

STUDIES ON FUR PERFORMANCE OF SKINS OF RABBITS BRED FOR MEAT PRODUCTION

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Abstract - The experiment involved 216 skins of New Zealand White (NZW), Californian (CL) and Termond White (TW) rabbits. Laboratory analyses evaluated hair cover physical properties (which were considered as diagnostic). They included down hair and guard hair thickness; down hair and guard hair length; hair cover density; and proportion of down hair and guard hair in rabbit hair cover. Proper technological indices were also calculated. The results of these studies showed that pelts obtained from typical meat breeds, slaughtered at 90 days, fully met the requirements of the fur industry and are valuable fur material.

INTRODUCTION

In addition to valuable meat, rabbits yield skins, which can be used in fur and felt production. This raw material is primarily used in the countries with winters and ambient temperature dropping below zero. In Poland there is such a climatic zone as well as the need to protect the body from the cold. Clothing from rabbit skins is among the cheaper ones, so it can satisfy the needs of wide social strata in this regard.

Increased demand for rabbit meat has increased the proportion of typical meat breeds in Poland, in place of small, fur breeds. Hence the domestic fur industry has a large amount of skins from young rabbits and meat breeds. Therefore, there is a need to undertake studies to determine the fur value of meat rabbit skins, obtained from young animals.

MATERIAL AND METHODS

The studies involved 216 skins of New Zealand White (NZW), Californian (CL) and Termond White (TW) rabbits (72 skins of each breed, with equal proportion of the sexes). The skins were from rabbits slaughtered at 90 days of age. After weaning, young rabbits were reared in a commercial farm with adjustable climate (temperature 14 - 16°C during rearing).

Laboratory studies on hair cover physical properties were done according to the methodology by KASZOWSKI (1957) and a modified method by NIEDZWIADK (1983). The thickness of down and guard hair is measured on a lanameter. 50 down and 50 guard hairs are measured at the root of the hair.

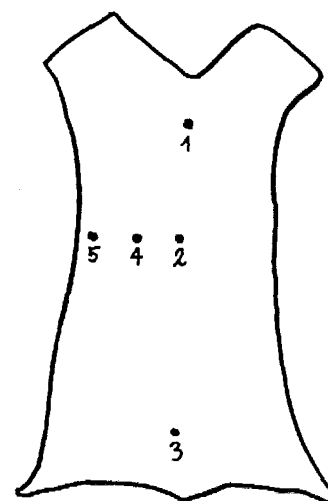
Hair length - 60 measurements for each type of the hair are taken using a properly calibrated ruler.

Hair density is given in microns. Skin samples 0.33 cm² in area are taken with a trephine. Then, the number of down and guard hairs are counted in the microscopic field in 6 squares (whose area is known) using a calibrated square grid. Then, the average number of hairs is counted in one square, and then recalculated for 1 cm² skin area.

Hair fractions include down and guard hair; they are separated manually. The whole sample and particular fractions are weighed using a torsion balance, which ensures identical thermal and humidity conditions for the weighed hair. The data obtained (weight of whole sample - 1 cm² skin area) are converted into percentage proportions of particular fractions.

Test samples were taken in 5 topographic parts of the skin (Figure 1). The following technological indices were calculated from the data

Figure 1 : Skin topographic parts samples for fur studies.



Sample 1 : Shoulder
Sample 2 : Centre of back
Sample 3 : Pelvic girdle
Sample 4 : Side
Sample 5 : Centre of belly

obtained : ratio of down hair to guard hair thickness, ratio of down hair to guard hair length, and hair softness coefficient, that is hair thickness to hair length ratio.

Statistical calculations were made using analysis of variance. The following linear model was assumed:

$$Y_{ijk} = u + a_i + b_j + (ab)_{ij} + e_{ijk}$$

where :

Y_{ijk} observation of animal k of sex j from breed group i

u mean value

a_i effect of breed i

b_j effect of sex j

$(ab)_{ij}$ effects of breed x sex interaction

e_{ijk} error

RESULTS

The analysis of variance proved that differences between the means for sexes were small and statistically insignificant. A statistically significant breed x sex interaction was not proved either. Therefore the results are listed for breeds, without accounting for the sexes.

Down hair thickness (Table 1) varied depending on the topographic part of the fur; it was from 11.4 to 12.6 m on the back, and from 11.2 to 11.8 m on the belly. It was more level on the side (11.8 - 12.0 m). Average hair lengths from 5 samples were similar (11.6 - 12.0 m) for all the breeds under study.

Guard hair thickness also varied in the topographic parts of the fur. Hair on the back was the coarsest, although in sample 1 hair thickness was the lowest. Average thickness of guard hair was 62.6 m for NZW, 58.0 m for CL, and 62.6 m for TW rabbits. Differences were significant only in the case of guard hair thickness calculated as a mean for the whole skin, between breeds CL, and NZW and TW.

Hair thickness variation was higher for guard hair than for down hair, both within samples and breed groups. It varied from 12.1 to 12.9% for average thickness calculated for the whole skin and down hair. Guard hair thickness varied from 13.6 to 15.9%.

The ratio of down hair to guard hair thickness also varied among the topographic parts and breeds. The average ratio for the whole skin varied from 1:4.8 for breed CL to 1:5.4 for breed TW.

The length of down hair (Table 2) in the furs of NZW rabbits in samples 2, 3 and 4 exceeded 20 mm. Slightly smaller values were in furs of breed CL, followed by breed TW. Average down hair length for the whole skin was 20.2 mm in NZW, 19.8 mm in CL, and 19.0 mm in TW. The length of guard hair for the breeds under study varied from 23.5 to 32.0 mm, with the lowest in sample 1. Californian rabbits had the longest hair. Average length of guard hair for the whole skin was 28.8 mm for NZW, 29.5 for CL and 28.0 mm for TW. Differences between average lengths were significant in NZW and TW for down hair and in CL and TW for guard hair. Down hair length variation was similar within breeds and samples (from 8.3 to 10.8%). Guard hair length was characterised by lower variation ($V = 6.4 - 8.0\%$).

The average ratio of down hair to guard hair length for the whole skin varied from 1:1.42 for NZW to 1:1.50 for CL. NZW down hair softness coefficients depended on the topographic part of the fur and varied from 0.67 in sample 1 (shoulder) to 0.50 in sample 3 (pelvic girdle)(Table 3). Guard hair softness coefficients in NZW and TW furs were similar (2.64 - 2.07), but lower in CL, both in particular samples and as an average for the whole skin.

The proportion of down hair in rabbit hair cover varied in relation to the topographic part of the fur. The highest proportion was in samples 3 and 4. The mean of 5 samples was 82% for NZW, 84% for CL, and 81% for TW furs. The highest down hair density was found in sample 3, the lowest in sample 5 (Table 4). The average density for the whole skin was 6000 - 6200 hairs/1 cm² skin in NZW and TW furs. The average density for CL was higher at 7110 hairs/1 cm² skin. The number of guard hair was small, from 124 in BT to 142/1 cm² in CL. The differences observed between the breeds for average down hair density (for the whole skin) were statistically significant between CL and TW, and significant between CL and NZW. Differences for guard hair number were highly significant between CL and TW.

DISCUSSION

Rabbit skins are used as a raw material by furrier's plants. Garments made of rabbit skins are light, attractive and have heat-insulating properties. Of significance in rabbit fur processing is adequate skin and hair cover quality. Its proper use for fur purposes depends on fur quality.

Laboratory analyses included those hair cover properties which were considered as diagnostic and in close relationship with fur use value (DUDA, 1974; KASZOWSKI, 1957; NIEDZWIADK, 1983). Hair cover quality was analysed in 5 topographic parts of the fur, because its quality depends on the sampling site (CEREVITINOV, 1962; KASZOWSKI 1957).

Down hair and guard hair thickness is an important indicator of fur value. It is not proper to improve furs with too thin down hairs to make quality imitations, for, because of their structure, they break down during the technological process. 11 microns are considered the lower limit of down hair thickness (DUDA 1974). Down hair thickness of the analysed breeds in all topographic parts exceeded 11 microns, so it fully complied with fur industry requirements. The great variation in down hair and guard hair thickness is related to a change in hair length and to the fact that the section of the hair is not ideally round (NIEDZWIADK 1983). It is also important to retain proper ratio of down hair to guard hair thickness. For rabbit skins, this ratio is defined as 1:4.50-5.00 (DUDA 1974). Of the analysed furs, only furs of breed CL are within the above limits, while the other breeds are characterised by higher ratios (1:5.30 and 1:5.40).

Down hair length is decisive for the utilisation of the fur for suitable imitations. With lengths exceeding 18 mm, the furs are improved to make the so-called long-haired furs - skunk and sable. In the studied breeds, the down hair length exceeded 19 mm, so it complied with industry standards. Also the ratio of down hair to guard hair length was adequate, between 1:1.5 (DUDA, 1974). The hair softness coefficient is calculated for technological purposes. CEREVITINOV (1962) and DUDA (1974) specify that it should range from 0.4 to 0.7 for down hair, and from 2.0 to 3.6 for guard hair. The results obtained in our studies are within the above limits.

One of the most crucial traits is hair cover density. It was highest on the back in all the breeds under study. It varied significantly among the breeds. Californian furs were characterised by the highest density. In comparison to furs from adult rabbits of the same breeds, the density was lower by about 500 - 600 hairs/1 cm² (NIEDZWIADK, 1983).

In summing up it must be said that hair cover properties of skins obtained from young, meat-type rabbits qualified them as full-value fur material to be processed for imitating fur. The high fur value of the breeds studied can be put down to the fact that under an intensive rearing system and in an adjustable microclimate, the hair cover of rabbits at 90 days of age achieves its first, growth maturity. The furs whose hair cover achieved the first, growth maturity, regardless of the animals' age, are characterised by high values of factors decisive for fur quality and suitability.

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Untersuchungen der Pelznutzung des Felles von Fleischkaninchen - Das Versuchsmaterial bildeten 216 Kaninchenfellen den Rassen: Neu-Zeländische Weiße (BN), Kalifornische (K) und Termondische Weiße (BT). Die Laboruntersuchungen fassten die Beurteilung den physischen Merkmalen der Haarbekleidung welche als diagnostische Anerkannt sind um: Dicke des Flaum- und Deckehaares, länge des Flaum- und Deckehaares, dichte der Haardecke sowie Anteil des Flaum- und Deckehaares im Decke den Kaninchen. Es wurden auch entsprechende technologische Kennziffer. Die Daten für og. Merkmale zeigten, daß die von typisch Fleischkaninchen erlangene Fellen (Kaninchen waren im Alter von 90 Tage geschlachtet) völlig den Voraussetzungen des Fell(Pelz)industrie entsprechen und bilden wertvolle Rohstoff.

Table 1 : Down hair and guard hair thickness (microns) and down hair to guard hair ratio mean and coefficient of variation

Traits	Sample										Mean for ____ skin	
	1 shoulder		2 centre of back		3 pelvic		4 side		5 centre of belly		x	v%
	v%	x	v%	x	v%	x	v%	x	v%			
New Zealand White (NZ)												
Down hair thickness	12.3	19.1	11.9	18.5	11.6	13.7	12.0	16.5	11.6	14.0	11.9	12.9
Guard hair thickness	52.8	25.3	66.7	20.1	64.8	17.9	62.9	19.0	65.8	19.8	62.6 ^k	15.0
Down to guard hair thickness	1:4.3	-	1:5.6	-	1:5.6	-	1:5.2	-	1:5.7	-	1:5.3	-
Californian (CL)												
Down hair thickness	12.6	18.2	12.0	16.1	11.8	12.2	11.9	15.0	11.8	13.3	12.0	12.2
Guard hair thickness	50.7	19.7	59.8	19.7	58.8	16.9	60.7	16.8	60.1	17.1	58.0	13.6
Down to guard hair thickness	1:4.1	-	1:5.0	--	1:4.9	-	1:5.1	-	1:5.1	-	1:4.8	-
Termond White												
Down hair thickness	12.0	18.4	11.6	18.1	11.4	14.6	11.8	16.4	11.2	16.1	11.6	12.1
Guard hair thickness	52.8	26.2	66.2	20.0	64.8	18.1	63.3	19.0	66.0	18.5	62.6 ^a	15.9
Down to guard hair thickness	1:4.3	-	1:5.7		1:5.6	-	1:5.4	-	1:5.9	-	1:5.4	-

Means with the same letters differ significantly (a,b, ... P<0.05):

Table 2 : Down hair and guard hair length (mm) and down hair to guard hair ratio

Traits	Sample										Mean for skin	
	1 shoulder		2 centre of back		3 pelvic		4 side		5 centre of belly		x	v%
	x	v%	x	v%	x	v%	v%	x	v%			
New Zealand White												
Down hair length	18.1	8.8	20.1	8.3	23.1	9.3	22.0	7.8	17.6	9.9	20.2 ²	7.9
Guard hair length	25.1	7.9	30.1	7.8	31.7	7.1	30.3	7.2	26.9	8.9	28.8	6.7
Down to guard hair length ratio	1:1.38	-	1:1.49	-	1:1.38	-	1:1.38	-	1:1.52	-	1:1.42	-
Californian (CL)												
Down hair length	17.5	8.6	21.8	9.4	22.1	9.1	19.9	7.9	17.5	9.7	19.8	7.0
Guard hair length	23.5	8.1	31.5	8.4	32.9	7.6	32.0	6.4	28.0	8.4	29.	6.0
Down to guard hair length ratio	1:1.34	-	1:1.44	-	1:1.48	-	1:1.60	-	1:1.60	-	1:1.50	-
Termond White												
Down hair length	18.4	10.0	19.5	9.5	20.3	9.7	20.0	9.6	17.4	10.8	19.0 ^a	7.8
Guard hair length	24.9	6.9	29.2	6.6	31.3	7.8	29.5	7.3	25.0	8.0	28.	7.0
Down to guard hair length ratio	1:1.35	-	1:1.49	-	1:1.54	-	1:1.47	-	1:1.43	-	1:1.47	-

Means with the same letters differ significantly-(a, b, ... P<0.05).

Table 3 : Hair softness coefficients and proportion of down hair and guard hair in hair cover

Traits	Sample										Mean for skin	
	1 shoulder		2 centre of back		3 pelvic girdle		4 side		5 centre of belly		down guard	
	down	guard	down	guard	down	guard	down	guard	down	guard		
New Zealand White (NZW)												
Softness coefficient	0.67	2.10	0.59	2.22	0.50	2.04	0.54	2.06	0.65	2.44	0.58	2.17
Proportion of hair in hair cover (%)	82.90	17.10	78.80	21.20	86.20	13.20	81.20	18.80	80.60	19.40	22.00	18.00
Californian (CL)												
Softness coefficient	0.72	2.15	0.55	1.89	0.53	1.78	0.59	1.89	0.67	2.14	0.60	1.96
Proportion of hair in hair cover (%)	83.90	19.10	80.50	19.50	89.00	11.00	86.00	14.00	80.60	14.40	84.00	16.00
Termond White												
Softness coefficient	0.65	2.20	0.59	2.26	0.56	2.07	0.59	2.14	0.64	2.64	0.61	2.23
Proportion of hair in hair cover (%)	79.90	20.10	79.00	21.00	86.20	13.80	80.90	19.10	79.40	20.60	81.00	19.00

Table 4 : Down hair and guard hair density in 1 cm² skin

Trait	Sample										Mean for skin	
	1 shoulder		2 centre of back		3 pelvic girdle		4 side		5 centre of belly		x v%	
	x	v%	x	v%	x	v%	x	v%	x	v%		
New Zealand White (NZW)												
Down hair density ('000)	4.00	25.7	7.74	20.7	9.90	15.9	6.45	28.3	2.90	25.9	6.20 ^a	20.2
Guard hair density (pcs)	141	27.8	148	25.9	149	21.6	135	26.9	86	30.9	132	13.5
Californian (CL)												
Down hair density ('000)	4.28	29.9	8.95	17.1	10.65	20.3	7.82	28.9	3.84	26.8	7.11 ^{Aa}	16.3
Guard hair density (pcs)	150	27.1	159	23.0	161	19.9	145	23.2	97	29.2	142 ^B	16.9
Termond White												
Down hair density ('000)	3.80	25.8	7.00	20.8	9.05	23.7	8.10	29.7	3.15	24.2	6.00 ^A	19.8
Guard hair density (pcs)	130	31.0	135	26.7	141	22.7	131	26.9	81	30.9	124 ^B	16.1

Means with the same letters differ significantly (A,B - P<0.01 ; P<0.05).