THE PRIMARY ESTIMATION OF HERITABILITIES OF SEVERAL MAIN CHARACTERS IN SAIBEI RABBITS

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Abstract - Sampling tests of several main characters were carried out in Saibei Rabbit herds in which the rabbits were raised under the similar conditions on the whole. The heritabilities of their several main characters were estimated as follows :

1. The heritabilities of several reproductive characters range from 0.1 to 0.24 ;
2. The heritability of daily gain from 7 weeks to 13 weeks is 0.53 ;
3. The heritabilities of adult weight and body length and heart girth range from 0.23 to 0.42.

INTRODUCTION

A Saibei Rabbit is a giant body, fur and meat dual-purpose new strain that was crossed, strictly selected and bred with two votations of French Buck Rabbits and Belgian Flemish Giant Rabits as parents. It has the characters of giant body, fast growth, high meat ration and high quality fur, and so on. It is important for us to estimate the heritabilities of several main characters of Saibei Rabbits to improve the level of offspring selecting and to short the breeding cycle. The results will provide technique data for more estimating on the genetic parameters of Saibei Rabbits.

MATERIAL AND METHODS

The materials of estimation came from the Saibei Rabbit herds feeding situation of which was similar before 1988. The range of samples was within the limits of $\bar{x} \pm 2s$.

Characters

Those consist of 8 characters : 4 reproduction, 3 maturity and 1 growth. They are litter size at birth, individual weight at birth, litter weight at 21 days, individual weight at weaning, maturity weight, maturity chest measurement, maturity body lengh and 7-13 weeks old daily gain.

Methods for estimation

The heritabilities were estimated via the method of correlation of same father half sib. The formula of estimation is as follows :

$$r_{HS} = \frac{MS_s - MS_w}{MS_s + (n_0 - 1)MS_w}$$

Where, r_{HS} means coefficient of correlation in the same group, MS_s means mean square between the male rabbits, MS_s means mean square within the male rabbits, no means the numbes of daughter of the male rabbit. When the numbers of daughter of the male rabbits are not equal the formula of calculating weighted average is as follows :

$$n_0 = \frac{1}{S-1}\left(N - \frac{\sum n_i^2}{N}\right)$$

where, S means the numbers of the male rabbits. N means the numbers of daughter in the sample. Σn^2_i means the sum of squares for the numbers of daughter in per male rabbit.

According to the principe of path coefficient, four times of coefficient of correlation in the same father half sib is heritability, that is, $h^2 = 4r_{HS}$.
The heritabilities estimated must be t-tested, the formula of t-test is as follows :

$$t = \frac{h^2}{\delta_{h^2}} = \frac{4r_{HS}}{4\delta_{r_{HS}}} = \frac{r_{HS}}{\delta_{r_{HS}}}$$

Where, h^2 means heritability and δh^2 means standard error of heritability and r_{HS} means coefficient of correlation in the same father half sib and δr_{HS} means standard error of coefficient of correlation in the same father half sib.

The calculating formula of standard error of coefficient of correlation in the same father half sib is as follows :

$$\delta_{r_{HS}} = \sqrt{\frac{2[1+(n_0-1)r_{HS}]^2(1-r_{HS})^2}{n_0(n_0-1)(s-1)}}$$

where, n_0 means the numbers of daughter in per male rabbit and S means the numbers of male rabbits and r_{HS} means coefficient of correlation in the same father half sib.

RESULTS AND DISCUSSION

1. The phenotypic parameter of main characters in Saibei Rabbits (Table 1).

Table 1 : Phenotypic parameters of main characters in Saibei Rabbits

Trait X	Litter size at birth	Individual weight at birth	litter weight at 3 weeks old	Individual weight at weaning	7-13 weeks old daily gain	Maturity weight	Maturity body length	Maturity chest measurement
Statistic amount (n)	2417	56	148	82	100	783	679	679
Mean (x)	7.1	64	1828	829	24.4	5370	51.6	37.6
Standard deviation (s)	2.23	10.1	417	115	4.85	444	1.74	3.31
Coefficient of variation (cv)	31.4	15.8	22.8	13.9	19.9	8.3	3.4	8.8

The result in Table 1 indicates that the coefficients of variation of 8 characters in Saibei Rabbits all range from 8.3 % to 31.8 % except maturity body length. The coefficient of variation of maturity body length is 3.4.

2. Estimation of heritabilities (Table 2)

Table 2. Estimation of heritabilities of main characters in Saibei Rabbits

Trait X	Litter size at birth	Individual weight at birth	litter weight at 3 weeks old	Individual weight at weaning	7-13 weeks old daily gain	Maturity weight	Maturity body length	Maturity chest measurement
Amount	13(88)	18(131)	9(37)	23(139)	14(96)	30(150)	99(171)	118(204)
Heritability	0.19	0.18	0.115	0.24	0.53	0.32	0.23	0.42
T-test	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

Note : the numbers in ( ) are the nest numbers of daughter of male rabbit. The numbers out of ( ) are the numbers of male rabbit

3. The result in Table 2 indicates that the heritabilities of 4 reproductive characters range from 0.1 to 0.24. The heritability of individual weight at weaning is 0.24 and others are all below 0.2. These belong to low heritability in line with low heritability of reproductive characters. The reason of low heritability is that it is influenced by the factors of feeding, sampling and measurement, and so on. This also indicates that the

environment error is the main factor that effects on the variation of reproductive characters. So it has no evident effect on the use of individual selection. The methods of family, in family and combination selection can improve the performance of reproductive characters.

4. The heritability of 7-13 weeks old daily gain in Saibei Rabbits is 0.35. According to phenotypic value the accuracy of breeding value of estimation is higher. The trait can achieve better result of selection and culture using indidivual selection. The heritabilities of adult weight, body length and heart girth are of middle. The heritabilities range from 0.23 to 0.42. Selecting breeder rabbits can achieve better result by means of individual selection and index selection.

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