Page 204 to 213

Volume 1 • Issue 5 • 2017

Research Article

Multidisciplinary Advances in Veterinary Science

ISSN: 2573-3435

Mastitis Prevalence and Cattle Raw Milk Composition of Traditional Dairy Farming System in Tuy's Province of Western Burkina Faso

Millogo Vinsoun[1]*, Illy Dieudonné[2], Kere Michel[1], Sissao Mariétou[1] and Kalandi Miguiri[2]

[1]Department of Animal Production, Research Laboratory for Training in Animal Health and Biotechnology (LARESBA), Institute of Rural Development, Nazi Boni University, 01 PO. Box 1091, Bobo-Dioulasso 01, Burkina Faso

[2]Endocrinology, Radioimmunology and Biochemistry Laboratory. Inter-States Veterinary Medicine and Science School, PO Box 5077, Dakar Fann, Senegal

***Corresponding Author:** Millogo Vinsoun, Department of Animal Production, Research Laboratory for Training in Animal Health and Biotechnology (LARESBA), Institute of Rural Development, Nazi Boni University, 01 PO. Box 1091, Bobo-Dioulasso 01, Burkina Faso.

Received: December 13, 2017; **Published:** December 19, 2017

Abstract

Subclinical mastitis is silent disease which causes loss of much amount of milk in traditional dairy farms. In several developing countries, the national milk production is based on those smallholder farmers who provide milk to urban population. The aim of the current study was to highlight dairy processors and consumers about milk hygiene and mastitis prevalence of traditional dairy farming system in Burkina Faso. Meanwhile, 155 samples of raw milk were collected from 35 farms of Tuy's province in Hauts-Bassins Region, Burkina Faso.

Milk samples were run for electrical conductivity resistivity for subclinical mastitis (Electronic Mastitis Detector, 4X4QMAST)) and milk composition (Dairy Milk Analyser, 2001, Miris AB, Sweden). In addition, survey was conducted on the dairy farming system. The data were subjected to ANOVA using R software version 2.13.0. The difference between means values were considered to be significant at $p < 0.05$. The average subclinical mastitis prevalence of was 30.33%. The survey also revealed that 3.23% of cows had only two udder quarters that were functional. Of these, 15.48% had only three functional quarters, compared to 81.29% who had all of the functional quarter's neighbourhoods that were functioning normally. None of the cows involved had supernumerary teats. The results showed that the daily milk collected per cow was very low (0.85 ± 0.38 litres) during once daily milking.

The feeding system was mainly natural pastures. The grazing was used by 77.14% of farmers and around 22.86% of them used concentrate like cotton seed cake. Milk composition showed low lactose and dry matter contents. Milk samples from cows suspected of subclinical mastitis exhibited higher density than those from apparently healthy cows. It was concluded that 1/3 of mils samples were positive for the electrical conductivity resistivity test. This indicates a low prevalence of subclinical mastitis in this area. The movement of the animals on pasture and less milking practice could explain this.

Keywords: *Traditional dairy farming; Milk composition; Mastitis prevalence*

Volume 1 Issue 5 December 2017

Citation: Millogo Vinsoun*., et al.* "Mastitis Prevalence and Cattle Raw Milk Composition of Traditional Dairy Farming System in Tuy's Province of Western Burkina Faso". *Multidisciplinary Advances in Veterinary Science* 1.5 (2017): 204-213.

Abbreviations: DMA: Dairy milk analyser; ANOVA: Analysis of variance

Introduction

In Burkina Faso, the demand for livestock products like milk will increase because of rapid urbanization which creates high food demand and needs of consumers. In 2015, around 9 million of cattle were assessed (DGESS/MRAH, 2015) which indicates a big potential for milk production. However, there is still a food deficit from livestock and national milk production is very far to satisfy population demand and the gap needs to be filled. The rough evaluation concluded that only 250 million of litres could be provide by the local dairy sector (Hamadou., *et al*. Sanon, 2006).

Regarding the potential, unprecise opinion thinks that less than 5% of the milk produced is collected. This is probably assessment since milk production system is traditional where animals are still moving for grazing. It is difficult to collect and assess how much milk is produced in Burkina Faso right now. It is therefore relevant to pay attention to local dairy farming system which provides almost 95% of total amount of milk consumed in the country (Millogo, 2010). At the same time, due to limited access to land and grazing pasture, peri-urban dairy farming system is promising (Millogo., *et al*. 2008) since it is possible by improving milking (Millogo., *et al*. 2011; Sissao., *et al*. 2017) to increase milk yield and milk hygiene in those areas.

The main challenge from traditional dairy farming tells us that milk is not a final objective of the farmer compared to farmer in peri-urban area close to market. It is a dual purpose system where animals are raised for higher number and milk is just collected for family consumption. The surplus of milk usually in the rainy season is sold in local market. In those types of farms, diseases control and hygiene management remains challenges for the dairy sector since milk is still from those areas. For example, the loss linked to mastitis remains unsolved question. Thus, subclinical mastitis is silent disease which causes loss of much amount of milk in traditional dairy farms. In several developing countries, the national milk production is based on those smallholder farmers who provide milk to urban population. The aim of the current study was to highlight dairy processors and consumers about milk hygiene and mastitis prevalence of traditional dairy farming system in Tuy's province of Western Burkina Faso.

Materials and Methods

Area and period of study

The study was conducted in the province of Tuy in Burkina Faso. The province of Tuy is located between latitudes 11° and 12° North; 3° and 4° West in the Hauts-Bassins Region. The study was conducted from August to November 2015. This period, which corresponds to the rainy season, is also the calving season for cows. The period was particularly marked by a delay in the first rains, which led to a widespread pasture deficit at the beginning of the study.

Farm characterization survey

The survey on rearing conditions was carried out in the form of an interview with dairy farmers. Each questionnaire included four parts: identity of the farmer, characteristics of the farm, breeding conditions and pathologies encountered. Through the questionnaire, several information's were collected. Those questions focused on education level of the farmers, age of farmers; livestock management that brought together food; health monitoring; and the reproduction. Questions on herd numbers, age of cows randomly selected and their lactation.

Milk sampling

A total of 155 cows were involved in our study. They were all local breeds (Zebu). None of them had ever been artificially inseminated. These cows were allocated in 34 farms of 5 departments of the province of Tuy including Houndé, Kombia, Koti, Founzan and Boni.

The age of cows ranged from 3 to 17 years old. The average lactation stage was 7 months old. Samples taken in five departments of Tuy province were analysed in Houndé.

The method used includes several steps. In all, 34 farms were involved in this study. The choice of cows was random. The minimum number of samples per farm was set at 2 while the maximum was 6 cows depending on the number of lactating cows on the farm. Samples were taken directly from the cow's udder. The samples were taken very early in the morning between 5 am and 7 pm. The milk samples used for the physicochemical analysis were collected in sterile 50 mL tubes. They were kept in a cooler for transport to the test site.

Laboratory analysis

The samples used for the mastitis test were collected directly from the cow. These samples were taken using the 4X4QMAST® conductimetry device from the manufacturer DRAMINSKI. For milk composition analysis the infrared method was used (Dairy Milk Analyser). The temperature and the pH of the milk were taken with the pH-meter and thermometer of the manufacturer HANNA.

Statistical analysis

The raw data was keyed on the Excel spreadsheet Microsoft Office® version 2013. This table constituted the database. Statistical analysis was performed using R version 2.13.0 software. The averages of the physico-chemical constants of milk per cow were analysed by the descriptive statistics method. The ANOVA test was performed to compare the averages of the different physicochemical parameters (fat, protein, lactose, dry matter and density) according to age groups; lactation rank; lactation stage and rearing conditions. The threshold of significance was set at 5%. The difference between the values was considered to be statistically significant at $p < 0.05$.

Results

Cows owners

Livestock farmers

The farmers concerned by the study were mostly illiterate (82.9%). Herders with primary school level accounted for 11.4% and only 5.7% of them had secondary education. Household heads were all men. Of these, 14.3% were under 30; those aged between 30 and 50 represented 54.3% while 31.4% were over 50 years old. Almost all the farmers surveyed were Fulani ethnic group (100%).

Animals and behaviour

The farms that were involved in the study were all traditional. Artificial insemination was not practiced by those farmers. All cattle met were of local zebu breed. Very little crossed bred were met on farms. Transhumance was the most common mode of rearing (71.43%). It was practiced on large farms (more than 30 heads). Different types of habitats emerged. Thus, 28.6% of the herds were penned in wooden enclosures only, 37.1% in wooden enclosures plus thorny, 20% in wooden enclosures linked together by barbed wire, only 2.9% of the herds were penned, while 11.4% were in the open. No enclosures were built with definitive materials.

Feed, animal health and milking

The animals were mostly fed on the natural course (77.2%). Only 22.9% of farmers claimed to supplement their herds. The survey showed that this supplementation was intended for sick animals and newly calved females. The complement used was exclusively cotton seed cake. The animals were nearly all watered in the reservoirs of water such as ponds and rivers. For diseases that occur on farms, the survey revealed that the most commonly encountered on farms in the province of Tuy are parasitic diseases (60%), respiratory diseases (22.9%), skin disorders (14.3%) and digestive diseases (2.9%). The reasons for visiting veterinarian in the various farms are respectively for vaccinations (85.7%) and care (14.3%). In addition, no farm manager used a veterinary agent for systematic deworming of animals. The survey also revealed that 3.23% of cows had only two udder quarters that were functional. Of these, 15.48% had only

three functional quarters, compared to 81.29% who had all of the functional quarter's neighbourhoods that were functioning normally. None of the cows involved had supernumerary teats. The milk conductivity resistivity test, which detected suspicious milk from cows susceptible to subclinical mastitis, detected 30.33% of suspected cases out of a total of 121 samples tested. The average resistivity of milk per quarter was 440 units. No confirmed clinical case was found. The milking technique was exclusively hand milking. On all the farms surveyed, 100% of the milker's did not wash their hands or cow's udders before and after milking. Washing hands before switching to another cow was also not respected in all farms involved in the study. The milking was done only once very early in the morning between 5 am or 7 pm in the evening in Koti and Founzan where it reached 9 am or even 10 am. Milking was done by women. The average amount of milk produced per cow was 0.85 ± 0.38 litters.

Dairy cows

The age of dairy cows in the survey was between 3 and 9 years and the first calving was around 58.8 ± 13.2 months according to farmers.

Raw milk composition and variation according to factors

Milk pH was 6.62 ± 0.10 and the average temperature measured was 31.90°C ± 1.93°C, while the average water percentage of the milk taken directly to the udder was 74.34% ± 14.08%. The table 1 shows milk fat, protein, lactose contents was similar to the reference values. In the table 2 milk components variation are shown according to different factors. It can be deduced that the different physicochemical parameters did not vary significantly with the age of the cows ($p > 0.05$). The variation of the physicochemical parameters as a function of the rank of lactation is shown in Table 3.

Physicochemical parameters	Averages and Standard Deviation	Limit variations	Reference values
Fat (g/l)	36 ,17 ± 1,60	24-55	37
Protein (g/l)	34,74 ± 0,54	29-50	32
Lactose (g/l)	20,48 ± 0,65	36-56	49
Dry matter (g/l)	98,43 ± 2,41	114-137	127
Density à 20°C	1,019 ± 0,00	1,028-1,033	1,031

Table 1: *Raw milk composition compared to references values.*

Milk components	Age range				*p-value*
	[3-5]	[6-9]	[10-13]	[14 et +]	
Fat (g/l)	34,91 ± 1,47	35,95 ± 1,60	39,98 ± 1,73	35,56 ± 2,15	0,697
Protein(g/l)	34,61 ± 0,48	34,84 ± 0,56	34,98 ± 0,60	33,93 ± 0,62	0,97
Lactose (g/l)	19,95 ± 0,58	20,58 ± 0,69	21,72 ± 0,57	18,73 ± 0,87	0,694
Dry matter (g/l)	98,54 ± 2,39	97,72 ± 2,37	102,61 ± 2,62	93,23 ± 2,72	0,815
Density à 20°C	1,018 ± 0,003	1,019 ± 0,003	1,020 ± 0,002	1,019 ± 0,003	0,112

Table 2: *Variation of milk components according to the age of dairy cows.*

The analysis showed a non-significant change in the physicochemical parameters as a function of the lactation rank ($p > 0.05$). The variation of the physicochemical parameters as a function of the stage of lactation is shown in Table 4. The statistical analysis revealed a significant variation of the lactose content with the stage of lactation ($p < 0.05$). Fat content and density varied significantly with stage of lactation ($p < 0.01$). Those of the protein and the dry matter varied significantly with the stage of lactation ($p < 0.001$). The changes in the physicochemical composition of the milk according to the type of feed are summarized in Table 5.

Milk components	Lactation Rank								p-value
	1ère	2ième	3ième	4ième	5ième	6ième	7ième	10ième	
Fat (g/l)	36,74 ± 1,59	37,90 ± 1,64	29,72 ± 1,42	36,88 ± 1,20	38,21± 1,45	44,89 ± 1,88	40,90 ± 3,48	48,75	0,323
Protein (g/l)	34,91 ± 0,41	35,97 ± 0,59	32,57 ± 0,61	34,23 ± 0,38	35,66 ± 0,60	37,05 ± 0,43	36,61± 1,01	31,82	0,246
Lactose (g/l)	19,85 ± 0,70	20,58 ± 0,65	20,36 ± 0,63	21,60 ± 0,60	24,04 ± 0,56	15,57 ± 0,76	18,25 ± 0,38	24,17	0,403
Dry matter (g/l)	99,56 ± 2,46	101,49 ± 2,33	88,56 ± 2,22	102,61± 2,10	99,65 ± 2,41	105,56 ± 2,64	100,98 ± 4,76	109,34	0,415
Density à 20°C	1,018± 0,00	1,019 ± 0,00	1,018 ± 0,00	1,019 ± 0,00	1,019 ± 0,00	1,018 ± 0,00	1,020 ± 0,00	1,020	0,88

Table 3: *Variation of milk components according to number of lactations.*

Milk components	Stage of lactation (months)			p-value
	[1-2]	[3-9]	[10 et +]	
Fat (g/l)	28,37 ± 1,43	34,10 ± 1,50	43,04 ± 1,65	0,001**
Protein (g/l)	31,12 ± 0,44	34,00 ± 0,50	37,43 ± 0,55	0,000***
Lactose (g/l)	16,27 ± 0,67	21,47 ± 0,63	19,89 ± 0,64	0,011*
Dry matter (g/l)	81,56 ± 1,72	96,60 ± 2,29	107,81 ± 2,52	0,000***
Density à 20°C	1,017 ± 0,00	1,018 ± 0,00	1,020 ± 0,00	0,001**

Table 4: *Variation of milk components according to stage of lactation.*

*= p < 0, 05;

**= p < 0, 01;

***= p < 0,001

Milk components	Natural pasture	Natural pasture + Complementation	p-value
Fat (g/l)	37,49 ± 1,64	33,08 ± 1,48	0,129
Protein (g/l)	35,46 ± 0,55	33,18 ± 0,49	0,024 *
Lactose (g/l)	21,39 ± 0,68	18,32 ± 0,52	0,006 **
Dry matter (g/l)	101,49 ± 2,41	91,21 ± 2,27	0,017 *
Density à 20°C	1,019 ± 0,00	1,018 ± 0.00	0,789

Table 5: *Variation of milk components according to feeding system.*

*= p < 0, 05;

**= p < 0, 01

The statistical analysis revealed a significant variation in the protein and dry matter contents ($p < 0.05$). These levels were relatively low for animals fed on natural pastures with supplementation in support. Feeding mode had a significant effect on milk lactose content ($p < 0.01$). It has also been low for supplemented animals in addition to the natural range. The variation of the different physicochemical parameters according to the different pathologies encountered is contained in Table 6.

Milk components	Respiratory diseases	Skin disorders	High parasitism	Digestives diseases	p-value
Fat (g/l)	33,69 ± 1,71	38,98 ± 1,32	36,17 ± 1,63	43,37 ± 1,20	0,533
Protein (g/l)	34,0 0± 0,58	34,30 ± 0,41	34,95 ± 0,56	37,23 ± 0,09	0,671
Lactose (g/l)	17,61 ± 0,57	20,1 5± 0,71	21,19 ± 0,64	28,23 ± 0,06	0,002**
Dry matter (g/l)	88,46 ± 2,26	102,71 ±2,11	100,47 ± 2,47	113,96 ±1,26	0,031*
Density à 20°C	1,018 ± 0,00	1,018 ±0,00	1,019 ± 0,00	1,023 ±0,00	0,030*

Table 6: *Variation of milk components according to diseases.*

*= p < 0, 05;

**= p < 0, 01

Statistical analysis revealed a significant variation in the dry matter content and density of the milk according to the pathologies ($p < 0.05$). The lactose content was significantly influenced by the different types of pathology ($p < 0.01$). In contrast to these parameters, the concentrations of fat and protein were not statistically significant ($p > 0.05$). The effect of mastitis on the change in the physicochemical composition of milk is summarized in Table 7. The density of milk varied quite significantly depending on the presence or absence of mastitis ($p < 0.01$). Milks in which mastitis was suspected were more concentrated than negative milks. The fat, protein, and lactose concentrations did not vary significantly with the presence or absence of mastitis ($p > 0.05$).

Milk components	Suspected mastitis positive	Mastitis Negative	p-value
Fat (g/l)	39,10 ± 1,50	41,43 ± 1,40	0,396
Protein (g/l)	37,06 ± 0,50	35,73 ± 0,50	0,266
Lactose (g/l)	22,66 ± 0,74	20,97 ± 0,68	0,233
Dry matter (g/l)	105,16 ± 2,09	106,48 ± 2,15	0,71
Density à 20°C	1 ,021 ± 0,00	1,018 ± 0,00	0,001**

Table 7: *Effect of subclinical on milk components.*

**= p < 0, 01

Discussion

Characteristics of dairy cows and their behaviour

The age ranges of the animals, recorded are similar to those of Dehoux and Hounsou-Ve (1992) observed during their studies in the traditional farms of North-East of Benin where they noticed a decrease of the number of cow between the classes age 4-5; 5-6; 6-7. These authors estimated that this decrease in the number of cows would be due to the epizooties of the 1980s, which led to a high mortality of older cows. But we think that this can be also due to the cows' reform, which is being practiced more and more by herders. With regard to the mean age at first farrowing, our results are superior to those of Wagenaar and Diallo (1988) who found a mean age at first calving in transhumant Fulani cattle farms in the Niger Delta in Mali. 50.2 ± 9.1 months. Guigma (2013) found higher calving ages than our results, especially in N'Dama (73 months) and Djakoré (64 months).

From these different results it appears that the cows raised traditionally are late. This confirms the observations of Tellah., *et al*. (2015). Indeed, in traditional farms, which are generally dominated by transhumance, the nutritional follow-up of heifers is weak. So that the animals get the weight required for late breeding. Adamou-N'Diaye., *et al*. (2003) found a difference in sexual precocity between Bourgou cattle raised in the traditional system (39.1 months) and others of the same breed reared in a semi-intensive system (30.1 months) in Benin.The average daily milk production per cow is lower than that of Bonfoh cited by Lizeaux and Baude (2011).

This author found in the peri-urban areas of Bamako in Mali an average daily milk production of 3.5 l/cow. This difference could be explained by the fact that the cows that were concerned by the study of the latter evolved into a traditional peri-urban system. They benefited then better food conditions contrary to ours. Indeed, the production potential of cows is a function of genetic factors (breed) but also of breeding conditions. Among these conditions, the diet is the most important.

Farms conducted sedentarily (28.57%) were composed of herds numerically smaller than those conducted in transhumant mode (71.43%). These observations corroborate those of Dehoux and Hounsou - Ve (1992). These authors attributed to this variation, the difference of ethnic family of Fulani pastoralists. Contrary to the latter we think that in our case, the land insecurity characterized by a pressure of cultivated land on those formerly reserved for grazing would be the cause. Indeed, the sedentary breeding that is practiced around the villages suffers from certain constraints including the lack of grazing space and park. This forces the breeders of this system to have a reduced number of animals to better feed them.

From our results, it appears that the grazingon natural pasture land is the most practiced. Complementation is rare and almost concerns the use of cotton cake as a concentrate. These results are similar to those found in Mali by Bonfoh (2010). From these observations we retain that the complementation of the animals in traditional breeding is based on the available local resources. In addition to food, water is a factor of herd mobility and plays a key role in traditional livestock rearing. Our results show that flocks were watered with surface water (100%). These results differ from those reported by Nkolo (2009) in Thiès and Ilboudo (2003) to Linguère who found that the animals were watered with drilling water in the order of 63.9% and 90%, respectively.

The presence of a large number of boreholes explained this. In our case, it should be noted that the study was conducted in the rainy season. The presence of rainwater in the riversRivers, coupled with the need for labour for field work that reduces the number of people caring for the herd explain our observations. However, the misuse of pesticides in fields that pollute these waters could be a danger to the health of animals. The survey concerning the health status of herds shows that parasitism was the most common pathology.

This can be explained by the fact that systematic deworming of the herd is almost non-existent in the farms visited. The test of the resistivity to the electrical conductivity of the milk made it possible to detect 30.33% of cases of subclinical mastitis. This technique, which appears to be a first in our conditions, gave results much lower than those of Bonfoh., *et al*. (2002). In fact, the latter, after carrying out microbiological analysis of milk from farms around Bamako, found a prevalence of subclinical mastitis of 72%. Our results corroborate those reported by Promet (2008) for whom the mammal infection rate of the Tunisian herd was 30%. These infection rates may be partly due to milking hygiene. It should be noted that in the farms surveyed, the milking was manual. Hand washing and udder washing before and after milking was not practiced. This is dangerous to the health of the cow's udder.

Raw milk components from farms

The results obtained from the physicochemical analysis show that the fat concentration is lower than the reference value (37 g/l). That of the protein was higher than that of a reference milk (32 g/l). But these values are all within the accepted limits of variation. The average protein content of our samples is close to that of Kamoun (2011) who found in farms of Northern Tunisia a protein content of 34 g/l. Millogo (2010) on farms around the city of Ouagadougou found fat concentrations higher than ours (5% on average).

In fact, the variation in fat depends on the breed, the stage of lactation, the diet and the milking system. It varies inversely with the daily quantity of milk produced. The higher the quantity of milk produced per day, the less milk contains fat. The lowest rates are found at the beginning and the peak of lactation. The role of diet in the variation of fat has been demonstrated. Lanet (2005) argued that fat synthesis is favoured by a sugar diet (beetroot, molasses and corn silage). For protein materials, in addition to genetics, diet and more specifically energy intake would influence the protein content. Thus, a deficient energy supply has a negative impact on the protein content. This decreases the capacity of the milk to be transformed into cheese. The contents of lactose and dry matter are lower than those reported by Labioui., *et al*. (2009) in Morocco and Mathieu (1998). These authors whose work was conducted on exotic breeds found

respective rates of 43.51 g/l and 117.5 g/l of dry matter. The lactose content was below the limit range (48 to 50 g/l) according to Danel (2005). Indeed, the synthesis of lactose milk is made through uridine diphosphogalactase. This enzyme is secreted by the mammary gland from glucose following various enzymatic reactions.

The synthesis is then carried out using synthesize lactose. In case of carbohydrate undernourishment, the animal may be unable to produce enough lactose. In our case, the animals did not benefit from carbohydrate supplements. This could partly explain the low lactose levels found. The lactose concentrations and the amount of milk produced are positively correlated. The low production per cow (0.85 ± 0.38 litter) may explain these results. It is also necessary consider the milking technique (manual without asepsis) and the time taken between samples and analysis that could allow the development of lactic acid bacteria capable of reducing the milk lactose content. The dry matter was also below the limit variations (114 to 137 g/l). The same comments for the fat concentration are valid for this parameter.

The analysis revealed an average density at 20°C of low Tuy milks compared to standard milk. Alais (1984) found a higher average than ours (1.031). The average in our study was below the limit variations (1.028 and 1.033). Our milk samples are taken from the cow's udder, the only factors that can be incriminated are the content of fat concentration, dry matter and temperature. For the temperature, note that the samples are slightly heated (40°C) before theirs analysis. This could affect the density that decreases with temperature. The average pH obtained was within the range of allowed variations (6.6 to 6.8). These results corroborate those of Sissao., *et al*. (2015) in pasteurized milks in Burkina Faso.

The difference with ours is in the nature of milk. Although these authors used pasteurized milk, our results were close. This means that the pH of milk is a relatively stable parameter. The temperature of fresh milk taken directly after milking was higher than that obtained by Bonfoh (2002) at hot milk outlets in the Bamako district of Mali (23.9°C). This difference is explained by the fact that the milks analysed by the latter after having been milked and transported to the point of sale were able to cool down. Nevertheless, this average remains lower than the results of Labioui., *et al*. (2009) found average values of 36.5 and 37.5°C. Several authors claim that the milk at the outlet of the udder must have a temperature close to that of the animal (37 to 38°C). The low temperatures found in our case may be due to the material used.

Variation of milk components according to cows and farming system

The age of the cow and her lactation rank had no influence on the physicochemical parameters. These parameters were particularly influenced by the stage of lactation, the type of feeding of cows, the types of pathologies generally encountered in the farms surveyed and in particular mastitis. The lactation stage of the cows had a significant effect on the physicochemical composition of the milk. The fat content, protein content, dry matter and milk density respectively increased with the different stages of lactation of the cow. As for the lactose content, it increased from the second month of lactation and then decreased from the 10th month of lactation. There is a positive correlation between the amount of milk produced and the lactose concentration. However, from the 10th month a cow having calved and normally cycled must be at the beginning of drying up therefore decrease of quantity of milk produced. Labouche and Peytavin (1957) also showed that milk fat increased during lactation while lactose decreased after breeding gradually until dry out. Protein, dry matter and lactose concentrations varied significantly depending on the mode of feeding.

These parameters were low in cows fed on natural pasture and receiving supplementation. Cows supplemented in our case are sick or newly calved animals. This supplementation, which was exclusively based on cottonseed cake, did not increase these different parameters, as Stoll (2002) has advocated. This could be explained by the fact that the disease causes a decrease in the functional capacity of the body of the animal, resulting in a lack of synthesis of these different compounds. The same observation is made with the different types of pathologies where there were significant variations in the lactose content, the dry matter but also the density of the milk. This same density has significantly varied in the case of mastitis. Milks suspected to be positive in the conductivity resistivity test had a higher

density than the negative ones (1.021 vs. 1.018). This could be due to the presence of somatic cells mainly leukocytes that increase the density of the milk. These observations corroborate those of Sissao., *et al*. (2015).

Conclusion

It was concluded that farms were all traditional with feeding system based on natural grazing. Farms were mainly conducted by transhumance and only a little less than a third of them were driven in sedentary mode. Artificial insemination was not practiced in any of the farms. The mean age at first calving was 58.8 ± 13.2 months. Average milk production was very low. One-third of the samples were positive for the electrical conductivity resistivity test.

This indicates a low prevalence of subclinical mastitis in this area. The movement of the animal on pasture and less milking practice could explain this. Milk composition showed low lactose and dry matter contents. The density of the milk was low and outside the limit of variation allowed. The different types of disease listed had a significant effect on the concentration of lactose, dry matter and milk density. Milk samples from cows suspected of subclinical mastitis exhibited higher density than those from apparently healthy cows.

Acknowledgements

The authors of the current research would like to thank Central Council for Research and Development (CORAF/WCARD) for financial support for this research. This research was support by MDTF Amprolait's project (Appui à l'amélioration durable de la productivité et de la compétitivité des filières laitières bovines en Afrique de l'Ouest et du Centre).

Conflict of interest

This work has no financial interest and no conflicts of interest are attached to it.

References

1. Adamou-N Diaye., *et al*. "Effet du systeme de production sur l'age au premier velage chez la vache Borgou au Benin.-Etude retrospective ." *Tropicultura* 21.2 (2003): 51-55.
2. AGECO and Groupe. "Analyse de la problématique de l'importation de la poudre de lait au Burkina Faso et de son effet sur le développement de la filière lait". Rapport de mission [en ligne] (2006).
3. Alais Charles. "Science du lait: principes des techniques laitières." (1984).
4. Bonfoh Bassirou., *et al*. "Human health hazards associated with livestock production". *Livestock in a changing landscape* 1 (2010): 197-220.
5. Bonfoh B., *et al*. "Qualité microbiologique du lait et des produits laitiers vendus en saison chaude dans le district de Bamako au Mali". Bioterre Rev Inter SC de la Vie et de la Terre Special (2002): 242-250.
6. Danel F. Composition chimique du lait.2005 [en ligne].
7. DUTEURTRE Guillaume., *et al*. "Etude relative à la formulation du programme d'actions détaillé de développement de la filière lait en zone UEMOA". *Dakar UEMOA/CIRAD* (2013) : 106.
8. Guigma WVY. "Appréciation de la qualité physico-chimique du lait frais en rapport avec les pratiques d'élevage dans les élevages autours de la ville de Kaolack au Sénégal". *Médecine Vétérinaires De Dakar* 19 (2013).
9. Hamadou H and Sanon Y. (2006). "Synthèse bibliographique sur la filière laitière au Burkina Faso. Réseau de recherche et d'échange sur la politique laitière". Document de travail N°3 53 pages.
10. Ilboudo D. "Contribution à l'étude des pratiques traditionnelles et des savoirs locaux des éleveurs transhumants dans la gestion des ressources pastorales au Sahel : Cas du Burkina Faso, du Mali et du Sénégal". *Médecine Vétérinaires De Dakar* 07 (2003).
11. Kamoun M., *et al*. "Monitoring milk urea level and feed ration as a potential tool for milk quality". *Journal of Physiology and Pharmacology Advances* 2.1 (2012): 69-76.
12. Labouche Cl and A Peytavin. "Sur la composition chimique des laits tropicaux: influence du stade de lactation sur les teneurs en graisse, lactose, calcium et phosphore". *Revue d'élevage et de médecine vétérinaire des pays tropicaux* 10.4 (1957): 373-382.

13. Labioui Hicham., *et al*. "Etude physicochimique et microbiologique de laits crus". *Bulletin de la Société de pharmacie de Bordeaux* 148 (2009): 7-16.
14. Lanet S. Composition du lait. 2000 Accès internet: (visité le 20 Avril 2016)
15. Lizeaux C and Baude D. "Sélection génétique et production laitière au Mali". -Enjeux économiques. BORDAS (2011) : 94.
16. Millogo V. "Milk Production of Hand-Milked Dairy Cattle in Burkina Faso". *Doctoral* 4 (2010): 978-91-576-7481-4.
17. Millogo V., *et al*. "Effect of different hand-milking techniques on milk production and teat treatment in Zebu dairy cattle". *Tropical Animal Health and Production* 44.5 (2012): 1017-1025.
18. Millogo V., *et al*. "Survey on dairy cattle milk production and milk quality problems in peri-urban areas in Burkina Faso". *African Journal of Agricultural Research* 3 (3): 215-224.
19. Millogo V., *et al*. "Raw milk Hygiene at farms, processing units and local markets in Burkina Faso". *Food Control* 21.7 (2010): 1070–1074.
20. MRA. Statistiques du sous-secteur de l'élevage –Annuaire (2011).
21. MRA /DGPSE, Ouagadougou, mars (2012). 155.
22. MRA/DGPSE.Tableau de bord du secteur de l'élevage au Burkina Faso.79 (2009).
23. MRAH/DGESS. Annuaire statistique. Ministère des Ressources Animales et Halieutiques (2015). 100.
24. Nkolo S. Typologie des élevages bovins pratiquant l'insémination artificielle en milieu traditionnel au Sénégal: Cas de la Région de Thiès. Mémoire Master: Productions Animales et Développement Durable, Dakar (EISMV) 4, (2009).
25. Prin-Mathieu C., *et al*. "Enzymatic activities of bovine peripheral blood leukocytes and milk polymorphonuclear neutrophils during intramammary inflammation caused by lipopolysaccharide". *Clinical and diagnostic laboratory immunology* 9.4 (2002): 812-817.
26. Millogo Vinsoun. "Milk production of hand-milked dairy cattle in Burkina Faso". *Epsilon Open Archive* 4 (2010).
27. Sissao Mariétou., et al. "Composition chimique et qualité bactériologique des laits crus et pasteurisés au Burkina Faso". *Afrique Science: Revue Internationale des Sciences et Technologie* 11.1 (2015): 142-154.
28. Stoll W. Alimentation de la vache laitière et composition du lait. (En ligne) (2002).
29. Tellah Madjina., *et al*. "Age au premier vêlage et intervalle entre vêlages de quatre races bovines en zone périurbaine de N'Djaména, Tchad". *Afrique Science: Revue Internationale des Sciences et Technologie* 11.3 (2015): 229-240.