



General characteristics of goat milk cheese (*Feta*) in the region of Tlemcen, Algeria

Djebli I. Ameur A. Gaouar SBS

Laboratory of Physiopathology and Biochemical of Nutrition (PpBioNut), Department of Biology, University of Tlemcen, Algeria

*Corresponding Author: Dr. Abdelkader Ameur Ameur, University of Tlemcen. Email: ameurabdelakder@gmail.com

Article history: Received: 12 February 2020; Revised: 25 March 2020; Accepted: 19 May 2020

Abstract

Goat milk, whose production is starting to develop in Algeria in recent years, has a number of advantages that even allow it to substitute cow's milk. It is a source of health benefits for humans; it contains more vitamins with a significant cheese yield than cow's milk. Our present study aims to study physicochemical, microbiological and for the first time trials of a fresh cheese (*Feta*) made from locally selected goat's milk in the region of Tlemcen and its 10 regions namely: Ouled Mimoun, Terny, Sebdou, Ain El houte, Remchi, Bensakrane, Maghnia, Sabra, Nedroma and Zenata. 27 goats from the local population were used for this study. The physicochemical quality (fat, density, conductivity, defatted dry extract, temperature, protein, mineral salts and lactose) of the milk sampled was measured using a LACTOSCAN Milk-Analyzer. Four flora (total germ, fecal coliform, *Staphylococcus aureus* and salmonella) were chosen to test the microbiological quality of the milk. The results obtained show that the good physicochemical quality of milk studied in all regions except the two regions of Nedroma and Maghnia showing a high fat content. A total absence of contaminations for the three types of fecal coliform flora, *Staphylococcus aureus* and *Salmonella* nevertheless for the total germs are found in all sampled regions. These results show that healthy goats hence the good practice of milking is applied during sampling. The manufacture of cheese type *feta* based on goat's milk was made in good conditions (raw material, hygiene, mechanical work ...) which led to a cheese of microbiological quality and nutritional and an interesting yield. The good breeding condition with a balanced diet gives a good quality of the milk and consequences of these results give an excellent forming thanks to the professional techniques of manufacturing a good *feta* cheese.

Keywords: Milk goat, Physicochimics, Cheese; *Feta*; Tlemcen

Introduction

Goat farming is very concentrated in the Asian continent with 58.2%, followed by the African continent with (36.1%) and in the end with a lower workforce in the regions of America and Europe. With respectively 3.4% and 1.5% of the world goat population.

The species *Capra hircus* occurs in Algeria in the form of a mosaic of very diverse populations all belonging to traditional populations. It includes in addition to these local populations, usually Nubian blood, animals mixed with blood from standardized breeds. The goat population of Algeria contains four major types (Bey and Laloui, 2005).

This group includes the Arbia breed, mainly located in the Laghouat region; the Kabyle breed, occupying the mountains of Kabylie and Auras, the Makatia breed is located in the highlands and in certain areas of the North; and finally the M'Zabia breed, located in the northern part of the Sahara. The breeding of these adapted breeds is oriented towards a mixed production (meat and milk), Hellal, 1986; Dekkiche, 1987; Sebaa, 1992 and Takoucht, 1998)

Cheese is the main goat milk processing products. Nevertheless, other products exist such as yoghurt, acidified milk, kefir, butter oil, cream, clarified butter (India and Iran), infant milks (Taiwan, New Zealand, Australia), ice cream and even candy made from sweet caramelized milk (Mexico, Norway, India) (Soustre, 2007).

In Algeria, contrasting with the rise of the goat sector in France, the processing of goat's milk remains low despite the hardiness and adaptation of the goat to the conditions offered by our country. Derivatives are mostly fermented milks (Raïb, Lben and Jben), most often of varied sensory quality (Badis et al., 2005).

The taste of goat's cheese is often unappreciated, considered too strong by consumers accustomed to cow products. In industrialized countries, on the other hand, goat's milk makes excellent cheeses. The manufacture of cheese depends essentially on the milk, but also of the ferments necessary for its transformation so the research in this field aims at elaborating a cheese, which presents organoleptic and nutritional characteristics identical or new, or even typical characterizing a territory, which is specific to us (Mahaut et al., 2000).

In this context, the objective of this study is the physicochemical and microbiological exploitation of goat milk collected locally from goat populations in the wilaya of Tlemcen and making Feta cheese from this collected goat's milk.

Materials and methods

Our study affected ten (10) communes: Sebdou, Ouled Mimoun, Bensakrane, Remchi, Terny, Sabra, Nedroma, Zenata, Ain El houte and Maghnia (Figure 1). The breeding situation as well effective herd, milking method, milk consumption and livestock feed are summarized in Table 1.

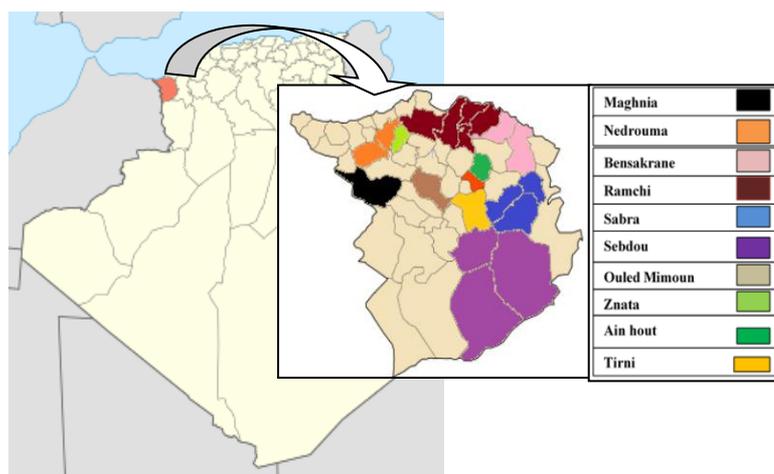


Figure 1: Location site of this study

Table 1: Situation and a number of goat farms inspected

Region	Effective herd		Milking	Milk consumption	Supply type
	Male	female			
Ouled Mimoun	3	8	Manual	Internal consumption	Green fodder, olive leaves and barley. Water freely available
Terny	2	6			
Sebdou	2	10			
Ain El houte	2	5			
Remchi	2	7			

Bensakrane	3	9
Maghnia	3	7
Sabra	4	9
Nedroma	5	11
Zenata	2	5
Total	28	77

Sampling and physico-chemical analysis:

The milk samples collected are samples from herds of healthy goats located in the Tlemcen region. The dates and places of sampling are indicated in table 2, date and origin of milk collection.

Table 2: Number and origin of milk samples by region

Date of sampling	Region	Number of samples
02/12/2018	Ouled Mimoun	3
02/12/2018	Terny	2
05/12/2018	Sebdou	2
25/12/2018	Ain El houte	3
25/12/2018	Remchi (Ain Yousef)	3
03/02/2019	Bensekranee	4
07/02/2019	Maghnia	3
20/02/2019	Sabra	2
26/02/2019	Nedroma	3
26/02/2019	Zenata	2
Total		27

The milk is processed manually from healthy goats, the udders are previously cleaned and disinfected with bleach. Then it is collected cleanly in 50 ml bottles, which have then been labeled and placed in a cold cooler at 4 ° C and are sent to the milk analysis laboratory at the level of dairy “Maison du lait” of Remchi . Before starting the analyzes, we proceeded to do the brucellosis test to check the quality of the blood collected and to eliminate any suspicion. In fact, the ring test or RING-TEST was used; it is an immunological precipitation test in a liquid medium conventionally used for the detection of the presence of brucellosis.

Physico-chemical analysis of milk

The purpose of the LACTOSCAN milk analyzer is to quickly analyze milk fat (FAT), non-fat solids (SNF), percentages of protein, lactose and water content, temperature (° C), freezing point, salts, total solids, as well as density of one and the same sample directly after milking, during collection and during processing (Figure 2).



Figure 2: LACTOSCAN milk analyzer automatic analyzer

Microbiological analysis:

The analyzes were carried out at both the Mansourah Institute of Veterinary Medicine (INMV) and the ONALAIT Tlemcen laboratory. According to the Pasteur Institute of Algiers and in collaboration with the National Veterinary Institute of Mansourah and according to the national standard: inter-ministerial decree No. 27 May 1998 fixing the microbiological criteria of certain. Dilutions were made in cascades of the dilution 10⁻¹ to 10⁻³. 1 ml of the milk to be analyzed in a tube containing the 9 ml of buffered peptone water solution, then 1 ml of this tube is taken to put it in a second tube and so on.

Enumeration and counting method:

Total germs: The count of total germs gives us information on barn hygiene and on the microbiological quality of the milk from the dilutions to prepare; in fact, the seeding is done on a nutritive medium of PCA agar. After incubation of the Petri dishes at 30 ° C for 72 hours, the resulting colonies appear on different sizes.

Staphylococcus-aureus: 0.1 ml of each dilution is spread in Petri dishes containing "Baird Parker" agar already prepared. Incubate the dishes at 37 ° C for 37 hours. *Staphylococcus aureus* colonies are black in color surrounded by a bright halo.

Fecal coliforms: 1 ml of each prepared dilution is placed in a Petri dish contains a culture medium 'VRBL'. Then they are incubated at 44 ° C for 24 hours. Fecal coliforms appear as small colonies with a diameter of 0.5 mm, dark red in color with fluorescence.

Salmonella: Step1: pre-enrichment: 25 ml of raw milk is put in a bottle contains 225 ml of peptonated water incubates the bottle at 37 ° C for 18 to 20 hours. Then, Step 2: enrichment, take 0.1 ml of the dilution of pre-enrichment and put it in a tube of 10 ml of vassiladis agitated report then incubated the tube at 37 ° c for 24h. Finally, step 3: isolation on boxes of hektoen agar by inoculation using a platinum loop containing a drop of the enrichment solution incubation at 37 ° C for 24 hours. *Salmonella* appear as a greenish colony with a black center.

Expression of the results according to the following calculation method, the number N of microorganisms present in the test sample as the weighted average from 2 successive dilutions using the formula: $N = \text{number of colonies} * \text{reverse it from dilution}$

Cheese processing

The process of making cheese (Feta) from raw milk from goats raised in the Tlemcen region, it was done according to the steps described by Pradal, (2012) (Figure 3). Indeed, to the total of 23 liters of raw goat milk, mesophilic type closers have been added to accelerate coagulation. Then the renneting and the curdling is done by the addition of the traditional rennet and after 24 hours, the contents are poured into a tank where it is chipped to the edge then stirred. Finally, the final product before it undergoes ripening, it passes after demolding, drying and drying, finally, molding and draining of the product.

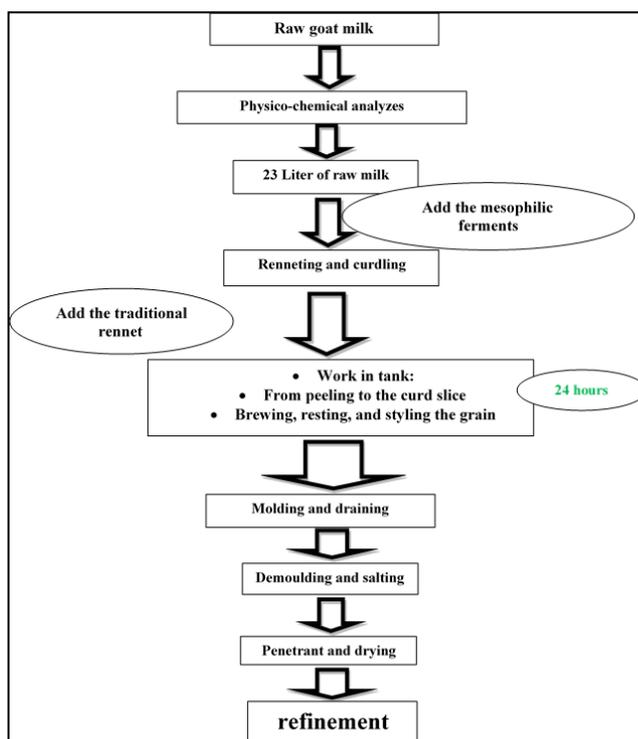


Figure 3: the process of making goat cheese (Pradal, 2012)

Statistical analysis

All statistical analysis of this study are carried out by the software XLSTAT (Version 2014.5.03). Descriptive analysis, the effect of regions were tested by ANOVA with Fisher Post-Hoc analysis (LSD). We also performed multivariate analysis such as principal competent analysis (PCA) and Ascending hierarchical classification (AHC).

Results and discussion

Study area and field survey:

The survey of this study is carried out on the whole of the regions of Ouled Mimoun, Terny, Sebdou, Ain El houte, Remchi, Bensakrane, Maghnia, Sabra, Nedroma, Zenata. These represent about 60% of the surface area of the Tlemcen wilaya and belong to semi-arid and sub-humid agro-ecological zones. Among the breeders surveyed, 25 breeders were surveyed with an average age of between (36 -65 years). The farms surveyed have goats from 15 to 30 goats mix with sheep flocks. Trafficking is manual and incomplete, daily milk production is average and the milk produced is often consumed.

*Physico-chemical quality:***Table 3:** Physico-chemical analyzes of the goat milk samples collected.

Study area	Sample	Fat (%)	D(kg/m3)	C (mS/cm)	EST (%)	T° (C °)	P (%)	MS (%)	L (%)
Ouled Mimoun	3	90.53±6.25a	33.55±3.12a	4.66±0.29	8.99±0.58a,b	23.47±0.58a	32.71±1.22b	0.76±0.08a	4.46±0.49b,c
Terny	2	90.31±8.70a	39.62±2.07a	5.40±0.80	10.22±0.23a	23.00±0.80a,b	33.32±1.68b	0.71±0.26a	5.13±0.04a,b
Sebdou	2	93.89±5.12a	31.68±0.74a	4.47±0.22	7.94±0.13b	23.90±0.20a	32.99±2.67b	0.71±0.02a	4.08±0.04c
Ain El houte	3	88.52±7.19a	38.85±1.40a	5.21±0.62	9.96±0.32a	22.93±0.64a,b	33.87±0.70a,b	0.88±0.03a	5.11±0.03a,b
Remchi	3	84.74±3.85a	32.84±2.74a	4.79±0.86	9.16±0.62a,b	22.03±0.64a,b,c	36.06±1.20a,b	0.46±0.32a	5.11±0.06a,b
Bensakrane	4	80.66±10.86a	38.90±1.97a	5.53±1.13	10.05±0.54a	20.00±1.00d	35.35±1.71a,b	0.78±0.16a	5.42±0.21a
Maghnia	3	73.06±26.62a	37.17±4.59a	4.65±0.24	9.24±0.52a,b	20.14±0.71c,d	34.87±1.72a,b	0.45±0.22a	5.14±0.14a,b
Sabra	2	80.74±2.51a	33.58±5.46a	5.00±0.00	9.13±0.13a,b	21.50±0.50a,b,c,d	33.56±3.56a,b	0.54±0.42a	5.17±0.39a,b
Nedroma	3	69.67±15.32a	34.20±3.87a	4.72±0.45	9.37±0.91a	21.00±1.33b,c,d	32.46±2.41b	0.45±0.30a	5.21±0.81a,b
Zenata	2	81.60±8.40a	37.79±3.24a	4.34±0.33	10.06±0.20a	19.50±0.50d	38.48±0.52a	0.47±0.19a	4.67±0.11a,b,c
Fisher (LSD)	-	ns	ns	ns	ns	***	ns	ns	ns

D: Density; **C:** Conductivity; **T:** Temperature; **P:** Protein; **MS:** Mineral salts; **L:** Lactose

a, b, c, d/ Fisher (LSD) / Analysis of the differences between the categories with a confidence interval of 95%:

*ns: no significant, * (0.01) ** (0.001) *** (0.0001)*

Physico-chemical analysis results of goat's milk are summarized in the table 3. The average fat content of the samples are 90.53%, 90.31%, 93.89%, 88.89% and 84.74%, 80.66% 73.06%, 80.47%, 69.67%, 81.60% in goats in the region Ouled Mimoun, Terny, Sebdou, Ain El houte, Remchi, Bensakrane, Maghnia, Sabra, Nedroma, Zenata respectively. The milk of the regions of Ouled mimoun, Terny, sebdou, Ain El houte, Remchi, Bensakrane, sabra, Zenata respectively compared to other regions this can be explained by the very rich and varied diet provided by the breeder and the conduct of breeding. On the other hand, the region of Nedroma and Maghnia, we recorded a low fat value of around 69.67% the low fat content of milk from the region of Nedroma and Maghnia of perhaps food. Values similar to that of our fat study are reported by Benyoub et al. (2016). This data confirm the superior quality of the milk of our goat population compared to foreign breeds.

The highest density of milk from the Terny, Ain El houte, bensakrane, Maghnia, Zenata region is between 39.62% for the Terny region, 38.85% Ain El houte, 38.90% bensakrane 37.17 % Maghnia, 37.79% Zenata (table3). On the other hand, the other regions are weak. If we compare our results with that of Benyoub (2016) in milk from the Zenata region and is very low compared to other regions. This is perhaps linked to several variation factors such as diet and driving style. The density depends on two main factors, which are the content of dry matter and that of fat (Lupien, 1995).

With regard to conductivity, this parameter the average value recorded in the regions Terny 5.40%, Ain El houte 5.21%, Bensakrane 5.53%, Sabra 5% respectively are higher compared to that of Ouled Mimoun region 4.66%, Sebdou 4.47%, Remchi 4.79%, Maghnia 4.65%. Nedroma 4.72%, Zenata 4.37%. These conductivity values recorded in the goat population of Tlemcen show that the milks analyzed are healthy and no evidence of mastitis.

About dry extract, we collected values for this parameter in the regions Terny 10.22%, Bensakrane 10.05%, Zenata 10.06% are higher compared to the other regions Ouled Mimoun 8.99%. Sebdou 7.94%. Ain El houte 9.96%, Maghnia 9.24%, Sabra 9.13%. Nedroma 9.37%. If we compare our results always with those of Benyoub (2016), we find that the values are very high which varies between 16.87% and 15.71% in the 5 study regions, the milk from goats of the Chouli region has a higher dry matter content compared to other regions, however, we recorded. All the milk samples analyzed in this study, with values ranged between 20.14 to 23.90 ° C. In fact, the temperature influences the acidity of milk.

The average value recorded for each sample of goat milk is 32.71%, 33.32%, 32.99%, 33.87%, 36.06%, 35.35%, 34.87%, 33.56%, 33.46 %, 38.48% Ouled Mimoun, Terny, Sebdou, Ain El houte,

Remchi , Bensakrane, Maghnia, Sabra, Nedroma, Zenata respectively table 3. Compared to cow's milk, the protein content is higher in goat's milk. Compared to other studies on Benyoub goat milk (2016), 4.18%, 4.18%, 4.39%, 4.71% and 4.39% for the regions of Chouli, Ain Fezza, Zenata, Bouhanek and Ouled mimoun respectively. Very little of the work cited in Algerian goat populations in terms of protein content apart from isolated studies done by (Moualek, 2013 and Roudj, 2005) that have worked on local populations in the region of Tizi Ouzou and the Oran region respectively. Protein content results vary considerably in the species and influenced by race, climate, diet, lactation stage, udder health and seasons (Haenlein, 1993).

Mineral salts and trace elements are essential components for the proper functioning of the body, which, however, does not know how to manufacture them. They must therefore be provided by food. We collected for this parameter an average of 0.45% -0.76% 0.88% in the regions respectively the results are close. For lactose, the average content recorded in our milk samples in almost the regions are the same values varied between 4.67% and 5.42% the Bensakrane region 5.42% higher than that of the other regions.

Principal components analysis (PCA)

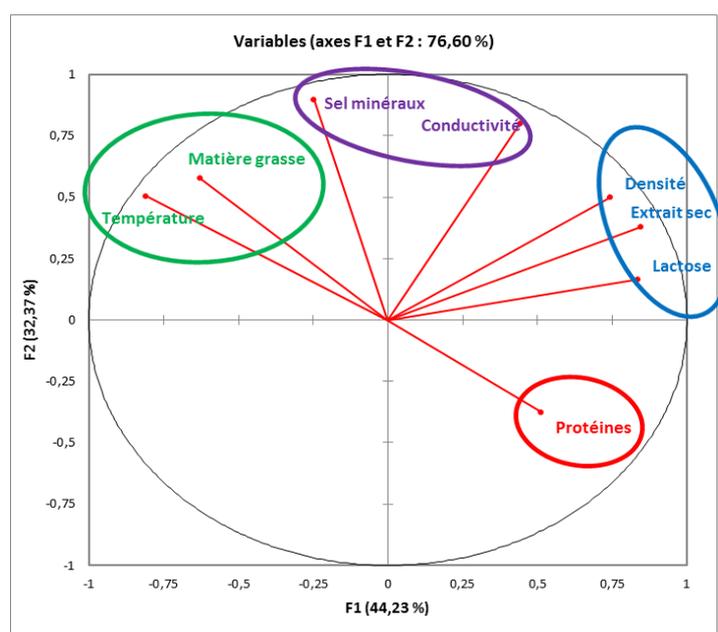


Figure 4: Correlation circle for physicochemical parameters

The analysis of the main components (PCA) is carried out on 27 goats of the local breed of the wilaya of Tlemcen, all the individuals are adult females, the PCA allows to identify two main axes of variation which form the foreground by reporting 76.6% of the total variability (Figure 16). Indeed, the first axis F1 explains 44.23% of the total variation; this axis is characterized by a positive correlation with the density, dry extract and lactose parameters and a negative correlation with fat and temperature. On the other hand, the second axis F2, by explaining 32.37%, this variability is positively correlated with the mineral salt and conductivity parameters and negatively with protein matter (Figure 4).

In general, the ACP made it possible to distinguish 4 groups which together represent the physicochemical parameters of the milk analyzed: The first group represents by a single parameter that is the protein level, while, The second group combines the three parameters: Dry extract, lactose and density are positively correlated.

The third group presents two parameters: Mineral salts and conductivity are positively correlated. Finally, the fourth group presents two parameters Fat and temperature are positively correlated. PCA shows a very varied distribution of the physicochemical parameters studied. Indeed, the rate of fat and proteins which are two very important parameters taken into consideration in any program to improve milk production. In fact, butyric rate (TB) and protein rate (TP) the two TP parameters show a weak relationship which results in milks with very varied characteristics.

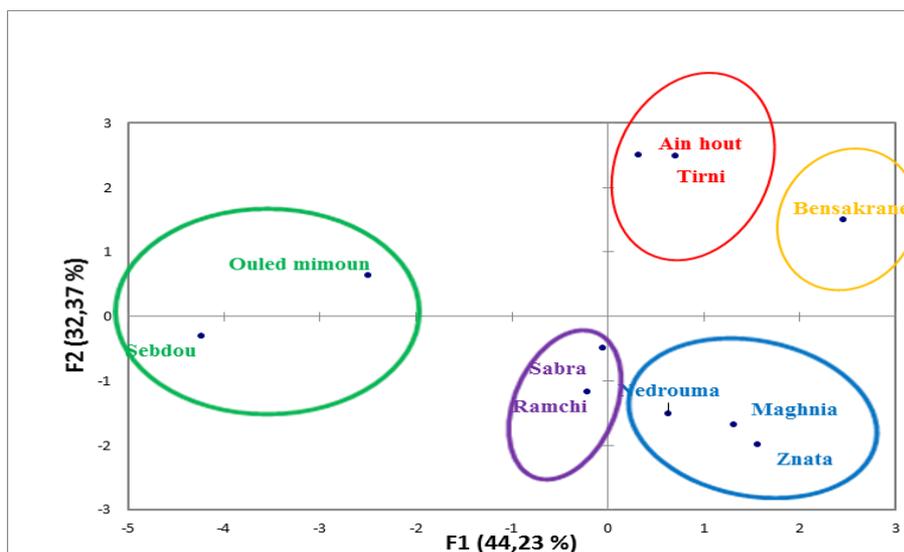


Figure 5: Analysis of the main components (distribution of individuals)

The principal components analysis (PCA) is carried out on 27 goats from the local goat population sampled from 10 regions (municipalities) of the wilaya of Tlemcen. All individuals are adult females. The PCA makes it possible to identify two main axes of variation, which form the foreground, reporting 76.6% of the total variability (Figure 5).

The first axis F1, explaining 44.23% of the total variation, made it possible to separate the first region of Bensakrane followed by the three regions of Zenata, Nedroma and Meghnia. On the other hand, the second axis F2, which explains 32.37%, is represented by the regions of Ain El houte and Terny. Regarding the rest of the regions (Ouled Mimmoun, Seb dou, Sabra and Remchi) is either presented negatively or by other axes, this is the case of two regions (Sabra and Remchi).

In general, the PCA analysis made it possible to distinguish five groups who share the same physicochemical characteristics of milk and which represent all of the 10 regions studied:

1. Milks that comes from the Bensakrane region is characterized by a very high density, dry extract and lactose.
2. Milks from two regions, namely Ain El houte and Terny are positively correlated with mineral salts and conductivities.
3. The region of Ouled Mimoun is characterized by milks very rich in fat.
4. The 3 regions of Nedroma and Maghnia and Zenata their milk very rich in proteins
5. The milk from the Sabra and Remchi regions shows no specific characteristics, this milk is moderately rich in physicochemical parameters

In general, the milks analyzed from 10 regions studied show a certain superiority on the physicochemical level from the regions to the others. This can be explained by several factors, in particular, the intoxicating factors such as breeding behavior and feeding or by physiological factors like the lactation stage.

Ascending hierarchical classification (AHC)

According to the 10 regions studied and according to the physicochemical analyzes of 27 goat milks, the ascending hierarchical classification (CAH) of our goat population in the wilaya of Tlemcen made it possible to distinguish three (3) classes (figure 6).

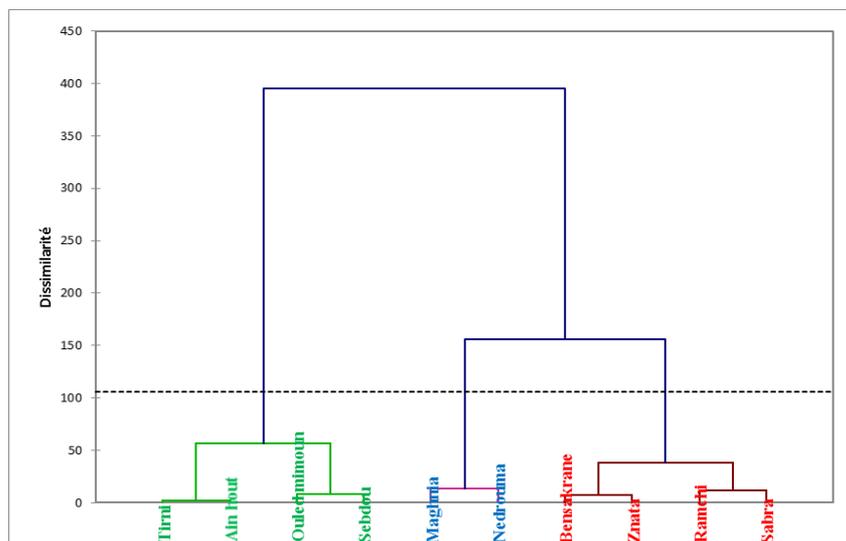


Figure 6: Ascending classification dendrogram of study regions according to physicochemical characteristics.

With regard to the typology of milk from the local goat population in the Tlemcen region, the three classes of milk (Figure 6) are characterized by very varied fat contents, namely: *Class 1*: higher very develop for example the rate of fat 90.8. *Class 2*: average with a fat of around 81.93 and *Class 3*: low with a fat content of 71.36. Thus, according to the protein level, these three classes are characterized by two categories, the second class and the third class are higher classes represented by a protein content of 35.22 and 35.86 respectively. On the other hand, the first class is characterized by a low protein level of order 33.22. Milks from regions that belong to class 1 and class 2, namely (Terny, Aine El houte, Ouled Mimoun and Sebdou) and (Bensakrane, Zenata and Remchi -Sabra) respectively, show very significant cheese-making properties compared to those of class 3, the latter includes the regions of Nedroma and Meghnia, whose sampled milks are very low in fat of order 71.36.

Microbiological results

In general, the microbiological composition of goat milk (bacteria, molds and yeasts), on the other hand, is much more dependent on environmental factors. Indeed, the milk contained in the udder of a healthy goat is practically sterile. Table 18 shows the results of the microbiological analysis and the enumeration of total fecal and coliform bacteria, *Staphylococcus-aureus*, *salmonella* from raw goat's milk collected in the regions of Ouled Mimou, Terny, Sebdou, Ain El houte, Remchi , Bensekrane , Maghnia, Sabra, Nedroma and Zenata (Table 4).

Table 4: Microbiological analysis of goat milk collected locally in the Tlemcen region

Region	Sample	GT (UFC)	CF	STAF	Salmonella
Ouled mimoun	1	10	Abs	Abs	Abs
	2	10	Abs	Abs	Abs
	3	05	Abs	Abs	Abs
Terny	1	500	Abs	Abs	Abs
	2	05	Abs	Abs	Abs
Sebdou	1	10	Abs	Abs	Abs
	2	8000	Abs	Abs	Abs
Ain El houte	1	4000	Abs	Abs	Abs
	2	5000	Abs	Abs	Abs
	3	09	Abs	Abs	Abs
Remchi	1	1000	Abs	Abs	Abs
	2	2000	Abs	Abs	Abs
	3	1000	Abs	Abs	Abs
Bensekrane	1	1000	Abs	Abs	Abs
	2	2000	Abs	Abs	Abs
	3	400	Abs	Abs	Abs
	4	40	Abs	Abs	Abs
Maghnia	1	500	Abs	Abs	Abs
	2	10	Abs	Abs	Abs
	3	80	Abs	Abs	Abs
Sabra	1	100	Abs	Abs	Abs
	2	30	Abs	Abs	Abs
Nedroma	1	50	Abs	Abs	Abs
	2	100	Abs	Abs	Abs
	3	30	Abs	Abs	Abs
Zenata	1	10	Abs	Abs	Abs
	2	8000	Abs	Abs	Abs

GT: Total Germ CF: fecal coliforms; STAF: *Staphylococcus - aureus*

These results show the total absence of contamination for the three types of flora, namely fecal coliforms, *Staphylococcus - aureus* and *salmonella*. However, for total germs they are found in almost all the sampled regions Ouled Mimou, Terny, Sebdou, Ain El houte, Remchi, Bensekrane, Maghnia, Sabra, Nedroma and Zenata respectively with values almost the same between 05 and 8000 (Table 4). Thus, the absence of contaminating flora such as total germs and fecal coliforms, *Staphylococcus - aureus*, *salmonella* is due to the milk contained in the udder of a healthy goat is practically sterile; the microorganisms present in milk therefore come from contamination by external environments and more particularly at the level of from animals: dirty udders, breast infection, ambient environment: air contamination and milking conditions, also equipment used channeling of the milking machine, milk tank, cheese-making utensils. From the environment: fodder, straw, feces, soil, water quality. The acidification of milk by lowering the PH or the rapid lowering of the temperature limits the development of these germs. For total germs, we find in all regions in values almost the same between 05 and 8000. Again, this absence found may be explained by the resistance of the genes.

Generally, the goats from 10 regions study in the region of Tlemcen, Ouled Mimou, Terny, Sebdou, Ain El houte, Remchi, Bensekrane, Maghnia, Sabra, Nedroma and Zenata are healthy goats hence the good practice of milking is applied during sampling.

Preparation of feta cheese

Figure 7: summarizes the stages of manufacturing and processing Feta cheese from raw goat's milk.



The incorporation of the rennet prepared in the tank.



The incorporation of the rennet prepared in the tank.

Coagulation of milk



Add rennet



Curd to rennet coagulation

Cutting the rennet curd into slices - curd



Trenching



**The presentation of rennet-type curds
Pre-draining**



Molding and draining



Pélardon mold



Drying



Salting after 5 hours



Refinement

Figure 7: The results are displayed in the form of cheese preparation images, so each step

Yield and quality of cheese

This yield can also be calculated by determining the number of liters of milk necessary to make a cheese of a given weight since we often assimilate liters and kilograms of milk. **Table 5** shows the results obtained that the milk in the mixture from 27 goats is very rich in fat and protein with values respectively 52.3% and 38.20%. It should also be noted that we have obtained a very high yield in terms of cheese. In 23 liters analyzed, 4 kg of net weight of cheese obtained after refining, it is explained that goat milk is twice as high as cow's milk in terms of yield.

Table 5: Physico-chemical properties of cheese made from goat milk collected in the wilaya of Tlemcen

Density	Acidity	Fat	Protein	temperature	Pasteurization	Yield
1033	17	52.3	38.20	10°C	+65	23L = 4KG

Feta is a curd cheese in Greek brine. The name of this cheese is borrowed from the Italian feta ("slice") which dates from the 17th century. The appellation feta associated with cheese is attested in the 19th century. It characterizes a cheese produced according to precise techniques. This type of cheese is traditionally produced from goat or sheep's milk. Feta cheese made from raw goat's milk, our Feta cheese and salted with a tangy taste. Feta cheese is perfect in salads with a soft texture.

Conclusion

In this study, we addressed the Typology of goat farming in Tlemcen and the development of goat milk (microbiological and physicochemical quality) and tries on processing (cheese). 27 goats were affected in different regions in Tlemcen. At the end of this study, the results of the microbiological analysis, it appears from this that the goats in this study region are generally healthy animals. According to the results of hierarchical classification, three classes classified in pairs were observed for the females of our local population of wilaya of Tlemcen. The principal component analysis (PCA) showed that our population is divided into 5 different groups to the other each group is positively correlated between them. According to the physico-chemical results of the milk, we notice that the milk of our local goat population and of good quality compared to the other studies that have been made with that our milk is of good quality with a fat content of 81.60%, a protein level of 33.35 and lactose of 5.42% fat and a protein matter. These characteristics show that the goat milk of our populations is deserved to be valued and exploited in. The transformation of milk into feta cheese responds to several factors: lactic ferments, technological parameter (coagulation conditions the nature and intensity of mechanical work, the speed of draining, the ripening conditions) and especially the milk used (chemical and microbiological composition). The manufacture of feta cheese from mixed goat milk, good nutritional quality with a wealth of mineral elements including calcium, a high-protein level and a good content of essential fatty acids. Finally, these results indicate that the milk from these regions is superior and better quality, especially in terms of microbiological and physicochemical qualities.

References

- Badis A. Laouabdia-Sellami N. Guetarni D. Kihal M. Ouzroutr 2005.** Caractérisation phénotypique des bactéries lactiques isolées à partir de lait cru de chèvre de deux populations caprines locales "ARABIA ET KABYLE". *Sciences et technologie*, 23, 30-37. Duteurtre et al, 2005).
- Benyoub KQ. Ameer Ameer A. Gaouar SBS 2018.** Phenotypic characterization of local goats populations in western Algerian: morphometric measurements and milk quality. *Gen. Biodiv. J* 2(1), 73-80
- Bey D. Laloui S. 2005.** Les teneurs en cuivre dans les poils et l'alimentation des chèvres dans la région d'El-Kantra (Biskra). Thèse. Doc.Vét. 120p.

- Dekkiche Y 1987.** Etudes des paramètres zootechniques d'une race caprine améliorée (Alpine) et deux populations locales (MAKATIA et ARBIA) en élevage intensif dans une zone steppique (Laghouat). Thèse. Ing. Agro; INA. El Harrach.
- Haenlein GFW 1993.** Producing quality goat milk, *Int. J. Anim. Sci*, **8**: 79–84.
- Hellal F 1986.** Contribution à la connaissance des races caprines algériennes: Etude de l'élevage caprin en système d'élevage extensif dans les différentes zones de l'Algérie du nord, Thèse. Ing. Agro. INA. El Harrach. Alger.
- Lupien JR 1995.** The FAO/UNU food composition initiative. *Food Chem.* 57, 171–173.
- Mahaut M. Jeantet R. Brûle G. 2000.** Initiation à la technologie fromagère. Techniques et documentation Lavoisier. Paris. 194 p.
- Moualek I 2011.** Caractérisation de lait de chèvre collecté localement séparations chromatographiques et contrôles électrophorétiques des protéines. Mém, Magi, Université Mouloud Mammeri-Tizi Ouzou (Algérie). 101p.
- Pradal M 2012.** Ce diagramme est cité dans le livre de la transformation fromagère caprine fermière page 295
- Roudj S. Bessadat A. Karam NE 2005.** Physicochemical properties and electrophoretic analysis of goat and cow raw milks from western Algeria, *Renc. Rech. Ruminants*, 2005, 12
- Sebaa A 1992.** Le profilage génétique visible de la chèvre de la région de Laghouat,
- Senoussi A 1989.** Initiation aux techniques de l'insémination artificielle chez l'Espèce Caprine en Algérie. Mémoire Ing. ITAS.
- Soustre Y 2007.** Questions sur les qualités nutritionnelles des protéines laitières. *Biocommunication*, 16, 01-04
- Takoucht A 1998.** Essai d'identification de la variabilité génétique visible des populations caprines de la Vallée de M'ZAB et des Montagnes de l'ZHAGGAR, Thèse Ing. Etat. Inst. Agro Blida, 52p.