

CHARACTERISTICS OF WOOL FROM PODHALE ZACKEL SHEEP

Aldona Kawęcka¹, Anna Kosiek², Jacek Sikora¹

¹ National Research Institute of Animal Production in Balice, Poland

² University of Agriculture in Kraków, Poland

Abstract. The experiment used Podhale Zackel ewes maintained in a flock included in the genetic resources conservation programme for this breed in the Podhale area. Staple length, wool yield and wool thickness were measured. Average double-clip wool yield was 1.9 kg with staple length of 15.6 cm. Wool thickness was measured by microprojection using a lanameter. The wool of Zackel sheep was classified as mixed thick wool having three fractions in staple. Average thickness was 26 μm for down hair, 50.2 μm for the medium fraction, and 68.6 μm for the guard fraction. In the wool flock, the down and guard fraction exceeded 40%, and the medium fraction was 17.5%. The results obtained show that the wool of Zackel sheep differs in both fibre thickness and weight proportion of fractions. The present Podhale Zackel differs from the old-type Zackel in higher wool yield and staple length, and greater content of down fibres.

Keywords: Podhale Zackel, sheep, wool

INTRODUCTION

Podhale Zackel sheep, which have been maintained in the Podhale, Podkarpacie and Beskidy regions for centuries, are very well adapted to harsh climatic conditions of the mountain and foothill area. The breed is characterized by high resistance to disease, longevity and strong mothering and herding instinct. The characteristic structure of the open wool coat of considerable density, with long fleeces falling on both sides of the trunk, provides excellent protection against the adverse effects of long rain. Their coat colour is white, but dark spots may sometimes appear around the eyes and at the mouth and ear end.

During the interwar period and in the 1950s, Podhale Zackels were improved by Friesian rams and Transylvanian Zackels [Jełowicki 1960]. Friesian rams improved wool yield and characteristics, and Transylvanian Zackels not only improved wool and body conformation traits, but also helped to maintain their ability to adapt to mountain conditions.

Corresponding author – Adres do korespondencji: dr inż. Aldona Kawęcka, Department of Animal Genetic Resources Conservation, National Research Institute of Animal Production, Krakowska 1, 32-083 Balice, Poland, e-mail: akawecka@izoo.krakow.pl

The improvement of Podhale Zackel sheep resulted in the creation of Polish Mountain Sheep and partial displacement of the genetic potential of the original Zackel. Today, as a separate breed, Podhale Zackel has been included in the genetic resources conservation programme, which has been implemented since 2008. The programme's breed standard specifies wool traits such as wool grade, character, staple length and yield.

The aim of the study was to characterize selected parameters of wool productivity in Podhale Zackel sheep from a flock taking part in the genetic resources conservation programme for this breed.

MATERIAL AND METHODS

The experiment used samples of wool from 32 randomly selected Podhale Zackel ewes, raised on a private farm in the Podhale region.

Wool measurements were made in July on a half-year's growth. Wool performance traits (staple length, yield) were determined and wool samples were collected for analysis of thickness. Staple length was measured on the side at shoulder height, accurate to 0.5 cm. Wool yield was determined by weighing shorn fleece to the nearest 10 g.

Fibre thickness was analysed on samples of wool clipped from the skin, at one-third of trunk height near the shoulder. Fibre thickness was subjected to laboratory analysis and percentage of individual fractions was determined according to the method reported by Doberczak [1954]. Taking fibre length and thickness as the criterion, wool coat was divided into down, medium and guard fractions. Thickness measurements were made on washed wool for each fraction separately. All fractions in each sample were weighed to determine their proportion in wool staple.

Wool thickness was determined by microprojection using an MP3 lanameter (Polish Optical Plant). The preparations were made as follows: about 1 mm fibre lengths were cut at one-third of the base of hair, placed in a drop of paraffin oil and spread evenly with a dissecting needle on the object glass. The preparation was covered with a cover glass and fibre thickness was read from the lanameter display using a millimetre scale. Measurements were done accurate to 1 mm, which corresponds to 2 μm at 500x magnification used to measure wool thickness. All fractions were weighed in each sample, and 600 fibre measurements were made for each fraction.

The calculations were performed using the formulas provided by Doberczak [1954]. For the other characteristics of wool, mean values and standard deviation were calculated, and minimal and maximal values were provided.

RESULTS AND DISCUSSION

The analysed material was found to contain mixed wool having three (down, medium, and guard) fractions in staple. Mean fibre thickness and fraction percentages are shown in Tables 1 and 2. Average thickness was 26.03 μm for down hair, 50.21 μm for medium

fraction, and 68.62 μm for guard fraction. In the wool flock, the down fraction formed 40.64%, the medium fraction 17.53%, and the guard fraction 41.89%. All fractions varied considerably in both thickness and proportion in wool flock. Coarse hair occurred in 29 of the wool samples analysed and its content averaged 10.29% (from 0.39% to 28.61%).

The highest variation in both hair thickness and content occurred in the guard fraction, and the lowest in the medium fraction.

Table 1. Mean fibre thickness and proportion of fractions in three-fraction staple

Tabela 1. Średnia grubość włókien i udział ilościowy frakcji zespołu włosowego trójfrakcyjnego

Traits Cechy	Down fraction Fracja puchowa	Medium fraction Fracja przejściowa	Guard fraction Fracja przewodnia
Wool thickness, μm Grubość wełny, μm			
M	26.03	50.21	68.62
SD	2.47	1.89	3.18
min.–max	22.20–32.66	46.86–54.92	61.20–74.60
Weight proportion, % Udział wagowy, %			
M	40.64	17.53	41.89
SD	4.59	2.69	5.91
min.–max	31.23–50.59	11.03–22.01	31.13–54.86

M – mean – średnia.

SD – standard deviation – odchylenie standardowe.

Table 2. Proportion of coarse fibres in the guard and medium fractions and the mean value for all fractions, %

Tabela 2. Udział włókien rdzeniowych we frakcji przewodniej i przejściowej oraz średnia dla wszystkich frakcji, %

Weight proportion, % Udział wagowy, %	Medium fraction Fracja przejściowa	Guard fraction Fracja przewodnia	Mean Średnia
M	2.50	29.81	10.29
SD	2.99	23.00	7.32
min.–max	1.70–7.12	1.95–89.83	0.39–28.61

According to the standard provided by Jełowicki [1960] and adopted by the breed conservation programme [Program ochrony rasy, 2008], the down hair of Zackel's wool should be of grade A/B (24 to 29 μm), and the guard fraction of grade D-D/E-E (37 to 60 μm). Values close to the standard were characteristic of the wool from Podhale Zackels farmed in Leśnica [Jełowicki et al. 1961], where hair thickness averaged 25.9 μm for down hair and 63.1 μm for guard hair. It should be stated that in terms of down hair thickness, the hair coats of the sheep studied resemble the down fraction of the Podhale Zackel that was farmed 50 years ago, whereas the coarse hair fraction is thicker at 68.62 μm on average.

Comparison of hair thickness in different fractions of the analysed wool samples with wool thickness data reported for Polish Mountain Sheep by Laudowicz [1988] shows that

in the analysed material, down hair was thinner and conformed to the standard only in 28% of the animals. More correct values were obtained for the guard fraction, because as much as 81% of the ewes had fibre thickness corresponding to the standard, while the other sheep had thicker fibres.

In Polish Mountain Sheep, Wójcikowska-Soroczyńska et al. [1992] demonstrated greater thickness of the down and medium fractions (33.7 and 58.6 μm , respectively) and similar thickness of the guard fraction (67.8 μm) to that obtained in our study.

In a study with wool from Coloured Polish Mountain Sheep, Woźniak et al. [2007] found a greater thickness of the down and medium fibres (29.56 and 56.28 μm , respectively), while guard hair thickness (66.97 μm) was only slightly different from that in our study. Kawęcka and Kosiek [2010] showed that the fibres of three-fraction staples from Coloured Polish Mountain Sheep had similar thickness parameters for individual wool fractions as those obtained for Podhale Zackel.

Percentage of fibres from different flock fractions in the analysed animals also showed differences. For over half of the material studied (17 staples), down hair content was higher than guard hair content and reached 50.6%, while the coarse fraction predominated in the rest of the material, reaching 54.8%. The smallest differences were found in the medium fraction. The high content of medium fibres, which are a type of guard fibres formed from modified external fibres, is characteristic of Zackels with a greater proportion of blood from fine-fleeced sheep [Kączkowski 1928, Męciński 1938]. In our study, in 22% of sheep, the proportion of medium fraction ranged from 11 to 14%. In Zackel Sheep raised in the Hutsul region before World War II, medium fibres formed 0.2 to 2.6% of the flock [Męciński 1938].

The estimated weight ratio of individual fractions in the analysed staples of Podhale Zackel is considerably different from the findings of Jełowicki et al. [1961], who reported the guard to down fraction ratio to be 1.5:1. In our study this ratio was 1.03:1, which indicates better quality cover, because it is accepted that the greater proportion of the down fraction means that the cover is of better quality. Meanwhile, a study with wool from Polish Mountain Sheep [Wójcikowska-Soroczyńska et al. 1992] showed a lower proportion of the down fraction (38.2%) and a higher proportion of the guard fraction (43.5%), while the proportion of the medium fraction was similar to that found in our study. Likewise, in Coloured Polish Mountain Sheep, Woźniak et al. [2007] showed a lower proportion of the down fraction (29.86%) and a higher proportion of the medium and guard fractions (20.16 and 49.98%, respectively). A study with wool from Coloured Polish Mountain Sheep [Kawęcka and Kosiek 2010] demonstrated a similar percentage of individual fractions as in Podhale Zackels, with a slight advantage of the guard fraction.

Of the 32 samples analysed, 29 contained coarse hair whose content averaged 10.29% (from 0.39 to 28.61%). The Podhale Zackel standard reported by Jełowicki [1960] stated that the cover should contain no more than 15% of coarse hair. A slightly higher proportion of coarse hair (18.4%) was reported by Jełowicki et al. [1961]. In our study, only 5 samples failed to meet this requirement.

The data on staple length and yield of wool are given in Table 3. The mean yield and staple length of the wool from the Podhale Zackel sheep studied conformed with the standard specified for Polish Mountain Sheep [Laudowicz 1988], but exceeded the values re-

ported by Jełowicki [1960], Jełowicki et al. [1961] and the conservation programme [Program ochrony... 2008] for Podhale Zackel sheep, according to which the annual yield of greasy wool from the ewes should be 3 kg, with guard hair length of 25 cm.

Table 3. Yield and staple length of wool
Tabela 3. Wydajność i wysadność wełny

Traits Cechy	Yield of wool, kg Wydajność wełny, kg	Staple length, cm Wysadność wełny, cm
M	1.927	15.58B
SD	0.378	2.398
min.–max	1.05–1.92	11.0–20.0

CONCLUSIONS

The wool of Podhale Zackel sheep is a mixed thick wool having three fractions in staple, a high proportion of guard hair, and a low proportion of the medium fraction. The considerable differences in thickness between down and coarse fibres are evidence that this wool is of lower quality, because the quality of wool increases with increasing thickness of internal hair and decreasing thickness of external hair.

The results obtained indicate that the wool from Podhale Zackel differs considerably in terms of fibre thickness, weight ratio of fractions, and content of coarse fibres. This shows that this group is not consolidated enough. Although the present Podhale Zackel differs from the old-type Zackel in yield of wool, staple length and higher content of down fibres, the thickness of these fibres resembles the old-type Zackel more than Polish Mountain Sheep.

As regards wool performance traits of the Podhale Zackel almost 50 years ago, traits such as staple length and yield of wool are higher today. However, the staples of present-day Zackels vary greatly and fail to meet the standard criteria. Therefore, the recommendation of Jełowicki et al. [1961] to improve Podhale Zackel sheep through efficient selection of animals for mating together with improvement of management, care and feeding conditions, is still valid. It seems, however, that after many years of neglect, it will be possible to restore the population of this sheep breed and to maintain the pool of valuable genes responsible for traits important from the breeding perspective, such as health and resistance to harsh environmental conditions of the mountains and foothills.

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CHARAKTERYSTYKA WEŁNY CAKŁA PODHALAŃSKIEGO

Streszczenie. Badania przeprowadzono na maciorkach cakła podhalańskiego, utrzymywanych w stadzie objętym programem ochrony zasobów genetycznych tej rasy na terenie Podhala. Analizowano cechy użytkowości wełnistej: wydajności, wysadności i grubości wełny. Średnia wydajność wełny w odroście półrocznym wynosiła 1,9 kg, natomiast wysadność 15,6 cm. Grubość wełny oznaczono metodą mikroprojekcyjną za pomocą lanometru. Wełna cakła należy do wełn mieszanych grubych, charakteryzujących się występowaniem trzech frakcji w zespole włosowym okrywy. Średnia grubość włosów puchowych wynosiła 26 μm , frakcji przejściowej – 50,2 μm , a frakcji przewodniej – 68,6 μm . Udział frakcji zarówno puchowej, jak i przewodniej w kosmyku wynosił ponad 40%, a frakcja przejściowa stanowiła 17,5%. Dzisiejszy cakiel podhalański różni się od cakła prymitywnego dawnego typu większą wydajnością i wysadnością wełny oraz większą zawartością włókien puchowych.

Słowa kluczowe: cakiel podhalański, owce, wełna

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