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Characteristics of selected parameters of wool from modern Świniarka sheep

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The aim of the study was to determine selected traits of the coat of modern Świniarka sheep from a flock included in the genetic resources conservation programme for this breed. Four types of hair coat were found: staples with one, two and three fibre types and uniform wool with isolated coarser hairs. Over 60% of the sheep had staples with two fibre types (down and coarse hair). Down hair, consisting of short, fine hairs, had an average thickness of 22.6 µm, while coarse hair was on average 45.3 µm thick. On average, down hair accounted for 78% and coarse hair 22%. The external hair contained medullated and kemp fibres. The staples with three fibre types were found in 4 ewes. The average thickness was 20.8 µm for down hair, 34.2 µm for mid-type hair and 47.9 µm for coarse hair. The average lock of wool consisted of 66% down hair, 9.5% mid-type hair and 24.4% coarse hair. Medullated hair was found in all wool samples in the external fraction, and kemp hair in three samples. Uniform wool was found in 5 ewes and its thickness averaged 23.27 µm. It was concluded that in terms of wool quality, Świniarka sheep raised in Chorzelów represent an improved type that differs from the primitive Świniarka sheep. The staples did not differ substantially in terms of fibre thickness, while the high down content is indicative of improved wool.

KEY WORDS: sheep / Świniarka sheep /wool

The Świniarka is a native breed of sheep (phot. 1 and 2) which was present in nearly all of Poland and was the starting material for the creation of later, noble types of crossbred sheep. Świniarka sheep were a very diverse population in terms of both body type and wool characteristics. The colouring of these animals was usually white, although black, brown and spotted individuals occurred as well. In the Świniarka standard, contained in the Genetic Resources Protection Programme for this breed [9], the wool coat is described

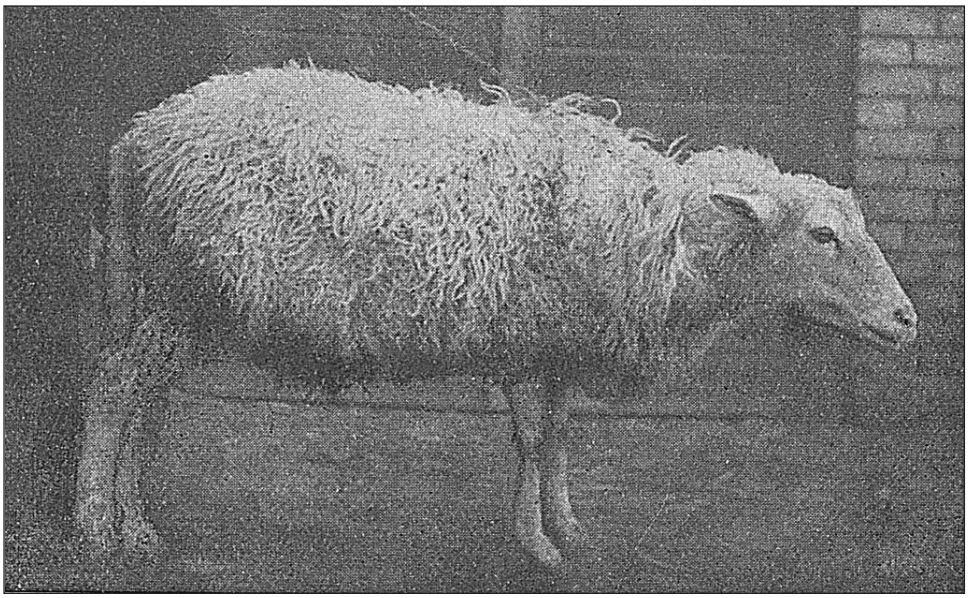

Photo 1. A Świniarka sheep from a farm in the vicinity of Suwałki (phot. S. Greulich [7])

Photo 2. A Świniarka ewe from the Experimental Farm in Chorzelów (phot. A. Kawęcka)

as mixed, open, loose and sparse, consisting of down, mid-type and medullated fibres, which form conical locks with pointed ends formed of long medullated fibres, and a base of intermediate width with short and generally sparse down hair. A share of 'kemp' fibres is permissible in more primitive individuals. The annual yield of greasy wool from an adult sheep is about 3 kg in rams and 2 kg in ewes, and the staple length of the wool may exceed 18 cm. Due to the tendency of the wool to felt, shearing is carried out twice a year.

The aim of the study was to determine wool quality on the basis of selected parameters of the wool coat of Świniarka sheep in a flock implementing the Genetic Resources Protection Programme for this breed.

Material and methods

The material consisted of wool samples taken from 30 randomly selected Świniarka ewes aged 2-3 years, kept in a flock belonging to the Experimental Station of the National Research Institute of Animal Production in Chorzelów. Samples of hair clusters were collected and the staple length was measured on six month's growth, before shearing. The wool was collected from the side of the trunk, cut close to the skin. Staple length was measured on the side of the animal at the height of the shoulder blade, to within 0.5 cm. Wool yield was determined by weighing the sheared fleece to within 10 g.

The thickness of the wool was determined by the microprojection method using an MP3 lanameter from Polskie Zakłady Optyczne. Laboratory measurements of the hair thickness were carried out on washed wool. Due to the difficulty of separating the fractions, at least 400 hairs per sample were measured and the proportions of fibre fractions clearly differing in thickness were determined. Fibre thickness was measured at the base of the lock, in the place where all types of hair are present. Microscope slides were prepared as follows: segments of the fibres of about 1 mm were cut and placed in a drop of paraffin oil, which was distributed uniformly on the slide with a dissecting needle. The specimen was covered with a cover glass and the fibre thickness was read on the lanameter screen using a millimetre scale [2].

The mean thickness was calculated using the following formula:

$$M = (A - \lambda) + F_1 \times \lambda$$

where:

$F_1 = S_2/S_1$

S_1 – sum of frequencies

S_2 – first cumulative sum

A – midpoint of the lowest class expressed in μm

λ – class range equal to 2 μm

For staple length and wool yield, means (M) and standard deviation (SD) were calculated and minimum (min.) and maximum (max.) values were given.

Results and discussion

Data on staple length and wool yield are shown in Table 1. The average wool yield in the six-month growth of wool in the ewes was 0.87 kg, varying from 0.39 kg to 1.38 kg, and the mean staple length was 10.4 cm (from 6 cm to 13 cm). The wool yield of the sheep in the six-month growth was not very high, and was similar to the values reported by Śliwa [11]. The staple length was in line with the standard contained in the Genetic Resources Protection Programme [4, 9].

Table 1
Yield and staple length of wool

Specification	Yield of wool (kg)	Staple length (cm)
Number of animals	n = 30	
M	0.87	10.40
SD	0.24	1.76
min. – max.	0.39 – 1.38	6 – 13

M – mean
SD – standard deviation

Four types of hair coat were observed in the material: clusters of mixed wool comprising two or three fractions, staples of uniform wool, and staples of uniform wool with isolated coarse hairs.

The wool coat comprising two fractions, i.e. a down hair fraction and an outer fraction of coarser hair, was represented in the highest numbers. This type of coat was found in 19 sheep, which was 63% of the population tested. The down fraction was composed of short, thin hairs with a mean thickness of 22.64 μm, while the mean thickness of the hairs of the outer fraction was 45.31 μm. The down hair fraction accounted for 77.7% on average, and the guard hair fraction made up 22.2% (Table 2). In 84% of the sheep with two-fraction wool, medullated fibres were present in the guard hair, constituting 3.91% on average, while kemp hair was observed in 13 sheep, accounting for 1.04% on average (Table 3).

A hair coat composed of three fractions was found in only 4 sheep, which was 13% of the population. The mean thickness of the hairs of the down fraction was 20.8 μm, that of the mid-type hair was 34.17 μm, and the thickness of the outer fraction was 47.90 μm.

Table 2
Mean fibre thickness and proportion of fractions in two-fraction wool coat

Specification	Down fraction	External fraction
Number of samples	n = 19	
Wool thickness (μm)		
M	22.64	45.31
SD	2.07	3.54
min. – max.	18.64 – 26.96	39.10 – 51.90
Proportion of fibres (%)		
M	77.78	22.22
SD	6.23	6.23
min. – max.	62.94 – 85.68	14.32 – 37.06

M – mean
SD – standard deviation

Table 3
Proportion of medullated fibres in the external fraction

Specification	Medullated fibres	Kemp fibres
Number of samples	n = 16	n = 13
M	3.91	1.04
SD	2.15	0.81
min. – max.	1.12 – 7.83	0.47 – 3.41

M – mean
SD – standard deviation

These values were somewhat lower than those given in the breed standard [9]. The range of fibre thickness in the conservation programme was 22-24 μm for the down fraction, 39-45 μm for the mid-type hair, and 47-53 μm for the medullated fibres. The mean proportion of the down fraction in the locks was 66.01%, while the proportions of mid-type hair and medullated fibres were 9.56% and 24.43%, respectively (Table 4). In all samples of the outer wool fraction, medullated fibres were present in numbers not exceeding 5%, and in three samples kemp hairs were observed, constituting slightly under 1% (Table 5).

Table 4
Mean fibre thickness and proportion of fractions in three-fraction wool coat

Specification	Down fraction	Mid-type fraction	External fraction
Number of samples		n = 4	
Wool thickness (μm)			
M	20.80	34.17	47.90
SD	1.07	2.89	2.29
min. – max.	19.34 – 21.84	30.32 – 37.20	45.3 – 50.2
Proportion of fibres (%)			
M	66.01	9.56	24.43
SD	10.95	1.80	10.17
min. – max.	55.87 – 80.92	8.00 – 11.24	11.07 – 32.89

M – mean
SD – standard deviation.

Table 5
Proportion of medullated fibres and kemp fibres in external fraction in three-fraction wool coat

Specification	Medullated fibres	Kemp fibres
Number of samples	n = 4	n = 3
M	4.35	0.94
SD	3.46	0.49
min. – max.	1.91 – 9.40	0.63 – 1.5

M – mean
SD – standard deviation

The next group comprised sheep with uniform wool with isolated coarser hairs. This type of fleece was observed in 5 ewes, which was 16.7% of the population. The uniform hair was dominated by thin fibres whose mean thickness did not exceed 23 μm, with isolated fibres of over 40 μm accounting for about 8% (Table 6). Medullated fibres and kemp fibres were present in two wool samples (Table 7).

A uniform hair coat was found in two ewes, which was 6.67% of the population. Its mean thickness was 23.27 μm. One sample contained medullated fibres in the amount of 2.45%, but no kemp fibres were noted (Table 8).

Table 6
Mean fibre thickness and proportion of fractions in uniform wool with isolated coarse hairs

Specification	Uniform wool	Isolated coarse hairs
Number of samples	n = 5	
Wool thickness (μm)		
M	22.42	41.82
SD	2.41	3.13
min. – max.	19.82 – 25.52	37.60 – 45.40
Proportion of fibres (%)		
M	92.53	7.47
SD	1.24	1.24
min. – max.	91.24 – 94.58	5.42 – 8.76

M – mean
SD – standard deviation

Table 7
Proportion of medullated fibres and kemp fibres in uniform wool with isolated coarse hairs

Specification	Medullated fibres	Kemp fibres
Number of samples	n = 2	n = 2
M	3.42	075
SD	2.02	030
min. – max.	1.95 – 4.88	0.54 – 0.96

M – mean
SD – standard deviation

The currently accepted standard for Świniarka sheep, under the Genetic Resources Protection Programme for the breed [9], describes its coat as sparse, mixed, open, loose, and composed of down, mid-type hair and medullated fibres. Improvement of the breed long ago led to great variation in the hair coat of this breed. In the 1920s it was difficult to define the Świniarka sheep as one breed type, as due to its very low performance it often underwent improvement aimed at producing higher-yielding crossbreds. In this way lowland sheep were produced, such as Łowicka, Leszczyńska, Poznańska, and Wielkopolska.

Table 8
Mean fibre thickness in uniform wool

Specification	Uniform wool
Number of samples	n = 2
Wool thickness (μm)	
M	23,27
SD	2,11
min. – max.	21.78 – 24.76

M – mean
SD – standard deviation

According to Skoczylas [10], sheep with mixed wool, which include the Świniarka sheep, usually have not been skilfully selected for coat quality, which is the reason for the wide variation in wool quality characteristics in this currently small population, and the difficulty in classifying it.

Kączkowski, at the end of the 1920s [5, 6], described the coat of the Świniarka sheep as mixed, composed of medullated fibres and down hair. The thickness of the down hair was 21.2 μm and they constituted 36.9%. The outer coat contained two types of white hair – with an average thickness of 54.6 μm, accounting for 50%, and with a thickness of 37.3 μm, with a 10.9% share. The outer coat also contained black hairs, which were the thickest (59.3 μm), and represented only 2%. The more primitive the sheep, the more stiff, milky--white, matte, medullated fibres called kemp were present in the wool.

Elster [3], who conducted observations of Świniarka sheep in the late 1940s in a sheepfold in Szczury, Greater Poland, also reported a high degree of diversity in the wool coat, ranging from typical locks to a coat with a half-staple structure and pointed and cylindrical staples. A lock structure was noted on the shoulder of 30% of individuals, pointed staples in 33%, and cylindrical staples in 27%. The remaining ewes (10%) had half-staple wool. In the wool of the hindquarters, over 55% of ewes had locks, 30% had pointed staples, only 4% had cylindrical staples, and 10% of ewes had a half-staple coat. The mean thickness of the wool of the ewes was 28.3 μm on the shoulder and 31.25 μm on the hindquarters, while in rams it was 30.0 μm on the shoulder and 30.9 μm on the hindquarters. The proportion of thin hairs from 24 to 29 μm thick was nearly 72% on the shoulder and 56% on the hindquarters, and in a few samples medullated and kemp fibres were present. From these data we can conclude that the Świniarka sheep in the flock in Szczury was a type that had clearly been improved with Merino sheep and differed from the primitive Świniarka.

Alkiewicz and Śliwa [1], in their description of the Świniarka sheep, mention that these were mainly sheep crossed with other breeds, e.g. Merino, Friesian, Blackheaded Mutton, or English sheep (Kent in the Kielce region), and were characterized by better wool performance.

Pięta et al. [8] characterized the wool coat of a Świniarka population re-created in the 1980s. They analysed the coat of Świniarka sheep in a genetic reserves flock in Lasocin and found four types of coat. The most common, occurring in over 76% of individuals, was a two-fraction coat with down hair 24 μm thick and medullated fibres 43.9 μm thick, while a two-fraction coat with thinner down hair and medullated fibres (16.6 μm and 33.8 μm, respectively) was noted in 8%, and a uniform, thinner coat (28.8 μm) in 13%. One ewe had a thicker coat (42 μm) with a few thin hairs. The thin hairs in all samples were non-medullated, while the hairs over 55 μm thick had a continuous medulla.

The two-fraction hair coat was also most commonly represented in the study material obtained from Świniarka sheep from Chorzelów, but coats of uniform wool and locks composed of three hair fractions were noted as well. The inner fraction consisted of non--medullated hair, while the outer fraction contained medullated fibres with continuous or discontinuous medullae. Thick hairs known as kemp were also present in the coat. The coat types did not vary greatly in terms of fibre thickness, and the down content was high.

In conclusion, the analysed population of Świniarka sheep consisted predominantly of animals with a two-fraction hair coat with clusters of uniform thickness and a high content of down, which may indicate an improved type of wool.

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