Preparation and Quality Evaluation of Raw Milk and Yoghurt Sourced from Machine Milked Jersey Cows

Grace O. Tona*

Department of Animal Production and Health, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria

P.M.B. 4000, Ogbomoso, Oyo State, Nigeria

Abstract

In this study, there was preparation of yoghurt from the raw milk of machine milked Jersey cows. Physicochemical parameters, mineral composition, microbiological qualities and sensory evaluation of raw cow milk and yoghurt samples were examined. Correlations between the proximate parameters versus sensory perception attributes of yoghurt were analysed. The results showed that the pH, titrable acidity, moisture and ether extract contents were significantly ($P<0.05$) higher in the raw cow milk than in the yoghurt. However, the values recorded for specific gravity, viscosity, protein, ash, carbohydrates and mineral contents were higher ($P<0.05$) in the yoghurt than in the raw cow milk. The total viable bacterial counts were 8.2×10^2 cfu/ml for raw cow milk and 3.7×10^3 cfu/ml for yoghurt; total fungal counts were 3.1×10^2 cfu/ml for raw cow milk and 9.6×10^2 cfu/ml for yoghurt; while coliform was absent in both samples. The sensory attribute scores for the yoghurt samples were all very high and ranged between 7.17 and 8.17 on a nine point hedonic scale. There were significant ($P<0.01$) but negative correlations between moisture content versus taste, aroma and texture of yoghurt (r = - 0.7.28, - 0.541 and – 0.971 respectively). There were also, strong positive correlations between fat content versus aroma and texture (r = 0.574, 0.500 respectively). Based on the findings of this study, it was concluded that the raw milk and yoghurt sourced from machine milked Jersey cows were of good physicochemical, microbiological and sensory qualities and these could serve as prove that good hygienic practices were observed on the dairy farm. Also, the yoghurt was found to be more acidic, had higher specific gravity and viscosity, was higher in most of the nutrients such as protein, ash, carbohydrates and the minerals (calcium, phosphorus, magnesium, sodium and iron) than the raw cow milk from which it was prepared.

Keywords: Jersey cows, raw milk, yoghurt, quality

1. Introduction

Global milk demand is growing by 15 million tons per year, mostly in developing countries (FAO 2010). These authors (FAO 2010), further stated that production of increased volume of milk by small scale dairy farmers would also create approximately three million jobs per year, and these could provide opportunities for establishing sustainable dairy chains that can meet the demands of local consumers and the world market. Some of the ways of making improvement in milk production in developing countries such as Nigeria, could be the use of exotic breeds such as Jersey cattle breeds. These could be useful in formulating the future breeding programme for genetic improvement of indigenous cattle populations for higher milk production potentials (Fayeye *et al.* 2013). Raw milk can be consumed directly in the form of liquid milk, or may be converted into milk products in order to improve its keeping quality and nutritive value. In developing countries like Nigeria, there is a growing consumer demand for dairy products such as yoghurt. Also the rising world market prices for dairy products offer better opportunities for milk and milk products producers.

Milk from various mammals can be used in the manufacture of different dairy products such as butter, cheese, yoghurt, ghee and sour milk (Bhatia *et al.* 2015). However, consumers always demand for nutritionally enriched milk and dairy products such as yoghurt. Yoghurt is a tasty fermented milk product which is very nutritious and easily digestible. The fermentation of milk to yoghurt is brought about by the symbiotic growth of two types of bacteria, *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. These are starter culture added to milk during yoghurt manufacture. Some researchers, (Yadav *et al.* 2015) explained that these two bacteria are used in a 1:1 ratio, *S. thermophilus* produces the acid whereas the aroma components are formed by *L. bulgaricus*. The rate of acid production is much higher when they grow together as compared to their individual growth. *Streptococcus thermophilus* grows faster and produces both acid and carbon dioxide which stimulates the growth of *L. bulgaricus*. Whereas the proteolytic activity of *L. bulgaricus* produces stimulatory peptides and amino acids which are utilized by *S. thermophilus*. The bacteriae produced lactic acid acts on the milk protein to give yoghurt its texture and its characteristic taste (Yadav *et al.* 2015). In another study by Ndife *et al.* (2014), it was stated that in recent times, research has shifted focus to diverse components in dairy products production, particularly fermented dairy products. These researchers (Ndife *et al.* 2014) mentioned that probiotics and prebiotics are evolving nutritional concepts in the development of dairy functional foods. The functional foods are nutritious, promote health and reduce risk of diseases. Probiotics was defined as live microbial food ingredients which beneficially affect the host animal by improving its intestinal microbial balance (Lourens-Hattingh & Viljeon 2001). Prebiotics however, are non-digestible foods that when they are passed into the digestive system help the desirable gut bacteria to grow and flourish (Aryana *et al.* 2007). Some health benefits were attributed to dairy foods which are probiotic in nature (Seckin *et al.* 2009). Some of such benefits include their anti-carcinogenic, hypo-cholesterolemic and antagonistic actions against enteric pathogens and other intestinal organisms. Yoghurt may also be regarded as a probiotic carrier whose nutritional benefits exceed that of milk (Seckin *et al.* 2009). Other health benefits of yoghurt include prevention of diarrhea, promotion of good gum health, facilitate the absorption of calcium and thus preventing osteoporosis (Ndife *et al.* 2014). These authors (Ndife *et al.* 2014) stated that dairy products quality include such characteristics as chemical composition, physical properties, microbiological and sensory properties and nutritive value among others. It is useful to evaluate the sensory qualities (colour, taste, aroma and texture) of a product since these could determine its acceptability by consumers.

Milk from machine milked Jersey cows were observed to possess good physicochemical and microbiological qualities which were attributed to the maintenance of better hygiene conditions, in comparison to hand milked cows (Tona *et al*. 2016a). Thus, the purpose of this research was to outline the steps in the manufacture of yoghurt, and quality assessment of raw milk and yoghurt sourced from machine milked Jersey cows.

2. Materials and Methods

2.1 Study Location

Collection of fresh raw milk from Jersey cows and the yoghurt preparation was carried out at a commercial dairy farm in Edu Local Government Area (LGA), Kwara State, Nigeria. Laboratory analysis was carried out at the Departments of Animal Production and Health and the Science Laboratory and Technology laboratories of Ladoke Akintola University of Technology (LAUTECH), Ogbomoso Nigeria.

2.2 Yoghurt Preparation

Three litres of the fresh raw milk was sieved with a clean cheese cloth (to remove all unwanted particles) into a well cleaned aluminium pot, and then pasteurized to 90^{o}C for about 15 minutes. The pasteurized milk was then cooled to 40^{o}C and inoculated with yoghurt commercial starter culture (*Lactobaccilus bulgaricus* and *Streptococcus thermophillus*). The set up was then kept undisturbed in an oven maintained at 35^{o}C for fermentation process to take place within a period of 6 to 12 hours. Then, about 30g of sugar and minute quantity of the desired flavour (strawberry flavour) was added with slight stirring. The finished product was then transferred into sterile plastic bottles, corked tightly and kept in a refrigerator at about 4^{o}C until needed for laboratory analysis.

Collection of raw milk from Jersey cows

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Sieving of raw milk with cheese cloth

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Raw milk pasteurization to 90 ^{o}C

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Cooling of pasteurized milk to 40 ^{o}C

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Addition of yoghurt culture (*Lactobaccilus bulgaricus*

and *Streptococcus thermophillus*) to cooled milk

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Stir and cover warm milk maintained at 35 ^{o}C

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Allow fermentation to take place within 6 to 12 hours

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Add the desired flavour to fermented yoghurt with slight stirring

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Transfer yoghurt into plastic bottles with adequate cork or cover and

then transferred to the refrigerator to be kept cooled at about 4^{o}C

↓

Serve yoghurt chilled

Figure 1. The Flow Chart of Yoghurt Preparation

2.3 Physicochemical Analysis of Milk and Yoghurt Samples

Twelve cow milk and 12 yoghurt samples (20 mls each) were analysed for their pH, specific gravity, titrable acidity, viscosity, moisture, protein, ether extract and ash contents.

The pH measurement was made using a digital pH meter, which was initially standardized with standard buffer solution of pH 4 and 7. The pH electrode was washed with distilled water and placed in each milk and yoghurt samples, then a few seconds was allowed for the reading to stabilize and the pH value was recorded.

The titrable acidity was measured by titrimetric method. Each of the milk and yoghurt samples used for the pH determination was transferred into a 250 ml conical flask, then 4 to 5 drops of phenolphthalein indicator was added. Then a 25 ml burette was filled with 0.1 M sodium hydroxide and titrated with the 0.1 M sodium hydroxide until the indicator just turns pink. The titre volume of sodium hydroxide added was then recorded. The percentage of total titrable acidity was then expressed as percent of lactic acid. This was obtained by multiplying the titre volume of sodium hydroxide by 0.09.

Percent ether extract was determined using the soxhlet apparatus equipment (AOAC 2005). Other parameters such as moisture, protein and ash were determined (AOAC 2005). Specific gravity was measured using a lacto-densitometer. Viscosity was measured using a viscometer using a glass tube and a normalized ball equipped with a chronometer at 20^oC and expressed in centistrokes.

2.4 Mineral Analysis of Milk and Yoghurt Samples

Milk and yoghurt samples were analysed for minerals according to the methods of AOAC (2005).

Digestion: Amounts of 0.5 g of the samples were weighed into a set of digestion tubes and 10 mls each of perchloric and nitric concentrated inorganic acids were dispensed into the sample tubes. The samples were digested on the digestion block at 120^oC for 2 hours until the organic substances were completely decomposed. At the end of the digestion, the samples were allowed to cool to room temperature. Digested samples were made up to the 50 mls volume with deionized water and then transferred into centrifuge tubes and shaken for 10 minutes. The solutions were transferred to the centrifuge machine and centrifuged at the rate of 4500 rpm for 5 minutes. Finally, the supernatants were placed in duplicates in a set of pyrex glass vials and analysed for Ca, P, Mg, K, Na and Fe levels. The Ca and Mg were burnt off in an atomic absorption spectrophotometer (AAS) and the intensity of their flame was measured at the appropriate wavelength, current and pressure. Potassium and sodium was read off in the flame photometer. Phosphorus was measured calorimetrically using the vanado-molybdate reagent (AOAC 2005). The results were then expressed in mg/100 g.

2.5 Microbiological Analysis of Milk and Yoghurt Samples

The media used in the laboratory analysis of microbiological properties of raw milk and yoghurt samples in this study included the following: MacConkey Agar for coliform organisms, Pseudomonas Agar for pseudomonas, Potato dextrose Agar for fungi, Nutrient Agar for aerobes, Mannitol salt Agar for staphylococcus and de Mannns Rogosa and Sharpe (MRS) for anaerobes.

2.5.1 Standard Plate Count

In the standard plate count, one ml of the milk and yoghurt samples (and in any dilution level) was dispensed into a sterile Petri dish using a sterile pipette. Then 15 – 20 ml of sterile nutrient agar was added and the two mixed thoroughly by swirling gently. The dish was then incubated in an incubator at 37^oC for 24 hrs. The number of colonies growing in the agar plate was then counted. (N.B.: This method is suitable for enumerating small number of bacteria, hence is suitable for low count samples. This is usually used for pasteurized milk or good quality raw milk.)

2.5.2 Isolation of Micro-organisms from the Milk and Yoghurt Samples

One ml each of the milk and yoghurt samples were measured out and subjected to serial dilutions within the ranges of 10^{-1} and 10^{-4}. One ml of each sample was then thoroughly mixed with 9 ml of sterile distilled water to give 10^{-1} dilution. Then next, 1 ml of the 10^{-1} dilution was also pipetted out and mixed with another 9 ml of sterile distilled water, screw capped to give 10^{-2} and repeated to give 10^{-3} and 10^{-4} dilutions repeatedly.

A sterile pipette was used to measure out 1 ml out of the 10^{-3} and 10^{-4} dilutions. It was pipetted into sterile Petri dishes and molten agar at 45^oC was poured onto it. It was swirled gently for even distribution of the inoculum in the agar. After solidification, the plates were then inverted and incubated in an incubator at 30^oC.

Plates containing the nutrient agar were allowed to stay over night while that of potato dextrose agar was incubated for 3 days. The bacteria will grow on the nutrient agar while fungi will grow on the potato dextrose agar.

2.5.3 Total Bacteria and Fungi Count and Identification

This was done by counting the different colonies on the different agar plates after incubation and multiplying with the dilution factor. Identification of the isolates was done after examining the cultural, morphological, biochemical, physiological characteristics, including microscopic and macroscopic examination of the various isolates.

2.6 Sensory Evaluation

The evaluation session took place in a classroom in the Department of Animal Production and Health, Ladoke Akintola University of Technology, Ogbomoso, Nigeria. The yoghurt samples were offered to a 12-member panel of judges, who were students, and were familiar with the consumption of yoghurt. Each judge was made to sit separately, in order to avoid biased assessment. Each yoghurt sample was then assessed based on the following sensory perceptions: visual assessment/ colour, taste, aroma, mouth-feel/ texture and general acceptance. The yoghurt attributes were quantified using a continuous nine point hedonic scale, as follows: disliked extremely = 1; disliked very much = 2; disliked moderately = 3; disliked slightly = 4; neither disliked nor liked = 5; liked slightly = 6; liked moderately = 7; liked very much = 8; liked extremely = 9. The relative intensity of each attribute was expressed as the mean of the scores obtained from the 12 judges and these mean scores were then tabulated.

2.7 Statistical Analysis

Data collected were subjected to one way analysis of variance (ANOVA) procedure of SAS (2002). Significant means were separated using the Duncan's multiple range test of the same software. Means, standard deviations and simple correlation analysis were carried out using the SPSS (2012) statistical package. Mean differences were considered significant at $P<0.05$.

3. Results

3.1 Physicochemical Properties of Raw Cow Milk and Yoghurt Samples

The physicochemical characteristics of raw cow milk and yoghurt samples are shown in Table 1. The pH, titrable acidity, moisture content and ether extract were significantly ($P<0.05$) higher in the raw cow milk than in yoghurt. On the other hand, specific gravity, viscosity, protein, ash and carbohydrates were significantly ($P<0.05$) higher in yoghurt than in raw cow milk.

Table 1. Physicochemical parameters of raw cow milk and yoghurt samples

Parameters	Raw cow milk	Yoghurt
pH	6.30 ± 0.01^a	4.80 ± 0.01^b
Specific gravity	1.10 ± 0.01^b	1.40 ± 0.01^a
Titrable acidity (% lactic acid)	0.18 ± 0.01^a	0.16 ± 0.02^b
Viscosity (centi-strokes)	183.30 ± 0.16^b	256.33 ± 16.62^a
Moisture content (%)	85.07 ± 0.19^a	78.00 ± 0.16^b
Protein (%)	3.70 ± 0.09^b	5.73 ± 0.14^a
Ether extract (%)	3.43 ± 0.05^a	1.60 ± 0.09^b
Ash (%)	0.83 ± 0.05^b	4.57 ± 0.14^a
Nitrogen free extract (%)	6.97 ± 0.21^b	10.10 ± 0.16^a

Data are mean values ± standard deviation; ^{a,b} Means in the same row with different superscript are significantly different ($P<0.05$)

3.2 Mineral composition of raw cow milk and yoghurt samples

The results presented in Table 2 showed that all the six mineral elements investigated were significantly ($P<0.05$) higher in the yoghurt than in the raw cow milk.

Table 2. Mineral composition of raw cow milk and yoghurt samples

Mineral contents (mg/100g)	Raw cow milk	Yoghurt
Calcium	181.67 ± 2.58^{b}	243.33 ± 6.83^{a}
Phosphorus	125.00 ± 4.47^{b}	186.67 ± 2.58^{a}
Magnesium	53.33 ± 2.58^{b}	78.33 ± 2.58^{a}
Potassium	25.00 ± 0.01^{b}	41.67 ± 2.58^{a}
Sodium	763.33 ± 2.79^{b}	981.67 ± 11.26^{a}
Iron	7.77 ± 0.14^{b}	9.27 ± 0.19^{a}

Data are mean values ± standard deviation; ^{a,b} Means in the same row with different superscript are significantly different ($P<0.05$)

3.3 Microbiological qualities of raw cow milk and yoghurt samples

Presented in Tables 3 and 4 are the microbiological qualities of raw cow milk and yoghurt samples and the International Standard Index (ISI) specifications for raw cow milk respectively. The total viable bacterial count and total fungal count were below 2.0×10^5, while coliform organism was absent in the raw cow milk and yoghurt samples. *Bacillus sp.* bacteria and *Rhizopus sp.* fungus were identified (Table 3).

Table 3. Microbiological qualities of raw cow milk and yoghurt samples

Parameters	Raw cow milk	Yoghurt
Total viable bacterial count (CFU/ml)	8.2×10^2	3.7×10^3
Organism identified	*Bacillus species*	*Bacillus species*
Total viable bacterial count (CFU/ml)	-	-
Organism identified	-	-
Total fungal count (CFU/ml)	3.1×10^2	9.6×10^2
Organism identified	*Rhizopus species*	*Rhizopus species*

- Absent / not detected

Table 4. International standards index (ISI) specifications for raw milk

Standard plate count	Grades
Below 2.0×10^5	Very good
Between 2.0×10^5 and 1.0×10^6	Good
Between 1.0×10^6 and 5.0×10^6	Fair
Over 5.0×10^6	Poor

Source: (Kutty & Khamer 2004)

3.5 Sensory evaluation of yoghurt samples

Table 5 shows the sense perception parameters for the yoghurt samples under study. The mean score values were all high.

Table 5. Sensory evaluation of yoghurt samples

Sense perception parameters	Scores
Colour	8.17 ± 1.57
Taste	7.17 ± 1.22
Aroma	7.33 ± 1.26
Texture	7.33 ± 1.10
General acceptance	7.67 ± 1.00

Data are mean values ± standard deviation

3.6 Correlations between proximate parameters and sensory perception scores of the yoghurt samples

As shown in Table 6, there were strong negative correlations between moisture content versus taste (r = - 0.728), aroma (r = - 0.541) and texture (r = - 0.971). There were also, strong positive correlations between fat content and aroma (r = 0.574) and between fat content and texture (r = 0.500).

Table 6. Pearson correlations of proximate parameters versus sensory perception attributes of yoghurt samples

	Proximate parameters			Sensory perception attributes		
	Moisture	Protein	Fat	Colour	Taste	Aroma
Protein	-0.240					
Fat	-0.277	-0.866**				
Colour	-0.238	-0.297	-0.171			
Taste	-0.728**	0.001	0.375	0.437		
Aroma	-0.541**	-0.298	0.574**	0.551**	0.911**	
Texture	-0.971**	0.001	0.500**	0.171	0.750**	0.631**

*= P<0.05; ** = P< 0.01

4. Discussion

The observed higher pH value of raw cow milk (6.30) than yoghurt sample (4.80), as shown in Table 1, implies that the yoghurt was more acidic and had higher titrable acidity (% lactic acid) content. This could be because during the preparation of yoghurt from raw milk, the addition of the yoghurt culture (*L. bulgaricus* and *S. thermophilus*) enhanced the production of lactic acid as was explained in a previous research work (Yadav *et al*. 2015). Similarly, some other researchers (Adewumi & Idowu 2014) reported pH of 6.26 for raw milk and a lower pH of 4.66 for yoghurt. In this study, the observed 0.18% titrable acidity (lactic acid) of raw cow milk is similar to the 0.18% lactic acid of raw cow milk reported elsewhere (Bhatia *et al*. 2015) and within the range of 0.18 to 0.23% lactic acid in raw cow milk of Jersey cows obtained in another study (Tona *et al*. 2016a). The significantly (P<0.05) higher specific gravity of yoghurt (1.40) than that of raw cow milk (1.10) could be a reflection of the lower moisture content of yoghurt than in the raw cow milk. Similarly, as explained above the viscosity of the yoghurt (256 centi-strokes) was higher (P<0.05) than for raw cow milk (183.30 centi-strokes). Reported values of 1.10 (specific gravity) and 183.30 centi-strokes (viscosity) of raw cow milk in the current study are within the range of 1.11 (specific gravity) and 175.23 to 190.47 centi-strokes (viscosity) of Jersey cows' raw milk samples observed in an earlier research (Tona *et al*. 2016a). In this study, it was observed that some of the proximate parameters such as protein, ash and carbohydrates were significantly (P<0.05) higher in the yoghurt than in the raw cow milk. A similar result was reported by other research workers (Adewumi & Idowu 2014), who explained that the increased protein content of yoghurt prepared form the raw milk could be due to the addition of starter culture (*L. bulgaricus* and *S. thermophilus*) which facilitated the production of essential amino acids. These amino acids may have served as building blocks during protein formation. The higher (P<0.05) contents of ash in yoghurt than in the raw cow milk might also have resulted due to the higher concentration of the ash in the yoghurt than in the raw cow milk.

In the present research, the fermentation (metabolic process which brings about chemical changes on an organic substrate) of the milk by the symbiotic growth of the starter culture (*L. bulgaricus* and *S. thermophilus*) could have resulted into the thicker product of yoghurt. The values of 125.00 mg/100g phosphorus and 53.33 mg/100g magnesium recorded in this research are within the ranges of 90.00 to 281.67 mg/100g of phosphorus and 33.33 to 78.33 mg/100g of magnesium in the colostrum, early lactation, mid lactation and late lactation milk of Jersey cows that were reported in a previous research work (Tona *et al*. 2016b). The significantly (P<0.05) higher levels of all the mineral elements investigated in yoghurt than in the raw cow milk (see Table 2) could be due to their higher concentration in the yoghurt (as earlier stated for ash content). Previous investigators (Ayman *et al*. 2009) mentioned that yoghurt is a concentrated source of essential minerals like calcium, potassium, magnesium, phosphorus and zinc.

In the current study, total viable bacterial counts were 8.2×10^2 in the raw cow milk and 3.7×10^3 in the yoghurt and the bacteria identified was *Bacillus species*, coliform was not detected. These results are in agreement with the statement of some dairy production researchers (Kutty & Khamer 2004) that for high grade milk, coliform organism should have been destroyed by pasteurization. Hence the coliform organism should not be present in 0.1 ml of pasteurized milk and its presence indicates post pasteurization contamination which usually could be from utensils or environment. Total fungal counts were 3.1×10^2 in the raw cow milk and 9.6×10^2 in the yoghurt and the fungus identified in both samples was the *Rhizopus species*. Thus, the biological qualities of both of the samples investigated were of very good grades (below 2.0×10^5). These results are in agreement with earlier findings (Tona *et al*. 2016a), which showed that Jersey cow raw milk had total viable bacterial counts range between 2.3×10^2 and 1.9×10^3, and *Bacillus sp*ecies was identified. While the total fungal count was between 1.3×10^2 and 3.3×10^3 and *Rhizopus species* and *Aspegillus species* were identified (Tona *et al*. 2016a). Also, in agreement with the results of the current study were the mean aerobic mesophilic bacterial counts between 1.9×10^2 and 2.2×10^5 cfu/ml and fungal counts of 8.6×10^1 to 2.5×10^4 cfu/ml, observed for yoghurt brands sold in Kano metropolis, Nigeria (Omola *et al*. 2014).

Scores for sensory evaluation of the yoghurt samples were as follows: 8.17 (colour), 7.17 (taste), 7.33 (aroma and texture) and 7.67 (general acceptance), based on a 9 point hedonic scale. These scores are within the ranges of values reported by other researchers (Ndife *et al*. 2014), who carried out a study on the production and quality assessment of functional yoghurts enriched with coconut. They recorded score ranges of 7.25 to 8.55 (colour), 6.50 to 8.75 (taste), 6.60 to 8.35 (aroma), 6.13 to 8.14 (mouth-feel or texture) and 6.60 to 8.35 (overall acceptability), based on a 9 point hedonic scale. These scores are within the commercially acceptable range of 4 – 9 scores recommended for yoghurt by the Karl Ruther nine points scheme outline (Tamime & Robinson 2014). Similarly, the results obtained in the current study are within the ranges of values reported in a previous study (Mohamed & Isam 2014) using the nine point hedonic scale, where sensory score ranges of 4.6 to 7.6 (aroma), 4.6 to 8.8 (texture), 4.2 to 7.4 (taste), 5.4 to 8.2 (colour) and 5.4 to 8.2 (overall acceptability), were observed when fresh and matured yoghurt sensory attributes assessment were carried out.

As shown in Table 6, there were significant (P<0.01) but negative correlations between moisture content versus taste (r = - 0.728), aroma (r = - 0.541) and texture (r = - 0.971) of the yoghurt samples, and similar observations were made by other researchers (Sandoval-Copado *et al*. 2016), who carried out research on Oaxaca cheese. These researchers (Sandoval-Copado *et al*. 2016) observed that moisture content had strong but negative correlations with certain texture parameters (firm, chewable and gummy). It could be deduced from this study that as the proximate characteristic (moisture content) increased, the sensory perception attribute (texture) decreased. Also, the strong positive correlations between fat versus aroma (r = 0.574) and texture (r = 0.500) could imply that as the fat content of the yoghurt samples increased, the aroma and texture also were increased. An explanation to the positive correlation relationship between fat and sensory perception attributes was given by previous researchers (Ndife *et al*. 2014). They explained that fat content had considerable influence on the sensory characteristics of yoghurt and this was because the fat acts as an aroma solvent.

5. Conclusion

This study has shown that the raw milk and yoghurt sourced from machine milked Jersey cows were of good physicochemical, microbiological and sensory qualities and these could serve as prove that good hygienic practices were observed on the dairy farm. Also, the yoghurt was found to be more acidic, had higher specific gravity and viscosity, was higher in most of the nutrients such as protein, ash, carbohydrates and the minerals (calcium, phosphorus, magnesium, sodium and iron) than the raw cow milk from which it was prepared.

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