

EVALUATION AND CORRELATION ANALYSIS ON QUALITIES IN PELT AND MEAT OF REX RABBIT

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Abstract - Since Rex rabbits were introduced, the qualities of pelt and meat have been reduced because of degeneration of variety and extensive management and so on. 28 Rex rabbits were slaughtered to study the change and correlation of qualitative characteristics of pelt and meat. A scientific basis for reference will be provided for breeding, feeding and management of Rex rabbit. The results showed that area of skin was 1099cm². The density of hair was 10575 pieces/cm². The length of hair fibre was 1.75cm. The diameter of hair fibre was 20.176 µm. Body weight and dressing percentage were 1981 g and 67.09% respectively. The pH, percentage of losing water, shear force value, cooking loss, content of fat and inosinic acid of muscles were 6.148, 33.93%, 2.413 kg/cm², 40.83%, 1.503%, 1.96 µg/g respectively. The positive correlations of area to body weight, dressing percentage, shear force value and content of fat were highly significant (P<0.01). The positive correlation of skin thickness to body weight was highly significant (P<0.01). The negative correlations of skin thickness to dressing percentage, inosinic acid were highly significant (P<0.01). The positive correlations of hair length to shear force value, content of fat were highly significant. The negative correlation of hair density to dressing percentage was highly significant.

INTRODUCTION

The principal value of Rex rabbits is their pelt, the meat is secondary. There are many fine characteristics with the pelt, for example, the fibre of hair is short, thin, close, beauty and firm etc. Thickness and softness of skin are moderate. There is more protein, higher digestibility, lesser fat and cholesterol in their meat, so many people like it. But the qualitative characteristics of fur and meat are being decreased recently because of extensive management and shortage of breeding purpose (QU YIBAI, 1993). To study, evaluate these characteristics and analyse their correlation are very necessary. It can provide a scientific basis for breeding, feeding and management.

MATERIAL AND METHOD

Experimental Animals - 28 Rex rabbits come from Rex farm in Wang Du Hebei province in May 1995. Their age was 4.5 months. Body weight was about 2000g.

Feeding and Management - The experimental rabbits were caged in single-layer cage. There were 2-3 rabbits in every cage. These rabbits fed on mixed feed which nutrient level was : DE 10.5 MJ/kg, CP 17.01%, fibre 15.10%, Ca 0.5%, P 0.47%.

Measured parameters and Method - The main parameters were slaughter weight, area of skin, thickness of skin, length, density and diameter of hair fibre, carcass weight (including head), pH, percentage of water losing, cooking loss, shear force value, content of fat and inosinic acid of muscles.

Slaughter weight : After these rabbits had not been fed for 24h, we measured body weight.

Area of skin : The length was measured from centre of neck to pelvis. The width was measured in worst. Length x width is area.

Thickness of skin : It was measured with a thousand degrees scale on shoulder, back and rump.

Length of hair fibre : It was a stretched length. 100 pieces were measured in every position (shoulder, back and rump).

Diameter of fibre : It was measured with micro-projector.

Density of hair : It was the numbers of hair fibre in 1 cm² on shoulder, back and rump.

Carcass weight : It was the weight that slaughtered rabbit's bladder, stomach, intestine, liver, lungs are removed from the body.

pH of muscles : The pH of *longissimus* muscles in last thoracic vertebra was measured with pH-meter.

Water binding capacity: Cut a piece of muscles about 1 cm thickness from *longissimus* muscle between 1-2 lumbar vertebra and put a pressure (35kg) on the piece for 5 minutes.

The formula was :

$$\frac{W1 - W2}{W1} \times 100 \%$$

W1 : weight before pressured

W2 : weight after pressured

Cooking loss: The *psaos* without membrane and fat was steamed in boiling water for 0.5h. Then it was refrigerated for 15 minutes.

Shear force value : It was measured by using tenderometer.

Dry matter: It was measured after drying in a stove.

Content of fat : It was measured by Soxhlet.

Content of inosinic acid was measured by spectrophotometer.

Data processing : Average, standard deviation and coefficient of variation (CV) were obtained by least square analysis. Correlation between qualities of pelt and meat were analysed.

RESULTS AND DISCUSSION

Quality of pelt (Table 1)

Area of skin and thickness - Area is a important standard to evaluate the quality of skin. The more the area is, the higher the utilisation rate is. In 1982, "Classify Standard about Rex Skin to Try Out" was laid down by import and export corporation in local product in China. It showed if area surpasses 1111.11 cm², the skin was the first rate, surpasses 944.44 cm² it was secondary. The result showed that the average area of skin was 1099.047 cm² and 38.98 % were the first rate. The least area was 1020 cm². It was obvious that the area of all skin was good.

The thickness of skin reflects sturdiness. The evenness of thickness is a important factor which influences utilisation rate of skin (TAO YURONG *et al.*, 1993). The result showed that the thickness was 3.986 mm. It was larger than the result which was measured by TAO YURONG *et al.* (1993). But it was similar to the thickness of New Zealand rabbit skin. It was obvious that Rex skin is thicker and lower in evenness.

Table 1 : Results of quality of rex pelt

content	area (cm ²)	thickness (mm)	length (cm)	diameter (µm)	density (pieces/cm ²)
\bar{X}	1099.047	3.986	1.753	20.176	10575.33
Sx	67.825	0.392	0.209	2.205	2584.534
C.V. (%)	6.171	9.840	11.920	10.930	24.444

Length, Density and Diameter of Fibre - Moderate length, density and diameter of standard fibre is 1.3-2.2 cm, 14-19 µm and 15000-30000 pieces/cm² respectively . It is the best when length is 1.6cm (TAN QIZHAO *et al.*, 1995; HOU SHINLI, 1995). The result showed that length of fibre was 1.75cm, C.V. 11.95% ; diameter was 20,176µm. C.V. 10.93% ; density was 10575 pieces/cm². Length and diameter were larger than standard and density was lower than standard.

The principal reason was unsuitable slaughter season. In general, the best season is winter and fibre of hair is thinner, thicker and smoother. The spring takes second place. The summer is the worst.

Age and body weight also influence the quality of skin. When Rex's age is 6-6.5 months old and it's weight is 3.0 kg, the quality of skin is better. In our experiment, Rex rabbits were 4.5 months old and 2.0 kg, and close inbreeding can be exist between breeds. These were factors to decrease quality of skin.

Quality of Carcass (Table 2)

Slaughter Weight - The result was showed on Table 2. The average body weight at the age of 4.5 months was 1.981kg but meat rabbit's weight was 2.0 kg at the age of 3 months (XING HUA *et al.*, 1994). Moderate weight of Rex is 2.5 kg at the age of 4-5 months (DU YUCHUAN, 1993). It is obvious that the average daily weight gain was lower in Rex rabbit than meat rabbit and standard velocity of Rex do. The reason were extensive management, close inbreeding and unsuitable environment condition.

Dressing Percentage - Dressing Percentage is a important index to evaluate meaty properties. The result showed that dressing percentage was 67.09%. It was higher than results which were measured by FENNELL *et al.* (1990) and ZANG SUMIN *et al.* (1994) with meat rabbit. It was suggested that the larger Rex should be remained when quality of skin does not be influenced.

Table 2 : Results of meaty properties

content	body weight (g)	dressing percentage (%)	pH	rate of losing water (%)	cooking loss (%)	content of fat (%)	content inosinic acid ($\mu\text{g/g}$)	shear force value (kg/cm^2)
X	1981.389	67.094	6.148	33.926	40.825	1.503	1.957	2.413
Sx	83.696	1.426	0.136	2.921	3.164	0.043	0.037	0.058
C.V. (%)	4.220	2.130	2.250	8.610	7.750	2.840	1.870	2.402

Quality of Meat

pH of the meat - pH of muscles is a important index to evaluate quality of meat. The higher the pH of muscle is, the slower the speed of glycolysis is. There is lesser seepage of water from muscles (JIANG BIGUANG, 1995)(XING HUA *et al.*, 1995). Going bad of protein is more difficult. The result showed that pH was 6.148. It was lower than the result which was measured by JIANG BIGUANG (1995), XING HUA (1994) with meat rabbit. It was obvious that the muscles preservation of Rex was more difficult.

Capacity of Binding Water - The rate of losing water is used to express the capacity of binding water. When rate of losing water is lower, the speed of glycolysis decreases. There is a lesser loss of nutrition in muscles (JIANG BIGUANG, 1995). The result showed that rate of losing water of *longissimus* was 33.9%. It was higher than the results which were measured by JIANG BIGUANG *et al* (1995), XING HUA *et al.* (1994) with meat rabbit. Therefore, Rex rabbit's muscles was unsuitable for a long time conservation.

Shear Force Value - The tenderness of muscle is expressed using shear force value. The lesser shear force value the muscle is, the tenderer the muscle is. The result showed that shear force value was 2.413 kg/cm^2 . It was lower than the result which was measured by somebody with New Zealand rabbit (XING HUA *et al.*, 1994). Rex's muscles were tender and palatable.

Cooking Loss - It is also a important index to evaluation quality of meat. The higher the cooking loss of muscles is, the more it loses when muscle is cooked. The result showed that cooking loss was 40.83%. It was higher than which were measured by XING HUA *et. al* (1994), JIANG BIGUANG (1995), NATHE (1993) with meat rabbit.

Chemical Composition of Muscles

Content of Fat - Juiciness and taste are influenced by content of fat. In certain range, when content of fat is higher, the taste and juiciness are better. The result showed that content of fat was 1.503%. It was lower than the result which was measured by ZANG SUMIN (1994) with meat rabbit.

Content of Inosinic Acid - Inosinic acid is a important componet of the fresh taste of muscle. When the content is higher, there is better fresh taste in muscles (SU SHUZHEN *et al.*, 1993; ZAN SUMIN *et al.*, 1994). The result showed that content of inosinic acid was 1.96 $\mu\text{g/g}$. It was lower than the result which was measured by ZHAO GUOXIAN (1995) with meat rabbit. So the fresh taste of Rex's muscles is shorter.

Correlation Analysis between Qualities of Pelt and Meat (Table 3)

The results showed that positive correlation of skin area to slaughter weight, dressing percentage, pH value, shear force value, content of fat were significant or extremely significant ($P < 0.05$ or $P < 0.01$). It was obvious that the larger slaughter weight is, the larger area of skin is, the higher dressing percentage is, the better conserved property is, the more juice in muscles there is. But when the area of skin is larger, the shear force value of muscles is larger, the tenderness is lesser. Although the area in per weight is smaller when body weight is larger, total absolute area is also larger. When weight is larger, there are thicker fibre and larger shear force value in muscles. In this moment, the speed of glycolysis is slower and there is lesser lactic acid to be produced, so pH value was higher. According to the changing laws of growth wave, muscles growth is principal in earlier stage, deposition of fat is later stage. Therefore, there was a higher content of fat in larger Rex than when weight is smaller Rex. The positive correlation of slaughter weight to skin thickness was extremely significant ($P < 0.01$). Negative correlations of thickness of skin to dressing percentage, content of inosinic acid were extremely significant ($P < 0.01$). It was obvious that the dressing percentage of Rex with thicker skin was lower than that skin was thinner when body weight was same. Fresh taste was shorter when weight was larger.

The positive correlations of length of fibre to shear force value and content of fat were extremely significant ($P < 0.01$). Negative correlation of fibre density to dressing percentage was extremely significant ($P < 0.01$). There were not significant correlation between others qualities of pelt and meat ($P > 0.05$).

Table 3 : Results of correlation analysis between qualities of pelt and meat

content	body weight	dressing percentage	pH	rate of losing water	Shear force value	cooking loss	content of fat	content inosinic acid
area	0.7386**	0.05685**	0.4107*	-0.0175	0.5175*	0.3681	0.7706**	0.1350
thickness	0.6129**	-0.5071**	-0.2940	-0.2252	0.1629	0.1471	0.2418	-0.6667**
length	0.2846	0.0949	-0.1573	-0.0580	0.5580**	0.1730	0.6767**	0.3394
diameter	0.2134	0.3082	-0.0733	0.2121	0.0880	0.3326	-0.1172	-0.0376
density	0.2986	-0.6425**	-0.2400	-0.2400	-0.1006	0.1873	0.3108	0.1265

notes : * = $P < 0.05$

** = $P < 0.01$

GENERAL DISCUSSION

It was known that area of Rex skin accorded with standard of grade by measuring skin of Rex. But because of some reasons, quality of pelt was reduced, for example, mixing blood, extensive management, and slaughter in bad time etc. These factors induce increase on the length, diameter of fibre and decrease on density of fibre. I think the principal method is to select breed frequently, avoid close breeding and mix blood, supply enough nutrition for growth of hair, create suitable condition and control age of slaughter.

In view of the facts that quality of pelt and meat were reduced, we should select larger Rex in weight and improve environment condition under quality of pelt does not been influenced.

The report about fat and inosinic acid in Rex's muscles is discovered by author. The results only become a basic to evaluate quality of muscles.

The results showed that slaughter weight, dressing percentage and content of muscles' fat were increased correspondingly when qualities of pelt were improved, but there was a decrease in tenderness and fresh taste of muscles. We should be overall balance in the selection of breed in the days to come.

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獭兔皮、肉性能评定及其相关关系研究

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摘 要

獭兔(力克斯兔)自引入我国后,由于品种退化,饲养管理的粗放及其它各方面的原因,使其皮肉性能产生下降的趋势。本试验以28只獭兔为材料,研究其在现有条件下的皮、肉品质变化及其相关关系,旨在为今后獭兔选育和科学饲养管理提供依据。结果表明,4.5月龄的皮张面积为 1099cm^2 ,被毛密度为 $10575\text{根}/\text{cm}^2$,毛纤维长度和直径分别为 1.75cm 和 $20.176\mu\text{m}$ 。宰前活重平均为 1981克 ,带头屠宰率为 67.09% ,肌肉的pH值、失水率、剪切力、熟肉率分别为 6.148 、 33.93% 、 $2.413\text{千克}/\text{cm}^2$ 、 59.17% 。肌脂率和肌苷酸含量分别为 1.503% 和 $1.96\mu\text{g}/\text{g}$ 。皮张面积与宰前活重、屠宰率、剪切力和肌脂率间呈较强的正相关;皮厚与活重呈正相关,而与屠宰率和肌苷酸含量呈负相关;毛长与剪切力和肌脂率呈正相关;毛密度与屠宰率呈负相关。以上相关关系均达到显著以上水平($P < 0.01$)。其它皮肉性状间相关关系不显著($P > 0.05$)。

关键词:獭兔;毛皮;肉;相关