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A COMPARATIVE STUDY OF WOOL QUALITY IN SHEEP BREEDS IN WESTERN ALGERIA

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Abstract

Our study of the wool quality in Algerian sheep breeds in western Algeria was based on the analysis of wool fineness which has been conducted by measuring the diameter of wool fibers. The data were collected from 60 samples from the the following breeds: Ouled Djellal, Hamra, Barbarine, Srandi, Daraa and Rembi. The average wool fiber diameter is 48.18 ± 39.49µm which is significantly different ($p < 0.001$) in the breeds studied. The average wool fiber diameter was 48.18 ± 39.49µm which is significantly different ($p < 0.001$) in the breeds studied, it varies from medium wool with a diameter of 28.89 ± 6.009µm in Ouled Djellal breed to coarse wool with a diameter of 74.17 ± 49.44 in Hamra breed. No significant effect ($p > 0.05$) of the sex on the wool finesse in different breeds was observed. This study is the initiation of future zootechnical study on the wool performance of different sheep breeds in Algeria by studying the wool quality.

Keywords: Sheep, Fineness, Wool, Breed, Algeria

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Introduction

The term "wool" is commonly used to indicate fibers produced by different breeds of sheep and other animal species. The wool strand is a fiber of circular section of 18 to 30 microns in diameter. Its cuticle is very resistant to physical and chemical agents. The scales that constitute it are transparent and very thin (0.3-0.5 microns). They overlap in the manner of roof tiles. They are firmly attached to the cortex. Each one makes half the turn of the fiber. All the characters of the scales give the "strand of wool" a remarkable aptitude for "felting".

The fleece is constituted by a considerable number of fibers whose characteristics are very different. The fineness of the strand is the smallness of its diameter. Combined with other qualities such as length and waviness, it constitutes the value of wool and provides to fabrics lightness, flexibility and strength. We measure exactly the fineness under the microscope, but the breeder must acquire the observation that allows a sufficient evaluation (Degois, 1970).

Also, the microscopic measure of diameters of the strands according to their profiles, the first recorded method used by Daubenton in 1977, is still used by many researchers. Indeed the international federation

of wool recommended this method in 1948 and set the rules to follow to get the best estimation of the mean of diameters (Rougeot, 1953).

Although sheep are raised in Algeria mainly for their meat, wool occupies an important place in industry and craftsmanship and this despite the production of synthetic fiber. The average annual production per capita is 1.2kg. It is usually recovered from May 15 through the use of traditional methods using "shears". The use of the mower is rare. Good mowing practice by an individual can be considered as an index of attachment to pastoralism and sheep. The marketing is currently done directly to the artisans or private collectors who plow the areas concerned after the period of the shearing (Khelifi, 1999).

The rapid estimation of the qualities of a fleece, by one or more samples, is interesting for several reasons (Charlet et al., 1953): i. It alone makes it possible to characterize a fleece for selection or heredity studies. ii. It allows to follow the influence of the environment (food, etc ...) on these characteristics. For this, we have studied for the first time the wool quality of Algerian sheep breeds (Ouled Djellal, Hamra, Srandi, Daraa, Barbarine and Rembi) by the analysis of the fineness of wool on a number of 60 samples.

Materials and Methods

Animals studied

Our work was carried out in western Algeria in four provinces with different biotopes (Tlemcen, Oran, Saida and Tiaret) in six sheep breeds (Ouled Djellal, Hamra, Srandi, Daraa, Barbarine and Rembi) during 2016/2017.

Figure 1. The national map shows the study areas.

The repartition according to breed, sex and region of the samples is presented in the following table

Table 11. Wool sampling by breed, sex and region

Region	Breed	Male	Female	Total
Saida	Hamra	5	6	11
	Barbarine	6	4	10
Tlemcen	Srandi	1	9	10
and	Daraa	5	5	10
Oran	OuledDjellal	0	9	9
Tiaret	Rembi	2	8	10
Total		**19**	**41**	**60**

Sampling

The determination of the points at which the samples must be taken to estimate the general characteristics of the fleece requires a precise knowledge of the variation of these characteristics according to the region of implantation (Charlet et al., 1953). For this study, the wool was taken at the neck. Samples taken were reserved in empty tubes. Two tubes for each individual were identified according to breed and sex.

Wool processing

The work was based on the following protocol:

1. Washing the filaments with soapy water (Wool filaments are washed with soap for at least three minutes). Washed with soda lye, the fleece can lose 50 to 70%.
2. Drying (We leave the filaments in the sun)
3. Coloring the filaments (acid and basic colorants): aqueous eosin and methylene blue.

Acids have no action on wool. This property is used to remove straws and other plant materials mixed with fleeces. These are treated with hydrochloric acid or nitric acid which attack the plant fiber and destroy it. The straw falls down like dust.

Microscopic study

The measurement was carried out undermicroscope, the observation was made in the areas where the filaments are flattened and parallel to the lamella lamellar superposition.

Many authors, Kronacher et al., (1925), Hardy (1933; 1935), Hardy et Wolf (1939), Grand-staff et Hodde (1940), Cuenca (1952),endeavored to develop methods for cross-sectioning woolen strands. Unfortunately, despite notable improvements to the cross section technique, the cuts obtained are not perfect: many strands are cut obliquely to the axis of the fiber and above all, we do not know to what extent the shape and dimensions of the section are influenced by compaction and contraction of the inclusion medium (Rougeot, 1953).

Statistical analysis

The effect of breed and sex were compared by the one-way ANOVA test followed by the Student Newman-Keuls multiple comparison test. All these data were analyzed using the statistical analysis software SPSS (version 19).

Results

Descriptive analysis

Means, standard deviations, minimum, maximum, and Variance ofthe fineness of wool in sheep breeds studied are shown in the table 2.

Table 22. Descriptive analysis of fineness of wool in sheep breeds studied

	Means	**SD**	**Variance**	**Min**	**Max**
Diameter (µm)	48.18	39.49	1559.72	20.00	250.00

Fineness variation

According to the breed

The variation of fineness of wool in the sheep breeds studied (Hamra, Barbarine, Srandi, Daraa, Ouled Djellal and Rembi) was presented in Table 3.

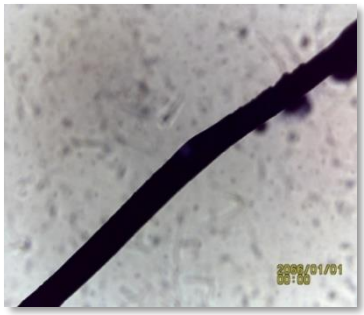

Figure 02. Wool filament of the Hamra breed

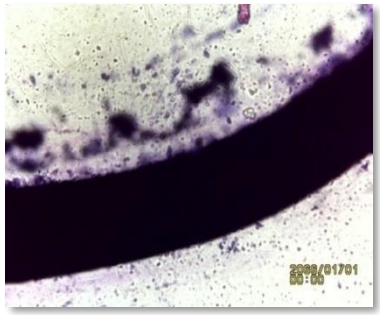

Figure 03. Wool filament of the Barbarine breed

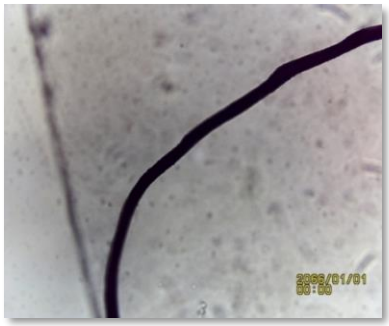

Figure 04. Wool filament of the Srandi breed

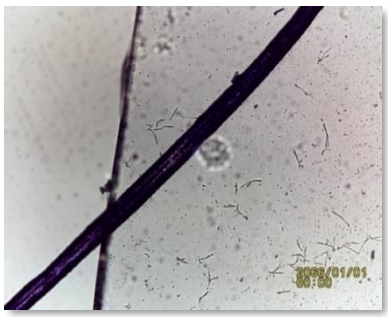

Figure 05. Wool filament of the Daraa breed

Figure 06. Wool filament of the Ouled Djellal breed

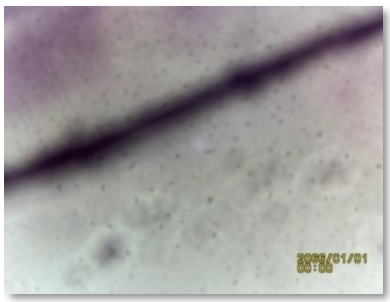

Figure 07. Wool filament of the Rembi breed

The animals studied showed significant difference ($p<0.05$) for the fineness of wool between the breeds studied with a total average diameter of 48.18 µm and maximum of 250 µm and minimum of 20 µm. The fineness in Hamra breed (12 wool fibers) is the highest (74.17 µm). While the lowest diameter is that of the Ouled Djellal (9 wool fibers) (28.89 µm).

Tableau 3. Variations of the fineness by breed.

Breed	N	Mean	Classification according to Degois, (1970)
Ham	12	74.17±49.444	Coarse
Bar	10	69.00±72.334	Coarse
Sar	11	35.45±12.933	Long
Dar	14	45.00±19.115	Coarse
OD	9	28.89±6.009	Medium
Rem	10	32.00±6.325	Long
P		*	

*Number of samples (N), Hamra (Ham), Barbarine (Bar), Srandi (Sar), Daraa (Dar), Ouled Djellal (OD), Rembi (Rem), * Significant at 0.05,*

According to the sex

The variation of fineness of wool in two sexes of sheep breeds is presented in Table 4.

The results present no significant difference in the fineness of wool between the two sexes of the sheep breeds studied (P> 0.05).

Table 4. Variations of finesse by sex

	N	Mean
Male	21	52.86±40.515
Female	45	46.00±39.278
P		ns

ns :not significant

Table 5. Presents the comparison between sheep breeds studied (Hamra, Barbarine, Srandi, Daraa, Ouled Djellal and Rembi) and other breeds in the world.

Table 05 .wool type of Algerian sheep breeds compared with other breeds in the world

Type of wool	Algerian sheep breeds studied	Moroccan and Tunisian sheep breeds	Sheep breeds in the world
Fine	-	-	- Merinos: (18 - 22 µ) - Rambouillet: (19 -25 µ) (Slen, 1958) « blood system »
Medium	OuledDjellal	-Timahdite, Béniahssen : (29-36 µ) - Sardi, Boujaad,Béni-Ghil(24 -31µ) Source www.anoc.ma (ANOC, 2011)	- New ZealandMerinos : (20 - 25µ) - Corriedale et Columbia : (22 - 34µ) - Finns et Cheviot (25 - 32µ) - Blue Faced Leicester (24 - 28 µ) - Hampshire, Shropshire, Oxford : (29 - 34 µ) - Romney : (31- 36 µ) - Targhee, Romeldale : (22 - 26 µ) - Southdown : (24 - 31 µ) - Suffolk, Dorset Horn,Montadale : (25 - 31 µ).(Slen, 1958)« blood system » - Lacaune (27,54 µ) (Angel et al., 1955)
Long	Srandi Rembi	-	Border, Leicester : (33 - 38 µ) « Blood system »
Coarse	Hamra, Barbarine, Daraa	- Sicilo-sarde, BlackofThibar (Tlimate, 1996 ; Meyer et al, 2004). Barbarine : (Khaldi, 1984 in. Bedhiaf-Romdhani, 2008).	Lincoln et Cotswold : (37 - 40 µ) « Blood system »

Discussion

Given the absence of data on the type and the wool quality in Algerian sheep breeds except the study of El-Bouyahiaoui et al., (2018) in a single breed: Tazgzawt, we made a step to know the wool performance in our breeds.The study of the wool fineness is an initiation of a work on the wool quality in Algerian sheep breeds.

Our classification has been carried out according to Degois, (1970) and compared with the classification of Bradford scaleand Blood system.

Blood system is an American classification, dating back to the introduction to the new world of merino sheep, reputed to produce the finest wool among all sheep breeds. To increase the size of the herd, the merino was crossed with other breeds already raised locally. When he was "thoroughbred", his wool was called "fine". The crossing with another race diminished the fineness, and according to the degree of crossing, one had the qualities "demi-sang", "3/8 of blood", "quarter of blood", etc ... (Grassart, 2010)

According to our results, the wool of the sheep breeds studied is coarse with an average diameter of 48.18 µm. It is coarse in Hamra breed (74.17 ± 49.444 µm); Barbarine (69.00 ± 72.334 µm) and Daraa (45.00 ± 19.115 µm), long in two breeds:Srandi (35.45 ± 12.933 µm) and Rembi (32.00 ± 6.325 µm) and medium in Ouled breed Djellal (28.89 ± 6.009 µm).

The wool type in Ouled Djellal breed was medium (The medium diameter fibers with a medium to long staple length. They are the most versatile of all the wool types), it was similar to Moroccan sheep breeds:Sardi, Timahdite, BeniGuil and Boujaâd (Boujenane, 1994 ; ANOC, 2011), dairy ewes of Lacaune breed and Ile de France breed (Angel et al., 1955) and other sheep breeds in the world : New Zealand Merinos (20 - 25 µ); Corriedal and Columbia (22 - 34 µ); Finns and Cheviot (25 - 32 µ); Blue Faced Leicester (24 - 28 µ); Hampshire, Shropshire and Oxford (29 - 34 µ); Romney (31- 36 µ); Targhee and Romeldale : (22 - 26 µ); Southdown : (24 - 31 µ) ; Suffolk, Dorset Horn andMontadale : (25 - 31 µ)(Slen, 1958) (Blood system : 44 à 70 On the Bradford scale).

The Rembi and Srandi breeds have long wool, with a larger average fiber diameter and long staple. It is easy to spin and very hard wearing. Long wool is lustrous and can have a silky feel. This wool was similar to that of the breeds Border and Leicester : (33 - 38 µ) (40 à 46 On the Bradford scale).

The Hamra, Barbarine and Daraa breeds have coarse wool, it was similar to the Tunisian breeds: Sicilo-sarde, BlackofThibar and Barbarine (Tlimate, 1996; Meyer et al., 2004; Bedhiaf-Romdhani, 2008) and Lincoln and Cotswold : (37 - 40 µ)(36 à 40 On the Bradford scale).

The wool of Daraa breed is used for the manufacture of Bernousse, this breed looks like the Black of Thibar; both breeds have black fleece with black head and legs (Djaout et al., 2017).

Conclusion

The absence of a study on the wool quality in Algerian sheep breeds requires a scientific approach to obtain a better knowledge of our local breeds performances.

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