

Sensory analysis:

The organoleptic properties of each cheese produced using the various coagulants were determined using the method of Potter, (1968). The products were assessed for appearance color, taste, aroma and overall quality and acceptability on a seven-point Hendonic scale (7, dislike extremely; 6, dislike very much; 5, dislike slightly; 4, indifferent; 3, like slightly; 2,like very much; l, like extremely) and the attribute mean score calculated.

Statistical analysis of data:

The results were expressed as mean ± standard deviation. Analysis of Variance (ANOVA) and Duncan's multiple range tests were used to determine significant differences between the mean values at $p \leq 0.05$.

Nutritional analysis:

The nutrient composition (ash, fat, moisture, carbohydrate and calcium of the cheese produced from the different coagulants was determined using the standard AOAC method (1990). The protein content was determined using the micro Kjeldal method.

RESULTS

The result obtained are as represented in table 1 and 2

Table 1: result of questionnaire on the organoleptic assessment

CHEESE TYPE	COLOUR	TASTE	AROMA	OVERALL ACCEPT
C. pocera	2.55±0.689a	2.35±0.67a	2.30±0.73a	2.50±0.88a
Pap water	1.95±0.88b	2.15±0.98a	2.30±1.03a	2.45±1.09a
Vinegar	2.30±0 80ab	2.55±1.50a	2.20±1.00a	2.55±1.09a

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Key a= more significant
b= less significant
ab = average significant

Table 2. Proximate analysis

Cheese type	Protein	Ash	Moisture	CHO	Calcium	Fat
Calotropis P.	12.76±0.01b	3,51±0.01a	54.23±0.02a	2.72±0.01c	32.12±0.02a	64.45±0.08a
Pap water	14.1 0i-0.16a	2.03J:0.05b	48.01±0.02b	8.08-1-0.02a	29.6 U0.02b	59.01.1.0.0 le
Vinegar	12,83±0.05b	2,1 l±0.05b	42.06±0.05c	2.67±0.02b	29.61±0.02b	61.69±0.52b

Key a= more significant
b= average significant
c = less significant

DISCUSSION

The result of the organoleptic properties showed differences m the value of colour, taste and aroma of the calotropis procera, pap water and vinegar cheese and the overall acceptability. The figure above explain the differences in the value and their rate of acceptability (a,b and ab).

The a indicates more significant
The b indicates less significant
The ab indicates average significant

The 'a' in the overall acceptability indicates general acceptance by the consumers. Therefore, the sensory attributes show that the three cheese are generally accepted by the consumers as discovered from respondent to the questionnaire assessment carried out at the biology laboratory of I lie federal polytechnic Bida. Niger state. The proximate analysis shows the differences in

protein, fat, ash, moisture, carbohydrate, calcium and oil of calotropis procera, pap water, and vinegar curdled cheese. Out of the three samples prepared, calotropis procera cheese has the highest fat content reading (64.45%) which is higher than the value 31.45% as reported by Alalade et al., (2006). The higher fat content in calotropis procera cheese could be as the result of its high curdling strength. The protein content of pap water cheese (14.10%) is lower than the value 45.3% reported by Johnson (2001), this may be due to the higher curdling strength The ash and calcium content including that of fat stated above having the following figure (3.51%), (32.12%) and (64.45%) of calotropis procera is higher than that of pap water and vinegar cheese, this may be due to its high curdling strength. The carbonhydrate content of pap water (8.80%) cheese is higher than that of vinegar and caloliopis pioccia this may be due to its higher curdling strength. The nutritional properties of vinegar cheese shown above and their rate in table among pap water and calotropis procera cheese state that he nutritional value of the vinegar cheese is still accepted by the body after consumption.

However, calotropis procera and pap water cheese is more preferred as discovered by the nutritional analysis and based on their nutritional value, vinegar cheese is also accepted. The organoleptic properties is also illustrated graphically to illustrate the effect of each curdling agent on the organoleptic properties of the cheese samples as shown that volume variation of each curdling agent has resultant variation on the organoleptic properties.

The proximate analysis was also illustrated graphically to determine or illustrate the effect of each curdling agent on the nutritional properties of the cheese sample.

Time range for the animal milk to curdle after the addition of each curding agent during the preparation of the cheese is explained in the figure below:

Calotropis procera	6 to 25 minutes.
Pap water	7 to 10 minutes.
Vinegar	5 to 12 minutes.

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The time range for the curdling agent to curdle the animal milk have a slight difference and the time for this curdling agent to curdle is important. The fastest curdling agent to curdle the animal milk to produce the cheese is vinegar (5 to 12 minutes).

CONCLUSION

The comparative study of the nutritional value and organoleptic properties of the varieties of cheese produced with animal milk which is curdled with various curdling agents such as: calotropis procera, pap water and vinegar, suggested and confirmed that pap water and calotropis procera were promising and generally desirable local curdling agent in cheese processing. From this study it was observed that the nutritional and organoleptic properties of the cheese based on the type and quantity of curdling agent added varies slightly from each other. Hence, cheese produced from animal milk using calotropis procera, pap water and vinegar are nutritious to the body and such cheese should be generally accepted in the country.

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