

PHENOTYPIC CHARACTERIZATION OF LOCAL GOATS POPULATIONS IN WESTERN ALGERIAN: MORPHOMETRIC MEASUREMENTS AND MILK QUALITY

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Article history: Received: 05 February 2018, Revised: 15 February 2018, Accepted: 22 April 2018

Abstract

The objective of this study is the phenotypic characterization and physico-chemical analysis of the milk of the goat population in the Wilaya of Tlemcen, in view of a contribution to a better understanding of goat genetic resources remains hitherto little studied; bodily measurements were performed at 59 individuals. This study examined 20 variables including 17 quantitative variables and 03 qualitative variables, the data were submitted to a PCA (principal component analysis), a centroid of classes, correlation coefficient and follows a hierarchical clustering (CAH). The results showed highly correlated variables ($HG, HS = 0.742$) ($HS, HD = 0.826$) and they divide the local goat population in the Tlemcen region into three classes according to the morphology of individuals, there are tall dwarf goats and other, with a mid-sized class. Regarding the quality of the milk from our goats, physicochemical analyzes show that milk is rich in fat and protein with 3.5% and 4.5% levels respectively. These characteristics provide superior quality and very comparable to the milk of goat breeds known for their cheese abilities.

Keywords: Goats, Local breed, Milk Quality, morphometric measurement, Tlemcen

Introduction

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 in 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 Aurès; the Makatia breed, 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. Hellal, 1986; Dekkiche, 1987; Sebaa, 1992 and Takoucht 1990.

Characterization is the first approach to sustainable use of the goat breed genetic resources and the first step in the characterization of local genetic resources it is based on knowledge of variations in morphological traits (Delgado et al, 2001). These last characteristics are important tools for classifying traditional livestock breeds in broad categories or racial groups (Solomon, 2008).

In Algeria, goat farming is one of the most traditional agricultural activities associated with sheep farming; this population remains marginal and represents only 13 % of the national herd (Fantazi, 2004). The breeding of these populations is adapted oriented mixed production (meat and milk. In addition,

Derivatives are mostly fermented milks (RAIB, Lben and Jben), usually varied sensory quality (Badis et al. 2005).

For a better knowledge of our goat populations, the objective of our work focuses on the morphological measurement and physicochemical analysis of milk goat populations of the Tlemcen wilaya on adult animals over three years old using a biometric profiling.

Materials and methods

Area of study :

The wilaya of Tlemcen occupies an area of 9017 km²; it includes 20 daïras subdivided into 53 communes. Our study carried out in five zones: Ain Talout, Chetouane, Henaya, Ouled Mimoun and Mansourah (Figure 1).

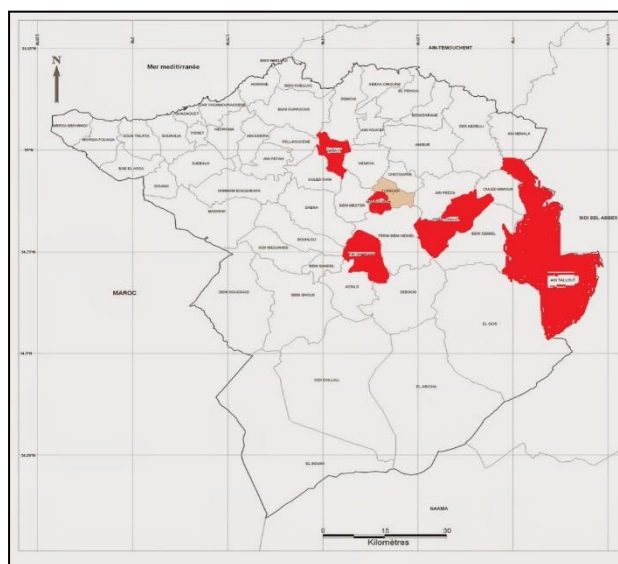


Figure 1. Geographical distribution of the study area of our study.

Animal material

All the animals in this study come from the local goat population introduced from Tlemcen, under a mixed rearing mode. Our study has focused on, a total of 59 adult goats belong to the local population of the wilaya of Tlemcen, and is distributed in the table 1.

Table 1. Distribution of the number of individuals per zone.

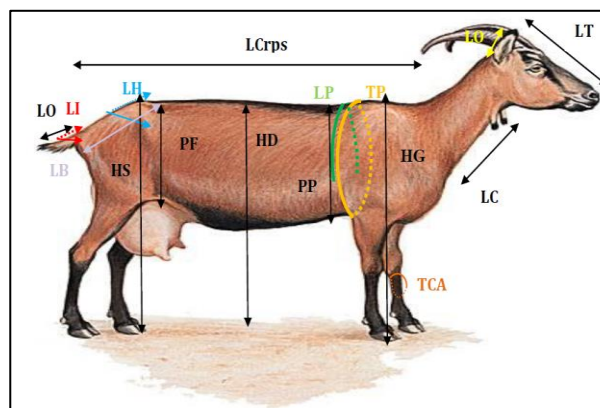
Zones	Number of individuals
Ain Talout	18
Chetouane	11
Henaya	3
Ouled Mimoun	15
Mansourah	12
Total	59

Measuring equipment :

The morphometric measurements (quantitative and qualitative) were done using a metric tape graduated in centimeters, a camera and a note pad to identify the animals (Table 2 and Figure 2)

Table 2. The different quantitative traits and their descriptions

Quantitative traits	Abbreviation	Description
Length of the head	LT	Distance between the nape and the tip of the nose
Lengths of the ears	LO	Measured from base to bottom end
Neck length	LC	Distance between the throat and the shoulder angle
Body length	LCrps	distance between the tip of the shoulder and the tip of the buttock
Length of the basin	LB	Distance between the tips of the hips and the tips of the buttocks
Hip lengths	LH	Distance between the tips of the buttocks
Widths at the ischions	LI	Measure passing vertically behind the withers and at the strap passage
Chest size	TP	Measure passing vertically behind the withers and at the strap passage
Depth of chest	PP	Estimated at the strap passage at the back of the forelegs
Chest width	LP	Passing the metric tape behind the withers at the passage of the straps
Height at withers	HG	Distance from the top of the withers to the ground
Back height	HD	Distance from the middle of the back to the ground
Sacrum height	HS	Distance from the ground rump
Depth of flank	PF	Measured deep inside the animal or estimated on the side
Hair length	LPL	Is made at the line from the back of the root to the end
Former cannon tower	CAW	Circumference of the barrel at one hand's hand below the lower part of the knee joint
Length of the tail	LQ	Distance between the point of attachment from the tail to the end

**Figure 2.** The categories of measurements performed

Concerning the qualitative traits, a set of notations on external phenotypic characters was visually appreciated on the presence and absence of three characters: the pendants, beard and horns.

Sampling and physicochemical analysis of milk:

The milk samples analyzed are milk of small, fresh mixtures, from herds of healthy goats, located in the region of Tlemcen. The milk samples analyzed in our study come from goatherds located in the Tlemcen region. Details of dates, sampling locations are shown on the table 3.

Table 3. Date and place of Milk sampling

Date	Sampling	
	Place	Number
18/04/2016	Ain Fezza	10
	Bouhnek	3
	Chouli	10
	Ouled Elmimoun	6
	Zenata	5
	Total	= 34

The milk is processed manually from healthy goats, and then it is collected cleanly in bottles of 50 ml, which were then labeled and placed in a cold cooler at 4°C and are sent to the milk analysis laboratory at the ITELV of Sidi Bel abdess where they are immediately analyzed.

Physicochemical analysis of milk

For analysis testing the quality of milk, we used an Ekomilk® -ULTRA analyzer device that uses new technologies, such as the principle of ultrasound (Eon Trading, 2001). Measurement Parameters are: Fat, Defatted Dry Extract, Density, Protein, Freezing Point and pH

Statistical analysis

The phenotypic descriptors or variables studied were analyzed by statistical Xlstat software (Addinsoft, 2014). Before beginning the statistical tests, a normality test on the values of different characters was carried out. The study of correlations between variables makes it possible to appreciate the interdependence that may exist between them (Ranarison, 2007). The correlation analysis between the different variables considered during the study reflects the variables with strong links between them. Thus, it determines whether the existing links are significant or not, either positively or negatively. According to Tomassone (1989) and Ranarison (2007) the correlation coefficient France can be *i*: $r \geq 0.80$, the variables are strongly related; *ii*: $0.50 \leq r < 0.80$; *iii*: the variables are moderately related, and $r < 0.50$, the variables are weakly related.

Results and discussion

Quantitative traits

Table 4. Descriptive statistics of quantitative measures

Variables (cm)	Mean \pm SD	Min	Max
LT	18,84 \pm 1,63	16	23
LO	16,57 \pm 2,15	13	24
LC	25,16 \pm 4,22	18	34
LB	22,61 \pm 3,38	17	33
LH	18,59 \pm 3,11	13	24
LI	11,71 \pm 2,00	9	18
PP	33,09 \pm 2,64	27	39
LP	35,79 \pm 4,47	28	45
HD	71,34 \pm 4,79	61	80
PF	31,50 \pm 4,41	24	43
LP	4,21 \pm 2,05	2	14
TCA	8,00 \pm 0,97	6	10
LQ	11,09 \pm 1,72	7	16
LCrp	73,80 \pm 4,70	62	86
TP	80,38 \pm 7,77	56	96
HG	70,82 \pm 4,78	54	80
HS	73,32 \pm 4,16	61	84

Qualitative traits

From the results of the frequency distribution, we notice that: 58% of females with horns the rest are clods (Figure 3). 37 % of our local goat population is characterized by the presence of beards while 63% do not have as well as 20 % of the females of our local goat population who have pendant and 80% are deprived (Figure 4 and 5) .

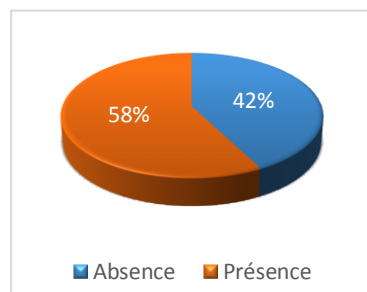


Figure 3. Frequency distribution of the presence of horns

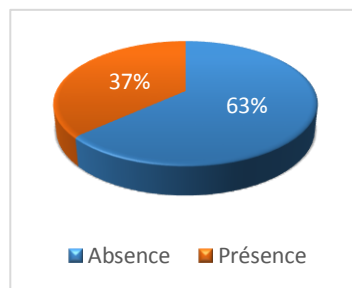


Figure 4. Frequency distribution of the presence of the beard

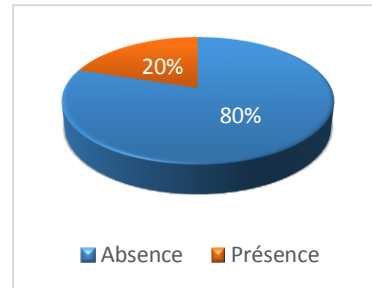


Figure 5. Frequency distribution of the presence of the pendant

Principal Component Analysis (PCA):

The principal component analysis (PCA) is carried out on 59 individuals of the local breed of the Tlemcen region; all the individuals are adult females. The PCA allows identifying two main axes of variation, which forms the foreground by relating 50.10 % of total variability (figure 5). The first axis, explaining 30,44 % of the total variation, represents goats with a morphology that noticed by a length of the body very developed with also a turn and a very large depth of chest, these goats have reduced breadths of chest. The second axis that explains 19.66 % of total variation represented by goats of body length and height at moderate tourniquet, but they have less developed lengths at the ischia, hair, pelvis and head.

A total of 50.1 % of the population variation are explained by both axis 1 and axis2, this distribution allow us to made up of 7 groups (**Figure 5**). We notice that all the characters move away from the center except for one group that is not interpretable while the set of characters is statistically interpretable.

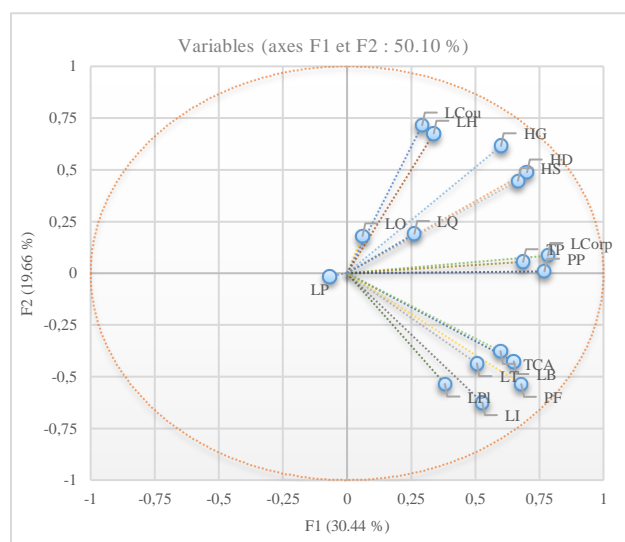


Figure 5. Circle of correlation of local goat populations

Figure 6 shows that Ain Fezza individuals are isolated from others; animals measured at this region belong to introduced breeds (Alpine and Saanen) and they are influenced by a different rearing mode from other individuals.

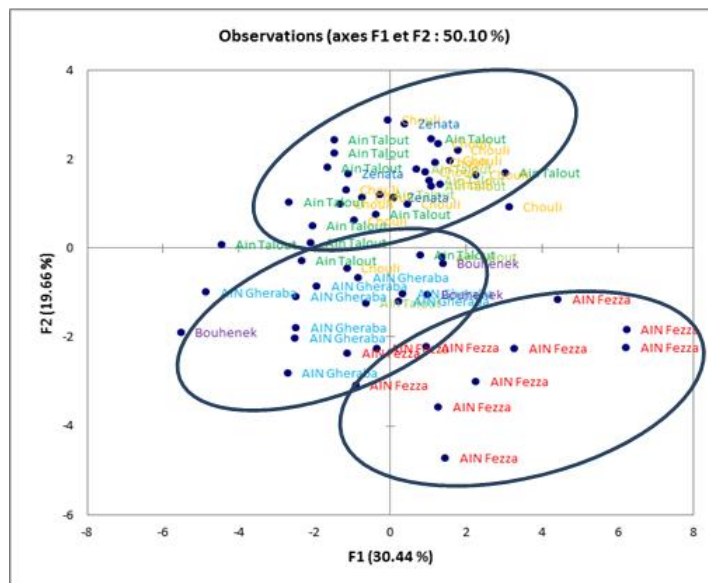


Figure 6. The distribution of observations of our goat population in the Tlemcen area

The distribution of individuals shows that there are three groups that are dispatched: a group (Ain Gheraba and Bouhenek) accumulated in the center, the second group (Ain Talout, Zenata and Chouli) being above. It is clear that the third group of Ain Fezza is isolated from the others; it can be concluded that animals that had body measurements at this region belong to imported breeds (Alpine and Saanen) and probably they have a specific breeding mode and different from other groups.

Physicochemical analyzes of milk

Table 5. Results of the physicochemical analyzes carried out on the samples of goats milk

Region	Samples	Milk parameters						
		STD (%)	SNF (%)	Water (%)	Fat (%)	Protein (%)	Density	FP (C°)
Chouli	10	16.87±1.71	11.32±1.34	83.04±1.74	5.25±0.52	4.18±0.42	1034.5 ±5.33	-0.679±0.06
Ain Fezza	10	15.89 ±2.05	11.40±0.72	84.10±2.05	4.49±1.57	4.18±0.45	1037.4±2.64	-0.721±0.06
Zenata	5	16,65±1,26	11,25±0,70	83,34±1,26	5,4±1,23	4,39±0,27	1036,54±2,97	-0,701±0,05
Bouhanek	3	16,21±2,54	12,24±0,70	83,79±2,54	3,96±2,66	4,71±0,30	1042,63±4,75	-0,790±0,05
Ouled Mimoun	6	15,71±1,71	11,51±1,15	84,28±1,71	4,2±1,30	4,39±0,46	1036,9±4,23	-0,700±0,07
Total milk	34	16.29±1.79	11.45±0.99	83.68±1.80	4.75±1.37	4.30 ±0.42	1036.8 ±4.43	-0.710 ±0.06

STD: Solid Total dry; SNF: Solids Non Fat; FP: freezing Point (-C°)

The results obtained in Table 5 show that the milk who came from goats of the Choulie region has a higher solids content compared to other regions, in contradiction of we recorded a very low value in the region Ouled Mimoun. The milk samples from Zenata and Chouli regions are rich in fat with values of 5.4% and 5.25% respectively compared to other regions this can be explained by the very rich and varied diet provided by the farmers and the farm management. On the other hand, in the region of Bouhanek, we recorded a low fat value of about 3.96% (Table 5); this low milk fat content may be due to the stage of lactation. (Masle and Morgan, 2001). Similar values to our fat study are reported by Drackova et al., (2008) with 5.6%. The protein content in our samples is very close to each other with a mean value of

4.3 mixing milk, compared to other studies on goat's milk, Remeuf and Lenoir (1985) with 2.7% and Vassal et al., (1994) with 2.7% Raynal-Ljutovac et al., (2008) with 2.6 %, shows the superiority of the protein content of our samples (Table 5).

In general, the results show that the goat's milk of the region of Zenata and Bouhenek is very weak compared to the other regions this is perhaps related to several factors of variations such as the feeding and the mode of farming. Looking the freezing points values, what a wetting index of milk samples from, our goat populations were characterized by as freezing point varies between -0.679 to -0.790 (Table 5), these values show that our samples is well below average, this can be explained by the high rate of fat and protein . Overall goat milk analyzed in the Tlemcen area from individual or mixed samples confirms that there is a slight superiority in the quality of this milk from our population compared to introduced breeds

Conclusion

In the present study, we addressed the phenotypic aspect of goats in the Tlemcen region, 59 goats were involved, which belong to five communes. To characterize these goats, 20 body measurements were performed (17 quantitative and 03 qualitative traits). At the end of this study, the results of the descriptive analysis, it follows that the goats of this region of study are in general animals, which are characterized by the presence of horns; and a height of withers from 70 to 80 cm. They are therefore medium-sized animals. Through the correlation tests between the different measured parameters show that, there is a great heterogeneity between these parameters and the females show a great homogeneity between them. Confirming that our local goat population in the Tlemcen region is not homogeneous. This too can be explained by the uncontrolled crossing practiced by the breeders. According to the physicochemical results of the milk, we note that the milk of our local goat population are a good quality compared to the other studies that were made with fat content and protein content with 4.75 % and 4.3 % respectively. These characteristics go up well that the goat's milk of our populations is deserved to be valorized and exploited in various forms in particular in the manufacture of the cheese. This study on the morphological characterization of goats can serve as a basis for other more accurate studies of genetic characterization of the goat species.

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