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Phenotypic characterization, typology of Rembi and ouled djella sheep breeds in western Algeria case of the wilayas of Tissemsilt and Tiaret

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Abstract:

Our work is to study the phenotypic characterization of Rembi and ouled djella breeds in western Algeria "Tissemsilt and Tiaret" and to make a situation of sheep breeding in these areas "The typology". To characterize this farm, data were collected during a retrospective survey of 18 farms. The majority of breeders (67%) have semi-modern sheepfolds, among the latter (76.47%), the ground is clay. The rest of the breeders (33%) have sheds which are with concrete floors. Moreover, more than (74%) of respondents use straw as bedding. (71.76%) of the buildings are ventilated by transoms. Sheep from all farms are managed in an extensive to semi-intensive system. The study was devoted to two breeds "Rembi and Ouled Djellal" in the two wilayas. to characterize the phenotypic level. 44 morphological characters including 24 quantitative and 20 qualitative were applied to 201 sheep heads including 150 females and 51 males spread over 12 communes of Tissemsilt and 3 communes of Tiaret were the subject of measurements and phenotypic description. We noticed a significant difference of 3.79Kg (p=0.015) between the weight of ouled djellal animals (36.25 ± 1.9 kg) and Rembi animals (32.46 ± 0.57 kg), For the ear length (LO), we recorded a value of 16.22 ± 0.32 cm for the ouled djellal breed and 15.15 ± 0.12 cm for Rembi breed, this superiority of the ouled djellal breed is very significant *(P=<0.001)*. The width of the ears of individuals from the ouled djellal breed (8.92 ± 0.26 cm) is significantly greater than that of Rembi individuals (8.4 ± 0.07 cm) with (*p=0.006)*. The animals of the ouled djellal breed are longer by 4.41cm compared to the individuals of the Rembi breed, this difference is significant (*p=0.008*) (fig.07). The chest of ouled djellal animals (30.06 ± 0.75cm) is significantly wider *(p=0.004)* than that of animals of the rembi breed (27.93 ± 0.29 cm) (fig.08). For the height at the withers, we noticed a significant difference of (2.13 cm) (*p=0.047*) between the two breeds studied. we also noticed a significant difference of (2.68 cm) (*p=0.026*) between the height of the sacrum of ouled djellal breed (84.19 ± 1.13cm) and that of the Rembi breed (81.51 ± 0.47cm).

Keywords : Characterization, Phenotype, CAH, Typologie, Rembi, Ouled djellal ; Tissemsilt, Tiaret.

Introduction

Sheep farming is an important part of national livestock production. Estimated at 23 million head, The sheep are distributed throughout the northern part of the country with however a higher concentration in the steppe and the high semi-arid cereal plains (80% of the total population); there are also populations in the Sahara, exploiting the resources of oases and desert routes (MADR, 2021). Algerian agriculture has been the subject of several reforms, which have completely disarticulated. To this end, animal breeding and especially sheep farming has been left to its own devices, led by breeders without any technical support fellowing extensive management practices (Tefiel *et al.*, 2018, 2020, belantar *et al.*, 2018). This breeding is based on the spontaneous vegetation of natural grasslands and its preferred use as a primary food resource (Bentchikou *et al.*, 2011). The sheep sector is a major socio-economic sector in the world, providing a large part of the production of meat, milk, and wool (El-Bouyahiaoui *et al.*, 2021). Of all the species, the Algerian sheep shows a great genetic diversity or genetic resource

consisting of several breeds well adapted to their environments, whose production performance is heterogeneous and their morphological characteristics are also diverse which seem to have a different genetic origin and which militate for the implementation of a work of identification of selection criteria (Gaouar *et al.,* 2009, 2017). These resources are hardly being used properly. Species with all breeds, varieties, and populations that characterize them are on the verge of extinction. The reasons for the disappearance of phenotypic standards can be summed up in the absence of intervention and monitoring of the state, the breeders are left to themselves and consequently, the farms have become disorganized, unmanaged reproductions and crosses are carried out anarchically between the different regions of the country. Our work falls within the framework of the genetic improvement of domestic animals, research have been carried out in this direction to study the « Identification or phenotypic characterization » of the sheep breed that exists in West Algerian and make an inventory of the sheep breeding in these areas « The typology ». It focuses on three main parts, firstly the inventory and location of breeders and animals in the study area, secondly the characterization of holdings through surveys, at the end the phenotypic description and measurements of the animal's external morphological characteristics

Materials and Methods

Overview of the study area

This work was carried out in western Algeria and sampled among the two Algerian administrative regions of Tissemsilt spread over 12 communes and Tiaret equally spread over 3 communes. Both regions have agropastoral characteristics and can be considered as regions that have great importance in the supply of sheep especially the breed of Rembi.

Compilation of the questionnaire

The surveys are essentially based on a questionnaire that has been drawn up in a fairly wide-ranging way and which allows the collection of as much information as possible concerning livestock, the holding and the holder (level of study, activities), sheep housing, feeding, reproduction, pathologies in study areas. So the investigation sheet was divided into several parts concerning the various points influencing the breeding. Study farms are randomly selected for sheep breeding only. This choice of breeders was obtained from the agricultural subdivisions after having had the approval of the Direction of Agricultural Services (DSA) of the wilaya of Tissemsilt and Tiaret.

Phenotypic characterization of sheep rearing in study areas:
Animal Equipment

The study of the morphological characters of the sheep was carried out on a sample of 18 farms holding 201 heads (150 ewes and 51 rams) characterized as adults whose age is between two and eight years and unrelated fill the character of the Rambi and ouled djellal breeds.

Variables Analyzed

The work was carried out on forty-four variables, twenty qualitative and twenty quantitative. These measurements for phenotypic characterization are based on work on the Algerian sheep population (Djaout *et al.,* 2015, Belantar *et al.,* 2018, Belkhadem *et al.,* 2019, Belharfi *et al.,* 2023). Qualitative variables are noted visually, however, the quantitative variables studied are measured as head length (LT), head width (TLA), ear length (LO), ear width (OLA), neck length (LC), shoulder width (LE), shoulder height (HG)Anterior Gun Tower (CT), Chest Tower (TP), Chest Depth (PP), Chest Width (LP), Back Height (HD), Flank Depth (PF), Sacrum Height (HS), Trunk Length (L), Body Length (LST), Total Length (LTOT), Pelvis Length (LB), hip width (LH), hamstring width (LI), tail length (LQ), wool wick length (LM).

Analyses statistiques

The statistical tool used in the analysis of survey results is Excel Stat 2013, which is a Microsoft Excel utility. The rest of the statistical analysis was conducted by the software R (3.5.0) and the latter for analyzing the descriptive statistics, principal component analysis (PCA) with hierarchical cluster analysis (HCA), and correlations. The analysis of variance is applied between the Ouled Djellal breed and Rembi by applying a type 3 ANOVA for an unbalanced sample.

Results and discussion

Typology of sheep rearing in study areas

The results of the surveys made it possible to accumulate a certain amount of information on the characteristics of the farms in the study regions and also on the mode of operation of their farms.

Age of the manager

The average age of the managers in the wilaya of Tissemsilt is almost 56 years. It varies between 34 and 77 years. The wilaya of Tiaret records an average age of breeders, which is about 64.66 years varies between 52 and 72 years. They are fathers or grandfathers of the family who take care of the direct management of their livestock. This situation is Slightly different from what some authors report; in Tizi-Ouzou, Hassini, and Lounas (2009) report that the average age of breeders is between 15 and 60 years. In Tizi Ouzou, Ayadi, and Ouchene (2011) indicate that 56.70% of breeders are not full 35 years. In contrast to Lebanon, Srour et al., (2005) reported that most breeder categories are between 34 and 70 years old. In Portugal, they are between 45 and 64 years old (Pacheco, 2006).

Level of training and experience of breeders

In the wilaya of Tissemsilt illiteracy affects (73%) of livestock farmers, on the other hand (20%) have a primary level. The upper level is present (7%). In the wilaya of Tiaret illiteracy affects (67%) of breeders with a percentage of (33%) having a secondary level. In contrast, in Bouira illiteracy affects (12.7%) of the farmers surveyed, primary and average levels affect respectively (23.81%) and (33.33%), and secondary level is reported (23.81%) of farmers. the upper level exists but with a low rate (6.35%) reported by Bouchritb and Ait taleb (2009). The majority of breeders in the wilaya of Tissemsilt (68%) have an average of 19.46 years of experience and that ranges from 6 to 52 years. The breeders in Tiaret (56%) have an average experience of 20.41 years and which varies from 40 to 66 years. Unlike Ayadi and Ouchene (2011) in Tizi-Ouzou, the average experience is 12.30 years. In Lebanon the average experience of 39 years (Srour *et al.,* 2005). What he shows us is that the experience in this field differs from one to the other.

Livestock building

According to the survey we conducted in the two wilayas the majority of breeders (67%) have semi-modern sheepfolds, among these (76.47%), the soil is clay. The rest of the farmers (33%) have sheds that have concrete floors. Moreover, more than (74%) of the respondents use straws as bedding. The sheep of all the farms surveyed in the two wilayas are conducted in an extensive to the semi-intensive system. Most livestock buildings (71.76%) are ventilated by imposts this means that all surveyed breeders take into account aeration as a very important environmental factor in their farm buildings and they rely on family labour only. The most important source of water is groundwater resources (wells), Ayadi and Ouchene (2011) in Tizi-Ouzou report two main water resources: groundwater resources (wells) and surface resources (dams and wadis). Feeding equipment and water troughs are traditional feeders and troughs. The equipment used on both farms was not changed for several periods.

Fig.01: (67%) of semi-modern sheepfolds

Fig.02: (33%) of modern sheepfolds

Feeding of sheep

In the farms surveyed in both wilayas, the most important season for ratio change is winter. The calculation of the feed ration is not respected because the sheep are grazing throughout the year. Their diet consists of pasture-based on crop residues, which shows the importance of natural rangelands and meadows in the diet of livestock. On top of that, food supplements through concentrate distribution, hay, wheat bran, barley straw, and dry feed. So, the daily ration of sheep is a combination of feed and concentrate brought in to meet the nutritional needs of the animals. Mineral and vitamin feeding is negligible on the farms surveyed; farmers do not have enough awareness of mineral intake in their diet.

Concerning the method of watering most of the respondents of the two wilayas give free water to their herds. In Adrar, on the other hand, the animals are fed from locally grown forages in the gardens but also with herbs gleaned by the women, and from crop waste and the family table. Jamali and villemot (1996). The addition of complementary foods is made up of differences in sorting dates, stones, dried bread and waste from the family table. Sometimes grain barley and wheat bran are distributed to fattened sheep for the holidays (Boubekeu *et al.,* 2015).

Fig.03: Place of distribution of sheep feed

Reproductive Management

Survey results indicate that all surveyed breeders make natural rise breeding uncontrolled. The rams are permanent with ewes. Moreover, the breeder randomly selected sound selection in both wilayas. In addition, Bouira, **Bouchrit, and Ait taleb (2009)** report that natural breeding is represented by (66%) of farms compared to artificial insemination. In the region of Sétif, natural riding is the most privileged mode of mating, this practice was encountered in (75%) of breeders (**Madani, 2000 and Mouffouk, 2007**). Reproduction is carried out in the spring in most cases, depending on the availability of food and the body condition of the sheep in late winter to ensure the best conditions for reproduction. This causes a free struggle throughout the year with a search for births before the winter and lactation in autumn following the stubble season (summer) with an average gestation time of the surveyed holdings is 168.44 days which shows that the breeders having the same breeds for breeding and reproduction.

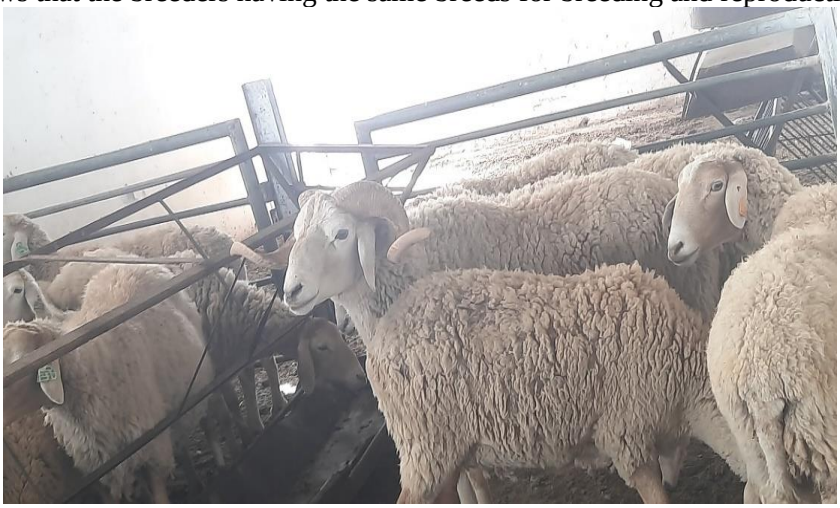

Fig.04: Free reproduction method in the Rembi breed

Hygiene and Health

The results of the surveys show that the majority of farmers of the two wilayas (69.39%) have a prophylaxis plan that takes into account cleaning and preventive treatments (vaccination). Hygiene measures are more or less taken into account on the farms visited. There are (20.23%) farmers who use disinfectant (biocide). The most common diseases in the studied farms are digestive and respiratory diseases in adults. In case of disease, the breeders call on the veterinarian for treatment in (70.25%) of the farms surveyed. Animals are much more vaccinated against parasitic diseases and pneumonia.

Phenotypic characterization of sheep breeding in the study areas:

In our study, we noticed a significant difference of 3.79 kg (p=0.015) between the weight of ouled djellal animals (36.25 ± 1.9 kg) and Rembi animals (32.46 ± 0.57 kg) **(table 01)**.

Table 01: Body measurements variation for the two studied breeds (O_D: ouled djellal)

Parameter	Breed	Mean ± Standrd error	F (1,199)	P
Weight (kg)	O_D	36.25 ± 1.9	6.028	**0.015**
	Rembi	32.46 ± 0.57		
LT (cm)	O_D	23 ± 0.28	0.044	0.834
	Rembi	22.92 ± 0.15		
TLA (cm)	O_D	13.81 ± 0.29	0.120	0.729
	Rembi	13.9 ± 0.09		
LO (cm)	O_D	16.22 ± 0.32	11.688	**<0.001**
	Rembi	15.15 ± 0.12		
OLA (cm)	O_D	8.92 ± 0.26	7.639	**0.006**
	Rembi	8.4 ± 0.07		
LC (cm)	O_D	29.28 ± 0.56	1.362	0.245
	Rembi	30.07 ± 0.27		
TCO (cm)	O_D	40.06 ± 1.12	1.107	0.294
	Rembi	41.51 ± 0.56		
LSI (cm)	O_D	59.72 ± 0.93	1.073	0.302
	Rembi	58.76 ± 0.36		
LToT (cm)	O_D	112 ± 1.24	7.078	**0.008**
	Rembi	107.59 ± 0.68		
L(cm)	O_D	77.34 ± 1.34	1.406	0.237
	Rembi	75.93 ± 0.45		
L B(cm)	O_D	33.5 ± 0.89	2.304	0.131
	Rembi	32.2 ± 0.33		
LE (cm)	O_D	28.13 ± 0.55	0.896	0.345
	Rembi	27.42 ± 0.31		
LH (cm)	O_D	30.69 ± 1	2.770	0.098
	Rembi	29.04 ± 0.39		
LI (cm)	O_D	27.06 ± 0.82	2.934	0.088
	Rembi	25.27 ± 0.43		
TP (cm)	O_D	105.78 ± 1.61	0.555	0.457
	Rembi	104.11 ± 0.93		
PP (cm)	O_D	39.75 ± 0.76	0.331	0.566
	Rembi	39.27 ± 0.34		
LP (cm)	O_D	30.06 ± 0.75	8.340	**0.004**
	Rembi	27.93 ± 0.29		
HG (cm)	O_D	87.16 ± 1.27	3.980	**0.047**
	Rembi	84.75 ± 0.47		
HS (cm)	O_D	84.19 ± 1.13	5.061	**0.026**
	Rembi	81.51 ± 0.47		
HD (cm)	O_D	84.13 ± 1.21	0.044	0.834
	Rembi	84.36 ± 0.42		
PF (cm)	O_D	38.72 ± 0.94	0.365	0.546
	Rembi	38.23 ± 0.3		
TA (cm)	O_D	113.91 ± 2.31	2.308	0.130
	Rembi	110.48 ± 0.88		
LM (cm)	O_D	6.47 ± 0.37	2.471	0.118
	Rembi	5.95 ± 0.12		
TC (cm)	O_D	9.59 ± 0.22	0.245	0.621
	Rembi	9.5 ± 0.07		
LQ (cm)	O_D	36.75 ± 1.02	0.329	0.567
	Rembi	36.17 ± 0.4		

What can be explained by the non-equitable distribution of the food ration, the way of distribution between the animals and the race led us to variable weights; these results are lower than the results reported by IANOR, 2007 and Dekhili and Aggoun, 2013 with 60 kg in the Ouled Djellal breed; 45-55 kg in Sardi; Chikhi and Boujenane, 2003. For the ear length (LO), we recorded a value of 16.22 ± 0.32 cm for the ouled djellal breed and 15.15 ± 0.12 cm for rembi breed, this superiority of the ouled ouled djellal breed is very significant *(P=<0.001)* (fig.05). The width of the ears of individuals from the ouled djellal breed (8.92 ± 0.26 cm) is significantly greater than that of Rembi individuals (8.4 ± 0.07 cm) with (*p=0.006)* (fig.06). The animals of the ouled djellal breed are longer by 4.41cm compared to the individuals of the Rembi breed, this difference is significant (*p=0.008*) (fig.07). The chest of Ouled djellal animals (30.06 ± 0.75cm) is significantly wider *(p=0.004)* than that of animals of the Rembi breed (27.93 ± 0.29 cm) (fig.08). For the height at the withers, we noticed a significant difference of (2.13 cm) (*p=0.047*) between the two breeds studied. we also noticed a significant difference of (2.68 cm) (*p=0.026*) between the height of the sacrum of ouled djellal breed (84.19 ± 1.13cm) and that of the Rembi breed (81.51 ± 0.47cm). For the parameters LT, LSI, L, LB, LE, LH, LI, TP, PP, PF, TA, LM, TC and LQ, we recorded a superiority of the values measured in the ouled djellal animals compared to the animals of the Rembi animals but this difference remains insignificant. for the TLA, LC, TCO, and HD parameters, we recorded a superiority of the values measured in animals of the Rembi animals compared to the values measured in animals ouled djellal but this difference remains insignificant. **Gaouar *et al.*, (2015)** supported the presence of a great phenotypic diversity between the breeds Ouled Djellal, Rembi. This diversity is important with a significant superiority (p <0.001) of the Ouled Djellal breed. Our results show that the Ouled Djellal breed is larger compared to the Rembi breed (p<0.001), The ouled djellal animals are the highest, largest of Rembi breeds studied with more developed frames. These results are according to **Harkat *et al.*, (2015).**

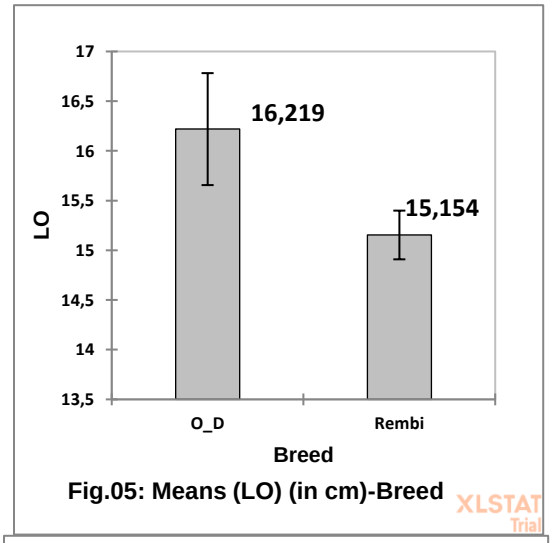

Fig.05: Means (LO) (in cm)-Breed

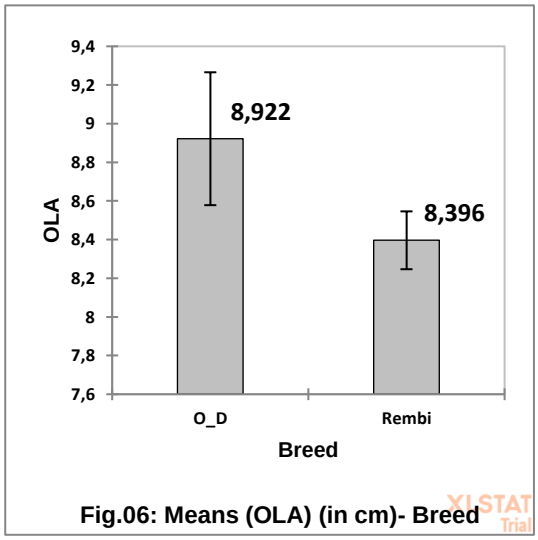

Fig.06: Means (OLA) (in cm)- Breed

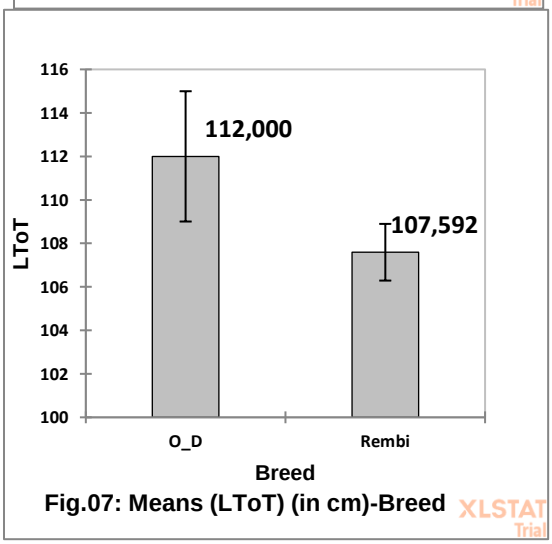

Fig.07: Means (LToT) (in cm)-Breed

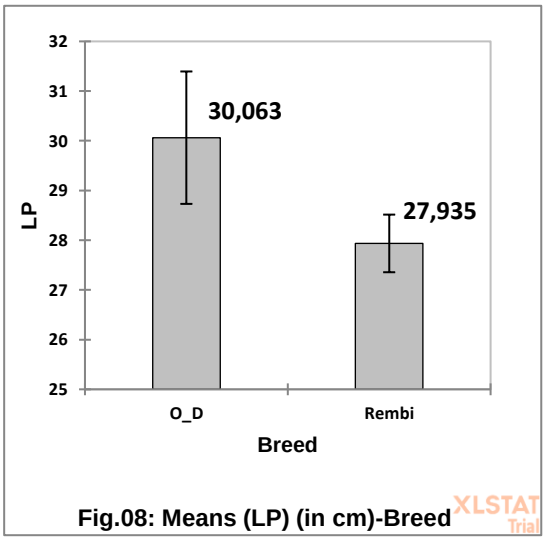

Fig.08: Means (LP) (in cm)-Breed

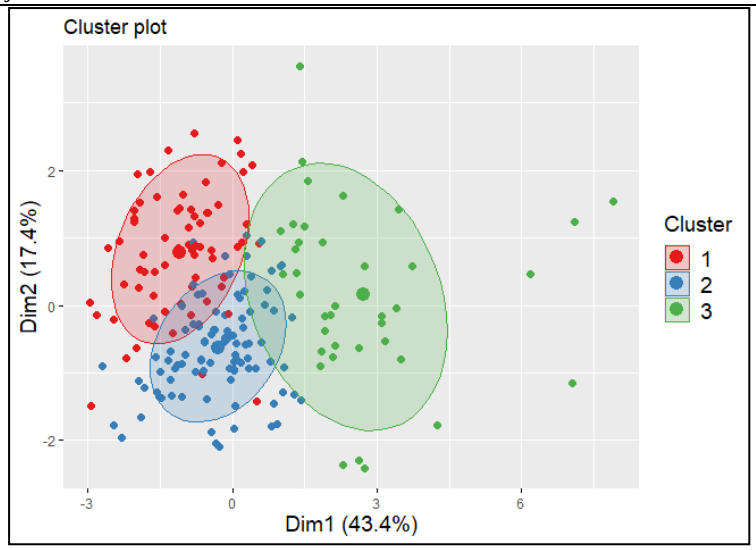

Fig. 9 : Individuals' plot according to the ear length classes

The hierarchical classification is carried out from a principal component analysis (PCA) where the weight, LO, OLA, LToT, LP, HG, and HS are introduced as main quantitative variables and the qualifying characters of the head (PF, MT, CT, PC, FC, OC, OR, LR, FY, Race and sex) are introduced as additional qualitative variables

Figure 9 shows the cluster plot of individuals according to the variable qualifying characters of the head, we notice that there are three groups of individuals with a slight overlap.

Hierarchical Ascending Classification (CAH)

The Hierarchical Ascending Classification is represented in Figure 10. Tables 2,3,4,5,6 and 7 present the description of each group by the body measurements.

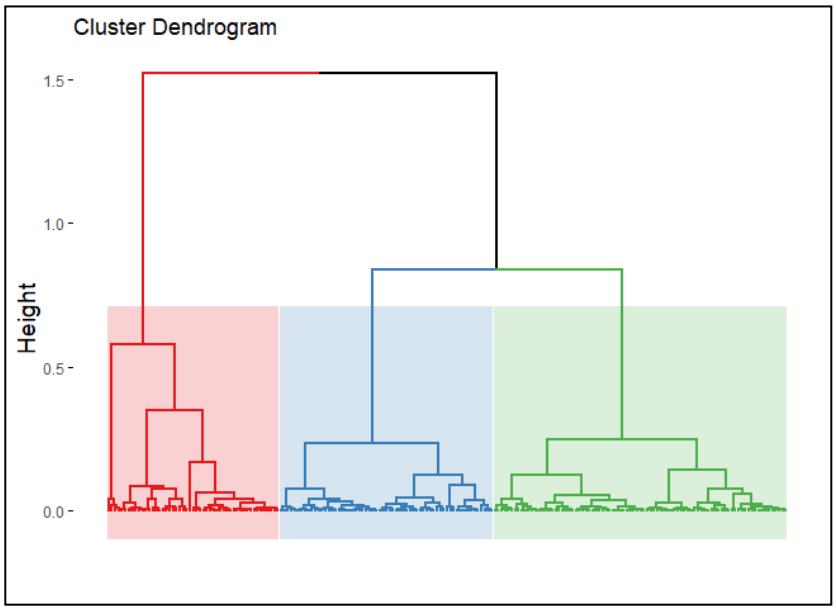

Fig. 10: Description of the hierarchical cluster analysis groups by the body measurements.

From figure 10. Tables 2,3,4,5,6 and 7, and based on the variables that had a strong contribution and representational quality (the weight, LO, OLA, LToT, LP, HG, and HS are introduced as main quantitative variables, and the qualifying characters of the head of animals (PF, MT, CT, PC, FC, OC, OR, LR, FY, Race, and sex), we find that:

Group 1: All the means (OLA, HG, weight, HS, LP, and LToT) in this group are lower than the overall mean except LO which is higher than the general average so it can be concluded that in this group the animals have a small size with slightly long ears. This group represents the Rembi breed. Tables 2 and 3.

Table 2 : Mean and standard deviation of the most characteristic parameters for group 1.

	M ± SD (Groupe)	M ± SD (Global)	p
LO	15.68 ± 1.59	15.32 ± 1.65	0.046
OLA	8.22 ± 0.82	8.48 ± 1	0.033
HG	83.49 ± 4.2	85.13 ± 6.28	0.028
weight	29.31 ± 3.16	33.06 ± 8.08	0.025
HS	78.94 ± 4.41	81.94 ± 6.22	0.013
LP	26.13 ± 2.91	28.27 ± 3.88	0.013
LToT	98.03 ± 4.14	108.29 ± 8.7	0.011

M*: Mean;* ***SD****: Standard Deviation*

Table 3 : The most characteristic modalities for group 1

	Cla/Mod (%)	Mod/Cla (%)	Global (%)	p
PF_T= Straight	47.83	64.71	45.77	0.000
OR=S_Pendant	38.07	98.53	87.56	0.000
Breed=Rembi	38.46	95.59	84.08	0.001
LR= Long	42.73	69.12	54.73	0.003
Sex=F	38.56	86.76	76.12	0.010

Cla/Mod *: Percentage of all individuals with this modality who fall into this class.* ***Mod/Cla*** *: percentage of all individuals in the class present this modality.*

Group 2: All the means (HS, OLA, LO, and HG) in this group are lower than the overall mean except LToT, which is higher than the general average. So it can be concluded that in this group, the animals are slightly longer. This group doesn't represent any breed; we can propose the hypothesis that these individuals come from anarchic crosses between the two races studied (Rambi and Ouled djallel). Tables 4 and 5. This strong resemblance is due to the approach of the two studied wilayas and the exchange between buying and selling on the weekly markets, the climate and relief which are identical.

Table 4: Mean and standard deviation of the most characteristic parameters for group 2.

	M ± SD (Groupe)	M ± SD (Global)	p
LToT	114.38 ± 108.29	108.29 ± 3.44	0.000
HS	80.98 ± 81.94	81.94 ± 4.73	0.040
OLA	8.29 ± 8.48	8.48 ± 0.73	0.011
LO	14.82 ± 15.32	15.32 ± 1.35	0.000
HG	82.84 ± 85.13	85.13 ± 4.52	0.000

M*: Mean;* ***SD****: Standard Deviation*

Table 5: The most characteristic modalities for group 2

	Cla.Mod	Mod.Cla	Global	p.value
LR= Medium	60.24	52.63	41.29	0.002
FC=FC_ABS	51.57	86.32	79.10	0.018
OC=OC_ABS	51.27	85.26	78.61	0.031
PF_T= busked	54.13	62.11	54.23	0.035
OR=Pendant	68.18	15.79	10.95	0.041

Cla/Mod *: Percentage of all individuals with this modality who fall into this class.* ***Mod/Cla*** *: percentage of all individuals in the class present this modality.*

Group 3: All the means in this group are higher than the overall mean so it can be concluded that this group has a big a large size compared to the animals of the other groups. This group represents the ouled djellal breed

Table 6: Mean and standard deviation of the most characteristic parameters for group 3.

	M ± SD (Groupe)	M ± SD (Global)	p
HG	93.82 ± 85.13	85.13 ± 5.73	0.000
HS	89.68 ± 81.94	81.94 ± 5.98	0.000
LP	33.05 ± 28.27	28.27 ± 3.33	0.000
weight	42.63 ± 33.06	33.06 ± 12.17	0.000
OLA	9.42 ± 8.48	8.48 ± 1.29	0.000
LO	15.95 ± 15.32	15.32 ± 2.05	0.010
LToT	111.45 ± 108.29	108.29 ± 7.03	0.013

M*: Mean;* ***SD****: Standard Deviation*

Table 7: The most characteristic modalities for group 3

	Cla.Mod	Mod.Cla	Global	p.value
Sex=M	43.75	55.26	23.88	0.0000
Breed=Ouled_Djellal	43.75	36.84	15.92	0.0004
FC=FC_Spiral	57.14	21.05	6.97	0.0012
PC= Presence	34.88	39.47	21.39	0.0048
OC=OC_back	34.48	26.32	14.43	0.0318

***Cla/Mod** : Percentage of all individuals with this modality who fall into this class. **Mod/Cla** : percentage of all individuals in the class present this modality.*

Conclusion

The results of breeding typology highlight the different characteristics of sheep breeding at the level of the two wilayas in the west of Algeria "Tissemsilt and Tiaret" as well as the descriptive statistical study which shows the importance of this activity and the characteristics of herders in the selected regions. In the two wilayas "Tissemsilt and Tiaret", the farms surveyed are managed by breeders whose average age does not exceed 65 years. Their levels of training still manage to reach the average level. These breeders have an average experience of 20 years and rely on family labor only. Lack of land and agricultural equipment are their major problems. The majority of breeders (67%) have traditional sheepfolds. The rest of the breeders (33%) have sheds which are with concrete floors. Moreover, more than (74%) of respondents use straw as bedding. Most livestock buildings (71.76%) are ventilated by transoms, which means that all the breeders surveyed consider ventilation as a very important environmental factor in their livestock buildings. The most important source of water is underground resources (wells), the feeding and watering facilities are traditional feeders and drinkers. The farms surveyed affected herds of different sizes. Sheep from all the farms surveyed are over one year old and unrelated and are managed in an extensive to semi-intensive system. The feed in this type of farming is largely composed of pasture-based crop residues, supplemented by barley straw and fodder. Reproduction is natural, uncontrolled, and without any selection effort. The survey results show that the majority of breeders in the two wilayas (69.39%) have a prophylaxis plan that takes into account cleaning and preventive treatments (vaccination). We found a presence of great phenotypic diversity between the breeds Ouled Djellal, and Rembi. This diversity is important with a significant superiority for the weight of animals; ear length; width of the ears; chest width; height at the withers; height of the sacrum and total body length.

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Conflict of Interest:

No potential conflict of interest was reported by the authors.

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