academicJournals

Vol. 8(27), pp. 3604-3607, 18 July, 2013
DOI: 10.5897/AJAR09.054
ISSN 1991-637X ©2013 Academic Journals
http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Bacterial assessment and keeping quality of milk obtained from savanna brown doe

Olatunji, A. E.[1]*, Ahmed R[2] and Njidda, A. A.[3]

[1]Department of Animals Science, University of Abuja, Nigeria.
[2]Niger State Agricultural Development Programme (ADP) Minna, Nigeria.
[3]Department of Animal Science, Bayero University Kano, Nigeria.

Accepted 11 June, 2013

Bacterial activities of milk obtained from Savanna brown doe, were chemically assessed before and after pasteurization. A total of 60 L of milk was collected from a randomly selected doe in 10 different herds within Minna, and was stratified into 3 treatments (T_1 - T_3), with 5 replicates (R_1 - R_5), in a completely randomized design (CRD). After collection one quarter of it was homogenously pooled and immediately taken to the laboratory for analysis (T_1), the other portion was left on the laboratory table to ferment (T_2) .The last quarter was pasteurized using the145°F (63°C) for 30 min (LTLT) (T_3). The biochemical results revealed an uneven disparity in all the treatments with high protein for fresh milk while fat was highest for pasteurized milk, this could be attributed to low activity of proteolytic and spoilage microorganism in fresh milk and the multiplication of fat splitting microorganism in the unpasteurized milk, the bacterial count (*Pseudomonas*, *Lactobacillus, Bacillus, Staphylococcus* and *streptococcus)* and frequently occurrence in treatments T_1 - T_2 indicate that these treatments was heavily loaded with different types of bacteria (proteolytic, lipolytic, coliform and lactic acid) when compared with T_3 (pasteurized), this could be due to lack of proper hygienic measure at all stages of collection and storage and/or pasteurization and diseased udder at the time of milk collection. Producer of milk and milk products should be pasteurized immediately after collection and should observe absolute aseptic measures when handling milk and milk products.

Key words: Savanna brown doe, milk keeping quality.

INTRODUCTION

Milk is a well-recognized high quality nutritional food elaborated by nature to foster the young ones and also good to maintain balance diet by the adult, its production and consumption had increased because of this knowledge, especially in most developing countries of the world. Unfortunately milk is the most easily perishable food. As a result attempts have been made to keep the quality of fresh milk in its original form as long as possible.

Milk is susceptible to contamination from sources like vessels, equipment used for milk and storage. Secreted milk by healthy udder is sterile but may become contaminated by the bacterial present in the tubules from where milk flows, in storage space and the cisterns (Uraih and Izuagbe, 1990). Milk is considered spoilt and unsafe for human consumption when it thickens. Some microorganisms spoil milk by impacting colour to it (Olatunji, 1997). *Serratia marcesceus* infection result in a bluish gray to brownish colour of milk, while *Pseudomonas synxanth* causes a yellow colour.

*Corresponding author. E-mail: adendeke@yahoo.com.

Table 1. Experimental procedure.

Replicate	T_1	T_2	T_3
R_1	T_1R,	T_2R_1	T_3 R_1
R_2	T_1R_2	T_2 R_2	T_3 R_3
R_3	T_1R_3	T_2 R_3	T_3 R_3
R_4	T_1R_4	T_2R_4	T_3R_4
R_5	T_1R_5	T_2R_5	T_3R_5

Olatunji (1997) observed that milk curdled or coagulated without acid production when the casein content is coagulated and will result in proteolysis by either *Bacillus subtilis*, *Bacillus cereus*, *Pseudomonas* spp and *Streptococcus lignitaciens*; given bitter flavour because of the release of peptides, while *Pseudomonas fluorescence* and *Candida lipolytica* will split fat in milk to produce glycerol and fatty acids which result in rancid taste and sourness.

Olatunji (1997) observed that pasteurization, especially the longtime low temperature (LTLT): 145°F (63°C) for 30 min is another means of preserving the quality of fresh milk.

The study was conducted to assess the effect of pasteurization on keeping quality of milk obtained from savanna brown doe.

MATERIALS AND METHODS

A total of sixty (60) L of milk was collected from 10 locally breed Savanna brown doe in Minna for the study. The collection period which lasted for 1 month 7 days with 2 weeks interval was collected from animal that are on management and feeding regime that are purely the traditional Fulani husbandry type, where animals graze from place to place in search of green pasture and towards the evening small quantity of sorghum bran is provided to supplement energy intake from forage.

Also milk-handling system conformed to the traditional system in that the kids are tied close to the dam to foster milk-let-down before milking which is done by any member of the family especially women and young once after the udder teat has being clean, using water from nearby stream. Animals were milked early morning time (8.00 h) and about 20 L of milk was collected from thoes that were chosen randomly within the same herd in Minna for the 3 collected periods making a total collection of 60 L of milk.

Milk samples collected were divided into 3 equal parts. One part was taken to laboratory fresh daily for analysis while another was kept on the laboratory table to sour, while the last portion was pasteurized under the long time low temperature pasteurization(145° for 63°C for 30 min). Samples were taken from the soured and pasteurized for laboratory analysis after the first, third, fourth, and fifth day of storage for biochemical and microbial analysis. The experimental procedure composed of 3 treatments that is, fresh milk (T_1), soured milk (T_2) and pasteurized milk (T_3) and 5 replicates (R_1 - R_5) assigned randomly in a completely randomized design (CRD) (Table 1).

Samples taken for microbial assay and biochemical analysis (Crude protein, fat and total solid) was done according to AOAC (1980). The routine laboratory procedure for standard microbial culture and plate count employed for evaluation are as follows:

Microbial analysis

The milk sampled was assessed for bacteriological quantity using the standard plate count. Total bacterial count, proteolytic, lipolytic, lactic acid bacteria (LAB) and Coliform counts were carried out by inoculating serially diluted sample in nutrient agar, milk agar, tributyrin agar, De Man Rogosa Sharpe agar and Ma'Conkey agar respectively and incubating them at 37°C for 48 h. The counts were expressed as colony forming units per milliliter of samples (cfu/ml).

Characterization and identification of isolates

Characterization of bacterial isolate was carried out using colonial morphology, microscopic techniques and biochemical test including gram staining, production of coagulase, oxidase, catalase and urease, methyl red-voges proskauer test, starch and gelatin hydroysis, spore stain, nitrate reduction and utilization of carbohydrates such as glucose, sucrose, mannitol, fructose, inositol, maltose and arabinose. The organisms were identified by comparing their characteristics with those of known taxa using the schemes of Cowan (1974) and Cruickshank et al. (1975).

RESULTS

Results of the biochemical analysis in percentage (%) ranged from 6.28 to 6.56 (pH), 14.00 to 25.42 (TS), 9.06 to 11.32 (CP) and 8.00 to 16.21 (EE) (Table 2).

Bacteria count per milliliter ranged from 9.8×10^7 to 1.4×10^8 in unpasteurized milk and from 1.2×10^8 to 1.7×10^8 in pasteurized milk, from day one to fifth day respectively. Value for fresh milk was 1.9×10^7 (cfu/ml) (Table 3), While values for Coliform count ranged from 1.2×10^4 to 1.8×10^5 cfu/ml, (pasteurized milk) and from 4.8×10^4 to 1.8×10^5 (cfu/ml) for unpasteurized milk (Table 4).

The bacterial isolated include species of *Bacillus, Micrococcus, Streptococcus, Staphylococcus* and *Escherichia* others include *Proteus, Pseudomonas, Lactobacillus, Achromobacter* and *Areobacter.* Percentage number of isolate was higher for T2 (15%) Unpasteurized fermented milk, compared to the pasteurized milk (7%) in T3 (Table 5).

DISCUSSION

Proximate analysis of the milk sample revealed that protein content was highest for fresh milk followed by unpasteurized milk and least for pasteurized milk, this could be as a result of low activity of proteolytic and spoilage micro-organism as indicated by Talaro and Talaro (1996). The fat content was highest for pasteurized milk followed by fresh and least for unpasteurized probably due to multiplication of fat splitting micro-organism in the unpasteurized milk. Frazier and Westofff (1988) reported that fat are subjected more often to chemical and microbial spoilage. The acidity nature of the unpasteurized milk may be due to the inferiority of lactic acid bacteria, which metabolized

Table 2. Chemical analysis of sampled Milk (DM Basis) (%).

Variable	PH	TS	CP	FAT
Fresh milk	6.56	14.00	11.32	11.00
UPGM	6.28	18.00	10.62	8.00
PGM	6.34	25.42	9.06	16.21

UPGM = Unpasteurized Goat milk FM = fresh milk, UGM = pasteurized goat milk.

Table 3. Bacterial counts of milk sample (cfu/ml).

Storage days	Pasteurized	Unpasteurized milk
1	9.8×10^7	1.2×10^8
2	1.0×10^8	1.3×10^8
3	1.1×10^8	1.4×10^8
4	1.2×10^8	1.5×10^8
5	1.4×10^8	1.7×10^8

Values for fresh milk = 1 Goat = 1.9×10^7 cfu.ml.

Table 4. Counts of coliform bacteria in milk samples (cfu/ml).

Storage days	Pasteurized	Unpasteurized milk
1.	6.4×10^4	7.6×10^4
2.	4.8×10^4	9.3×10^4
3.	1.1×10^5	1.2×10^4
4.	1.7×10^5	1.5×10^5
5.	1.8×10^5	1.8×10^5

Values for fresh milk = 1 Goat 5.9 × 104 cfc/ml.

Table 5. Frequency of occurrence of bacterial in milk sample (Cfu/ml).

Bacteria	Unpasteurized milk	Pasteurized milk
Bacillis spp	2(13.3)	2(28.6)
Micrococcus spp	2(20.0)	1.(14.3)
Streptococcus spp	2(13.3)	0(0.0)
Staphylococcus spp	4(26.7)	1(14.3)
Escherichia coil	1(6.7)	1(14.3)
Proteus spp	1(6.7)	0(14.3)
Pseudomonas	0(0.0)	0(0.0)
Lactobacillus spp	2(13.3)	0(14.3)
Achromobacter spp	0(0.0)	1(0.0)
Areobacter spp	0(0.0)	0(0.0)
Total number of isolates obtained	15%	7%

Value in parenthesis represents percentage isolates.

sugar to lactic acid (Talaro and Talaro, 1996). This also might help to check the proliferation of spoilage bacteria in the milk samples.

The result obtained for bacteria indicated that the samples were heavily contaminated. However, lower count was obtained in the pasteurized milk than unpasteurized. This agreed with Frazier and Westhoff (1988) who recorded low pathogenic bacteria count after pasteurization. Coliform count in the samples analyzed were quite high, especially after the fourth day in both

pasteurized and unpasteurized milk. The presence of coliform in the sample could be due to the fact that after defecation, the local milk handler did not clean their hands properly or use water contaminated with facial matter from nearby stream. Coliform bacteria are undesirable in milk and milk product (Prescott et al., 1990; Umoh et al., 1990).

The proliferation of *Bacillus* spp. and S*taphylococcus* spp. in the sample reflects the abundance of the organisms in nature. *Bacillus* spp. produce spores, which help the organisms to withstand harsh conditions and germinate when the conditions become fovourable (Umoh et al., 1990). *Staphylococcus aureus* inhabits the skin and nostrils of a man and animals from where they could be shed on foods through coughing and sneezing (Ado and Wong, 2000). *Lactobacillus* and *Streptococcus* species are desirable, as these organism are responsible for the aromas and flavours of milk and milk products (Bryan, 1980).

The presence of pigment producing bacteria like *Pseudomonas* causes discolouration in milk under storage (Sale, 1967). Other undesirable organisms in the milk samples obtained are *Staphylococcus* and *Coliform* (*Escherichia coli* and *Proteus* spp.). Talaro and Talaro (1996) reported that coliform, bacillus and pseudomonas can spoil milk and cheese by proteolysis because of gas production, sliminess and off-flavour.

CONCLUSION AND RECOMMENDATION

The bacterial isolates observed in this study are suspected to contaminate the sample from various sources, which could be due to poor handling and storage after milk collection. The environment, utensils used, the state of hygiene of the animal from which the milk was collected and the sanitary condition of the milk collectors are all possible source of contamination.

It is recommended that the milk collection should be done with utmost hygienic measure and that milk should be pasteurized immediately after collection to reduce the load of bacteria especially the pathogenic ones. Government should endeavor to assist the poor fulani milk producer, in buying and getting these product into a collection centers were proper equipment for pasteurization are provided before the products get to the consumer, in view of the danger inherent in this product.

ACKNOWLEDGEMENTS

The author acknowledges the contribution of Prof U. J. Ijah of the Department of Biological Science and staff of Biological Science, Microbiology Unit Federal University of Technology, Minna for analyzing this product and Malam Tahid, of the Department of Animal Science, University of Abuja who did the type-setting of the whole work.

REFERENCES

AOAC (1980). Association Of Official Analytical hemists Official Methods Of Analysis Washington D.C. U.S.A.

Ado SA, Wong M (2000). Isolation and Characterization Of Bacillus Cereus From 'Nono' (A Fermented Milk) Spectrum J. 2:164-167.

Cowan ST (1974). Manual For The Identification Of Medical Bacteria, University of Cambridge Press Cambridge.

Cruickshank KR, Duguid JR, Marmion BP, Swain PH (1975). Medical Microbiology (4th ed) Churchill Livingstone, New York. pp. 356-357.

Frazier WC, Westhoff DT (1988). Food Microbiology (4th ed) Mcgraw-Hill Book Company, Singapore. pp. 419-428.

Olatunji EA (1997). Effect Of Different Methods On Keeping quality Of Cheese. Proceeding of 10th Annual Conference of The Biotechnology Society of Nigeria. pp. 54-63.

Prescott ML, Harley SP, Klein AD (1990). Microbiology W.M.C. Brown Publisher, Subuque, pp. 850-851.

Sale AJ (1967). Fundamental Principles Of Bacteriology (6thed). M.C. Graw. Hill Company New York St Louis San Francisco. 22:17-22.

Talaro K, Talaro A (1996). Foundations In Microbiology, W.M.C. Brown Publisher (7th ed), Dubuque.

Umoh VJ. Adesiyun AA, Gomwalk, NE (1990). Seasonal Rarfation, Characteristic and Entero-toxin Production By *Staphylococcal* Isolate From Ferment, Milk Product. J. Food Microbiol. 3:468-545.

Uraih N, Izuagbe Y (1990). Dairy Microbiology Public Food. Indust. Microbiol. 12:49-54.