



# PROCEEDINGS OF THE 11<sup>th</sup> WORLD RABBIT CONGRESS

Qingdao (China) - June 15-18, 2016

ISSN 2308-1910

## Session Fur & Wool

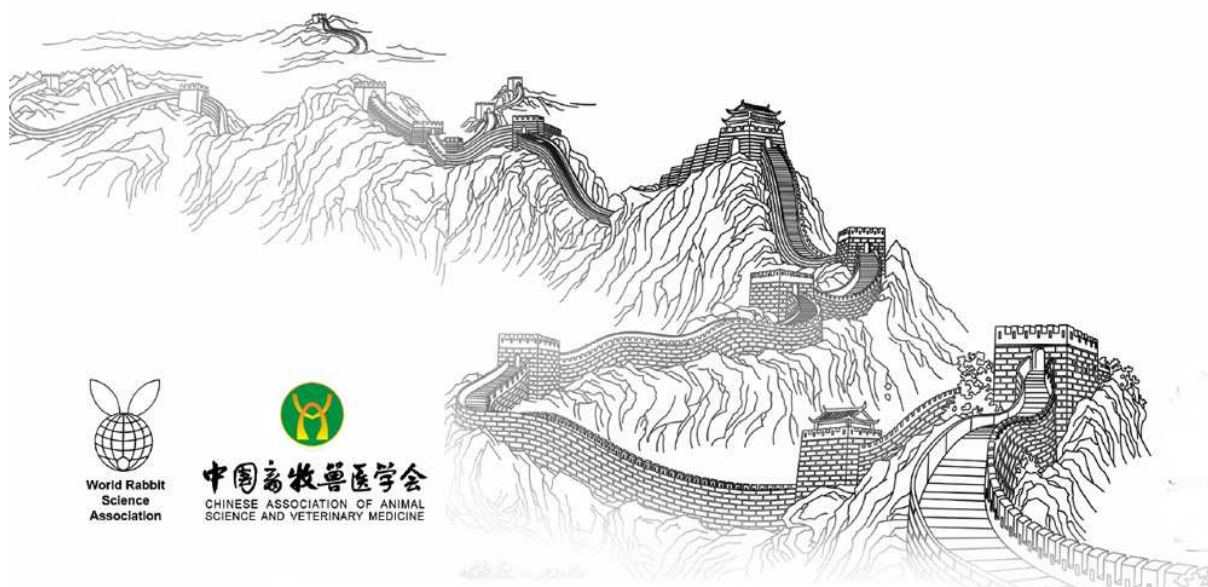
***Cui J.H., Liu A.R., Lv S.Q., Shi J.L., Zhang Z.C., Cheng Y.B.***

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**Full text of the communication**

*How to cite this paper :*

*Cui J.H., Liu A.R., Lv S.Q., Shi J.L., Zhang Z.C., Cheng Y.B., 2016 - Research on quality of rex rabbit hide in paramos climate zone of Hulun Buir area in Inner Mongolia. Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China, 825-828.*



## RESEARCH ON QUALITY OF REX RABBIT HIDE IN PARAMOS CLIMATE ZONE OF HULUN BUIR AREA IN INNER MONGOLIA

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### ABSTRACT

The variability of quality of rex rabbit fur from different strain of rex rabbit produced in the Inner Mongolia Hulunbeier municipal alpine climate zone, was studied during a period of three years according season and age of animals. In Hulunbeier area acquisition of Rex rabbit fur quality of samples, send College of textile and food engineering, Sichuan University were detected, hides area, coat thickness, hair density, hair length index assessment hides quality in accordance with the obtained Hulunbeier alpine region of Rex Rabbit Fur Quality in different varieties of Venus Rex breed quality good, in the four seasons in spring and autumn Rex rabbit fur quality is better, in the different months weight to 5.5 months old fur quality better.

**Key words:** Rabbit skin; hair thickness; hair length; fur quality

### INTRODUCTION

Rex Rabbit which originated in France is a typical fur type rabbit. It is called as Rex Rabbit due to its fur appears like the precious furbearer otter. As herbivore, Rex Rabbit has advances of low investment in feeding, rapid turnover and easy to raise etc. In order to help the herdsmen in Hailaer area to increase the income, Hailaer Farm Enterprise Group introduced the Rex Rabbit feeding since 2009. Currently, there are about 500,000 Rex Rabbits in the entire Hailaer area.

There is abundant forage resource in Hulun Buir area, Inner Mongolia. Hulunbuir Pasture Land which is one of the four largest worldwide grasslands is called the best grassland in the world. The abundant forage resource is very suited for grassland animal husbandry. Meanwhile, Hulun Buir city covers an overall area of 25 million hectares, with fertile soil and high natural fertility. The abundant grain yield can provide fodder for Rex Rabbit with high quality and low price. While Hulun Buir city locates in the northeast of China, the extreme low temperature in winter can reach to -47.5°C and the high temperature in summer only lasts for a short period, hence the weather in spring and autumn is more suitable. Also, Rex Rabbit is mostly introduced and raised, there is no report on whether the hide quality will vary and therefore impact the feeding income in this paramos climate zone. This article starts from this study point, attempts to compare the quality of Rex Rabbits of different varieties, slaughter seasons and slaughter months to explain this question (Wu Jinsha, 2005).

### MATERIAL AND METHODS

The testing was divided into two parts, with testing samples collected from Arong Banner Kangming Rabbit Company in Hulun Buir city, Inner Mongolia, respectively in 2011 and 2012.

The hide used for testing in the first part was collected in 2011. 15 hides were randomly taken from the four varieties of Rex Rabbit individuals of the same slaughter batch in this farm, each with the consistency slaughter month. Varieties included Venus Rabbit, Hebei Rabbit, Color Rex Rabbit and Local Rex Rabbit

(Future generations of individuals been introduced and trained since 2011). The three measurement indicators included the length and width of the hide (hide area = length \* width), under fur thickness and fur length. Tile the hide sample on the table, and use a ruler to measure the fur length and width, precise to one millimeter. The overall hip back and neck fur thicknesses (pressure foot diameter of 10.00mm, constant pressure of  $393\pm 3g$ ) and skin thickness with thickness gauge were measured, and then subtracted the skin thickness from the fur thickness to obtain the under fur thickness. And the length of rabbit fur was measured directly with a vernier caliper.

The hide used for testing in the second part was collected in 2012, with local Rex Rabbit selected as samples. In four slaughter seasons, i.e. January, May, August, October, 10 hides were taken to conduct four indicator measurements as hide area, water content, under fur thickness and fur length. The measurement method was same as the first testing. Then precisely cut a hide sample of 3 cm × 3 cm from the hip back and back line of the rabbit samples. Formaldehyde fixatives were used to fix the hide samples for 24h. Then cut histological frozen sections, die with iron hematoxylin, observe with an optical microscope and take photos to determine the actual area of the photo under the same magnification time conditions and calculate the follicle internal hair density (Wu Jinsha, 2005; Gao Bolv *et al.*, 2011).

Descriptive statistics and multiple comparisons of data were calculated by software SAS9.2.

## RESULTS AND DISCUSSION

The testing results of hide size of different varieties of Rex Rabbit are shown in Table 1. The results show that comparing with the other three varieties of Rex Rabbit, the average hide area of individual offspring of Venus is the largest, followed by the Hebei Rex Rabbit, Color Rabbit, and Local Rex Rabbit which has the minimum hide area. Although there is a discrepancy in average fur length and width, average width of Venus Rex Rabbit, Hebei Rex Rabbit and Color Rex Rabbit, the discrepancy is not significant; but the measurement indicators of the three introduction varieties are significantly higher than the Local Rex Rabbit.

**Table 1** Hide Area of different varieties of Rex Rabbit

| Variety                   | Average Fur Length (cm) | Average Fur Width (cm)  | Average Fur Area (cm <sup>2</sup> ) |
|---------------------------|-------------------------|-------------------------|-------------------------------------|
| Offspring of Venus Rabbit | 42.1±0.5 <sup>A</sup>   | 24.40±1.15 <sup>A</sup> | 1027.29±52.00 <sup>A</sup>          |
| Offspring of Hebei Rabbit | 41.0±1.3 <sup>A</sup>   | 23.67±1.97 <sup>A</sup> | 954.23±101.02 <sup>A</sup>          |
| Color Rex Rabbit          | 40.7±3.6 <sup>A</sup>   | 22.60±1.53 <sup>A</sup> | 922.67±138.68 <sup>A</sup>          |
| Local Rex Rabbit          | 34.5±0.2 <sup>B</sup>   | 21.17±1.24 <sup>B</sup> | 850.34±42.30 <sup>B</sup>           |

The under fur thickness and fur length of different varieties of Rex Rabbit hides are shown in Table 2. According to the results, the average under fur thickness of Venus Rex Rabbit hides is the largest, followed by the Local Rex Rabbit, then Hebei Rex Rabbit and Color Rex Rabbit. It can be seen from the Duncan comparison results on average under fur thickness of the four Rex Rabbits that although there is a discrepancy between Venus Rex Rabbit and Local Rex Rabbit, the discrepancy is not significant; there is no significant discrepancy in under fur thickness between Hebei Rex Rabbit and Color Rex Rabbit; but the under fur thickness of the former two varieties is significantly higher than the latter two. According to the comparison results of the fur length of the four Rex Rabbits, the overall average gross overall length of the Hebei Rex Rabbit is the longest, which is significantly higher than the other three varieties, respectively the Local Rex Rabbit, Venus Rex Rabbit and Color Rex Rabbit. There is a discrepancy in the fur length of the three Rex Rabbits, but not significant.

It can be seen from the above results that the advantages and disadvantages of different varieties of Rex Rabbits vary. Overall, the production ability of introduction varieties is quite good, but whether they can adapt to the local climate of Hailaer is to be verified. The adaptability to local climatic conditions of Local Rex Rabbit Hailaer is certainly better than the introduced varieties. Although its hide area is not as good as other varieties, the under fur thickness and fur length are better than average, which shows that they have the potential to improve. Cross breeding methods can also be tried to increase the production capacity of the Local Rex Rabbit.

**Table 2.** Under Fur Thickness and Fur Length of Different Varieties of Rex Rabbit Hides

| Variety                | Average Under Fur Thickness (cm) |                      |                        | Average Fur Thickness(cm) |                       |                       |                       |
|------------------------|----------------------------------|----------------------|------------------------|---------------------------|-----------------------|-----------------------|-----------------------|
|                        | Hip Back                         | Neck                 | Overall Avg. Thickness | Hip Back                  | Neck                  | Abdomen               | Overall Avg. Length   |
| Offspring Venus Rabbit | 2.6±0.2 <sup>A</sup>             | 2.6±0.2 <sup>A</sup> | 2.6±0.2 <sup>A</sup>   | 3.0±0.3 <sup>A</sup>      | 2.1±0.3 <sup>AB</sup> | 2.4±0.3 <sup>AB</sup> | 2.3±0.1 <sup>B</sup>  |
| Offspring Hebei Rabbit | 1.6±0.1 <sup>B</sup>             | 1.6±0.5 <sup>B</sup> | 1.5±0.4 <sup>B</sup>   | 2.6±0.2 <sup>B</sup>      | 2.3±0.1 <sup>A</sup>  | 2.7±0.2 <sup>A</sup>  | 2.7±0.2 <sup>A</sup>  |
| Color Rex Rabbit       | 1.6±0.4 <sup>B</sup>             | 1.4±0.2 <sup>B</sup> | 1.5±0.03 <sup>B</sup>  | 2.5±0.1 <sup>B</sup>      | 1.9±0.02 <sup>B</sup> | 2.3±0.1 <sup>B</sup>  | 2.2±0.03 <sup>B</sup> |
| Local Rex Rabbit       | 2.2±0.2 <sup>A</sup>             | 2.2±0.2 <sup>A</sup> | 2.2±0.2 <sup>A</sup>   | 2.4±0.1 <sup>B</sup>      | 2.2±0.3 <sup>A</sup>  | 2.4±0.2 <sup>A</sup>  | 2.4±0.3 <sup>B</sup>  |

**Table 3.** Analysis Results of Hide Area, Under Fur Thickness and Fur Length of Rex Rabbits slaughtered in different seasons.

| Season | Length (cm)             | Width (cm)               | Hide Area (cm <sup>2</sup> ) | Water Content (%)        | Hip Back Underfur Thickness (cm) | Hip Back Fur Length (cm) |
|--------|-------------------------|--------------------------|------------------------------|--------------------------|----------------------------------|--------------------------|
| Spring | 45.23±6.54 <sup>A</sup> | 25.85±2.82 <sup>A</sup>  | 1183.4±281.4 <sup>A</sup>    | 35.02±3.73 <sup>A</sup>  | 1.57±0.35 <sup>A</sup>           | 2.65±0.26 <sup>A</sup>   |
| Summer | 36.9±3.03 <sup>B</sup>  | 27.67±4.88 <sup>B</sup>  | 1029.9±249.6 <sup>A</sup>    | 16.86±3.90 <sup>B</sup>  | 1.35±0.12 <sup>A</sup>           | 2.36±0.24 <sup>A</sup>   |
| Autumn | 41.0±4.55 <sup>AB</sup> | 23.85±1.01 <sup>A</sup>  | 977.4±110.2 <sup>A</sup>     | 20.44±10.87 <sup>B</sup> | 1.50±0.27 <sup>A</sup>           | 2.61±0.16 <sup>A</sup>   |
| Winter | 44.28±3.24 <sup>A</sup> | 20.77±1.77 <sup>AB</sup> | 916.4±58.5 <sup>A</sup>      | 34.83±4.53 <sup>A</sup>  | 1.56±0.11 <sup>A</sup>           | 2.63±0.36 <sup>A</sup>   |

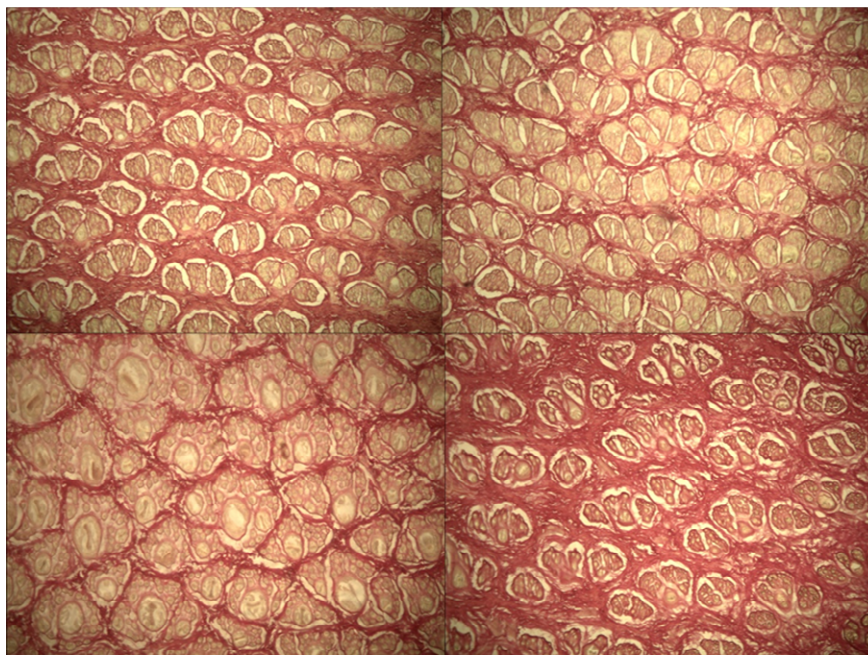
The measurement results of hide area, under fur thickness and fur length of the Rex Rabbits been slaughtered in different seasons are listed in Table 3. It can be seen from the results that the hide area of Rex Rabbits is the largest in spring and smallest in winter. But the seasonal discrepancy hasn't reached the significant level. It can be seen from the under fur thickness and fur length results calculation results that with the same hide area, the under fur thickness and fur length is the longest in spring and shortest in summer. The discrepancies in four Seasons are not significant.

Choose the best one from different angles of vision to take photos under biological microscope, and then select a representative image for observation technique, and calculate the results of hair follicle density, as is showed in Table 4. It can be seen from the counting results that the density of hair follicles is the highest in autumn and minimum in winter.

**Table 4.** Counting Results of Histological Section in Different Seasons

| Season | Hair Follicle (amount/cm <sup>2</sup> ) |
|--------|---|
| Spring | 11642.7±1129.0 <sup>A</sup>             |
| Summer | 10979.5±1480.2 <sup>A</sup>             |
| Autumn | 12547.5±947.7 <sup>A</sup>              |
| Winter | 9359.2±1061.4 <sup>B</sup>              |

Figure 1 shows the hair follicle structure of the Rex Rabbit (flat cut, 40 ×), as can be seen, the overall Rex Rabbit fur density in spring is greater than those in other three seasons. But hair follicles in spring show irregular arrangement with compact distribution, while hair follicles in winter clustered closely, but mostly arranged regularly. As can be observed from figure 1, several wool fibers developed in one hair follicle, basically with the same opening direction and have a certain angle to the horizontal surface of the skin. The size of the hair follicle at the outlet opening determines the size of the pores of the traits, which also directly affect the thickness of grain of Rex Rabbit (Sun Danghong *et al.*, 2000).



**Figure 1.** Hair Follicle Structure of the Rex Rabbit been Slaughtered in Different Seasons (Flat Cut, 40 ×): top left corner is collected in Spring, top right in Summer, lower left in Autumn and lower right in Winter.

To summarize the above results, different seasons only have small effects on the hide of Rex Rabbits without significant discrepancy, as Rex Rabbit is indoor feeding. But all the results present maximum in the spring and minimum winter, which shows that the ambient temperature discrepancy in Hailaer Paramos Climate Zone has certain impact on the feeding of Rex Rabbit hides (Li Weihong *et al.*, 2009).

## CONCLUSION

Hailaer Paramos Climate Zone has certain impact on the quality of Rex Rabbit hides, but the impact is not significant, mainly because Rex Rabbit is indoor feeding which has less affected by natural ambient temperature. This result also shows that attention should be paid to the feeding house management when feeding the Rex Rabbit to ensure breeding economic benefits. Overall, the hide of Rex Rabbits is good in quality in spring and autumn. At the same time, by analyzing the data, it can be seen that the production advantages of the different varieties of Rex Rabbit vary. On the whole, the quality of hides of Venus Rex Rabbit is quite good and Local Rex Rabbit has much room for improvement.

## ACKNOWLEDGEMENTS

This Project was supported by National Modern Agricultural Rabbit Industry Technology System CARS-44-15

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