EFFECTS OF DIFFERRENT STRAINS AND COMBINATIONS ON THE PRODUCT PERFORMANCE OF REX RABBIT

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ABSTRACT

The productive performances of American (A), German (G) and French (F) rex rabbit were compared under same raising conditions. The A is the best for litter size at birth and at weaning, birth and weaning weights (30-days old), and survival rate of weaned rabbit. For the same traits, F is better than G, while F was the second for the individual weight at weaning and 3-month old. At 5-months of age, G had the highest body weight followed by F and A. The fur density, length and skin area at 3-months and 5-months old of the G are the highest. The fur length at 3-months old is similar to that at 5-months old, the fur length of G is longer than that of F and A is the shortest. These data showed: G and F rex rabbit had strong capacity of growth development and fur follicle differentiation. Crossing rex rabbits of A type as dam with G and F types as sire, respectively G×A and F×A were made. The results showed that cross rabbit had better reproductive performances than F and G, but were similar to A. The rabbit reproductive performances were mainly determined by the dam. The experiment was conducted to compare birth weight and weaning survival rate between the two crossbreds. No significant differences were observed. The litter size at birth and at weaning, daily gain and fur thickness of crossbreds rabbit were better than for F, A and G. Thus the crossbreed had the highest commercial value. A second crossbreeding experiment with the two above crossbreds as dam and G and F rex rabbit as sire, G×FA and F×GA, respectively, was conducted. The result showed G×FA crossbred reproductive performances were the best among the four crossbred types. Except for litter size weight at birth, significant differences were observed between G×A, F×A and F×GA for other traits. To conclude, when crossbreeding was carried on, A type was the ideal dam and F and G are the ideal sires. Performances of A×F and A×G were similar. When using A×F and A×G as dams and F and G as sires, the reproductive performances, body condition and fur quality of crossbreds were better than in the parents and G×FA was the best. Thus G×FA was the best combination in practice.

Key words: Rex rabbit, growth development, fur density, fur length, reproductive performances.

INTRODUCTION

Rex rabbit is a typical kind of animal used for fur production. Owing to its excellent profile, it was favored of the consumer. China had successively introduced different strains of Rex rabbit from the United States, Germany and France and organize its production in various regions in China to promote the development of the rex rabbit industry. Because of the different breeding systems, objectives and management conditions in different area, three strains have formed the different characteristics. As a result of natural and artificial selection, this characteristic is clearer. For example, the American type is a small animal with a low fur density, but its adaptability, disease-resistant and reproductive abilities are better. The fur density and growth rate of French and German stain are superior to the American one. How to reasonably using these genetic resources is a very important problem.

MATERIAL AND METHODS

Animals and management

Rex rabbit of American (A), German (G) and French (F) strains were used. All the rabbits were raised under same nutritional conditions. They were fed with balanced nutrition pellet and drunk freely. Young rabbit were weaned at the 30 days old.

Crossbreeding experiments

In a first cross breeding experiment and according to the different characteristics of the three strains, the American strain does were chosen as dam, while the German and the French were used as sire in order to produce GxA and FxA crossbred.
In a second crossbreeding experiment, GxA and FxA does were crossed with French and German sires respectively in order to produced FxGA and GxFA crossbred animals.

Measurement of productivity abilities and data analysis

In this experiment, the reproductive abilities (litter size, litter weight) at birth and at weaning, survival rate at weaning, growth rate and animal status of the three purebred and different crossbred does were measured under the same nutritional and management conditions. All data were analysis by using SPSS software.

RESULTS

Reproduction of different strains

Result given on table 1 showed that the average litter size was 7.76, 6.96 and 7.28 respectively for American (A), German (G) and French (F) pure breeds. Among these strains, A was the best and there were highly significant differences between A and G

(p<0.01) and significant differences between A and F (p<0.05). But there were no differences on the litter weight between the three strains. Litter size at weaning was 7.09, 6.19 and 6.58 respectively for A, G and F. A was the best with a high significant difference (p<0.01) and a significant difference (p<0.05) respectively compared with G and F. There were no notable differences (p>0.05) between strains for the litter weight at 30 days old. The highest survival rate at weaning was observed for A, but compared to G and F there was no statistical differences.

Table 1. Reproductive performances (mean ± SD) of the different strains.

Strain	Litter number	Litter size at birth	Litter weight at birth (g)	Litter size at weaning	Litter weight at weaning (g)	Survival rate (%)
A	120	7.76±1.78^{a}	397.3±75.5^{a}	7.09±1.33^{a}	3249.7±571.0^{a}	91.33^{a}
G	120	6.96±1.63^{c}	389.8±79.1^{a}	6.19±1.31^{c}	3383.9±575.6^{a}	88.94^{a}
F	120	7.28±1.74^{b}	391.6±74.5^{a}	6.58±1.42^{b}	3362.5±550.5^{a}	90.45^{a}

Figures followed by different letters are significantly different (p<0.05 or p<0.01).

Fur density and growth performance of different strain

Growth performances and fur characteristics are given on table 2. Weaning weight of G was higher than F and A. There were highly significant differences (p<0.01) between A and G and significant differences between F and G (p<0.05). A similar trend was observed for growth performances at three and five months of age. Among the three strains, the highest fur density was observed on G. There was no significant differences on fur density between G and F, but F and G had a significant higher fur density than A at both three months old (p<0.05) and five months old (p<0.01). The longest fur length was observed on G, but there were no significant differences between G and F while A showed a significant shorter fur length (p<0.05) at both three and five months old. The largest skin area was observed on G with no statistical differences between F and G while A showed a significant smaller skin area (p<0.05).

Reproductive performance of different strain combinations

Table 3. Statistics (mean ± SD) on the reproduction performances of different strain combinations

Strain	Number	Litter size at birth	Litter weight at birth (g)	Litter size at weaning	Litter weight at weaning (g)	Survival rate (%)
G×A	120	7.73±1.35^{b}	407.2±63.5^{a}	7.15±1.34^{b}	3380.1±593.9^{a}	92.53^{a}
F×A	120	7.76±1.31^{b}	399.5±62.5^{a}	7.17±1.32^{b}	3363.4±585.2^{a}	92.42^{a}
F×GA	90	7.70±1.46^{b}	409.6±63.8^{a}	7.17±1.29^{b}	3481.4±595.3^{a}	93.12^{a}
G×FA	90	8.08±1.49^{a}	413.5±64.4^{a}	7.61±1.38^{a}	3464.4±588.9^{a}	94.23^{a}

Figures followed by different letters are significantly different (p<0.05 or p<0.01).

Table 2.Statistics (mean ± SD) of fur characteristics and growth performance of the different strains

Strain	Weaning		3 months old				5 months old				
	N	Weight (g)	N	Weight (g)	Fur density (fibre/cm^2)	Fur Length (cm)	N	Weight (g)	Fur density (fibre/cm^2)	Fur Length (cm)	Skin area (cm^2)
A	850	458.4 ± 46.8^c	350	1788.5 ±135.2^c	11522 ±1044^b	1.75 ±0.12^b	300	2676.4 ±145.7^b	13983 ±1152^c	1.76 ±0.11^b	1150.2 ±87.0^b
G	742	546. 7 ± 56.1^a	350	2273.1 ±198.8^a	13816 ±1321^a	1.98 ±0.21^a	300	3116.3 ±176.1^a	16856 ±2512^a	1.94 ±0.14^a	1255.0 ±95.4^a
F	807	511.0 ± 54.8^b	350	2160.2 ±181.4^a	13435 ±1239^a	1.86 ±0.18^a	300	3013.5 ±155.6^a	16388 ±2223^a	1.89 ±0.12^a	1231.5 ±93.6^a

Figures followed by different letters are significantly different ($p<0.05$ or $p<0.01$).

Table 4. Statistics (mean ± SD) on growth performance and fur characteristics of different strain combinations

Cross bred	Weaning		3 months old				5 months old				
	N	Weight (g)	N	Weight (g)	Fur density (fibre/cm^2)	Fur length (cm)	N	Weight (g)	Fur density (fibre/cm^2)	Fur length (cm)	Skin area (cm^2)
G×A	858	490.2 ± 55.3^b	250	1986.3 ±206.3^c	12732 ±1431^b	1.88 ±0.15^a	250	2999.1 ±228.6^b	15242 ±1707^b	1.89 ±0.16^a	1228.1 ±92.9^a
F×A	860	479.6 ± 50.4^b	250	1947.6 ±202.3^c	12604 ±1416^b	1.82 ±0.13^a	250	2986.1 ±233.6^b	15135 ±1699^b	1.83 ±0.15^a	1225.1 ±93.2^a
F×GA	430	519.6 ± 55.1^a	250	2376. ±246.8^a	13834 ±1552^a	1.87 ±0.21^a	250	3135.4 ±245.3^{ab}	16553 ±2003^a	1.89 ±0.19^a	1259.4 ±95.8^a
G×FA	456	527.5 ± 54.4^a	250	2413.6 ±251.4^a	13945 ±1566^a	1.89 ±0.22^a	250	3229.3 ±258.5^a	16890 ±1875^a	1.92 ±0.24^a	1280.3 ±97.1^a

Figures followed by different letters are significantly different ($p<0.05$ or $p<0.01$).

Reproductive performances of the different crossbreds are given table 3. There were no notable differences ($p>0.05$) on reproductive performance between GxA and FxA, but significantly differences were observed between FxGA and GxFA ($p<0.05$) on litter size at both birth and weaning. No differences ($p>0.05$) have been seen on the others traits. The best reproductive performances were observed for G×FA crossbred.

Growth performance and fur characteristics of the different crossbreds.

Growth performances and fur characteristics of the different crossbreds were given on table 4. Weaning weight of the strain A, F and G descendants were smaller than of the crossbred ones. The difference is highly significant（$p<0.01$）at three months old and significant ($p<0.05$) at five months old. The weight of the three-way crossbreds was superior to that of two-way crossbreds and the differences were significant ($p<0.05$). The highest weight was observed on G×FA. There was no significant difference ($p>0.05$) on fur length among the different combinations. The skin area of the two-way cross descendants was similar to that of G and F but was lower than that of the descendant crossed by the three different strains but the differences were not significant ($p>0.05$). The best growth and fur characteristics performances were observed on G×FA.

DISCUSSION

Reproductive performances of the three pure breed strains

The reproductive performances of strain A are superiors to the other two ones. The number of born rabbits per litter was 0.48 (6.59%) and 0.8 (1.49%) higher in A than F and G respectively. Differences are lower than reported by FU and LIU (2002) but higher than WANG and WANG (2002). Weaning survival rate of A was the highest and G was the lowest. The growth rate and fur density of G and A was absolutely better than A. Specially G have stronger growing potential and hair follicle differentiation abilities. The fur length of the three strains was all over the optimum length (1.6 cm) and G is the longest. The results are consistent with ZANG and LI (1996) and WANG and WANG (2001), but lower than reported by ZHAO and LIN (2001).

Productive performance of crossbred animals

No reports on comparison between different strain rabbit about reproductive performances were found. The research indicates that the litter size of the binary crossbred surpasses that of strain F and close to strain A. So crossbreeding is a good method to improved reproductive performances and selection of parents is important. The crossbreds show a better survival rate at weaning. The weaning litter weight was not different between purebred strains and crossbred animals. But owing to a higher litter size the individual weaning weight of A is lower than those of crossbred. The individual final weight and fur density of crossbreds is closed to that of the purebred sires, so it had a great economical profit.

Comparison between two-way and three-way crossbreds

The original weight between two-way crossbreds was similar. Three-way cross is better than the two-way one for the litter weight at weaning, survival rate, growth performances and fur density, but the differences were not significant .

The trials indicate that A is a perfect sire for crossbreeding with G or F as dam. It can fully use the three strain advantages. It is an efficient method for increasing Rex rabbit commodity profiles. The offspring of the two-way crossbreeding are used as the dam, and G and F as sire respectively. The offspring of three-way cross, particularly G×FA is superior for reproductive performances, growth rate and fur quality and always better than the two-way cross. This three-way cross is the optimum way to produce commercial Rex rabbit.

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