

# THE DETERMINATION OF SIMPLIFIED SELECTION INDEX OF REPRODUCTIVE CHARACTERS IN SAIBEI RABBITS AND ITS DIAGRAM CALCULATION

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**Abstract** - This article deals with the determination of simplified selection index of three reproductive characters in Saibei rabbits. The index formula to be solved is as follows :

$$I = 4.0546 P_1 + 0.0191 P_2 + 0.0439 P_3$$

Where, I means the index to be calculated,  $P_1$ ,  $P_2$ ,  $P_3$  mean the phenotypic values of litter size born alive, weight of litter at 21 days, rabbit weight at weaning. 4.0546, 0.0191, 0.0439 mean coefficient values of three reproductive characters. The procedure of calculation can be greatly simplified by using the method of diagram. Details of making a calculating diagram are presented.

## INTRODUCTION

A Saibei rabbit bred by means of crossbreeding is a new strain with a lot of fur and meat. It has such good characteristics as large build, high growth rate, strong resistance of disease, high meat production, crude feeding and strong adaptation. In order to retain these characteristics, select excellent individuals and purify herds, increase the weight of excellent individuals and improve the quality of rabbit herds, we have determined the simplified selection index formula of reproductive characters in Saibei rabbits and its diagram calculation.

## MATERIAL AND METHODS

### Source of the data of simplified selection index

According to the initial data of Saibei rabbits collected since 1980, we have estimated the heritabilities of main characters (Table 1). On the basis of economic values and economic importances of three reproductive characters of litter size born alive, weight of litter at 21 days, individual weight at weaning in Saibei rabbits, different weight values have been given (Table 2).

**Table 1 : The heritabilities of reproductive characters in Saibei rabbits (Unit : nest)**

Trait (x)	Statistic amount (n)	Heritability ( $h^2$ ) <sub>i</sub>	The method of estimation
Litter size born alive	13(88)	0.19	Correlation of half-sib
Wt. of litter at 21 days	9(37)	0.115	Correlation of half-sib
Individual wt. at weaning	23(139)	0.24	Correlation of half-sib

Outside the brackets are the numbers of male rabbits and inside the brackets are the numbers of daughter litter of male rabbits.

## The method of estimating the simplified selection index

The formula of determination of simplified selection index is as follows :

$$I = \sum_{i=1}^n \frac{W_i h_i^2 P_i}{\bar{P}_i} \quad (1)$$

In order to select breeding rabbits and contrast each other in different breeding farms and rabbit herds, we take the simplified selection index of three reproductive characters on an average as 100 so that the formula can be transformed as follows :

$$I = \sum_{i=1}^n \frac{W_i h_i^2 P_i \times 100}{\bar{P} \sum W_i h_i^2} \quad 2)$$

Where, I means the simplified selection index and  $P_i$  means the phenotypic value of individual at character i and  $\bar{P}_i$  means the mean phenotypic value at character i and n means the numbers of characters and  $W_i$  means the economic weight value at character i.

**Table 2 : The relevant data of three reproductive characters in Saibei rabbits (Unit : nest, g, zhi, %)**

Trait (x)	Statistic amount (n)	Average (p <sub>i</sub> )	Standard deviation (s)	Coefficient variation (c. v)	Economic importance (w <sub>i</sub> )	Heritability (h <sub>i</sub> <sup>2</sup> )
Litter size born alive	2417	7.1	2.23	31.4	0.25	0.19
Wt. of litter at 21 days	148	1828	417	22.8	0.50	0.115
Individual wt. at weaning	478	829	115	13.9	0.25	0.24

## The method of making the calculating diagram

There are so many female rabbits that we have to calculate thousands of times if each female rabbit is included in the formula.

It's really a hard job. But the calculating procedure can be greatly simplified by using calculating diagram and can even exceed an ordinary electron calculator.

The method of making a calculating diagram is "averaging way". First, according to the formula of determination simplified selection index the three character ranges must be computed. Second, dividing coefficient  $L_{p_1}$ ,  $L_{p_2}$ ,  $L_{p_3}$  of diagram rulers have to be calculated. The dividing coefficient of diagram ruler  $P_0$  and its position and the position of index ruler I and its the dividing coefficient must be determined also. Third, on the basis of the distance and length given the diagram rulers  $P_3$ ,  $P_2$ ,  $P_0$ ,  $P_1$  and I can be drawn one by one on a picture paper. Among them picture rulers  $P_1$ ,  $P_2$ ,  $P_3$  are averaged on the basis of ranges and picture ruler  $P_0$  is not graduated. The position of index ruler I at 100 can be determined. At last the index ruler I is divided into equal parts at 100 according to dividing coefficient  $L_I$ .

## RESULTS AND ANALYSES

### The determination of simplified selection index of reproductive characters in Saibei rabbits

In the light of relevant data of three reproductive characters the index formula to be solved is as follows :

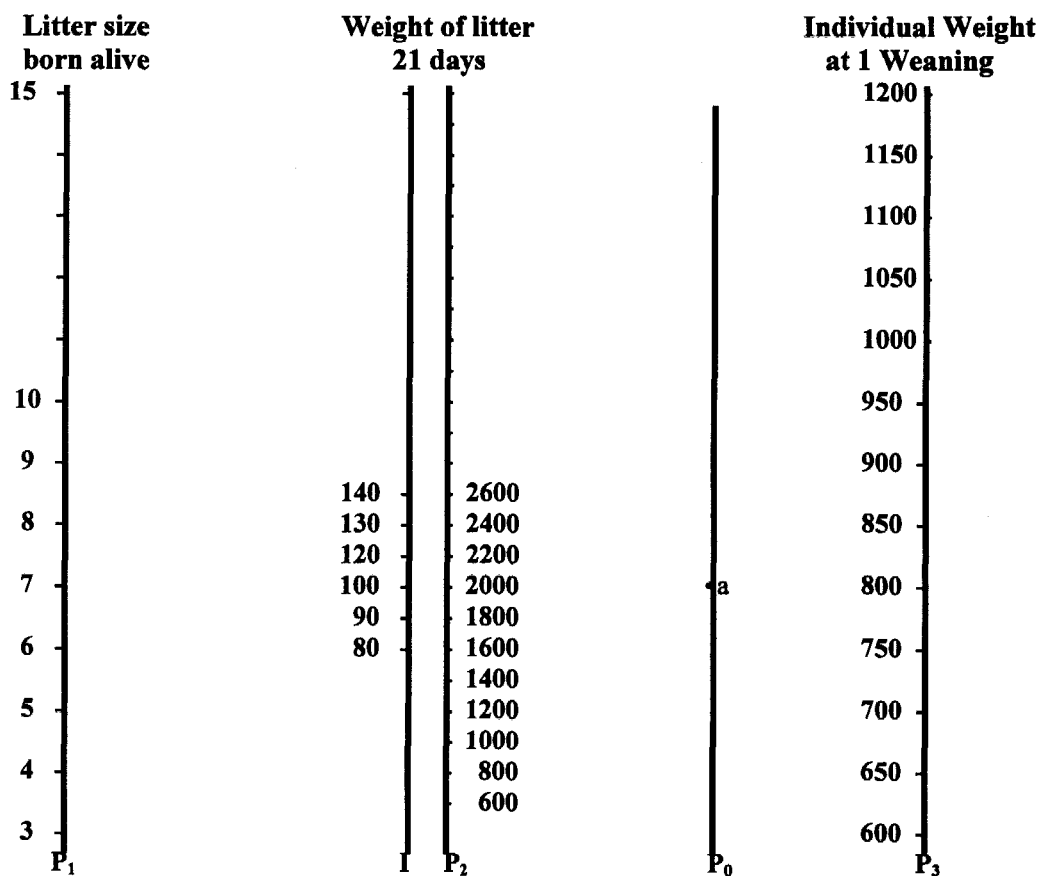
$$I = 4.0546P_1 + 0.0191P_2 + 0.0439 P_3$$

Where, I means simplified selection index and P<sub>1</sub> means the phenotypic value of litter size born alive and P<sub>2</sub> means weight of litter at 21 days and P<sub>3</sub> means individual weight at weaning.

So it can be know that the simplified selection index is the method of multiple traits selection and a form of compound breeding values. It considers not only heritability of per trait but also the economic value of per trait. In general, it excels not only the order selection but also independent culling. As far as the result of the order selection is concerned, if there is negative correlation between traits one productive performance will be improved while the other will be reduced. As for independent culling, if there is not correlation between traits the probability of the individual to be selected is only 0.41 % when the three traits of a individual are selected above one standard deviation of the average value of herd.

### The calculating diagram of three reproductive characters in Saibei rabbits (Figure 1)

Figure 1 : Calculating diagram of three reproductive characters in Saibei rabbits



### The illustration of the calculating diagram

If there are 8 rabbits in a litter, weight of litter at 21 days is 2245 grams and the individual mean weight at weaning is 944 grams, the selection index value of the individual can be evaluated by using calculating diagram. First, the point 2245 of ruler P<sub>2</sub> is connected with the point 944 of ruler P<sub>3</sub> with a line. The line can meet ruler P<sub>0</sub>. Second, this point is joined to 8 of ruler P<sub>1</sub>. The line crosses ruler I. The reading value of ruler I is 118. The index value is in line with the result of formula of simplified selection index. The index value calculated via the formula of simplified selection index is as follows :

$$I = 4.0546 \times 8 + 0.0191 \times 2245 + 0.0439 \times 994 = 118.9$$

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