

MORPHOMETRIC PARAMETERS OF REX RABBITS' HAIRS

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The paper presents the results of measurements of the structure of Rex rabbit fur coat representing varieties: Castor, Blue, Chinchilla, Orange, Black, Havana, Lynx, Brown Marten, Blue Marten. Hair samples were collected from live animals being in a similar age, from the hindquarters, at the time of a full fur coat maturity. Performed measurements showed that the color variety influences statistically significant ($p < 0,01$) on the fur coat morphometric parameters such as the hair diameter and length. Among the tested varieties the Blue Marten Rex was characterized by the shortest hair (guard hairs — 2,52 cm, wool hairs — 2,40 cm) and the Black Rex by the longest (guard hairs — 3,45 cm, wool hairs — 3,09 cm). Most equal fur coat was found in a variety Chinchilla Rex, where the difference between wool hairs and guard hairs was — 0,01 cm. The diameter of the base part of hairs slightly differed between varieties. Larger differences were recorded in the apical part of the hair. The smallest diameter of the guard hair was found in the varieties Black Rex (54,33 μm) and the biggest in Lynx Rex (80,33 μm). The thinnest wool hairs were found in the variety Castorex (12,80 μm) and diameterest in Orange Rex (22,00 μm).

Key words: RABBIT, REX RABBIT, FUR COAT, HAIR

The breeding of rabbits for the fur needs to become acquainted with issues related to the hair coat. Its main features are: the composition of the coat, height and hair length, density, flexibility, softness, diameterness, color and gloss. The equalization of these characteristics throughout the coat is very desirable. However, within characteristics the high variability is recorded what is associated with morphology of hair and skin. The diameter and hair length affects the strength of the coat, its softness, furriness and elasticity. These parameters are dependent on the age of the animal, its sex, climate, season, diet, or its genetic characteristics, breed and color variety [6]. Rex rabbits are typical animals used for a fur production. Their coat has a smaller length of the guard hairs, better quality, density and equalization than common rabbits [1]. A characteristic feature of their coat is almost the lack of two layers coat structure, typical for fur animals. Rex rabbits, due to mutation, have a shortened the length of the guard hair, which are similar like wool hairs [2].

The full value coat appears in rabbits at the age of 7 months, what is important at the assessing of the animal phenotype. The most desirable characteristics rabbits fur coat is obtained in the period from mid-October to mid-March. Rex rabbits can be also pelted at the age of 5 months, but then received skin is low [7].

The aim of this study was to compare morphometric parameters and characterize the hair coat of Rex rabbit, representing different color varieties.

Materials and methods

The study was conducted at the Rex rabbits from the color varieties: Castor, Blue, Chinchilla, Orange, Black, Havana, Lynx, Marten Brown, Blue Marten. Totally examined hairs taken from 100 individuals. Hair samples were collected from live animals being in a similar age, from the hindquarters, at the time of a full fur coat maturity. The measurements of the guard and wool hair diameter was done with use of the optical lanameter (PZO-MP3-Nr 1443). The diameter of each hair was measured in two places: at the base part (Pars basalis) and at the thickest place of apical part (Pars apicalis). Hair length was assessed using a standard ruler to the nearest 0,01cm. The complementary

microscopic examination of hair with use of Nikon Eclipse 50 i was also carried out and made their photographic documentation with a digital microscope camera Moticam 2500.

The obtained results were statistically calculated using Statistica 8,0 (StatSoft 2007). The effect of color variety on the measured parameters of hair was estimated using ANOVA. The Tukey's test was used to evaluate differences between rabbits' varieties.

Results and discussion

The analysis of variance showed that the color variety is a factor which affects statistically significant on all tested parameters of guard hairs as well as wool hairs ($p < 0,01$). On the basis of the measurements it was found that the shortest length of guard hairs has a variety Blue Marten Rex (2,52 cm) and the largest Black Rex (3,45 cm). The Tukey's test revealed a number of statistically significant differences between the average lengths of guard hair of tested color varieties, especially between the Blue Marten Rex and the others with the exception of Chinchilla Rex.

Measurements of guard hair diameter showed that the thinnest base part occurred in a variety Chinchilla Rex (11,33 μm) and thickest in Brown Marten Rex (18,67 μm). However, measurements made in the apical part took the smallest value in a variety Black Rex (54,33 μm) and the largest variety in Lynx Rex (80,33 μm). The Tukey's test showed statistically significant differences mainly between varieties Castor, Blue, Chinchilla, Orange versus Black, Brown, Marten and Lynx (Tab.1).

Table 1

Morphometric parameters of rex rabbits' guard hairs

Colour type	N	Hair length (cm)				Diameter of Pars basalis (μm)				Diameter of Pars apicalis (μm)			
		Mean	SE	Min.	Max	Mean	SE	Min.	Max.	Mean	SE	Min	Max.
Castor	25	3,06	0,06	2,60	3,70	13,73	0,59	10,0	23,3	55,87	2,66	36,7	80,0
Blue	10	3,21	0,10	2,70	4,00	13,33	0,94	10,0	16,7	65,67	4,21	53,3	80,0
Chinchilla	10	2,78	0,10	2,50	3,00	11,33	0,94	10,0	13,3	59,00	4,21	43,3	73,3
Orange	10	3,03	0,10	2,70	3,40	12,33	0,94	10,0	13,3	58,33	4,21	40,0	80,0
Black	10	3,45	0,10	2,80	4,00	18,00	0,94	13,3	23,3	54,33	4,21	43,3	63,3
Havana	10	3,27	0,10	2,90	3,70	14,33	0,94	13,3	16,7	70,33	4,21	56,7	106,7
Lynx	10	3,18	0,10	2,80	3,50	18,33	0,94	10,0	26,7	80,33	4,21	60,0	100,0
Blue Marten	10	2,52	0,10	2,00	2,80	15,00	0,94	10,0	20,0	62,67	4,21	36,7	90,0
Brown Marten	5	2,94	0,14	2,90	3,00	18,67	1,32	16,7	23,3	67,33	5,95	60,0	73,3
Total	100	3,05	0,04	2,00	4,00	14,63	0,37	10,0	26,7	62,40	1,50	36,7	106,7

Measurements of the length of wool hairs showed that the shortest hairs has a Blue Marten Rex (2,40 cm) and the longest a Black Rex (3,09 cm) (Tab. 2). These results correspond with results obtained by the measurement of guard hairs. The smallest difference in the length of wool and guard hair occurred in a Chinchilla Rex (-0,01 cm) and the highest in a Brown Marten Rex (0,50cm). In the measurement of the diameter wool hairs the lowest average value was reported in the base part of a Chinchilla Rex (7,00 μm) and the biggest in a Black Rex (10,67 μm).

While, in the measurement of the apical part of a hair the lowest value received a Castorex (12,80 μm) and the largest an Orange Rex (22,00 μm).

Measurements of the hair diameter obtained in this work are comparable to those obtained in studies of Barabasz et al. (2008) carried out in variety Costorex. These authors give the following average values of of the hair diameter measured on the hindquarters: basal part of guard hairs — 16,25 μm , the apical part of guard hairs — 56,50 μm , and average wool hair diameter 17,29. However, reported by them average hair length was 2,14cm, what is much lower than result obtained in present work. This difference may be a result of different genotype of studied rabbits and slightly lower quality of their coat.

Table 2

Morphometric parameters of rex rabbits' wool hairs

Colour type	N	Hair length (cm)				Diameter of Pars basalis (μm)				Diameter of Pars apicalis (μm)			
		Mean	SE	Min	Max	Mean	SE	Min	Max	Mean	SE	Min	Max
Castor	25	2,89	0,07	2,30	3,40	7,73	0,40	6,7	10,0	12,80	1,03	6,7	16,7
Blue	10	2,86	0,10	2,40	3,50	8,33	0,64	6,7	13,3	16,00	1,63	1,0	23,3
Chinchilla	10	2,79	0,10	2,50	3,00	7,00	0,64	6,7	10,0	13,33	1,63	6,7	26,7
Orange	10	2,92	0,10	2,70	3,20	9,33	0,64	6,7	13,3	22,00	1,63	13,3	30,0
Black	10	3,09	0,10	2,70	3,80	10,67	0,64	6,7	16,7	20,67	1,63	13,3	33,3
Havana	10	2,99	0,10	2,50	3,60	7,33	0,64	6,7	10,0	21,67	1,63	13,3	33,3
Lynx	10	2,94	0,10	2,50	3,90	7,67	0,64	6,7	10,0	21,67	1,63	13,3	26,7
Blue Marten	10	2,40	0,10	1,80	2,90	8,33	0,64	6,7	10,0	19,00	1,63	10,0	26,7
Brown Marten	5	2,44	0,15	2,00	3,10	7,33	0,90	6,7	10,0	17,33	2,31	10,0	26,7
Total	100	2,80	0,04	1,80	3,90	8,17	0,22	6,7	16,7	17,50	0,62	6,67	33,33

This is shown by the difference between the length of wool and guard hair, which for a Rex rabbits type should be possibly minimal. Analyzing the of common rabbits coat parameters can be seen that the diameter of hair, both wool ($\sim 15 \mu\text{m}$) and guard ($\sim 65 \mu\text{m}$) is more conservative parameter than length [5].

On the basis of microscopic observations it was found that in the base part, the guard hairs have a uniserial or biserial medulla (Fig.1), but the at the apical part medulla was multiserial (ladder) (Fig. 2). Wool hairs are characterized by uniserial medulla along the shaft (Fig.3). Occasionally in the apical part is observed the emergence of a second row (Fig.4).



Fig. 1. Pars basalis of a guard hair of the Orange Rex rabbit (biserial ladder medulla).



Fig. 2. Pars apicalis of a guard hair of the Chinchilla Rex rabbit (multiserial ladder medulla).



Fig. 3. Pars basalis of a wool hair of the Castorex rabbit (uniserial).



Fig. 4. Pars apicalis of a wool hair of the Blue Rex rabbit (uniserial medulla changed for biserial).

Conclusions

Conducted measurements of Rex rabbits' hair showed that color variety has a statistically significant influence on morphometric parameters such as the hair diameter and length. Among the tested varieties a Blue Marten Rex was characterized by the shortest hair, and a Black Rex by the longest. The most equal hair coat was found in a variety Chinchilla Rex. Diameter of the basal part of the hair slightly differed between varieties. Larger differences were recorded in the apical part of the hair. The biggest diameter of a guard hair was found in the varieties Lynx and Havana. The tickest wool hairs were found in varieties Orange and Lynx.

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МОРФОМЕТРИЧНІ ПОКАЗНИКИ ШЕРСТІ КРОЛИКІВ ПОРОДИ РЕКС

Резюме

У статті представлені дані вимірювань структури шерсті кроликів породи Рекс таких видів: Кастор, Блу, Шиншила, Оранж, Блек, Гавана, Лінкс, Браун Мартен, Блу Мартен. Зразки шерсті взяли в живих тварин однакового віку з задніх частин у час повної зрілості хутра. Отримані виміри показали, що різноманітність кольорів впливає на ($p < 0,01$) морфометричні показники такі як діаметр та довжина. Серед досліджених зразків Блу Мартен Рекс характеризувалась найкоротшим хутром (захисна шерсть — 2,52 см, хутро — 2,40 см) а Блек Рекс найдовшим (захисна шерсть — 3,45 см, хутро — 3,09 см). Рівномірні дані показав вид Шиншила Рекс, різниця між хутром і захисною шерстю становила -0,01см. Діаметр основної частини шерсті відрізнялась у різних видів кроликів. Найбільші відмінності зафіксовані в верхній частині шерсті. Найменший діаметр захисної шерсті був у Блек Рекс (54,33 μm) і Лінкс Рекс (80,33 μm). Найтонше хутро у виду — Касторекс (12,80 μm) і Оранж Рекс (22,00 μm).

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МОРФОМЕТРИЧЕСКИЕ ПОКАЗАТЕЛИ ШЕРСТИ КРОЛИКОВ ПОРОДЫ РЕКС

Аннотация

В статье представлены данные измерений структуры шерсти кроликов породы Рекс таких видов: Кастор, Блу, Шиншила, Оранж, Блек, Гавана, Линкс, Браун Мартен, Блу Мартен. Образцы шерсти взяли у живых животных одинакового возраста из задних частей во время полной зрелости меха. Полученные измерения показали, что разнообразие цветов влияет на ($p < 0,01$) морфометрические показатели такие как диаметр и длина. Среди исследованных образцов Блу Мартен Рекс характеризовалась кратчайшим мехом (защитная шерсть — 2,52см, мех — 2,40см) а Блек Рекс самым длинным (защитная шерсть — 3,45 см, мех — 3,09 см). Равномерные данные показал вид Шиншила Рекс, разница между мехом и защитной шерстью составляла -0,01см. Диаметр основной части шерсти отличалась у разных видов кроликов. Наибольшие отличия зафиксированы в верхней части шерсти. Наименьший диаметр защитной шерсти был у Блек Рекс (54,33 μm) и Линкс Рекс (80,33 μm). Самый тонкий мех у вида — Касторекс (12,80 μm) и Оранж Рекс (22,00 μm).

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