

Evaluation of thickness and color of wool in primiparas of Żelaźnieńska and Corriedale Sheep

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Abstract: *Evaluation of thickness and color of wool in primiparas of Żelaźnieńska and Corriedale Sheep.* The study was conducted on 19 samples of wool of Żelaźnieńska Sheep and 28 samples of wool of Corriedale Sheep. The thickness of fibre and rendement were examined. The color of wool were measured by colorimetric technique. Basis of studies found a wider range of thickness fibre of Corriedale Sheep and narrow range of thickness fibre of Żelaźnieńska Sheep compared with the standards. Particular importance is to eliminate from the breeding primiparas Corriedale Sheep characterized by nominal thickness of fibers 25 μm and less. Average nominal thickness of the fibers were consistent with the cited standards. In Żelaźnieńska Sheep breed obtained, positive and highly significant correlation coefficients of rendement and thickness to brightness (L^*) and found a significant correlation coefficient between rendement and the share of yellow color (b^*). In Corriedale Sheep found positive and significant statistical correlation coefficient between the brightness (L^*) and nominal thickness. Correlations between traits characterizing the color of wool, and in particular the measurement of brightness (L^*), to features such as the nominal thickness of the fibers, indicate different trends occurring in Żelaźnieńska Sheep and Corriedale Sheep.

Key words: sheep, wool, thickness of fiber, color

INTRODUCTION

Sheep's wool had a large role in the production, in times of the planned economy (GUS database from 2013).

Currently, due to a significant decrease in its economic meaning, there is no pay attention to quality of wool in breeding work. Due to the fact that in genetic resources program many breeds of sheep are protected, it is interesting to check the thickness of its wool and compare the obtained results with the standards described by Wójcikowska-Soroczyńska et al. (1993). That could be useful to track possible changes of wool. The objective aim of protecting native breeds of sheep is to keep quantitative and qualitative usability of animals (Krupiński 2012). That helps to compare possible changes and allows the adjustment of direction of breeding work.

Therefore, it was decided to investigate the thickness, color and rendement of the wool of Corriedale Sheep and Żelaźnieńska Sheep. Due to need for free interpretation of the results, the samples of wool were collected during the shearing from 2 years old ewes, before their first birth Wójcikowska-Soroczyńska et al. (1993).

MATERIAL AND METHODS

The research material consisted of samples of wool from primiparas of Żelaźnieńska

Sheep (n = 19) and Corriedale Sheep (n = 28). The sheep were from a private farm located near Poddebice and from Research Farm of Sheep and Goats – WULS-SGGW in Żelazna, both farms located in Łódź Voivodeship. The main subject of studies was the wool taken from primiparas of both breed during shearing. It took place in January four weeks before lambing. Wool samples were collected from the side part of the animal (center of the last rib) and used to determine the thickness and color of the fibers. Then the wool has been washed with a detergent in water at a temperature not higher than 40°C. The wool was thoroughly dried and removed from it all impurities. The next steps were done in laboratory. Loosening of fibers was performed on samples weighing 2.5 g derived from each of the tested sheep.

Measurement of content of impurities consisted of weighting the wool samples before washing and after washing. During washing all impurities (plants, sand, dust and lanolin) were removed.

The rendement and level of impurities were determined. Both parameters were expressed as percentage. Measuring the thickness of the wool fiber was carried out using the method of Air-Flow (SGS 2011). The device used for measuring was the production of CLM Components LTD, and the measurement has been done according to following standard: IWTO-6-98 (2010). The results were expressed in nominal value (μm). The results of thickness measurements of wool were divided into groups (μm):

- Żelaźnieńska Sheep: 24–26.9; 27.0–28.9; 29.0–30.9; 31.0–32.9; 33.0–34.9; 35.0–36.9;
- Corriedale Sheep: 23.0–24.9; 25.0–26.9; 27.0–28.9; 29.0–30.9; 31.0–32.9; 33.0–34.9.

The color of wool was examined using device Chroma Mater CR-40 (Konica Minolta Ltd.). The color was measured using the system of color space $L^*a^*b^*$ (L^* – brightness, a^* – share of the red color, b^* – share of the yellow color). The results were statistically analyzed within each breed separately using the IBM SPSS Statistics 21 software. The statistical model included the group of thickness of wool. Correlation coefficients between the rendement and nominal thickness of fibers and wool color measurement were calculated. Results of studies are presented in charts and tables.

RESULTS AND DISCUSSION

The results of measurement of wool for both breeds are presented in Table 1. In both breeds the average thickness of wool were consistent with the model described by Wójcikowska-Soroczyńska et al. (1993). However, the rendement in Żelaźnieńska Sheep was higher and the content of impurities was lower compared to the model. In case of Corriedale Sheep rendement and the content of impurities consisted with described model. Range of thickness of wool is presented in Figures 1 and 2. In both breeds, the class of thickness of wool showed a highly significant effect on the

TABLE 1. Wool measurements of primiparas Żelaźnieńska Sheep and Corriedale Sheep

Specification		Żelaźnieńska Sheep Primiparas	Corriedale Sheep Primiparas
n		19	28
Nominal thickness of fiber (μm)	\bar{x}	30.95	29.96
	SE	0.75	0.45
Rendement (%)	\bar{x}	84.57	66.48
	SE	2.14	1.03
Impurities (%)	\bar{x}	15.43	33.52
	SE	2.14	1.03
Color of wool			
L*	\bar{x}	82.46	79.16
	SE	0.48	0.43
a*	\bar{x}	-0.23	-1.42
	SE	0.11	0.11
b*	\bar{x}	14.29	12.54
	SE	0.51	0.72

nominal thickness traits (Niżnikowski and Rant 1997, Niżnikowski et al. 1997, 1998, 2005). The range of the size nominal thickness of wool showed the highest number of samples in the range of 29.0–30.9 in Żelaźnieńska Sheep (Fig. 1). However, the nominal thickness value range was much narrower than that described in the standard (Wójcikowska-Soroczyńska et al. 1993). That indicates to conduct breeding work towards expanding the range of fluctuations of the nominal thickness, even at the expense, thinning of that thickness of fiber. The distribution of the occurrence of a nominal thickness of the fibers had upward trend for the frequency of fibers in the higher thickness class for Corriedale Sheep. In Corriedale Sheep breed correction of nominal thickness value should be done with keeping the average values on

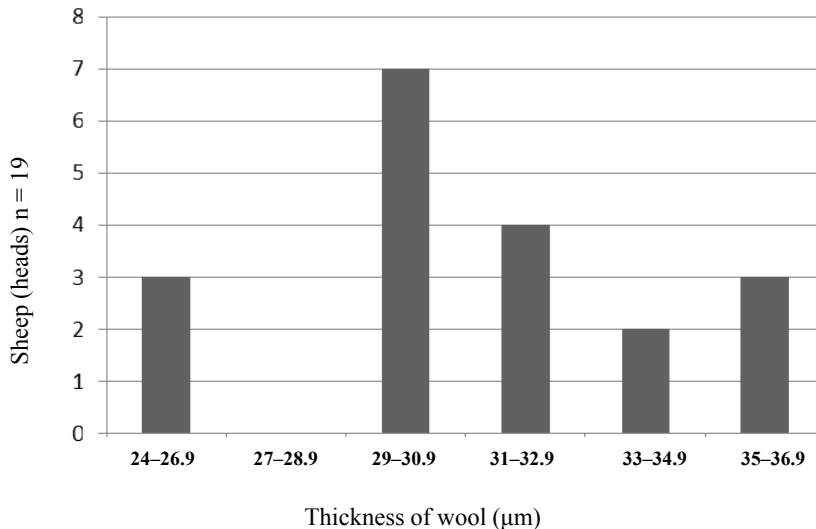


FIGURE 1. The number of Żelaźnieńska Sheep in fiber thickness ranges ($P \leq 0.01$)

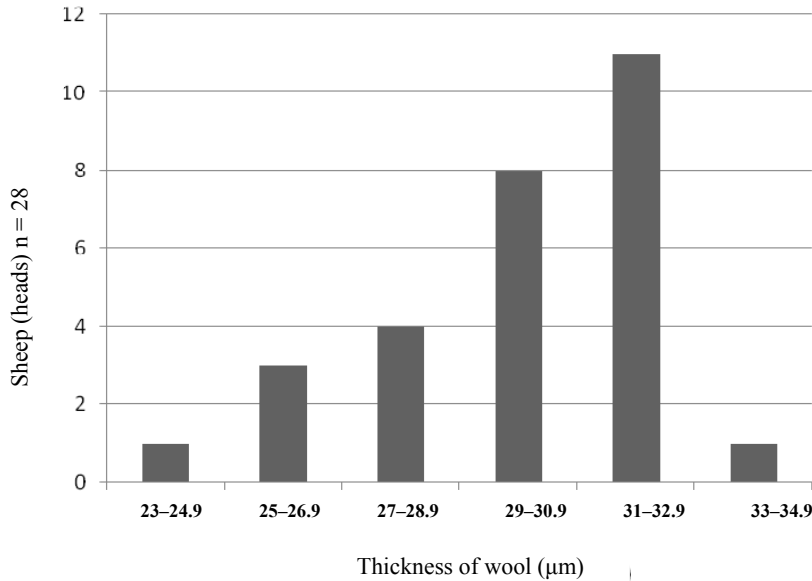


FIGURE 2. The number of Corriedale Sheep in fiber thickness ranges ($P \leq 0.01$)

the current level. Animals that were characterized by very low values at the nominal thickness of 25 μm and less should be eliminated. The results of the assessment of color wool measured colorimetric technique were very interesting (Table 1). In *Żełaźnieńska* Sheep noted the high level of brightness (L^*) at small values of green color (a^*) and high values for the yellow color (b^*). Corriedale Sheep have also high level of brightness of the color, but the share of green color was higher but yellow color was lower.

It is difficult to comment on these results due to the fact that the colorimetric technique so far in the national survey was not used before. Table 2 presents the correlation coefficients between the technological features of wool and color within breed. Particularly impor-

tant were highly statistically significant correlations between the brightness of the color (L^*) and rendement, as well as between the brightness of the color and the nominal thickness in *Żełaźnieńska* Sheep. There were positive and achieve high value (Niżnikowski and Rant 1997, Niżnikowski et al. 1997, 1998, 2005)

The correlation coefficient between rendement and yellow color was statistically significant but the value was lower and negative. The obtained results indicate the possibility of using colorimetric techniques in the evaluation of the quality characteristics of wool from *Żełaźnieńska* Sheep. In Corriedale Sheep obtained only a significant and negative correlation between the nominal thickness and the brightness (L^*). That indicates the different

TABLE 2. The correlations between the measurements of the color and the wool traits in Żelaźnieńska Sheep and Corriedale Sheep

Specification	Żelaźnieńska Sheep (n = 19)			Corriedale Sheep (n = 28)		
	L*	a*	b*	L*	a*	b*
Rendement (%)	0.970 ^b	-0.270	-0.490 ^a	-0.013	0.086	0.207
Nominal thickness of fiber (µm)	0.950 ^b	-0.120	-0.410	0.434 ^a	-0.060	-0.069

^a p ≤ 0.05, ^b p ≤ 0.01.

trends in the relationship of color wool with a nominal thickness in comparison with the values of this indicator identified in Żelaźnieńska Sheep. Summing up the correlation coefficients and the level of statistical significance can be observed the possibility of using a colorimetric technique in the assessment of the quality characteristics of wool from Żelaźnieńska Sheep inspired by these results requires further research in this area.

CONCLUSIONS

The obtained results lead up to following statements and conclusions:

1. A wider range of nominal thickness in Corriedale Sheep, and too narrow in Żelaźnieńska Sheep compared with the standards described by Wójcikowska-Soroczyńska et al. (1993) which requires correction by the further breeding work. Elimination of the breeding primiparas Corriedale Sheep characterized by a nominal thickness of fiber of 25 µm and less, should be regarded as particularly important. The average nominal thickness of the fibers was within the cited standards.

2. Very high values for the brightness of the color measured by the colorimetric method in both breeds.
3. Positive and highly significant correlation coefficients of rendement and thickness to brightness (L*) and found a significant correlation coefficient between rendement and the share of yellow color (b*) in Żelaźnieńska Sheep.
4. Positive and significant statistical correlation coefficient between the brightness (L*) and nominal thickness in Corriedale Sheep.
5. Correlations between traits characterizing the color of wool, and in particular the measurement of brightness (L*) to features such as the nominal thickness of the fibers, indicate different trends occurring in Żelaźnieńska Sheep and Corriedale Sheep. The correlations should be used to assessing the productive value and developed through further research, separately for each breed.

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- Streszczenie:** Ocena grubości i barwy wełny przystępek owcy żelaźnieńskiej i corriedale. Badania przeprowadzono na 19 próbach wełny owcy żelaźnieńskiej i 28 corriedale pobranych podczas strzyży wykonanej na przystękach przeznaczonych do dalszej hodowli. Ocenie poddano cechy grubości włókien i rendement oraz barwy wełny mierzonej techniką kolorymetryczną. Na podstawie przeprowadzonych badań stwierdzono szerszy przedział grubości nominalnych u owiec corriedale oraz zbyt wąski u owiec żelaźnieńskich w porównaniu z przyjętym wzorcem, co wymaga korekty poprzez pracę hodowlaną. Za szczególnie ważne uznać należy wyeliminowanie z hodowli przystępek corriedale charakteryzujących się grubością nominalną włókien 25 μm i mniej. Średnie grubości nominalne włókien mieściły się w standardach zgodnych z cytowanym wzorcem. Uzyskano również wysokie, dodatnie i wysoko istotne współczynniki korelacji rendement i grubości nominalnej z pomiarem stopnia jasności (L^*) oraz istotny współczynnik pomiędzy rendement a udziałem barwy żółtej (b^*) u owiec żelaźnieńskich oraz dodatni i istotny statystyczny współczynnik korelacji pomiarem stopnia jasności (L^*) a grubością nominalną u owiec corriedale. Związki korelacyjne pomiędzy cechami charakteryzującymi barwę wełny, a w szczególności pomiarem stopnia jasności (L) a cechami np. grubości nominalnej włókien, wskazują na odmienne tendencje występujące u owiec żelaźnieńskich i corriedale.

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